



Conviron CMP5090

Service Manual

For controllers using:

Version 6.2 software
Independent temperature shut-off (ITSO)
External battery



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Chapter 1: Introducing this manual

Who the manual is for This manual is intended for service technicians and others with appropriate technical knowledge and experience for working safely on the CMP5090 controller. Some of this work involves both high voltage hazards and components that can be destroyed by electrostatic discharge (ESD).

This manual tells you how to look for the causes of problems and fix them – it is primarily a troubleshooting manual.

What the manual contains This manual contains the following:

Chapters:

1. *Introducing this manual*, which, in addition to this outline, provides some key warnings for working safely on the controller, some advice on contacting Conviron, and a block diagram of the control system.
2. *Troubleshooting*, which provides an overview of the troubleshooting process and details covering several situations.
3. *Alarms*, which provides a listing of alarms and how to respond to them.
4. *Procedures*, which covers replacing boards, triacs and drivers, pinging boards, verifying controller software configuration, using the diagnostic screen, and testing outputs.
5. *Boards and sensors – overview*, which provides general information on the boards and sensors and their connections.

Appendices:

- A. Glossary of Labels
- B. CMP5090 Major Component Reference List
- C. Cleaning and Maintenance

Note: *The software contained in the CMP5090 controller is the property of Conviron or its licensors and is protected by copyright law.*

Equipment safety

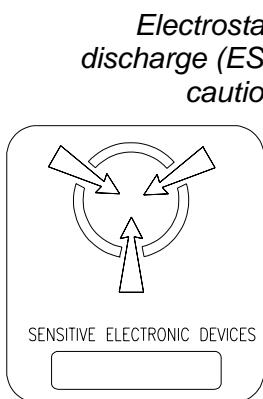
Water cautions



Water damage hazard:

Direct spraying of water and standing water in or around the chamber that could come in contact with the electrical components present the risk of water damage to both high and low voltage electrical components. Avoid these conditions. If you have any doubt of safe

watering practices, contact Conviron.



**Electrostatic
discharge (ESD)
cautions**

Electrostatic hazard:

Many electronic components used in the controller can be damaged or destroyed by electrostatic discharge (ESD) potentials that you cannot even feel.

You can discharge 5000 volts without feeling the shock. This voltage, however, is strong enough to destroy many of the components of the controller.

If you must handle the boards, you must wear a grounded wrist strap. The best ground is to the triac heat sink. In addition,

- Do not let anyone work on the control panel who is not wearing a grounded wrist strap. Make sure everyone that may work on the control panel knows about these procedures
- Do not touch any parts or conductors on the board, even when you are wearing a grounded wrist strap
- Do not lay paper on static-sensitive parts
- Use anti-static bags for components that you have removed for shipping to Conviron

Failure to follow proper ESD precautions may void the warranty!

Equipment Safety continued

Battery expiry / Memory-loss cautions



Memory-loss hazard:

A continuous supply of electricity to the controller is essential to preserve its memory. If its memory is lost, the controller won't operate and you will have to arrange for its replacement.

An external battery provides backup for the regular supply of electricity to maintain continuity for brief periods when the regular supply may not be available.

The battery must be replaced (see Procedure 4:11) at intervals NOT exceeding 5 years to ensure that the battery is ready to perform as expected.

To promote battery life:

- ➔ Keep the controller disconnect switch ON (use only the start/stop switch to turn electricity for the chamber on and off)
- ➔ Keep ambient temperatures within the range of human comfort

Characterization-loss caution



Characterization-loss hazard:

Only personnel familiar with the operation of the chamber should use the diagnostic screen. It is restricted to the highest security level, 40, if you have passwords turned on.

Conviron recommends password protection to prevent unauthorized persons from changing the software configuration. The lower part of the diagnostic screen allows access to the characterization settings. Loss or alteration of these settings could degrade performance to the point of loss of control.

Getting help: Conviron's technical support

Before you call Please look in the *Troubleshooting* and *Alarms* chapters for possible solutions before calling. You may find information that eliminates some possibilities and shortens the time to resolve the problem.



Chamber serial number required:

When you call Conviron for technical support, you must provide the model and serial number of the chamber. They are on a rating plate on the side of the chamber.

Numbers for technical support

Toll free in North America 1-800-363-6451

Regular telephone 1-204-786-6451

Fax 1-204-783-7736

Toll Free in Europe 0800 - 0326422

Regular telephone/fax 44 1353 749595

E-mail Technical Support Desk service@conviron.com

Parts Sales (NA) parts@conviron.com

Training Coordinator training@conviron.com

Customer Service (Europe) service@conviron.eu

Parts Sales (EU) parts@conviron.eu

Sales info@conviron.com

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Canada

World Wide Web



Check out Conviron's World Wide Web site at
www.conviron.com

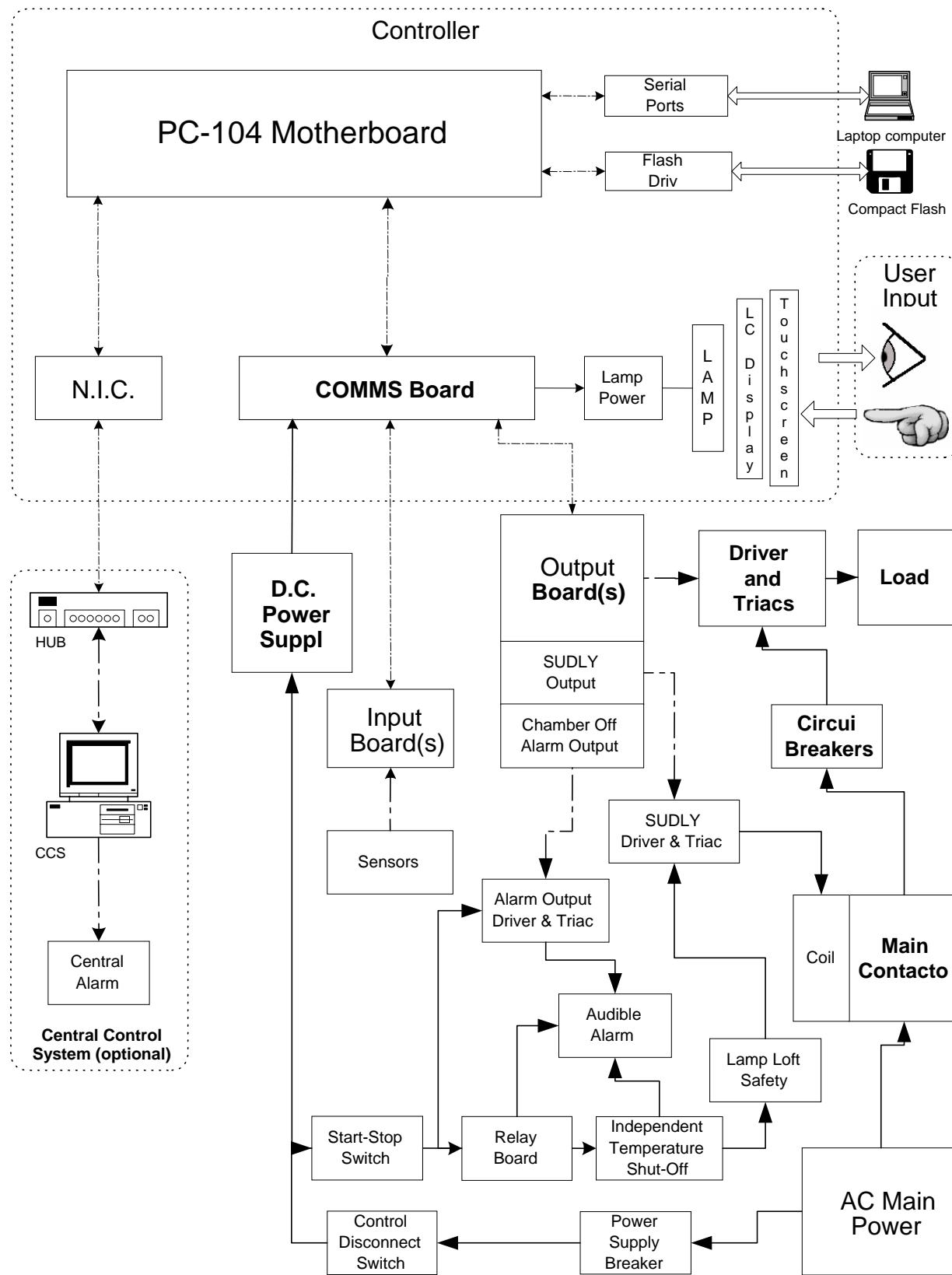


Figure Chapter 1: -1: Block diagram of control system

Chapter 2: Troubleshooting

The troubleshooting process

To fix a problem or to prepare for contacting Conviron for help with a problem, proceed as follows:

1. Scan the list of problems covered in this chapter and the list of alarms in the next chapter.
2. Go to the section that best fits the description of the problem or alarm.
3. Scan the list of symptoms and causes that might apply.
[Symptoms are not listed for all causes because in some cases the statement of the symptom and the statement of the cause are the same, and in others the symptoms are not apparent until more investigation is done.]
4. Look for evidence of the causes and apply the solution
5. If it is necessary to contact Conviron, take note of the model and serial number on the chamber, and see *Getting Help* in Chapter 1 for contact numbers and addresses.

Problems covered in this chapter

• Chamber will not start (controller is operating) <i>includes flowchart for analyzing problem</i>	2-2
• Controller will not complete startup	2-16
• Touch screen does not respond	2-20
• Flash drive does not work	2-22
• Controller restarts (reboots) unexpectedly	2-24
• Unusual sensor readings	2-26
• Output will not turn off	2-28
• Output will not turn on <i>includes flowchart for analyzing problem</i>	2-30
• Erratic chamber operation	2-34
• Display problems	2-36
• Board will not ping	2-38

Alarms generally reflect another set of problems. Alarms and how to respond to them are discussed in the next chapter, *Alarms*.

Layout of the following pages in this chapter

Note the facing-pages layout—symptoms, causes, and solutions appear on the left and background and illustrations for the same problem on the right.

Problems and symptoms; causes and solutions

Layout: Note the facing-pages layout used in this chapter. Look at the left page for symptoms, causes, and solutions and at the facing page on the right for background and illustrations related to the same problem.

Chamber will not start (Controller is operating)

Symptom	Possible Cause	Solution
	Start/stop switch is in the off position	Make sure that the start/stop switch is on. When this switch is in the off position the main contactor cannot close. For the location of this switch on your chamber, refer to the Operating Manual.
	Electrical supply circuit breaker is turned off	Turn all power supply circuit breakers on.
	Controller is not running a program	Make sure that the program icon on the status screen is flashing. Run a program. The controller must be running a program before the contactor will be closed to operate the chamber.
	Controller is in diagnostic mode	Make sure that the diagnostic icon on the status screen is not flashing.
	Start-up delay (SUDLY) setting	Look at the start-up delay setting in the options screen to see whether the delay being experienced is within the range of the setting. This setting allows the user to set a delay before the chamber will start after a power failure. If the feature is enabled, the first time you run a program after restarting the controller, there will be a delay before the chamber will start.
	Control panel door or electrical access panel is open	Close the door or panel. Some chambers are equipped with power disconnect switches on the control panel door and access panels to all electrical areas. If any of these doors is open or if any of the switches is not in the closed position, the chamber will not start.

Chamber will not start (Controller is operating)

Background and Figures

For the chamber to start, the contacts in the main contactor must be closed. Otherwise no power is supplied to the chamber. The main contactor is part of the SUDLY circuit and all parts of this circuit must work to start the chamber.

The following is a list of all components that are part of the SUDLY circuit followed by a list of the software settings that affect this circuit.

Hardware:

- external power switch or breaker
- start/stop switch
- power supply breaker
- control panel door power disconnect switch (if installed)
- SUDLY triac and driver
- SUDLY fuse (if installed)
- relay board
- independent temperature shut-off (ITSO)
- temperature sensor
- lamp loft hi limit safety switch (Lamp Loft 70°C Limit)
- main contactor

Software settings:

- startup delay settings in options screen
- TEMP settings
- controller must be running a program or in diagnostic mode

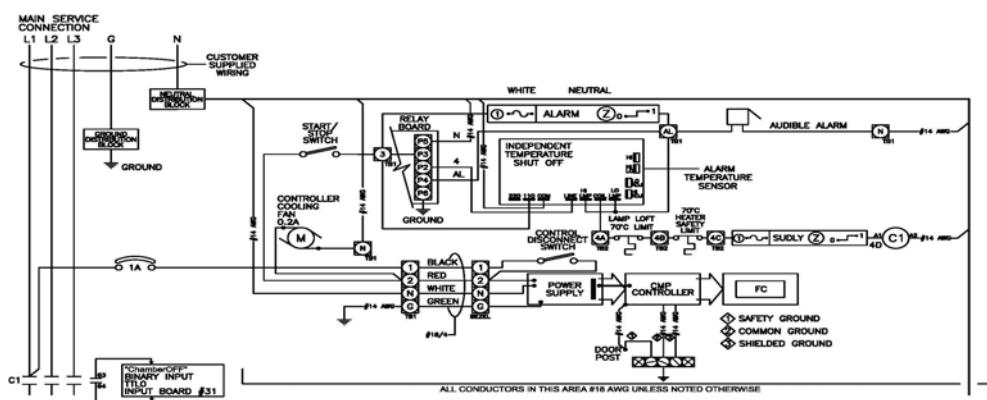


Figure Chapter 2: -1: Typical SUDLY circuit

With the start/stop switch off and the controller disconnect switch on, the user may set programs and learn the operation of the controller without the machine running. The central control system can also 'see' the unit when the start/stop switch is off.

Controller
Disconnect
Switch

Chamber will not start (Controller is operating) continued

Symptom	Possible Cause	Solution
	RS-485 bus cable is not connected to input or output boards or is defective	Make sure that: <ul style="list-style-type: none">the RS-485 bus cables are connected to the output boards, input board, and controllerthe communication LEDs on all boards are flashingall outputs are functioning correctly (Outputs can be tested using the diagnostic screen [see Procedure 4:7]. The program must not be running when using the diagnostic screen.)
	Temperature sensor is not connected to the input board	Make sure that the sensor is securely connected. If the temperature sensor is not plugged into the input board, the chamber will not start.

Chamber will not start (Controller is operating) continued

Background and Figures

The I/O (input/output) communication bus is used by the controller to communicate with the input and output boards. Each input board and output board on the system must be connected to the controller via the I/O communication bus.

I/O communication bus

The boards are connected in series with each other. The input board must NOT be last; otherwise, the boards may be connected in any order.

Use only Conviron RS485 bus cables. There are many cables that appear similar but may not provide the correct connection. The RS485 cables come in various lengths.

The part numbers for standard lengths the RS485 I/O bus cable are:

- 15cm (6") 70212
- 30cm (12") 70406
- 60cm (24") 70407
- 91cm (36") 70408
- 1.22m (48") 70409
- 1.52m (60") 70410
- 1.83m (72") 70411

The pin out connections for the RJ12 connector on the RS485 I/O bus are:

Pin out connections for I/O bus

Wire	Signal Name
• 1	+12V
• 2	GND
• 3	RS485 signal +
• 4	RS485 signal -
• 5	GND
• 6	+12V

Chamber will not start (Controller is operating) continued

Symptom	Possible Cause	Solution
<i>and buzzer sounding</i>	Anything that causes the main contactor to drop out for more than a few seconds, including the following: TEMP alarm settings exceeded	Look at the temperature reading for the TEMP label in the diagnostic screen (see Figure 2-2). Look at TEMP alarm hi and lo parameters in the alarm screen. If appropriate, change the TEMP parameters in the alarm screen so that the current temperature reading is inside the TEMP alarm range. If the temperature in the chamber is outside the range specified in the alarm screen the chamber will not start.
ITSO settings exceeded	Look at the temperature reading for the TEMP label in the diagnostic screen (see Figure 2-2). Look at high and low settings on the ITSO. With reference to the standard settings described on page 5-8, if appropriate, change the settings on the ITSO. If the temperature in the chamber is outside the ranges specified by the ITSO settings, the ITSO will drop line-side power to SUDLY.	

