

SUN ELECTRONIC SYSTEMS

ECOX HEAT/COOL TROUBLESHOOTING GUIDE

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COVERS MODELS ECOx REV E , REV F

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TROUBLESHOOTING AN ECOX (REV F AND LATER) CHAMBER WITH HEATING AND COOLING ISSUES

Note: ECOX chambers mfg after 2000 will have the REV F style controller. This is a 2-stack controller that uses an I/O board mounted on the chamber's firewall. Check the serial label on the back of the chamber to determine controller Rev. See page 8 for troubleshooting an ECOX with a REV. E and earlier controller.

TROUBLESHOOTING A CHAMBER NOT HEATING

- Separate control section from chassis by removing screws along top/bottom of right side of chamber.
- Separate control section from rest of chamber and verify that the gray ribbon cable from motherboard to I/O board is securely seated on both ends.
- Verify that red/black twisted pair from bottom terminal strip labeled HEAT is connected securely to the 25A heater SSR installed on firewall next to I/O board.
- With the red heat LED on, the DC voltage to 3&4 of the 25A heater SSR should be between 3 and 5 VDC.
- If this voltage is present on the heater SSR, then with voltmeter set to AC, the AC voltage measured on terminal 1 & 2 across heater SSR should be close to 0VAC.
- If the voltage across 1&2 of the 25A heater SSR is not approximately 0VAC when the RED heat LED is on, then SSR could be faulty or there could be an open heater element or poor connection to one or more heater elements.
- To verify that heater elements are OK, you can measure the total equivalent resistance at the points listed in the table. The value measured should be within a few ohms of the value listed in the table.

MODEL	VOLTAGE	MEAST. TERMINALS	OHMS	HEATER ELEMENTS
EC0A/01	110 VAC	11 & 9 ON I/O BOARD	10	(2) 600 WATTS
EC0A/01	220 VAC	11 & 10 ON I/O BOARD	40	(2) 600 WATTS
EC02/12	110 VAC	11 & 9 ON I/O BOARD	8	(2) 800 WATTS
EC02/12	220 VAC	11 & 10 ON I/O BOARD	32	(2) 800 WATTS
EC03/13	220 VAC	11 & 10 ON I/O BOARD	20	(4) 600 WATTS

- If a much higher resistance is measured, then a poor connection to a heater element exists or there is an open heater element.

To determine if a poor connection exists:

- Remove the chamber back plate and set aside fiberglass insulation. Inspect wiring to heater elements and check that nuts are tight, there are no charred connectors, or cracked/broken ceramic insulators. Repair as needed.

To determine if a heater element is open:

- Remove wiring to heater element and use ohmmeter to measure resistance of each heater element.

TROUBLESHOOTING A CHAMBER HEATING ALL THE TIME

With chamber powered on and the RED heat LED off, the chamber should not heat up at a fast ramp rate. The residual heat from motors, however, will cause a very slow increase in temperature of the chamber.

If the chamber is heating at all times:

- Separate control section from chassis by removing screws along top/bottom of right side of chamber.
- Measure the DC voltage across 3&4 of the 25A heater SSR. It should be approximately 0vdc when RED heat LED is off.
- If a voltage is present, then either there is short in gray I/O ribbon cable or main motherboard is faulty. You can rule out the ribbon cable by temporarily using the ribbon cable used by the front panel. If problem clears, then problem is a faulty ribbon cable. If problem persists, then controller is faulty and should be sent in for repair. Call Sun for an RMA number.
- If no voltage is present on 3&4 of the 25A heater SSR, then measure the AC voltage across 1&2. With the red heat LED off, the voltage should be approximately that of the line voltage. If the voltage measured is close to zero, the SSR is most likely shorted internally. Otherwise, there is most likely a heater terminal shorted to ground via a broken ceramic insulator or has opened up and making contact with chamber (ground).
- To determine if a short from terminal to ground exists, remove the backplate of the chamber and set aside fiberglass insulation. Inspect for broken ceramic insulators, charred or loose wiring. Measure the resistance from each terminal to ground (inner chamber). It should read a very high resistance. If not, then heater element is faulty and should be replaced. Contact Sun for part numbers or assistance.

TROUBLESHOOTING AN ECOX REV F CHAMBER WITH A DC VALVE THAT IS NOT COOLING

If the green cool LED IS coming on and the chamber is not cooling:

The chamber requires a LIQUID supply for the chamber to cool. **It will not cool with gas.** Verify that the correct coolant is being used for the chamber. This information is located on the serial label listed on the back of the chamber. If you are using an LN2 or LCO2 Dewar (tank), verify:

- The supply hose is connected to the LIQUID port.
- The tank is not empty.
- The supply pressure is within 25 psi of the stated pressure listed on the label located on the back of the chamber.

- The supply hose should be as short as possible (6' is ideal) and insulated to minimize vaporization of the liquid before it gets to the chamber.

If you are using 850 psi LCO₂, verify that you are using a SIPHON cylinder to ensure that liquid CO₂ is drawn and that the tank is not empty.

If you are confident that the chamber is receiving a liquid supply:

- Separate control section from chassis.
- Verify that the gray ribbon cable from motherboard to I/O board is securely seated on both ends.
- The coil resistance of the DC valve can be measured. To do this, remove the black valve wires from terminals 15&16. Set meter to measure resistance. The value should be approximately 18 OHMS. If an open resistance is measured, the coil is faulty and needs to be replaced.
- If the resistance is OK, reconnect valve wires to 15 and 16.
- Set chamber to cool. When the green cool LED is on, the driver board sends out a 20-25 volt pulsed signal that can be viewed on a scope OR the average DC voltage of this can be measured with a voltmeter.
- Set the voltmeter to measure DC volts and measure the voltage to 15 & 16. The voltage should be between 4 Vdc and 7 Vdc.
- If this voltage is not present (0Vdc measured) then the valve driver board could be bad. To verify if driver board is faulty, verify that the 3-5Vdc cool control voltage from the controller is getting to this driver board. This control signal is present between the pins labeled + and – (on the I/O board) next to the leads on the cool driver board . If this signal present and no voltage is present on 15 & 16, then most likely the cool driver board is faulty.
- If a voltage IS present on 15 & 16 of the I/O board, verify LN₂ supply pressure is within 25 psi of the rated pressure listed on back of chamber. If the valve continues to not open, valve is most likely faulty and should be replaced or sent in on RMA. Contact Sun at 321-383-9400 for assistance.

TROUBLESHOOTING AN ECOX REV F CHAMBER WITH AN AC VALVE THAT IS NOT COOLING

If the green cool LED IS coming on and the chamber is not cooling:

The chamber requires a LIQUID supply for the chamber to cool. **It will not cool with gas.** Verify that the correct coolant is being used for the chamber. This information is located on the serial label listed on the back of the chamber. If you are using an LN₂ or LCO₂ Dewar (tank), verify:

- The supply hose is connected to the LIQUID port.
- The tank is not empty.
- The supply pressure is within 25 psi of the stated pressure listed on the label located on the back of the chamber.
- The supply hose should be as short as possible (6' is ideal) and insulated to minimize vaporization of the liquid before it gets to the chamber.

If you are using 850 psi LCO₂, verify that you are using a SIPHON cylinder to ensure that liquid CO₂ is drawn and that the tank is not empty.