More "... and buzzer sounding cases continued on page 2-8"

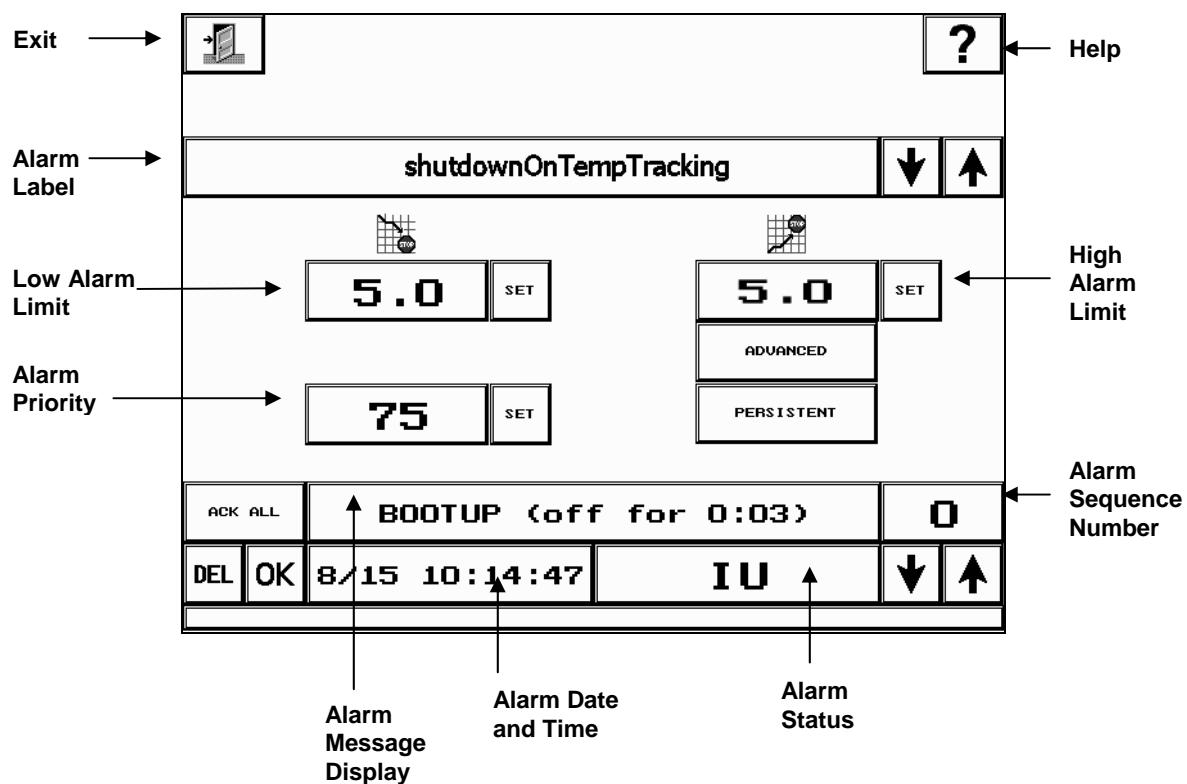
Alarm Types

Conviron offers two different versions of alarm monitoring. Tracking or Deviation.

- Tracking alarms are based on the set point at any particular time in the program, including during ramping. The user sets the minimum and maximum variance from set point. (Standard alarm configuration.)
- Deviation alarms set upper and lower limits that apply to the entire program. (Optional alarm configuration.)
- Both alarms include a preliminary warning and shutdown settings.

The Alarm Screen

To access the Alarm Screen, touch the Alarm  button in the Status Screen toolbar.



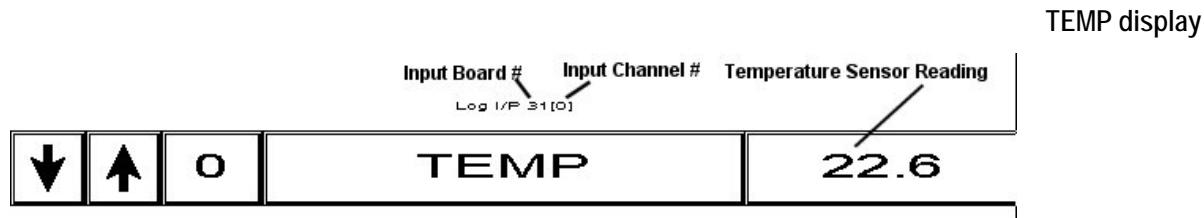
Alarm Options

Alarm priority

Priority determines what action is taken when an alarm limit is reached, for example raising an alarm message, initiating an auto-dialer.

The chart below displays various temperature alarms and possible settings.

- ITSO = Independent Temperature Shut Off
- Track SD = Shut Down on Tracking alarm
- SDTD = Shut Down on Temperature Deviation (optional)
- TEMP = Temperature warning alarm
- Track Warn = Tracking alarm warning

Chamber will not start (Controller is operating) continued**Background and Figures****Figure Chapter 2: -2: TEMP display in diagnostic screen**

The temperature alarm shuts the chamber off in the event of unwanted temperature deviation outside the temperature alarm parameters. This is displayed as TEMP in the alarm and diagnostic screens.

Temperature alarms and sequence

If the controller detects chamber temperature has reached either the "hi" or "lo" TEMP parameters, it turns off the SUDLY output to disconnect power for the main contactor coil. This shuts down the chamber including lights, heaters, fans, pumps, and compressors. The controller continues to run.

bd lost synch <bd#> alarms are generated for all output boards except the one containing SUDLY, to indicate that chamber power has been interrupted.

Once a parameter is exceeded by 1°C, the controller generates a TEMP alarm.

Alarm messages that result from this condition are **ov lim log inp <P1> <P2> TEMP** or **und lim log inp <P1> <P2> TEMP**.

The temperature alarm (TEMP) feedback information comes from the same sensor used for temperature control.

See Chapter 3 for more information on alarms.

We recommend a 5°C offset from highest and lowest setpoint in the multi-day program for temperature (TEMP) parameters. This is especially true if aggressive 'step' changes are made in the temperature program.

TEMP alarm recommended settings

Chamber will not start (*Controller is operating*) continued

Symptom	Possible Cause	Solution
<i>and buzzer sounding</i>	Voltage difference between neutral and ground on the relay board	<p>Measure the voltage between the neutral (P5) and the ground (P6) on the relay board. If it exceeds 3 volts AC or DC, arrange for changes to electrical supply.</p> <p>The relay board will not start the chamber if there is a voltage difference greater than approximately 18 volts AC (RMS) or 25 volts DC between neutral and ground on the board. The voltage must drop below approximately 6 volts AC (RMS) or 8.5 volts DC in order for the chamber to restart.</p> <p>At the input of the chamber control panel, the voltage between neutral and ground should never exceed 3 volts AC or DC. If the voltage is higher than this, the electrical supply may be incorrect or in need of corrective action.</p> <p>To test the relay board, unplug the 3 wire jumper between the relay board and the input board.</p> <p>This removes the 5V signal from the relay and the chamber will shut down.</p>
Triac/Driver failure on the SUDLY output		<p>Measure the voltage between the line and load side of the SUDLY output or measure between the line side of the output and neutral.</p> <p>Also see the problem, <i>Output will not turn on.</i> (page 2-28)</p> <p>If the output is turned on there should be no voltage difference. If the triac or driver, on the SUDLY output are not operating correctly the chamber will not start.</p>

More "... and buzzer sounding cases continued on page 2-10"

Chamber will not start (Controller is operating) continued

Background and Figures

The relay board has a relay that supplies power via SUDLY to the main contactor when the relay contacts are closed. This turns on the power to the chamber. The relay coil must have a 5 volt signal from the input board to permit the relay to operate. (Note: also see the opposite page about excessive neutral to ground voltage.)

Relay board operation

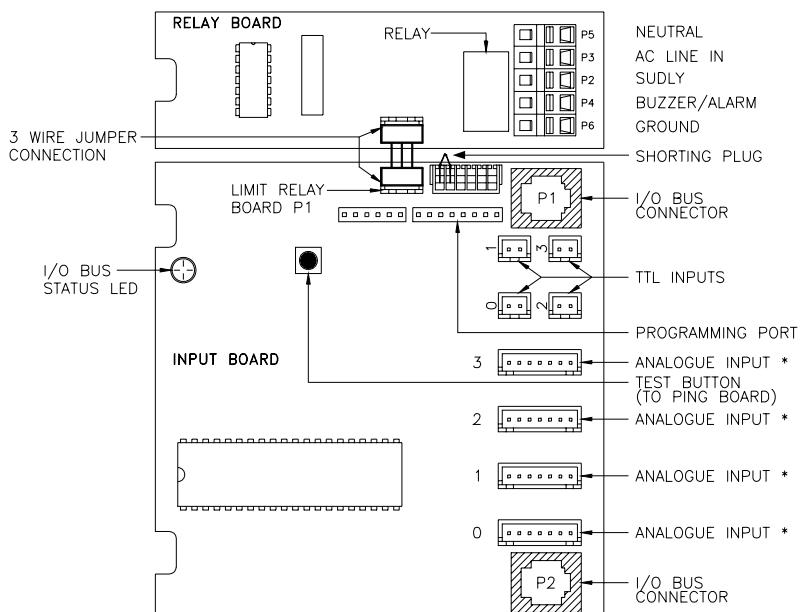


Figure Chapter 2: -3: Input Board and Relay Board

The relay board has two outputs – SUDLY (P2) and buzzer (P4). The following combinations of conditions are possible:

- **P2 on → Buzzer off:** normal operating condition.
- **P2 off → Buzzer on:** the relay has been disengaged by the neutral to ground voltage sensor or the three wire jumper from the input board has been disconnected. Restart is immediate once the problem is corrected.
- **P2 off → Buzzer off:** there is no line voltage to the relay board or the board is defective. Ensure the Start/Stop switch should be in the on position. There should be line voltage across pins P3 and P5.

Chamber will not start (Controller is operating) continued

Symptom	Possible Cause	Solution
<i>and buzzer sounding</i>	Output board with SUDLY output is damaged	Replace the damaged output board.
	Lamp Loft Hi Limit Safety switch in canopy is open  LAMP LOFT 70°C LIMIT	Replace the limit switch. The Lamp Loft Hi Limit Safety switch is a fusible link in series with the output from the relay board via SUDLY to the main contactor coil. It is designed to shut down the chamber at 70°C. It has no user setting. Its purpose is to act as a safety against fire hazard. Typically it is located above the lamp canopy where the greatest heat build up would be. It will reset when the temperature in the chamber drops below the safety threshold.
	SUDLY fuse is open	If the chamber is equipped with fusing, look at the SUDLY output fuse and replace if necessary.
	Wrong configuration files installed on the controller.	Verify configuration files (see Procedure 4:6). Re-install the software with the correct configuration files (see Procedure 4:9). If the software configuration files on the controller are incorrect the chamber will not start.

Chamber will not start (Controller is operating) continued**Background and Figures**

Description available in Chapter 5, part 3.

Output board

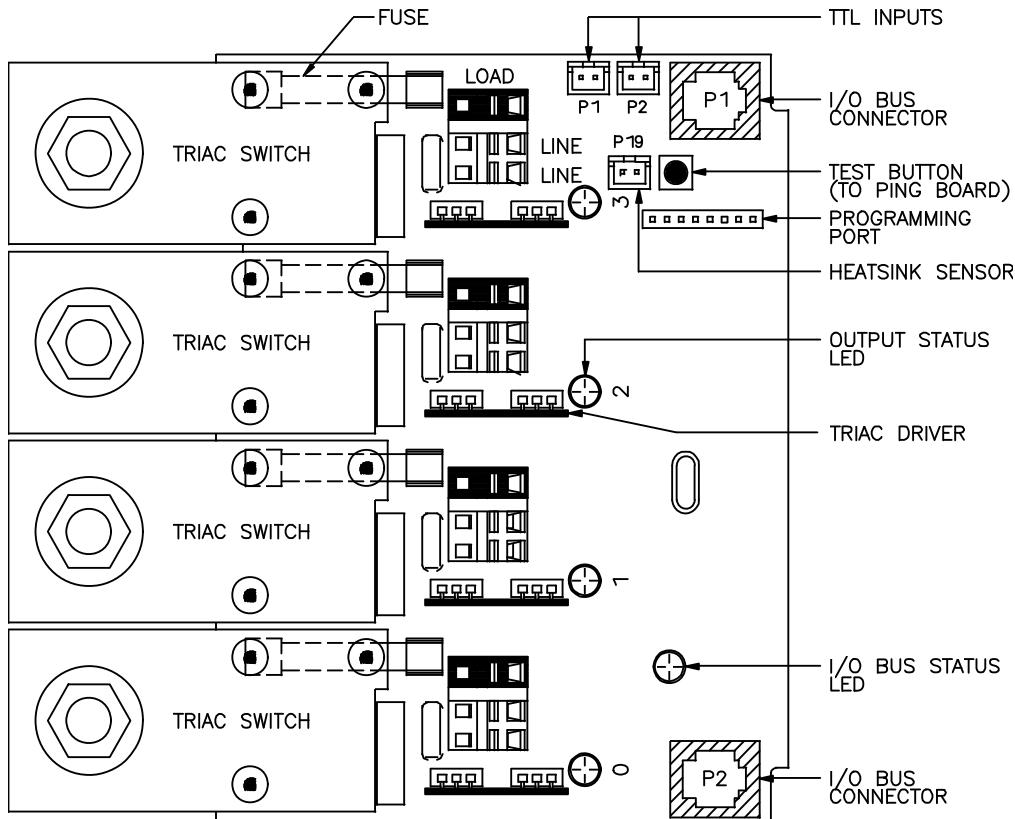


Figure Chapter 2: -4: Output Board with Triac Switches

Chamber will not start (Controller is operating) continued

Symptom	Possible Cause	Solution
	Output boards pinged incorrectly	<p>Re-ping the boards (see Procedure 4:5).</p> <p>If the output boards are not pinged correctly the chamber can start but the controller will turn on the wrong outputs. For example, the SUDLY output may be where a burst heater is supposed to be or lighting outputs could be switched with solenoid outputs. Serious damage may be done to the chamber.</p>

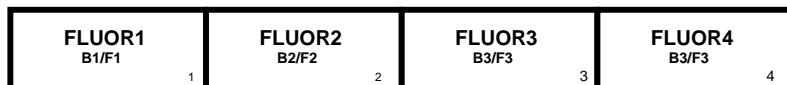
Chamber will not start (Controller is operating) continued**Background and Figures**

Pinging is the process of identifying each output or input board to the controller (see Procedure 4:5).

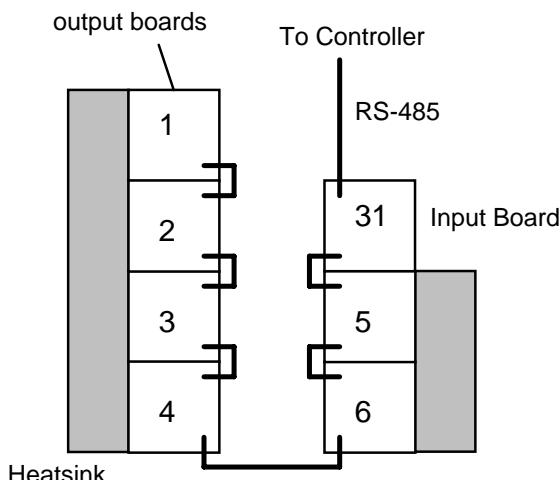
Numbers on labels on the heat sinks indicate the order of the boards. Figure 2-5 below shows an example for output board #1 with output numbers 1 to 4 on the lower right corner of each rectangle. Board #2 would have outputs 5 to 9, and so on.

Pinging

Board numbering

**Figure Chapter 2: -5: Output Labels**

As shown in Figure 2-6 below, output boards are numbered 1, 2, 3 ..., usually from top to bottom, left to right; and input boards are numbered 31, 30, 29 ..., from top to bottom.

**Figure Chapter 2: -6: Typical Input and Output Board Layout**

NOT same order as bus:
The boards are NOT numbered in the same order that they are connected to the RS-485 communication bus.

Chamber will not start (controller is operating) continued

Background and Figures

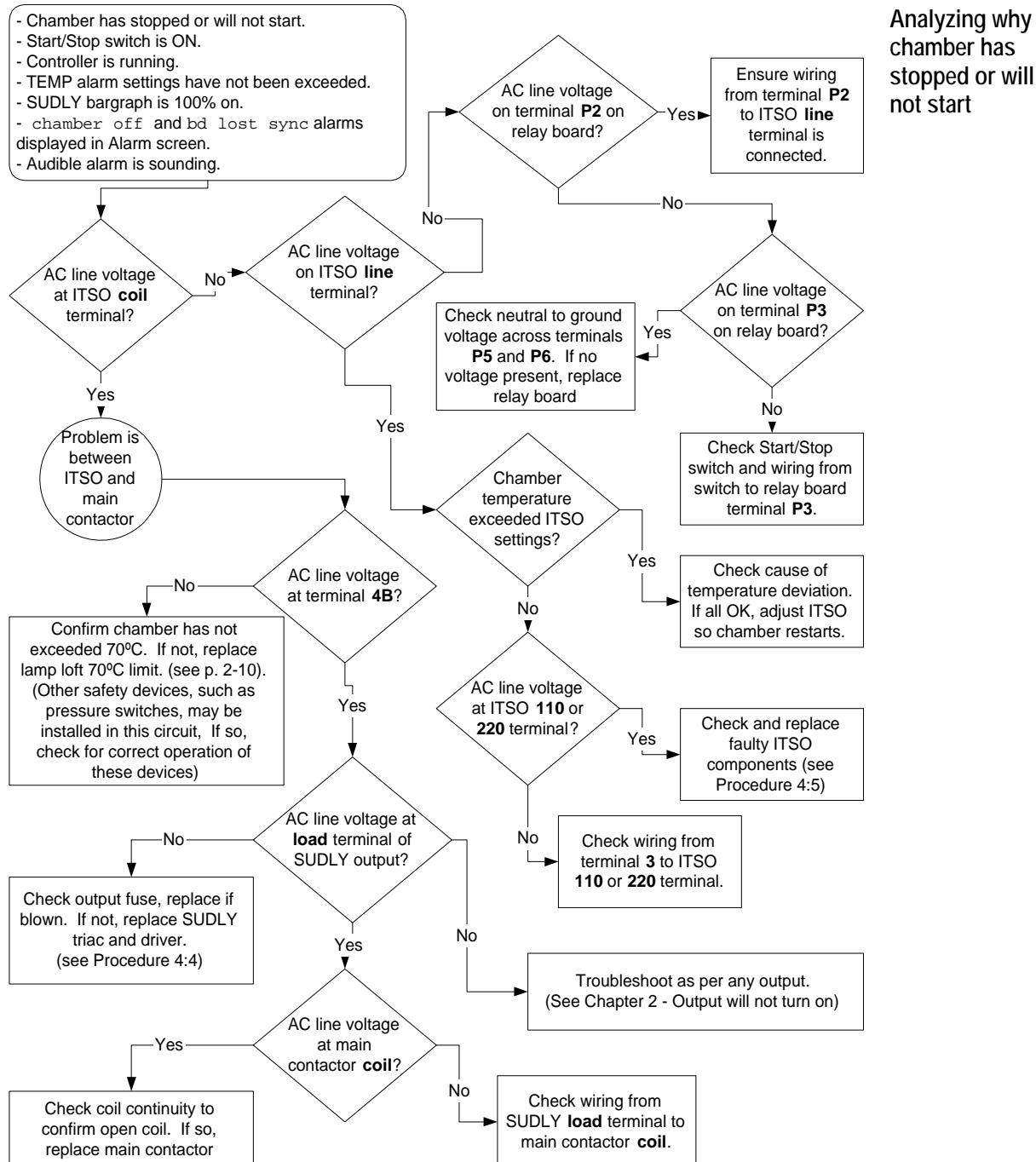


Figure Chapter 2: -7: Analyzing why chamber has stopped or will not start

Controller will not complete startup

Symptom	Possible Cause	Solution
	No power to controller – loose connection or defective cable	After turning power to the controller off as a caution against electric shock , inspect the connection points at the power supply and at the controller. If the cable is damaged replace with it with cable 70385.
	No power to controller – defective power supply	With power on and taking care to avoid electric shock , measure voltage in and voltage out. If there is 115 volts or 220 volts in but no voltage out, replace the defective power supply.
	Control panel door or electrical access panel is open	Close the door or panel. Some chambers are equipped with power disconnect switches on the control panel and access panels to all electrical areas. If any of these doors is open or if any of the switches is not in the close position, the controller will not start.
<i>and 8-segment LED not flashing</i>	COMMS board is damaged	Make sure that the 8-segment LED on the COMMS board is operating. If this LED is not flashing and the power is on, then the COMMS board is damaged.
<i>and keyboard error message</i>	CMOS settings are incorrect	Replace controller (see Procedure 4:1). When starting (booting) the controller, look on status screen for the message 'keyboard error'. These messages indicate that the CMOS settings are incorrect.
<i>and "mapping ..." message displayed</i>	Flash RAM corrupted	Replace the controller or arrange for a qualified technician to correct the CMOS. After the controller stops, look on status screen for the message 'mapping...' This message indicates that the Flash RAM is corrupted.
<i>and continually repeats the start up (boot-up) process</i>	Incorrect configuration files	Replace the controller or arrange for qualified technician to reformat the Flash RAM. Re-install the software with the correct configuration files. If the controller continually repeats the startup (boot-up) process, the configuration files are incorrect.

Controller will not complete startup

Background and Figures

The 8-segment display is located on the COMMS Board. This LED display flashes a series of symbols when the COMMS board has power and is operating.

8-Segment Status LED

The decimal point on the 8-segment display will light up when the screen is touched.

Controller will not complete startup continued

Symptom	Possible Cause	Solution
<i>and 'cannot ping board #nn, press reset button' message displayed</i>	Board will not 'ping'	Make sure that the RS-485 cable is securely connected. See Procedure 4:5 on 'Pinging Boards'
	Damaged output board	Try starting (booting) the controller without any board connected to it (remove the RS-485 cable from the controller). If the controller starts up after disconnecting the RS-485 cable, one of the boards in the system is damaged. Connect each board individually to determine which board is causing the problem. Replace the damaged output board.
<i>and 'CMOS battery failed:' message displayed</i>	Battery expired	Replace the controller. Battery maintenance to avoid this problem is described in Procedure 4:11.

Controller will not complete startup continued

Background and Figures

To restart (reboot) the controller –

1. Turn the controller disconnect switch off.
2. Wait at least 3 minutes.
3. Turn the controller disconnect switch back on.

Restarting
(rebooting) the
controller

When power is restored, the controller will go through what is called the startup (boot up) process. Startup takes about 2 minutes.

There is a red and black toggle switch located near the controller or in the compact flash drive pocket.

The specific location varies according to the chamber model. See the control panel layout in the chamber user guide for the specific location.

Touch screen does not respond

Symptom	Possible Cause	Solution
	Touch screen is not configured correctly	Restart the controller. Zero the static RAM and recalibrate the touch screen.
	Touch screen is not connected to COMMS board correctly	Look at the cable between the COMMS board at the back of the controller and the touch screen. Make sure that the cable is seated securely in the socket.
	Controller is busy with other tasks.	Wait a few seconds and try again. Sometimes the controller may not respond immediately because it is busy with other tasks.
	Controller software has 'crashed'.	If you have tried the above solutions with no results, try restarting (rebooting) the controller and zeroing the static RAM (see procedure on opposite page). In most cases, when the controller software 'crashes' the controller will restart automatically.

Touch screen does not respond

Background and Figures

Static RAM is the random access memory area where the following information is stored:

Static RAM

- alarm parameters
- options screen settings
- logged data
- current program
- Touch screen configuration
- Service history

Static RAM memory is not affected by removing power from the controller.

If for some reason this memory becomes corrupted, it can be reset by 'zeroing the static ram.'

Note: Once started the following procedure MUST be completed.

Zeroing Static
RAM

To zero the static ram –

1. Restart the controller.

After about 30 seconds the following message appears:

DO YOU WANT TO ZERO THE STATIC RAM (Y/N) TOUCH SCREEN
FOR Y

2. Touch the screen once.

The following message appears:

STATIC RAM WILL BE ZEROED

Touch circle



After a few seconds the touch screen for calibration appears. The process halts with this screen displayed until you perform the next step.

3. Touch the circle once.
The circle moves to the top, right of the screen.
4. Touch the circle again.
The circle moves to the bottom, right of the screen.
5. Touch the circle again.
The circle moves to the bottom, left of the screen.
6. Touch the circle again.
The screen calibration is complete. You will have to reset the controller's options and the logging and alarm setpoints.

Recalibrating
touch screen

If the touch screen is not configured correctly or the screen is touched incorrectly during the calibration process, it must be repeated. The controller must remain powered for at least 3 minutes after each calibration attempt. Failing to do so could result in damaging the controller.

Flash Card drive does not work

Symptom Possible Cause

Solution

Incorrect software installed on the controller	With a flash card in the drive, in the save program screen, attempt to switch to drive E:\ If you cannot switch to drive E:\, the software is configured incorrectly.
Compact Flash Drive not connected to power supply	Re-install the software with the correct configuration files. While watching the LED on the front of the flash card drive, restart the controller. If the LED lights up for a few seconds when the controller restarts, the power supply is working correctly. If the LED flashes and then remains on solid, the power supply is working correctly. If the LED does not light up, make sure the flash card power supply cable is securely connected.
Bad Compact Flash Drive / Card	Use another device or computer to verify that the card in the flash card drive is not damaged.
LED is off	Driver not loaded properly Reboot the controller and verify that the driver is successfully loaded when the controller starts up.

Compact Flash Drive does not work

Background and Figures

A quick check can be performed to determine if the controller software is configured for a compact flash drive.

1. Go to the program screen 

2. Press the Save icon 

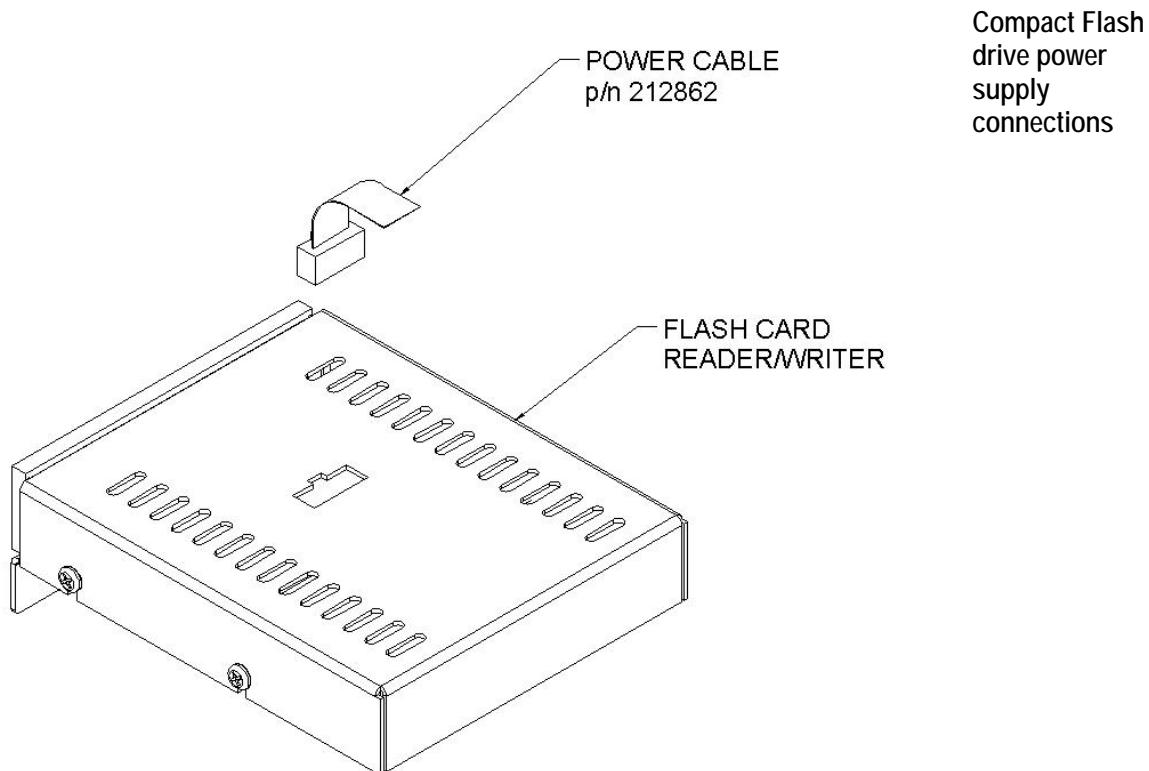
3. Press the arrow keys to change the selected drive



Testing compact
flash drive
settings in
controller
software

Figure Chapter 2: -8: Drive selection in program save screen

If a **E:** appears in the list, then the software is configured for a compact flash drive. If not, the software is not configured for a compact flash drive and a software update is required.



Compact Flash
drive power
supply
connections

Figure Chapter 2: -9: Compact Flash Drive Power Supply Connections

Controller restarts (reboots) unexpectedly

Symptom	Possible Cause	Solution
<i>before the GUI is displayed</i>	Incorrect configuration files	<p>Re-install the software with the correct configuration files.</p> <p>If the controller reboots before the GUI (graphical user interface) is displayed on the screen, then there is a software configuration error.</p>
<i>intermittently</i>	Bad power supply cable	<p>Make sure that the controller power supply cable is securely connected.</p> <p>If the problem persists, replace the controller power supply cable with the appropriate Conviron part.</p>
	Bad power supply	<p>Verify the voltages on the controller power supply.</p> <p>The correct voltages are:</p> <ul style="list-style-type: none">• Incoming voltage, depending on installation site building power supply:<ul style="list-style-type: none">• 115v +/- 10% 60hz, or• 220v +/- 10% 50hz.• Output voltages:<ul style="list-style-type: none">• pin 1: +12vdc• pins 2 and 3: + 5vdc• pins 4 and 5: ground• pin 6: -12vdc

Controller restarts (reboots) unexpectedly

Background and Figures

The part number for the power supply cable is 70385.

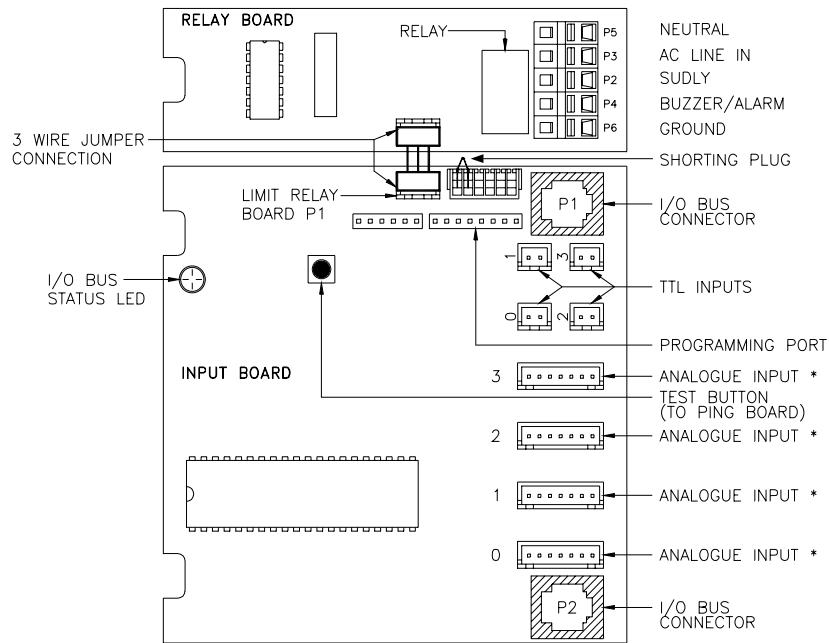
Power supply
cable

Unusual sensor readings

Symptom	Possible Cause	Solution
	Faulty sensor.	Replace sensor.
	Faulty input board.	Replace input board (See Procedure 4:2)
	Sensor wires beside high voltage lines.	Reroute sensor wires. Separate high voltage and low voltage lines as much as possible. Do not run low voltage wires in the same track as high voltage lines. The high voltage lines can create electrical noise in the low voltage lines and cause incorrect sensor readings and erratic behavior.
	Incorrect software (sensor type mismatch)	Make sure that the software configuration matches the sensors actually in use. For an overview of sensor inputs and sensors, see the sections on <i>the Input board</i> and <i>Sensors</i> in Chapter 5.

Unusual sensor readings**Background and Figures**

Description available in Chapter 5, part 1.

Input board**Figure Chapter 2: -10: Input Board and Relay Board**

Output will not turn off

Symptom	Possible Cause	Solution
	Shorted triac	<p>Determine whether a triac is shorted by one of the following methods:</p> <ul style="list-style-type: none">• Use the diagnostic screen to turn the output on and off. See 'Using the diagnostic screen' (Chapter 4). If the output remains on at all times, then the triac is shorted.• Use multimeter to measure voltage across load and neutral with output off. If there is no voltage and the output LED is off, then the triac is shorted. <p>If the triac is shorted replace both the triac and driver.</p>
	Incorrect software	<p>Determine whether correct version of software is installed in the controller. (see Procedure 4:6)</p> <p>Re-install the software with the correct configuration files.</p>

Output will not turn on

Symptom	Possible Cause	Solution
No line voltage		<p>Measure the voltage between the line side of the Wago terminal on the output and the neutral.</p> <p>If there is no line voltage the output will not operate.</p>
Board not communicating with controller		<p>Make sure the breaker is on and the wiring for the circuit is correct and secure.</p> <p>If the chamber is equipped with fusing, look at the fuse for that output.</p> <p>Look at the communication LED on the board.</p> <p>If it is not flashing, the board is not communicating with the controller and will not turn on the output.</p>
Faulty triac or driver		<p>Make sure that all the RS-485 cables are securely connected.</p> <p>Make sure that the board is pinged correctly.</p> <p>Look for signs of damage on the board (see Output board damaged below).</p> <p>Replace <i>both</i> the triac and the driver at the same time.</p> <p>The most common reason that an output will not operate is a faulty triac or driver.</p>
Problem with the load		<p>Make sure the circuit for load is closed and connected to neutral.</p> <p>If the load is 'open' or not connected to neutral, the output will not operate correctly and may cause other outputs on the same board to operate erratically.</p>
Output board damaged		<p>Look for the following signs of a damaged output board:</p> <ul style="list-style-type: none"> • communications LED does not flash • output board will not 'ping' when controller starts • burn marks or discoloured traces on either surface of the board or on the parts mounted on it <p>If any of these signs is present, replace the damaged output board and all triacs and drivers on that board.</p>

Output will not turn on

Background and Figures



Damaged board:

A damaged output board indicates serious electrical damage to the system, possibly caused by an electrical short. When the output board is removed, carefully inspect the back of the board for any indication of electrical damage. Look for damage on all the other output boards on the system. The fluorescent lighting circuits are the most common ones to fail. *Inspect all loads for a short circuit before restarting the chamber.*

Output will not turn on continued**Symptom Possible Cause****Solution**

Incorrect software

Determine whether correct version of software is installed in the controller (see Procedure 4:6)

Re-install the software with the correct configuration files.

Output boards pinged incorrectly

Re-ping the boards (see Procedure 4:5).

If the output boards are not pinged correctly the controller will not be able to start the chamber.

Defective or poorly crimped I/O bus cable

While wearing an anti-static wrist strap wiggle the I/O bus cable that is associated with the failed output.

If the output comes on, replace the cable with one of the same length

Output will not turn on continued

Background and Figures

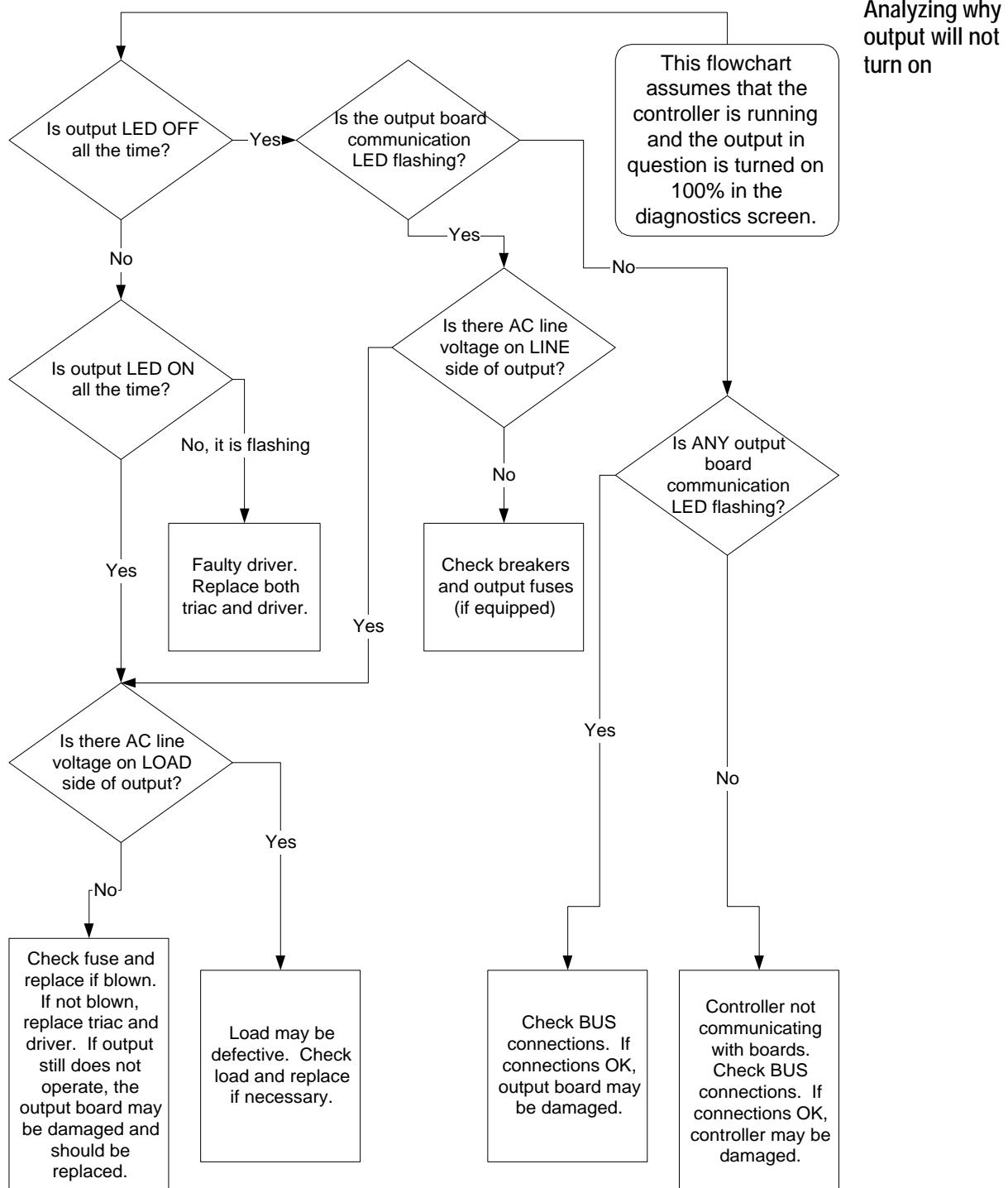


Figure Chapter 2: -11: Analyzing why output will not turn on

Erratic Chamber operation

Symptom	Possible Cause	Solution
<i>tends to happen same time every day</i>	Incorrect Software Output boards pinged incorrectly Unused output(s) not grounded Output not working	Determine whether the correct version of software is installed in the controller (see Procedure 4:7). Re-install the software with the correct configuration files. Re-ping the boards (see Procedure 4:6). Make sure that all unused outputs are properly grounded. Verify the operation of each output on the chamber. If one of the critical outputs such as a proportional valve (PV) or solenoid valve is not working the chamber will not function correctly.
<i>loss of efficiency or failure to operate</i>	Wrong version of driver for phase-to-phase load	Verify the type of load and the type of driver Some use phase-to-phase instead of phase-to-neutral. If it is a phase-to-phase load, make sure that a heavy duty zero crossing driver is installed.
<i>(random) intermittent shutdown – no alarm</i>	voltage potential difference between neutral and ground in building electrical supply	Measure voltage between neutral and ground on relay board. If exceeding 3 volts, get electrician to fix the problem.

Erratic chamber operation**Background and Figures**

Examples of erratic chamber operation are:

- Lights flashing on and off
- Poor temperature control
- Outputs function intermittently
- Chamber starts only intermittently

Erratic behavior

Some of the many possible causes are listed below.

Unused outputs *must* be correctly grounded—if they are not, the chamber may act erratically.

Grounding of unused outputs

An unused output can be grounded by connecting *both* the line and load for the output to a ground. The only acceptable grounds are a Wago terminal connected to ground or to the grounding lug in the breaker panel. Do *not* use the control panel frame as a ground.

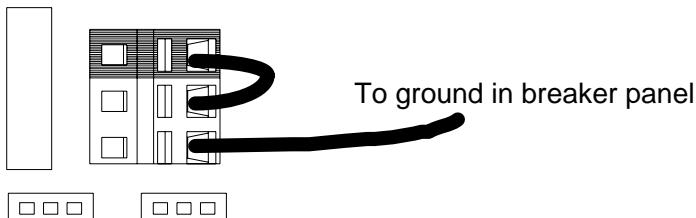


Figure Chapter 2: -12: Grounding of unused outputs

With older versions of output board software, a common reason for erratic chamber operation is noise on the incoming power line. It can cause an output board to turn off all the outputs on that board intermittently. The results can be lamps turning off and on for no reason and poor temperature control.

Output Board Software

The solution is to update the software on the output boards or install new output boards with the updated software.

Software Label



The outputs that control phase-to-phase loads (instead of phase-to-neutral) require a different version of the driver, called the heavy duty zero crossing driver, part 72417. These drivers are marked with a blue band. This driver is used with triac part 72403. Both parts are rated at 600 volts.

Heavy duty zero crossing driver

The regular driver, part 72134 should *not* be used for these outputs.

Display problems

Symptom	Possible Cause	Solution
<i>display too light or dark</i>	Inappropriate contrast setting	Adjust setting. Adjustments are made using the contrast and brightness controls.
<i>partial display or black stripe at top</i>	Bad display connection	Reseat LCD cable connection (see Instructions on opposite page).
	Defective display or burnt out backlight or lamp ballast for backlight	Attempt to adjust setting and reseat LCD cable connection as above. If the problem is not corrected, replace the controller.

Display problems

Background and Figures

If the display is very dark or very light the display contrast can be adjusted Contrast Settings
using the contrast and brightness controls.

Occasionally users report a partial display or “black stripe” across the top of the display screen. In most cases the cause is a loose LCD cable connection at the display. The cure is to gently re-seat the connector. Exercise caution when doing this because the connector is recessed between the display and the controller CPU board as shown in the diagram below.

Reseating LCD cable connector

INSTRUCTIONS:

1. Make sure that START/STOP switch is in the STOP position and the CONTROLLER DISCONNECT switch is in the OFF position.
2. Make sure that adequate electrostatic discharge precautions are taken (You must use a grounding wrist strap).
3. Carefully insert a small flathead screwdriver between the display panel and the motherboard and press down gently on both ends of the white connector.

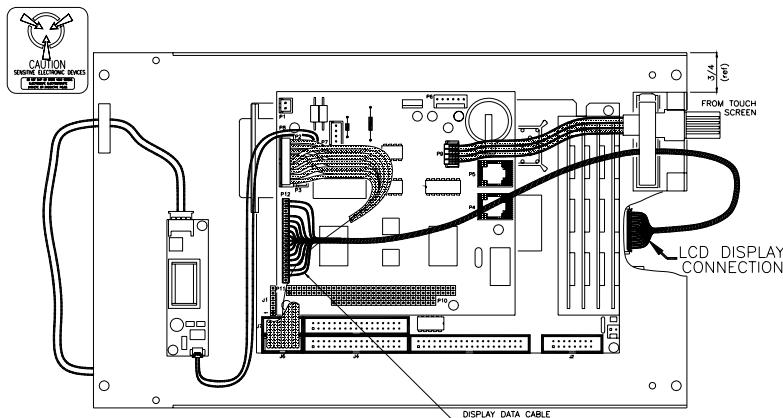


Figure Chapter 2: -13: LCD Display Connections on Controller

4. Restart the controller and unit.

Board will not ping

Symptom	Possible Cause	Solution
	Damaged board	To test for location of damage: <ul style="list-style-type: none">• connect directly from board to controller COMMS board and try to re-ping• repeat for other boards on system If no boards will ping, then controller COMMS board is damaged and controller must be replaced. If other boards ping, then board that does not ping is damaged and must be replaced along with its triacs and drivers.
	Damaged COMMS board	Replace board or boards as appropriate. Same test as above. The COMMS board is part of the controller. Replacing the COMMS board requires replacing the whole controller.

Board will not ping

Background and Figures



Damage:

A board that will not ping or a controller that will not ping a board is an indication of serious electrical damage to the system. Possibly caused by an electrical short. When the board is removed, carefully inspect the back of the board for any indication of electrical damage. It is also advisable to check all the other output boards on the system for damage.

Electrical damage

If damage is found, all the loads on the chamber should be checked for short circuits. All triacs and drivers on damaged boards should be replaced.

Chambers with fuses installed in the output circuits reduce the likelihood of major damage. However, it is still recommended to check for short circuits.

Chapter 3: Alarms

See the *User Guide* regarding:

- an overview of alarms
- displaying the alarm screen and understanding its fields
- setting alarms
- steps users can take to respond to alarms

Alarm codes, their meaning, and suggested solutions

Alarm code	Description	Suggested solution
1/2 wv; bd <board#> ch <channel#>	An output is half-waving. Line synchronization has been lost.	<p>There is a problem with the output board.</p> <ol style="list-style-type: none">1. Check that the Stop/Start switch is set to ON.2. There may be no power. Check the power supply to the board.3. There may be a hardware defect. Call Technical Support.
A-D ov rng; bd <board#> ch <channel#>	A-D convertor on input board has its "over-range" bit set	This is a serious error with the sensors. Call Technical Support.
A-D pol; bd <board#> ch <channel#>	A-D convertor on input board has its "polarity error" bit set	
ALARM	<p>The controller has activated a local audible alarm buzzer in response to one of the following sets of conditions:</p> <ol style="list-style-type: none">1. the chamber is ON, and a program is running, and there is an active alarm with a priority of 40 or less2. there is an unacknowledged persistent alarm with a priority of 40 or less3. the main contactor drops out for more than one minute (a COA or chamber off alarm event)	Attend to the specific active, persistent, or COA alarm as described elsewhere in this chapter.

Alarm code	Description	Suggested solution
alm to host	An attempt to send an alarm message to the host failed.	1. Check the storage space available on the floppy or the internal storage on the controller.
alm to disk	An attempt to send an alarm message to the compact flash card failed.	2. If there is still enough memory, there may be a problem with the communications or the device. Call Technical Support.
bd lost synch; bd <board#>	The board has lost synchronization with the line frequency.	There is a problem with the output board. 1. Check that the Stop/Start switch is set to ON. 2. There may be no power. Check the power supply to the board. 3. There may be a hardware defect. Call Technical Support.
CHAMBER BOOTUP	Indicates the last time the controller was powered on.	It is simply an informative message.
Chamber Off	Chamber off alarm – The main contactor has dropped out for more than a minute while a program was running.	Check for causes as described in <i>Chapter 2: Troubleshooting</i> in the section on Chamber will not start (controller is operating)
log data crpt	The logged data in static RAM is corrupt, and will be erased.	This message displays if the power goes off when a program is running. When the controller is turned on again, you will have lost some logged data. Ensure all programs are stopped before you turn the power off to the controller.
log to host	An attempt was made to send logged data to the host. The attempt failed.	These messages usually display in sequence. The system tries to send the data first to the host, then to the disk.
log to disk	An attempt was made to send logged data to disk. The attempt failed.	Whether these messages display or not depends on the setting of the LOOP and NO LOOP options in the Options screen.
log data lost	An hour's worth of logged data could not be sent to the host or to a compact flash card. The data is lost.	Four settings are possible. They apply only to internal storage in the controller.
		No Loop Alarm The default. Prevents overwriting data in storage.
		Loop Alarm Write over the oldest data in storage. Raise the alarm.

Alarm code	Description	Suggested solution
		Loop No alarm
		No Loop
		Write over the oldest data in storage. No alarm is raised. When storage is full, stop logging. No alarm is raised.
max ret exc get_bd_mem	Maximum retries exceeded trying to read memory of an input or output board.	Message indicates a serious hardware problem. Call Technical Support.
max ret exc set_bd_mem	Maximum retries exceeded trying to set memory of an input or output board.	
max ret exc; inp bd <board#>	Maximum retries exceeded communicating with input board.	This is a serious error. Call Technical Support.
max ret exc; out bd <board#>	Maximum retries exceeded communicating with output board.	
ov lim lin inp: <parameter1> <parameter2> <input label>	Over the limit on a linear input parameter1 is the high alarm setpoint parameter2 is the actual condition in the plant growth area input label is the name of the alarm setting. See Appendix A: <i>Glossary of Labels</i> for more information on input labels.	1. Check the alarm setting for the sensor. 2. Verify that the chamber temperature is appropriate by physically checking the plant growth area. 3. May mean a defective sensor.
und lim lin inp: <parameter1> <parameter2> <input label>	Under the limit on a linear input parameter1 is the low alarm setpoint parameter2 is the actual condition in the plant growth area input label is the name of the alarm setting. See Appendix A: <i>Glossary of Labels</i> for more information on input labels.	

Alarm code	Description	Suggested solution
ov lim log inp: <parameter1> <parameter2>	Over the limit on a logarithmic input parameter1 is the high alarm setpoint	1. Check the alarm setting for the sensor. 2. Verify that the chamber temperature is appropriate by physically checking the plant growth area. 3. May mean a defective sensor.
<input label>	parameter2 is the actual condition in the plant growth area input label is the name of the alarm setting. See Appendix A: <i>Labels</i> for more information on input labels.	
und lim log inp: <parameter1> <parameter2>	Under the limit on logarithmic input parameter1 is the low alarm setpoint	1. Check the alarm setting for the sensor. 2. Verify that the chamber temperature is appropriate by physically checking the plant growth area. 3. May mean a defective sensor.
<input label>	parameter2 is the actual condition in the plant growth area input label is the name of the alarm setting. See Appendix A: <i>Labels</i> for more information on input labels.	
ov lim <parameter1> <parameter2>	Over the limit on any input or output	1. Check the alarm setting for the sensor. 2. Verify that the chamber temperature is appropriate by physically checking the plant growth area. 3. May mean a defective sensor.
<input label>	parameter1 See note. parameter2 See note. input label is the name of the alarm setting. See Appendix A: <i>Labels</i> for more information on input labels.	
und lim <parameter1> <parameter2>	Under the limit on any input or output parameter1 See note. parameter2 See note.	Note: Parameters 1 and 2 are arbitrary fixed values. They don't indicate an actual condition.
<input label>	input label is the name of the alarm setting. See Appendix A: <i>Labels</i> for more information on input labels.	

Alarm code	Description	Suggested solution
r err; log hand fr sram	The log handler was unable to read a value from the static ram (internal storage).	1. Shut down the controller. 2. As the machine powers up, watch for the message asking you to ZERO THE SRAM.
w err; log hand to sram	The log handler was unable to write a value from the static ram (internal storage).	3. Touch the screen to zero the SRAM. 4. Recalibrate the touch screen by following the prompts. 5. If the error recurs, call Technical Support.
Ret exc in snd bg	Maximum retries exceeded when sending background processing information to communications board.	Call Technical Support. This is not a serious error, but you may lose data if it is not corrected.
RS485 BUS	An error has occurred while communicating with the COMMS board.	This may indicate that the COMMS board has failed. Check and replace any bus cables that are defective. Verify grounding is correct (call Technical Support with any questions). Reboot system and observe if the error recurs. If error persists, replace controller.
triac on; bd <board#> ch <channel#>	The triac is on when it should be off.	May be a defective triac.
wb > db	Wetbulb is hotter than drybulb.	This suggests a problem with the relative humidity in the plant growth area. Check that the water supply to the wetbulb is working.

Independent temperature shut-off (ITSO)

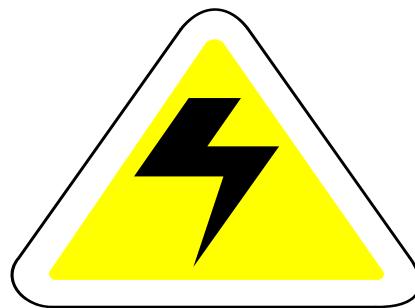
The ITSO protects the chamber from damage by shutting it off if its temperature sensor reading is outside the range of ITSO high and low settings. When it shuts off the chamber, it also sounds the buzzer alarm.

For more information about the ITSO, see Part 4 of Chapter 5 on Boards and Sensors.

Chapter 4: Procedures

Procedures included in this chapter

1. Replacing a controller
2. Replacing an input board
3. Replacing an output board
4. Replacing a triac and driver
5. Replacing independent temperature shut-off (ITSO)
6. Pinging and re-pinging boards
7. Verifying controller software configuration
8. Using diagnostic screen
9. Testing outputs
10. Updating software
11. Replacing external controller battery



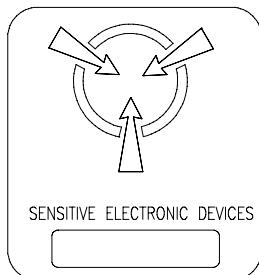
Warning – High Voltage Hazard:

Power Off: Ensure Power is off to the entire control panel before beginning any work on boards, triacs, or drivers.

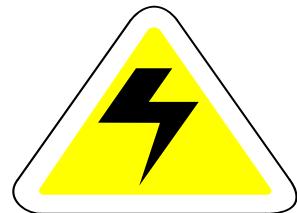


Electrostatic hazard:

Follow cautions against electrostatic discharge described in Chapter 1.

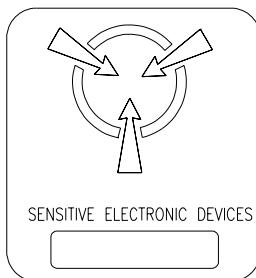


4:1. Replacing a controller



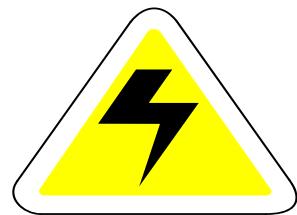
Warning – High Voltage Hazard

Ensure power is off!



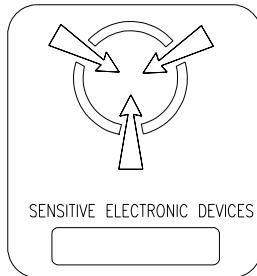
1. Set the start/stop switch to the stop (off) position.
2. To turn off power to the controller, move the controller disconnect switch to the off position.
3. Remove back plate from controller
4. Remove I/O Bus communication cables from P4 and P5 on COMMS board.
5. Remove CCS communication cables from network card (if installed).
6. Remove power supply cable from P6 on COMMS board.
7. Remove card reader and cables (if installed) from controller.
8. Remove serial port cable.
9. Remove the four mounting nuts and pull the controller away from the mounting plate.
10. Replace the controller back plate and put it in an anti-static bag. Seal the bag and attach the Return Goods Authorization form including fault description, customer name, and date of repair.
11. Look at the foam pad around the controller mount, remove any dirt, and smooth out any rough spots.
12. Remove the new controller from its anti-static bag and secure with 4 nuts to the mounting studs. Tighten the 4 nuts. Make sure that the ground wire(s) are anchored under the mounting nuts. Do not over tighten the nuts—over tightening will affect the operation of the touch screen.
13. Look for any damage during shipping. Specifically, inspect the white wires that run from the lamp ballast to the fluorescent lamp in the display, for any damage. Make sure that wires are not caught in the mounting studs.
14. Reconnect all the cables to the controller. (Power supply, I/O Bus, CCS communication, serial port cable, and compact flash card reader cables)

4.2. Replacing an input board



Warning – High Voltage Hazard

Ensure power is off!



1. Remove I/O Bus communication cables (P1 & P2).
2. Remove the shorting plug.
3. Label all sensor cables and remove them from their sockets.
4. Label any TTL sensor cables and remove them from their sockets.
5. Remove 3-cable jumper between the boards.

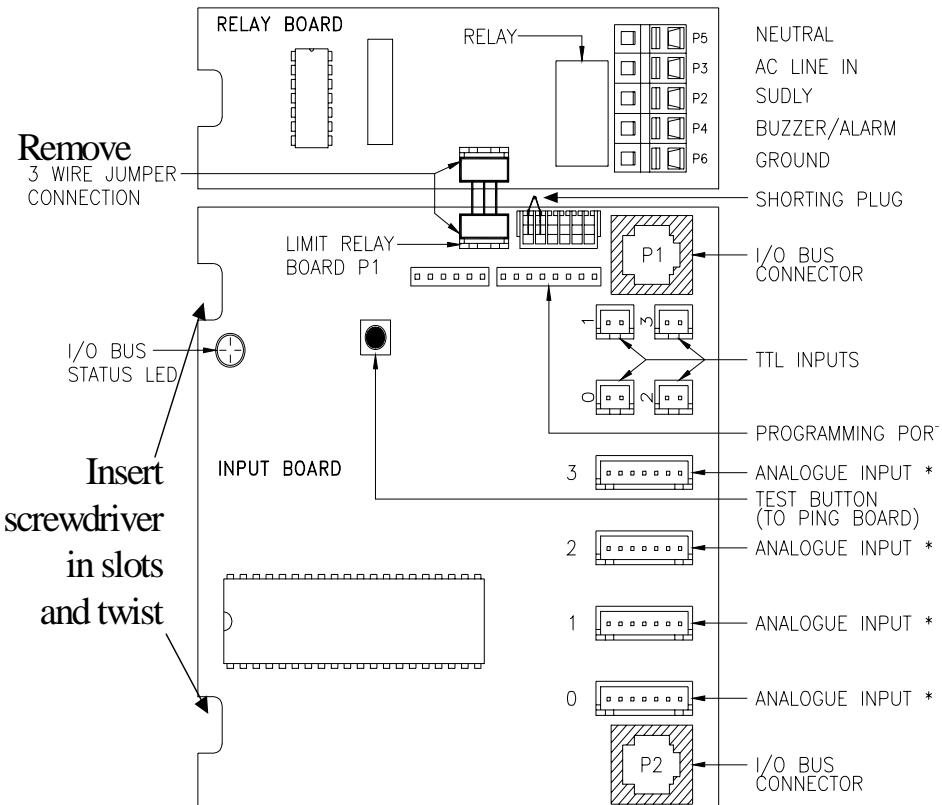


Figure Chapter 4: -1: Input Board and Relay Board

6. Insert screwdriver in the slots indicated above and gently twist to pop the board out of the mounting track.
7. Put the input board in an anti-static bag.

4.2. Replacing an input board continued

8. Insert the new board into the snap track by inserting one side into the groove on the side of the track and snapping into the other side. Make sure that both sides of the board are in the grooves as shown in the following diagram.

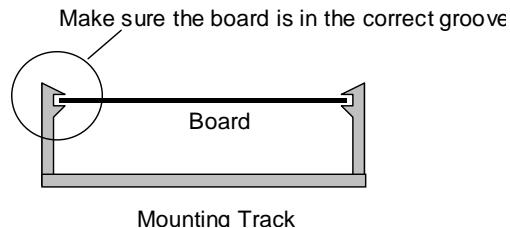
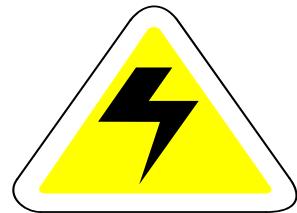


Figure Chapter 4: -2: Input Board on Mounting Track

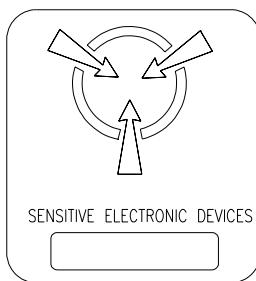
9. Reconnect all sensor cables, the shorting plug, the 3-cable jumper, and the I/O bus communication cable. Make sure that all connections are seated firmly. Make sure that sensor cables are returned to the sockets from which they were removed.
10. Re-ping the board using Procedure 4:5.

4:3. Replacing an output board



Warning – High Voltage Hazard

Ensure power is off!



1. Remove RS-485 communication cables.
2. Remove drivers from the output board and place in an anti-static bag.
3. Remove bolts from the triac assembly.
4. Use a screwdriver to carefully pry the triac away from heatsink and pull the triac away from the board.
5. Make sure all wires are marked and remove them from the Wago terminals.
6. Remove output board from the snap track by inserting a screwdriver into the slots indicated below, and gently twisting it to pop the board out of the mounting track. Put the board in an anti-static bag.

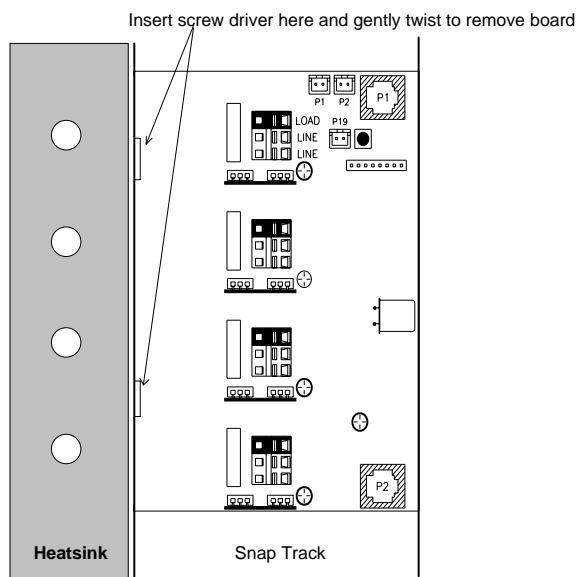


Figure Chapter 4: -3: Output Board mounting

7. Remove the replacement board from its anti-static bag.

4.3. Replacing an output board continued

8. Insert the board into the snap track by inserting one side into the groove on the side of the track and snapping into the other side. Make sure that both sides of the board are in the grooves as shown in the following diagram.

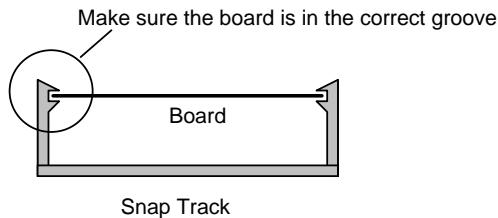
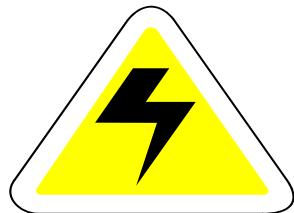


Figure Chapter 4: -4: Output Board mounting track

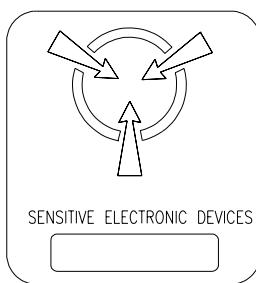
9. Reconnect all wires to the Wago terminals. Make sure that all the connections to the terminals are secure and that there are no loose strands of wire between the terminals.
10. If the output board is being replaced because of electrical damage, replace all the triacs and drivers with new components at the same time.
11. Insert the triacs into the spade terminal on the output board. Make sure that each of the triac pins goes inside the spade terminal. If you are installing a new triac, you may have to use a screwdriver to straighten the spade terminals to get the triac pins to fit.
12. Bolt the triacs to the heatsink.
13. Insert the drivers into the sockets.
14. Reconnect the RS-485 communication cables.
15. Restart the controller. Make sure that the start/stop switch is in the off position.
16. If the new board has not been pinged, the controller will ask you to ping the new board. The following message will appear on the controller screen:
INITIALIZING Board...
Press the RESET button on board ID number *nn* (*nn* = board ID number. eg; 1, 2 etc.)
17. Make sure that the board number on the screen corresponds to the board number you have changed and press the reset button or 'ping' button on the board. See the section on Board Numbering and Pinging for more information.
18. Before running a program and starting the chamber, use the diagnostic screen to test each output on the new board.

4:4. Replacing a triac and driver



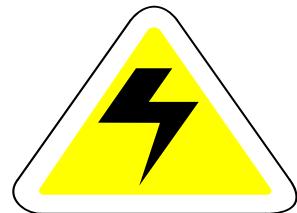
Warning – High Voltage Hazard

Ensure power is off!



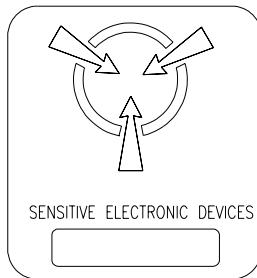
1. Remove driver.
2. Remove triac bolt.
3. Use a screwdriver to carefully pry the triac away from heatsink.
4. If the triac and driver are to be kept, place them in an anti-static bag.
5. Insert the triacs into the spade terminals on the output board. Make sure that each of the triac pins go inside the spade terminals. If you are installing a new triac, you may have to use a screwdriver to straighten the spade terminals to get the triac pins to fit.
6. Bolt the triacs to the heatsink.
7. Insert the drivers into the sockets.
8. Before running a program and starting the chamber:
 - use the diagnostic screen to test all outputs
 - if you suspect an ouput board failure, see Procedure 4:3

4:5. Replacing independent temperature shut-off (ITSO)



Warning – High Voltage Hazard

Ensure power is off!



Each of the following 3 parts of this procedure, corresponding to the 3 parts of the ITSO, may be done separately:

- Replacing the potentiometer assembly
- Replacing the sensor
- Replacing the control board

The location of the parts varies with the chamber model type.

Replacing the potentiometer assembly

1. To loosen the black knob of the potentiometer, turn the set screw on the side of the knob counterclockwise.
2. Remove the knob.
3. To remove the nut that holds the potentiometer to the bracket, turn it counterclockwise.
4. Pull the potentiometer out through the back of the bracket.
5. Make note of which pin the potentiometer cable is connected to and gently remove it.
6. Install the new potentiometer in the bracket with the nut provided.
7. Turn the potentiometer dial completely counterclockwise.
8. Reattach the knob to the potentiometer making sure that the white notch on the knob lines up with the -50 marking on the mount.
9. Plug the other end of the new potentiometer cable into the appropriate pin on the control board.

Replacing the sensor

Note: If you need assistance finding the aspirator, note the chamber model and serial number and contact Conviron Technical Support.

1. To determine which sensor to remove, compare the replacement (ITSO) sensor to the 2 sensors in the aspirator.
2. Remove the old (ITSO) sensor.
3. Install the new sensor in the aspirator and run the cable to the control board which is located under or near the potentiometer assembly.

If the control board is located under the potentiometer assembly, remove it by removing the four screws that hold it in place.

4. Connect the sensor cable to the "Hi-Lo" pin of the control board.

Unless you are also replacing the control board AND if you had to remove the potentiometer assembly in step 3, re-attach the potentiometer assembly with the four mounting screws.

4:5. Replacing independent temperature shut-off (ITSO) continued

Replacing the control board

1. If the control board is located underneath the potentiometer assembly, remove the four screws holding the assembly in place.
2. Ensure that all the cables and wires connected to the control board are labeled appropriately according to the pins they are attached.
3. Carefully remove all wires and cables from the control board.
4. Remove the five screws attaching the board to the control panel.
5. Using the five screws, attach the new board to the control panel.
6. Re-attach the wires and cables to the board using the labels and electrical schematic for reference.
7. If you removed the potentiometer assembly in an earlier step, replace it with the four mounting screws.

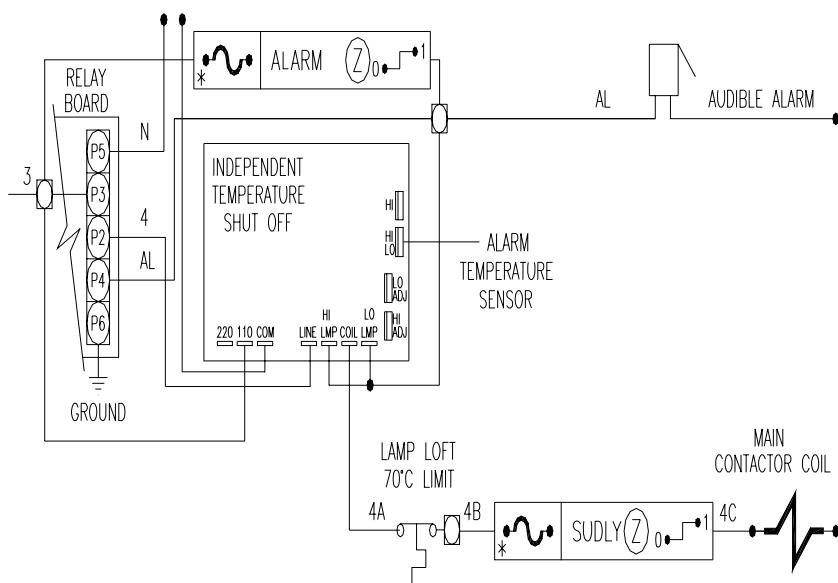
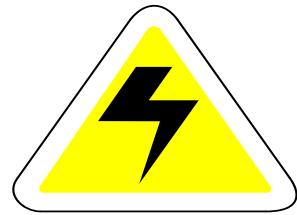


Figure Chapter 4: -5: Independent Temperature Shut-off (ITSO)

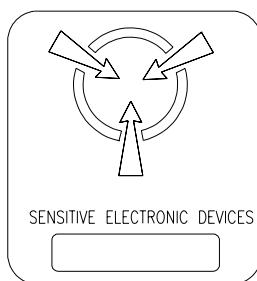
4:6. Pinging and re-pinging boards

Pinging



Warning – High Voltage Hazard

Ensure power is off!



Background:

Pinging a board is the process of assigning a board its identification number. When replacement boards are shipped from the factory they do not have their ID numbers set.

When the controller software starts, it reads the configuration files and determines how many boards should be connected to the system. The software then tries to communicate with each board that is supposed to be connected to the system. If the controller cannot find a board on the system with the ID number it is looking for it will display a message similar to the following:

INITIALIZING Board...

Press the RESET button on board ID number 1

This message means that the controller cannot find a board #1 on connected to the system.

Procedure:

- Upon display of message above, to assign a board with ID #1, momentarily press the reset (or ping) button on the board. (See the diagram below.)

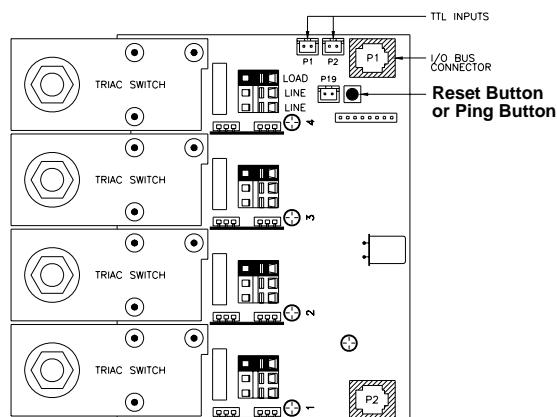


Figure Chapter 4: -6: Reset Button Location

When you press the reset button, the controller will beep and the board will be assigned ID #1. The controller will then move onto the next board. If it can not find board #2 it will ask you to press the reset button on board #2.



Wrong ID number can cause serious damage:

It is extremely important that the boards are assigned the proper ID number.

The process is the same for input boards (31,30,29...).

4:6. Pinging and re-pinging boards continued

Re-pinging

If for some reason the output boards/input boards have been pinged in the wrong order or a board has been pinged with the wrong ID number, follow the following procedure to re-ping the boards:

1. Remove the I/O Bus connection from the controller and remove one end of all jumpers between the output and input boards.
2. Restart the controller.
3. When the controller displays message '*cannot ping board #1 press reset button,*' connect board 1 to the I/O Bus.

If the board is already pinged as board #1 the controller will move on to the next board.

Otherwise, push the reset (test) button on board #1.

There are two ways to connect the board to the controller. If board #1 is the first board on the I/O Bus, then just connect the bus to the first board. If it is not the first board, then use a separate cable to connect the board directly to the controller. (The preferred method is to connect each board individually to the controller.).

4. When controller displays '*cannot ping board #2 press reset button,*' connect board #2 to the I/O bus.

If it is the next board on the I/O bus, then connect the jumper between board #1 and board #2. If it is not the next board, then use a separate cable to go directly from the controller to the appropriate board.

It is very important when repinging a board that the only boards connected to the controller are boards you have already re-pinged or the current board you are pinging.

5. Repeat step 4 for the remaining boards.
6. Reconnect all the boards to the controller by reconnecting all the jumpers between the boards.

4.7. Verifying controller software configuration

This procedure checks the controller software configuration. The procedure involves listing the output labels in the diagnostic screen and comparing them with the labels on the heat sink.

1. Stop the program
2. Enter the diagnostic screen. The label displayed should be the first output.
In the example in Figure 4-6 below, the small numbers (1[3]) below the output label (FLUOR1) represent the board number (that is, 1) and the output channel (that is, 3).



Figure Chapter 4: -7: Diagnostic Screen Display

3. Find the corresponding label on the heatsink and physically verify that the output address (that is, board n and channel n) is the same as displayed on the diagnostic screen.

See example in Figure 4-7 below.

Note: The small characters (such as B1F1 under FLUOR1) relate to the schematic diagrams which accompany the machine, not the the output channels as such. They refer to the circuit breaker (B1) and the specific circuit (F1) an output is on.



Figure Chapter 4: -8: Example heatsink label

Note: The electronic range of output channels is 0 through 3 (see Figure 4-8), while the range used for outputs starts counting at 1, that is FLUOR1.

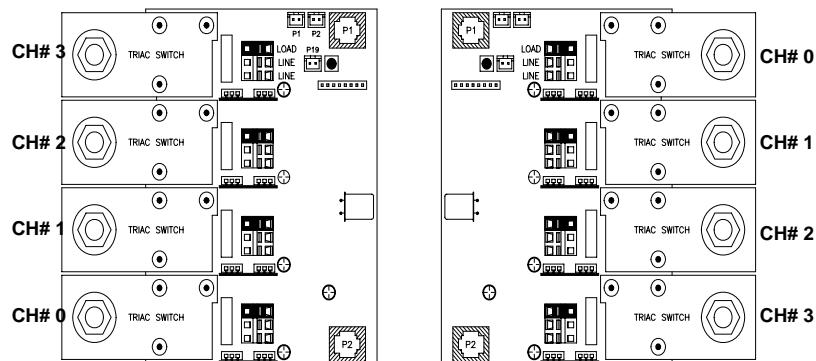


Figure Chapter 4: -9: Output Board channel numbers

4.7. Verifying controller software configuration continued

4. To turn the output on (%100), press the up and down arrows.
5. To verify the output is on, observe the red LED beside the output. If the LED is on (when the output is set to 100%), the output is configured correctly.
6. On the diagnostic screen, to move to the next output label, touch the down arrow.
7. Repeat steps 3 though 6 until you have verified all the outputs.

The outputs listed in the diagnostic screen match the heat sink labels with the correct software installed on the controller.

NOTE: SUDLY must be turned on to 100% before any other output will engage.

4:8. Using the diagnostic screen

Overview The diagnostic screen is used to verify that your sensors, output switches and loads are working properly. The screen allows service personnel to test each output or input individually.

The operation times for each output are displayed so maintenance can be scheduled.



Characterization-loss hazard:

Only personnel familiar with the operation of the chamber should use this screen. It is restricted to the highest security level, 40, if you have passwords turned on.

Conviron recommends password protection to prevent unauthorized persons from changing the software configuration. The lower part of the diagnostic screen allows access to the characterization settings. Loss or alteration of these settings could degrade performance to the point of loss of control.



Warning

You will want to stop the program before using the diagnostic screen. See the program screen to stop programs. If you do not stop the program, you will not be able to test outputs. The program settings will override the control of the outputs.

Chamber design	Outputs	What happens	Recommended action
DX system (compressor)			
Solenoids	Solenoids off, compressor on	Compressor pumps down or goes into full cooling	Turn compressor breaker off.
Proportional valve	PV closed, compressor on	Chambers runs in full cooling	Turn compressor breaker off or open the HCMVLV to 50%.
Glycol (no compressor)			
Proportional valve	PV closed	Chamber does not receive coolant	Chamber warms up depending on the loads being turned on. Watch the chamber temperature.

4.8. Using the diagnostic screen continued

Displaying the diagnostic screen To display the diagnostic screen, touch the Diagnostic icon in the status toolbar.



Figure Chapter 4: -10: Status Toolbar

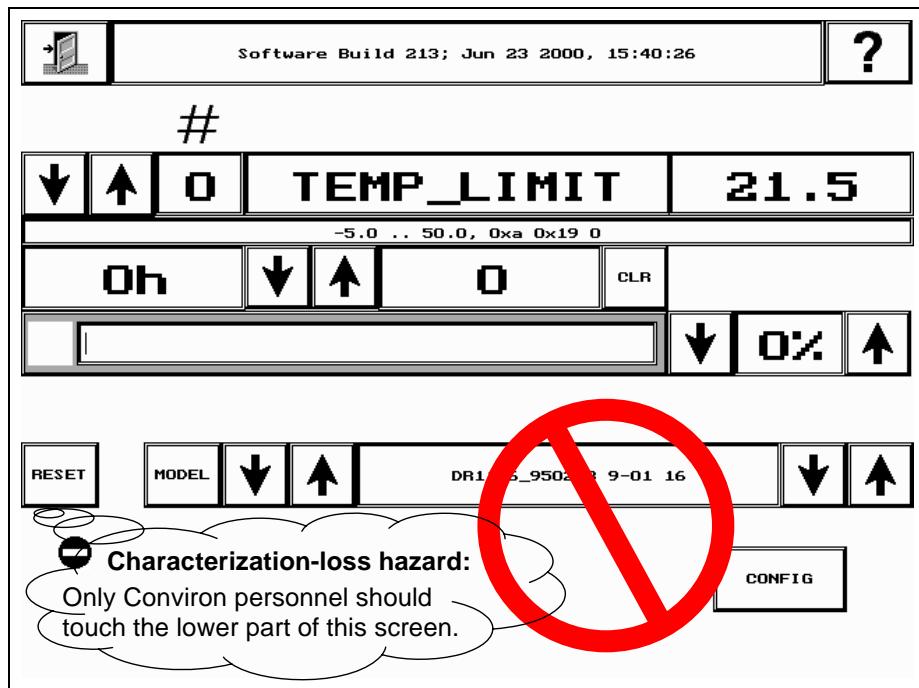


Figure Chapter 4: -11: Diagnostic Screen

Diagnostic toolbar icons



Exit: to return to the status screen.



Help: to display on-line help for a field.

Using help



1. Touch [?].

2. Touch the field.

On-line help displays. Touch the scroll bars if necessary to move through the on-line help display.

3. To return to the previous screen, touch the Exit icon.

4:8. Using the diagnostic screen continued

Output label fields



Figure Chapter 4: -12: Output Label Fields

These fields show:

- The output or input label number, an internal sequence (in the example, 0).
- The output or input label (in the example, FLUOR1). In the case of outputs label displayed matches the label on your chamber schematics and physical label on the board. A list of labels can be found in Appendix A.
- The current setting of the output 0-100% (in the example, 0.0%, or off).
- The physical location of the input or output **1[3]**. The first number is the board number, the second is the output channel. For more information on board layouts see the Procedures 4:2, 4:3, and 4:5.

Inputs and equations are for viewing only; they tell you that the controller is reading the sensor or display the value calculated by the equation.

- Input boards are numbered 31, 30, 29, . . .
- Output boards are numbered 1, 2, 3, . . . and outputs on each board are numbered 0, 1, 2, 3, . . .
- - - - indicates an equation or setpoint

Service history fields



Figure Chapter 4: -13: Service History Field

These fields show the service history for the output:

- The number of hours the output has been on (2h or two hours in the example)
- The number of cycles this output has completed (11 in the example)

Touch the CLR button to clear the service history for this output; for example—if a light has been replaced, you would want to start the service history for the new bulb from the beginning.

4:8. Using the diagnostic screen continued

Relative power

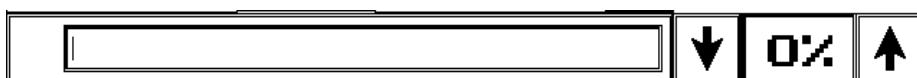


Figure Chapter 4: -14: Relative Power Fields

These fields show the current setting relative to the maximum (0-100%) setting or setpoint.

The bar graph provides a graphical representation, and the percent field displays the actual percentage of the setpoint.

Touch or to change the settings.

Input/output configuration

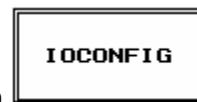


Characterization-loss hazard:

Conviron recommends password protection to prevent unauthorized persons from changing the configuration.

To display the characterization screen (available only to Conviron service personnel):

1. Touch



2. Touch the IOCONFIG button

4:9. Testing outputs

Preparation To test any output you must first turn on the SUDLY output, which will close the main contactor and supply power to the chamber.

Testing Procedure

1. Touch  or  to the left of the Output label fields to display the Output label.

Look at the physical location field if you are unsure if the label identifies an output. Output boards are numbered 1, 2, 3, . . . and outputs are numbered 0, 1, 2, 3, . . .

2. Touch  in the Power bar.

The current setting changes to 100%.

The bar graph indicator to the left is fully on.



Touching  the right of the power indicator switches the output off.

3. Verify that the source is on. For example, for this output, FLUOR1, check that the fluorescent level one lights are on in the plant growth area. An amp meter can be used to check loads that cannot be visually checked (heaters, etc.).

4:9. Testing outputs continued

4. Test the outputs in turn, as needed.



Important:

Be careful what you turn on and off, to what value, and for how long.

Turning a fluorescent output to any value other than 0% or 100% can damage the ballast. Turning a heater on for a long time can damage the controller. The conditions you set on the diagnostic screen remain on while you have the screen active. All outputs turn off when you leave the diagnostic screen.



Tip:

For a list of Output labels and their descriptions, go to the status screen and touch Help for the Output label field in the lower left corner of the screen.



5. When you have checked all the outputs, touch the Exit icon  in the upper left corner of the screen to return to the Status screen.

6. Run a program.

4:10. Updating software

Overview This procedure describes the process for upgrading the software and configuration files in the CMP5090 controller.

Please read this entire procedure before starting the update.

The procedure has been described in six parts:

- I. Backing up and deleting the programs.
- II. Connecting a computer to the controller.
- III. Loading the software update onto the controller.
- IV. Recalibrating the touchscreen.
- V. Setting date and time.
- VI. Restarting the controller.



Tip

- **Controller** refers to the CMP5090 controller on the chamber.
- **Computer** refers to the computer or notebook that you are using to perform the upgrade.



Important:

If your chamber is equipped with a Compact Flash Card Reader, refer to the next section titled “Installing software using a compact flash card”.

If you control your growth chambers using Conviron’s Central Control System (CCS), you can also upgrade controller software through the CCS. Refer to *Upgrading CMP5090 controller software* in Chapter 4 of the *Central Control System User’s Guide*.



If you make a mistake:

1. Wait three (3) minutes before turning off the controller.
2. Wait another 10 seconds before turning the controller on again.

4:10. Updating software continued

Required equipment You will need the following items to upgrade your controller's software.

- Software update disk supplied by Conviron. This disk will be a bootable disk. If your computer is running Windows 95 or 98, you must use this bootable disk to run the program from DOS.
- IBM compatible computer with one free communications (COM) port.
- Standard NULL modem cable (contact Conviron's Customer Service Department for details if necessary).
- The serial number of the chamber you are updating.



Important:

The upgrade disk is certified for a specific serial numbered chamber.

Do not use the upgrade disk for a different serial numbered chamber.

Not following this recommendation could render the chamber inoperable.

1. Identify and record all resident programs and alarm setting (or save data on existing flash card).
2. Remove original card and replace with software equipped Conviron supplied flash card.
3. Reboot controller
4. The controller will go through a boot-up sequence. When the controllers displays the message "running autobat", it will immediately generate a "beep" sound and display the message "upgrade file(s) found". At this time, touch the screen to start the upgrade process.
5. Upon successful completion of all files, the controller will display the message "upgrade process completed successfully".
6. The controller will generate a beep sound followed by another.
7. A message will display "Prepare to zero sram-touch screen to continue"
8. Controller will continue the boot-up sequence. It will generate a single beep sound and then display the message:
"Service personnel only:
do you want to zero the static RAM (Y/N) touch screen for YES
9. Touch the scrren
10. Complete zeroing the static ram process by touching the 4 dots as they appear.
11. The controller

4:10. Updating software continued

Part I: If the software upgrade is **not** going to change the configuration of your controller, you may reuse your programs. If you want to reuse your programs make note of the columns, user, and factory limits in the program table before you perform the upgrade. Compare these to the controller's columns, user, and factory limits in the program table after the upgrade.

To back up and delete your programs

1. If your controller has an external disk drive, copy your programs to a floppy disk following the instructions in Chapter 3 *The Save screen: save your program* of the *Conviron CMP5090 User's Guide*.

Or

If your controller is connected to a Central Control System, copy your programs to the CCS following the instruction in *Saving a program on the CCS* in Chapter 5 of the *Central Control System User's Guide*.

You are now ready to delete the programs.

2. Touch the Program icon  on the Status Screen.

3. In the Program Screen, touch either

- The Open Program icon  or
- The Save Program icon 

The Open or Save screen displays.

4. Touch the up  and down  arrows to select the program number.



5. Touch  to delete the program.

6. Touch the Exit icon  to return to the Program screen.

In the next procedure, you will connect the controller to the computer.

4:10. Updating software continued

- Part II:** To connect the controller to the computer
- Connecting the computer**
1. Plug one end of the NULL modem cable into the RS-232 port on the front of the controller and the other end into the COM port (RS-232) on the back of the computer. The NULL modem cable ends are identical.
 2. Make note of which COM port, COM1 or COM2, you are using.
 3. If the controller is currently running, turn it off.
 4. Wait at least 10 seconds and turn the controller on. Be ready to touch the controller screen.

As the controller performs its startup sequence, you will see several messages on the screen as shown below.

Starting ROM-DOS...

OFF

TOUCH SCREEN TO LOAD CHAMBER-HOST DRIVER
(DEFAULT)

TOUCH SCREEN TO LOAD REMOTE SERVER AT 9600 BAUD

TOUCH SCREEN TO LOAD REMOTE SERVER AT 115K BAUD

5. Touch the screen when you see the message, "TOUCH SCREEN TO LOAD REMOTE SERVER AT 115k BAUD." You have about two seconds to touch the screen before the controller continues with its startup procedure.

The controller displays the message "Using COM1 at 115K+ Accessing Drive D:"

COM1 is the communication port of the controller.

6. If you do not see the message, turn the controller off, wait 10 seconds, and start the upgrade procedure over.

In the next part of the procedure, you will load the software onto the controller

4:10. Updating software continued

- Part III:** To load a software upgrade onto the controller.
- Loading the software upgrade**
1. Insert the upgrade disk into the computer disk drive. The Conviron CMP5090 Update program appears.
 2. Turn on the computer.
- The computer starts from the upgrade disk
3. Press <Enter> key to continue.
- The upgrade program displays information about the upgrade, including the serial number of the chamber.
4. Verify that the information is correct and press <Enter> to continue or <Esc> to quit.
- The upgrade program asks you to specify which computer COM port the NULL modem cable is connected to.
5. Using the up and down arrow keys, select the COM port that you are using and press <Enter> to continue.
- The upgrade program displays the message, CMP5090 LOCATED ON DRIVE D: The drive letter may be different on your system.
6. Press <Enter> to continue.
 7. The upgrade program displays the message, Make sure disk is in the drive and press any key or <Esc> to quit.
 8. Press any key to continue.
- The upgrade program copies the software files onto the controller. This will take up to 15 minutes.
- When the upgrade is complete, the program displays the message, The update has been completed. Press <Enter> to reboot the CMP5090. **Do not** continue until you have read the next section.



Wait:

Do not turn off power to the controller for 3 minutes after completing the software update.

In the next part of this procedure, you will restart the controller and recalibrate the controller's touch screen.

4:10. Updating software continued

**Part IV:
Recalibrating the
screen**



Read before restarting:

Read these instructions before restarting the controller. You must be prepared to touch the screen at specific times.

If you make a mistake, wait at least three minutes, power off the controller, and then start over.

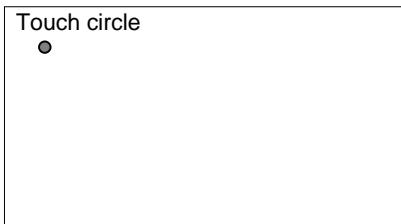
After the upgrade program is finished copying the software, the program will prompt you to press <Enter> to restart the controller.

1. Read these instructions first, wait 10 seconds, and then press <Enter>.

The screen is blank for a few seconds and then displays the question, DO YOU WANT TO ZERO THE STATIC RAM (Y/N).
TOUCH SCREEN FOR Y.

2. Touch the screen once.

The controller displays the message, STATIC RAM WILL BE ZEROED.



After a few seconds, the touch screen for calibration appears. The process halts with this screen displayed until you perform the next step.

3. Touch the circle once.



Important:

Accuracy is essential to the proper calibration of the touch screen, so touch the circle in the center.

The circle moves to the top, right of the screen.

4. Touch the circle again.

The circle moves to the bottom, right of the screen.

5. Touch the circle again.

The circle moves to the bottom, left of the screen.

6. Touch the circle again.

The controller continues its boot-up process. The Status screen displays.

The screen calibration is complete and the new software version is active. In the next part of the procedure you will set the correct time and date on the controller.

4:10. Updating software continued

**Part V:
Setting date and
time**



1. Touch the Options Icon  on the Status Screen.
2. In the Options Screen, set the correct time and date.

YOU WILL HAVE TO RESET THE CONTROLLER'S OPTIONS, AND LOGGING AND ALARM SETPOINTS. Refer to Chapters 5 and 7 in the *Conviron CMP5090 User's Guide* for more information.



3. Exit the Options Screen by touching the Exit icon  to return to the Status Screen.

For more information, please contact Conviron's Customer Care Department.

In the next part of this procedure you will restart the controller and reload your programs.

4:10. Updating software continued

- Part VI:** To restart the controller
- Restarting the controller**
1. Disconnect the NULL modem cable from the controller.
 2. Wait at least 3 minutes and turn the controller off.
 3. Wait 10 seconds and turn the controller on.
- The controller completes its start up procedure and then displays the Status screen.
4. Test the controller by moving from screen to screen using the touchscreen.
 5. If you can reuse your programs, reload them following the instructions in *The Save screen: save your program* in Chapter 3 of the *Conviron CMP5090 User's Guide* or *Saving a program to a chamber* in Chapter 5 of the *Central Control System User's Guide*.



Important:

The configuration of your controller after the upgrade must be identical to its configuration before the upgrade for you to reuse your old programs.

Before reloading your programs verify that the columns and the user limits in the program table are identical to the program table before the upgrade.

6. Destroy or reformat the upgrade disk after using the chamber for 7 days. **Do not** save or reuse the software.

The upgrade is complete.

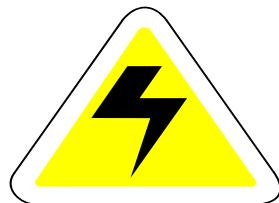
Note: The alarm priority must be set to 20, to trigger an autodialer or central alarm monitor.

4:11. Replacing external controller battery



Memory-loss Hazard

Ensure regular supply of electricity to controller is ON!



Warning – High Voltage Hazard

Ensure power to chamber is off!

Read and understand this procedure completely before trying to replace the controller battery.

The controller battery is on the back of the controller attached with a Velcro fastening system and a locking electrical connector. On most chamber models, you must open the control panel door to access it. A warning label next to the battery (shown in Figure 4-15) tells you when the battery must next be replaced.

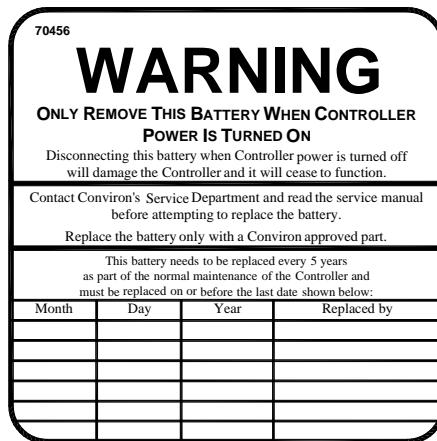
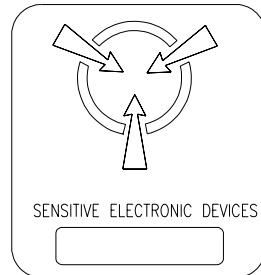


Figure Chapter 4: -15: Battery Replacement Warning Label

1. Ensure that you have the replacement controller battery that is specified in the Major Component Reference List (Appendix B of the *Conviron CMP5090 Service Manual*) and one of the following tools ready:
 - a probe – 1.5mm (1/16") diameter by 12mm (1/2") long, or
 - a flat-blade screwdriver – 3mm (1/8") wide
 2. Verify that the regular (building) supply of electricity (from your electrical utility to the controller) is ON and is not likely to be interrupted.
 3. Verify that the *controller* disconnect switch is in the ON position and **leave it ON** throughout this procedure.
 4. To turn the chamber off (for safety reasons) while maintaining the building supply of electricity to the *chamber*, turn the start/stop switch to the stop (off) position.
 5. To unlock the electrical connector to the battery (see Figure 4-16), press its release catch by one of the following methods:
 - insert the probe through the vent hole
 - insert the screwdriver through the battery plug opening



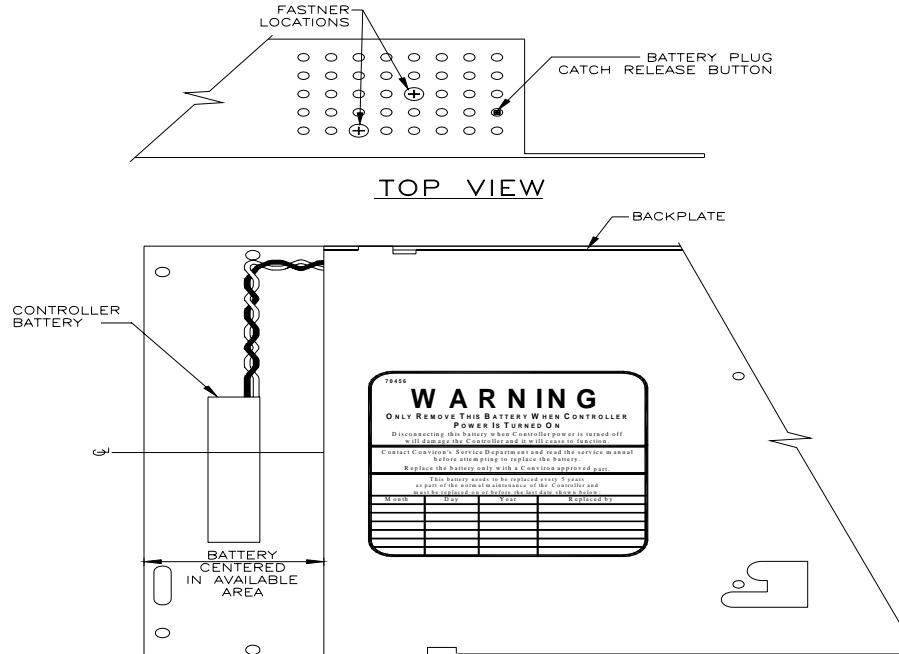


Figure Chapter 4: -16: External Battery

6. To remove the existing battery, separate its Velcro fasteners.
7. To install the new battery, insert and lock its electrical connector and join the Velcro fasteners.
8. Verify that electrical connector and the Velcro fasteners are secure.
9. On the Warning label, put your initials beside the current "replace by" date, and write a new "replace by date" that is 5 years away.

Note: Testing the success of the replacement involves a risk of losing controller memory. If the memory is lost you must replace the whole controller. If you want to do such a test, plan it for a time when you can arrange to have a replacement controller sent to you. At that time you may perform the test by turning the controller disconnect switch to off for 15 seconds and then ON again. If the controller reboots completely and all functions of the controller behave as they should, the replacement was successful. Specifically verify the following functions:

- accept and run a program
- change time and date
- recognize the compact flash card drive

Chapter 5: Boards and Sensors – Overview

Organization of this chapter

1. Input board
2. Sensors
3. Output board, triacs, and drivers
4. Independent temperature shut-off (ITSO)

1. Input board

General The input board (or module) provides connection points for sensors used to control chamber operation and/or collect data. This board also provides the connection point for the relay board. The input board sends a signal for on screen status display, control of the chamber, logging of data, and so on.

The operation of the board is controlled by software on both the board itself and in the controller. To add or remove sensors from the board, a software change is required in the configuration file on the controller.

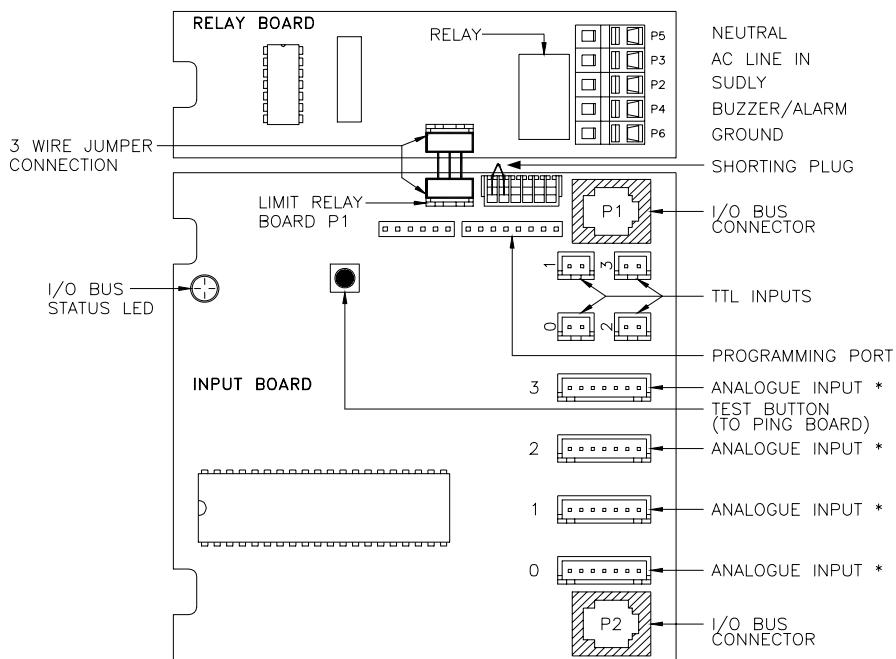


Figure Chapter 5: -1: Input Board and Relay Board

Connection to I/O communication The input board is connected to the I/O communication RS485 bus via the black RJ-11 sockets. Either socket may be used.

RS485 bus The I/O communication RS485 bus allows communication between the controller and the system boards.

The cable used in the I/O communication RS485 bus is six wire straight through with RJ-11 connectors. It looks like a standard North American telephone cable, but is not wired the same way.

1. Input board continued

LED Indicators The LED indicator on the input board flashes when the board is communicating with the controller. If the LED is not flashing, then:

- the board is not connected to the I/O communication bus, or
- the controller is not operating, or
- the input board is not operating correctly.

Analog Inputs Analog inputs are used for sensors such as temperature, humidity and CO₂. The input board can use all common types of sensors (voltage, current, and resistance). Controller software and sensor plug configuration must be matched to the type of sensor and sensor socket being used.

The Input board has four analog inputs. Analog sensors are connected to the input module with seven position JST connectors. Each Input is designed to accommodate a current input, a resistive device, a voltage signal, or a thermistor.

Current: Channels 0 and 1 have a current range capability of 0 to 50mA and channels 2 and 3 have a range of 0 to 20mA. Two ranges are provided to maximize resolution for each signal range (*examples: Horiba CO₂ sensor, Vaisala Electronic Dry Humidity Sensor*).

Thermistor: The input board is designed to use a YSI44030 (3K ohm @ 25°C) thermistor. These are Conviron's standard sensors (described in the following section on Sensors).

Voltage: Each of the input board's inputs has a voltage range of 0.0 to 2.5V. For sensors with low voltage outputs (0 to 25mV), the input board can be programmed to boost the signal on those channels (*example: Vaisala Humitter RH sensor*).

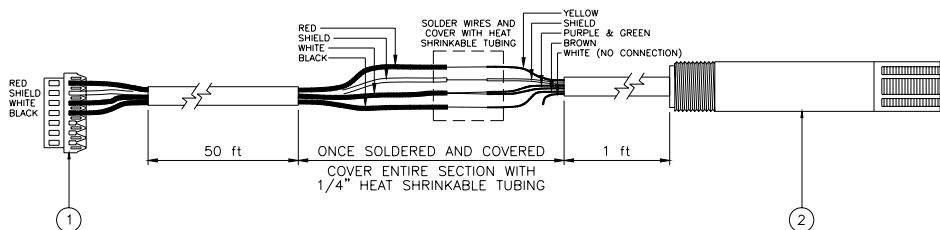
Resistive: Channels 0 and 1 have a resistance range capability of 0 to 5K ohms and channels 2 and 3 have a range of 0 to 500K ohms. The two choices are provided to maximize resolution for each signal range (*examples: damper position sensor, soil moisture sensor*).

TTL Inputs The input board has 4 TTL inputs. These inputs are used to measure on/off readings such as a current switch on a fan motor, or a door switch. To add a TTL input the controller software configuration must be updated.

Connection to the Input Boards is with 2 position JST connectors. The TTL inputs are designed to detect a logic low (shorted) or a logic high (open) switch condition. These are suitable for any smart sensor that has dry contact outputs (*examples: sail switch, current switch sensor, limit switch*). No voltage should be applied to these inputs.

2. Sensors

- Temperature Sensor** The temperature sensor is a thermistor. It is available in 3m (10'), 9m (30'), and 15m (50') lengths (part nos. 72407, 72408, 72409).
- Humidity Sensor** The standard design for the CMP4000 control system is a dry humidity sensor (DHS), usually a Vaisala Humitter. These sensors come equipped with a calibrated cable in lengths of 3m (10'), 9m (30'), and 15m (50') (part nos. 209517, 209518, 209519). The sensor is usually located in the chamber aspirator.



2	79162	SENSOR, HUMITTER 50U, STD 12" LD	1
1	79172	CONNECTOR, 07NR-E2R (JST) 22Ga.	1
SYM PART # DESCRIPTION QTY			

Figure Chapter 5: -2: Vaisala Humitter

- CO₂ Sensor** Units equipped with CO₂ control typically use a Horiba or a Vaisala system. Either system is mounted on the outside of the chamber. Control is managed through the CMP5090 which includes a Status Screen display of setpoint and actual values and an additional column in the Programming Screen for setting desired levels.
- Light Sensors** Light sensors typically used by Conviron are made by Licor. There are two types, photometric and Quantum. Photometric measures spectrum in lux. Quantum measures intensity in microeinsteins.
- Other Sensors** Frequently a user of equipment has a need to connect sensors to the control system to monitor and log data. These might include leaf temperature sensors, voltage or current sensors, even pressure transducers for the refrigeration system. Compatible sensors wired to a JST connector can be used with the system. *However, Conviron must alter the controller software to effect the sensor.*
- The independent temperature shut-off (ITSO) has its own sensor located in the aspirator. See Part 4 of this Chapter for more information about the ITSO.

3. Output board, triacs, and drivers

General An output board (see diagram) consists of four proportional outputs numbered 1 - 4 on the board which corresponds to controller numbering 0 - 3. Each output consists of a low voltage side (12VDC control signal from the controller) and a high voltage (switched AC) side connected between the breaker panel (line) and the controlled output device (load) such as the lamps, heaters, fans, etc

Line and load connections are made by way of a Wago terminal block on the board. The 12VDC connection is by way of an I/O communication bus jumper connection. Most chambers require more than one board. The first board is connected by the I/O Bus connection to the controller and jumpers to the next board via a similar connection, and so on as required.

The triac driver is a small square circuit board connected to a socket on the output board. The triac is mounted on an aluminum plate connected to the output board by three lug connectors and bolted at the other end to a heat sink. Each output requires a triac and driver.

Software setting files in the controller will determine how each proportional output operates.

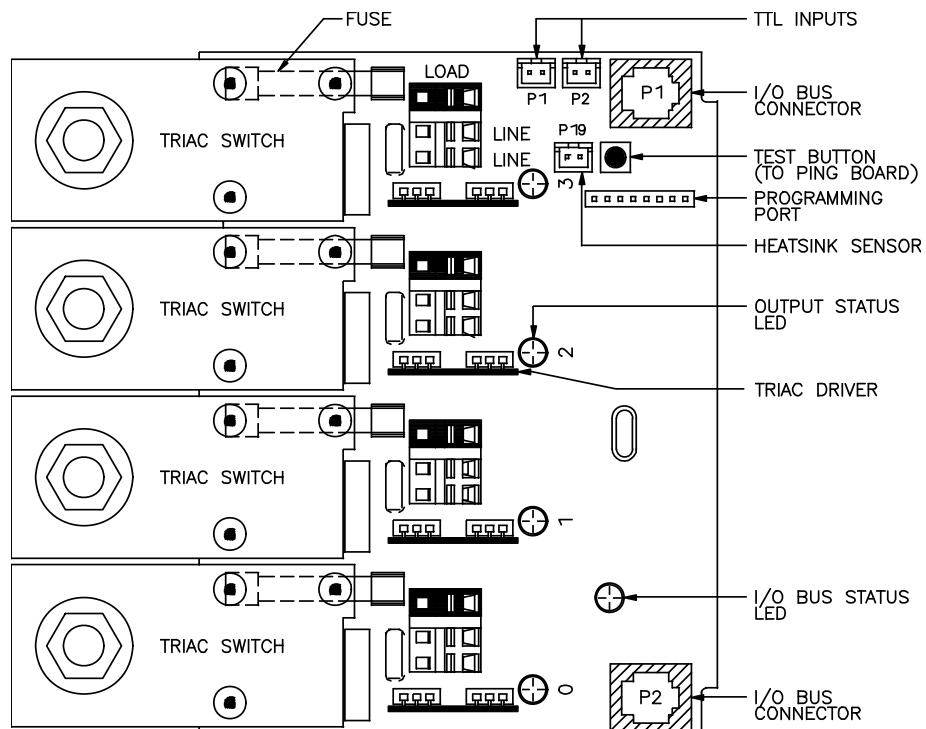


Figure Chapter 5: -3: Output Board with Triac Switches

3. Output board, triacs, and drivers continued

Operation of outputs There are three control methods for an output. Typical loads and the appropriate driver to use vary as follows:

Control Method / Definition —Type of Driver	Typical Load
On/Off Binary / Digital two state on/off control for other than lighting loads — Zero crossing	Always use a zero crossing driver with: <ul style="list-style-type: none">• SUDLY• non-lighting, on-off loads rated at 1 amp or less (contactor coils, relay coils, solenoid valves)
On/Off Burst proportional / Time proportioning on/off — Zero crossing	Always use a zero crossing driver with: <ul style="list-style-type: none">• all phase to phase loads (typically heaters*)• all auxiliary circuits (except where the load is known to lighting, load draws more than 1 amp, or it is not an on/off output)
On/Off Binary / Digital two state on/off control for lighting loads — Non-zero crossing	Always use a non-zero crossing on all lighting circuits
Phase cut Proportional / Analog signal varying 0%–100% of AC signal voltage — Non-zero crossing	Always use a non-zero crossing driver with: <ul style="list-style-type: none">• all phase cut proportional loads (typically proportional valves and damper motors**)• all lighting circuits• all loads rated at more than 1 amp (except phase to phase loads)

Exceptions to the rules:

- *Phase to neutral heaters must use a non-zero crossing driver
- **Most damper motors require a non-zero crossing driver.
Exception: CO₂ damper motor
- A chemical dryer damper might use either – look at the schematics to determine the correct one.

3. Output board, triacs, and drivers continued

- LED Indicators** The I/O communication bus status LED on the output board flashes when the board is communicating with the controller.
- Each output has an output status LED. For burst on/off control the LED will be on when the controller has the output turned on.
- If the output is proportional burst mode (solenoid, heater etc.), the LED will flash.
- The LED does not flash for phase cut outputs.
- The LED will also flash if the driver for that output is damaged.
- To test phase cut proportional outputs, the diagnostics screen should be used to turn the output on 100%, the LED will not flash if the driver is operating correctly.

4. Independent temperature shut-off (ITSO)

The ITSO protects the chamber from damage by shutting it off if its temperature sensor reading is outside the range of ITSO high and low settings. When it shuts off the chamber, it also sounds the buzzer alarm.

The operation of the ITSO is not directly reflected on the Alarm screen of the controller. However, if the ITSO shuts off the chamber, the resulting loss of power to the outputs will trigger ‘bd lost synch’ and ‘chamber off’ alarms.

Default settings are made at the factory using knobs which are located, away from normal user access, inside the control panel, because they are not intended to be used for controlling experiments.

The factory default settings are 5° outside the chamber operating range. If the settings are changed, they should be at least 10° outside the range of the programmed high and low temperature settings for the experiment and 5° outside the range of the temperature (TEMP) alarm trip points.

Appendix A: Glossary of Labels

This appendix lists and describes the labels used on the CMP5090 controller.

See the *Users' Guide* for information on the categories of labels.

Labels

	Label	Description
Input labels	TEMP	Temperature inside the plant growth area
	TEMP1	Unit temperature
	TEMP2	Lamp loft temperature
	TEMP3	Leaf temperature
	HUM	Humidity
	HUMWB	Humidity wet bulb temperature
	HUMDV	Humidity dry sensor, voltage type
	HUMDC	Humidity dry sensor, current type
	C02	Carbon dioxide sensor
	C02HC	Carbon dioxide Horiba, current type
Output labels	C02XV	Carbon dioxide brand X, voltage type
	SUDLY	Start up delay
	DRIER	Dehumidify drier
	HUMREC	Humidify CAH receptacle
	BHSV LV	Bottom heat solenoid valve
	BCS VL V	Bottom cool solenoid valve
	THSV LV	Top heat solenoid valve

Appendix A: Glossary of Labels

Label	Description
TCSVLV	Top cool solenoid valve
HSVLV	Heat solenoid valve
CSVLV	Cool solenoid valve
HCMVLV	Heat/cool modulating valve
COSVLV	CO2 solenoid valve
SNVLV	Humidify spray nozzle solenoid valve
SNVLV1	Humidify spray nozzle solenoid valve
SNVLV2	Humidify spray nozzle solenoid valve
DSVLV	Drain solenoid valve
AVSVLV	Air vent solenoid valve
MSVLV	Misting solenoid valve
WSVLV	Watering system solenoid valve
PSVLV	Priming solenoid valve
CFMTR	Circulating fan motor
LLFMTR	Lamp loft fan motor
EFMTR	Exhaust fan motor
EDMTR	Exhaust damper motor
DBDMTR	Dehumidify bypass damper motor
DDDMTR	Dehumidify drier damper motor
HCMTR	Humidify CAH motor
FLUOR1-8	Fluorescent lamp levels 1 to 8
INCAN1-8	Incandescent lamp levels 1 to 8
MHAL1-8	Metal halide lamp levels 1 to 8
HPSOD1-8	High pressure sodium lamp levels 1 to 8
MVAP1-8	Mercury vapor lamp levels 1 to 8
HTR1-8	Electric heater levels 1 to 8

Label	Description
TDHTR1	Top defrost heater 1
BDHTR2	Bottom defrost heater 2
DAHTR3	Top damper heater 3
DAHTR4	Bottom damper heater 4
DRHTR5–6	Drain heaters 5 and 6
DHTR7–10	Defrost heaters 7 to 10
ASHTR	Anti sweat heater
FLUORBNK	Fluorescent lamp bank
INCANBNK	Incandescent lamp bank
SODIUMBNK	High pressure sodium lamp bank
HALIDBNK	Metal halide lamp bank
MVAPORBNK	Mercury vapor lamp bank
HEATERBNK	Electric heater bank
INC_HALBNK	Incandescent-metal halide lamp bank

Appendix B: CMP5090 Major Component Reference List

The following is a partial list of the parts related to the CMP5090 control system. If you are unsure whether you have identified the correct part or all the required parts, we highly recommend that you contact Conviron Global Link Service for assistance.

Part #	Description	Notes
212387	CMP5090 CONTROLLER,	LCD DISPLAY, ETHERNET CARD, EXTERNAL DIMMING CONTROLS INCLUDED, EXTERNAL BATTERY
78146	INDEPENDENT TEMP SHUT-OFF - POTS	HI AND LO POTENTIOMETERS
78147	INDEPENDENT TEMP SHUT-OFF SENSOR	SENSOR AND LEAD
78189	INDEPENDENT TEMP SHUT-OFF BOARD	
79409	POWER SUPPLY	CONTROLLER DC POWER SOURCE
72421	OUTPUT BOARD,	NEXTGEN12 CODE SWV 3.20
72422	OUTPUT BOARD, 24 VOLT	NEXTGEN12 CODE SWV 3.20
79270	FUSE, OUTPUT BOARD	ABC-15 AMP
79401	INPUT BOARD REVISION 2	
72413	TRIAC DRIVER	OUTPUT SWITCH CONTROL
72417	TRIAC DRIVER, ZERO-CROSSING	CMP4542 - X BLUE BAND
72418	TRIAC DRIVER (RED)	OUTPUT SWITCH CONTROL (LOW AMP LOAD)
79403	TRIAC, 15 AMP	OUTPUT SWITCH
72414	TRIAC, 2 AMP	OUTPUT SWITCH (2 AMP MAX)
79407	TEMPERATURE SENSOR, 3m (10')	TEMPERATURE INPUT
79408	TEMPERATURE SENSOR, 9m (30')	TEMPERATURE INPUT
79409	TEMPERATURE SENSOR, 15m (50')	TEMPERATURE INPUT
72231	EXTERNAL CONTROLLER BATTERY	CRITICAL MEMORY BACK-UP BATTERY
209517	ELECTRONIC DRY HUMIDITY SENSOR, 3m (10')	HUMIDITY INPUT
209518	ELECTRONIC DRY HUMIDITY SENSOR, 9m (30')	HUMIDITY INPUT

Part #	Description	Notes
209519	ELECTRONIC DRY HUMIDITY SENSOR, 15m (50')	HUMIDITY INPUT
70212	I/O 485 BUS CABLE – 15cm (6")	CONTROL SYSTEM COMMUNICATION
70206	I/O 485 BUS CABLE – 30cm (12")	CONTROL SYSTEM COMMUNICATION
70207	I/O 485 BUS CABLE – 60cm (24")	CONTROL SYSTEM COMMUNICATION
70208	I/O 485 BUS CABLE – 91cm (36")	CONTROL SYSTEM COMMUNICATION
70209	I/O 485 BUS CABLE – 1.22m (48")	CONTROL SYSTEM COMMUNICATION
70210	I/O 485 BUS CABLE – 1.52m (60")	CONTROL SYSTEM COMMUNICATION
70211	I/O 485 BUS CABLE – 1.83m (72")	CONTROL SYSTEM COMMUNICATION
70246	NULL MODEM CABLE	USED TO LOAD CTRL. SOFTWARE
742287	FLASH CARD READER	USED TO UP/DOWN LOAD SOFTWARE & LOG FILES
70385	YCABLE FOR POWER FOR POWER SUPPLY (also see 70400 for V1 and V2 controllers)	CONTROLLER AND FLOPPY DRIVE POWER
742539	COMPACT FLASH CARD	256 MB
72406	LIMIT RELAY BOARD	

Appendix C: Cleaning and Maintenance

Cleaning LCD touch screen display Use water or window cleaner to clean the touch screen display. Put spray cleaner into center of cloth and fold over so no abrasive content of cleaner will be rubbed on the screen.

Air filter maintenance Every control panel has at least one air inlet to allow fresh air into the panel for cooling the components. The inlets have a filter pad to remove dust and other particles that can reduce air flow causing problems.

Change the filters regularly to ensure good air flow in the control panel.

Battery maintenance  **Memory-loss hazard:** A continuous supply of electricity to the controller is essential to preserve its memory. If its memory is lost, the controller won't operate and you will have to arrange for its replacement.

An external battery provides backup for the regular supply of electricity to maintain continuity for brief periods when the regular supply may not be available.

The battery must be replaced at intervals NOT exceeding 5 years to ensure that the battery is ready to perform as expected. The time of the next scheduled replacement is recorded on a warning label on the back of the controller.

The regular supply of electricity to the controller must be ON while you replace the battery (see Procedure 4:11).

To promote battery life:

- ➔ Keep the controller disconnect switch ON (use only the start/stop switch to turn electricity for the chamber on and off)
- ➔ Keep ambient temperatures within the range of human comfort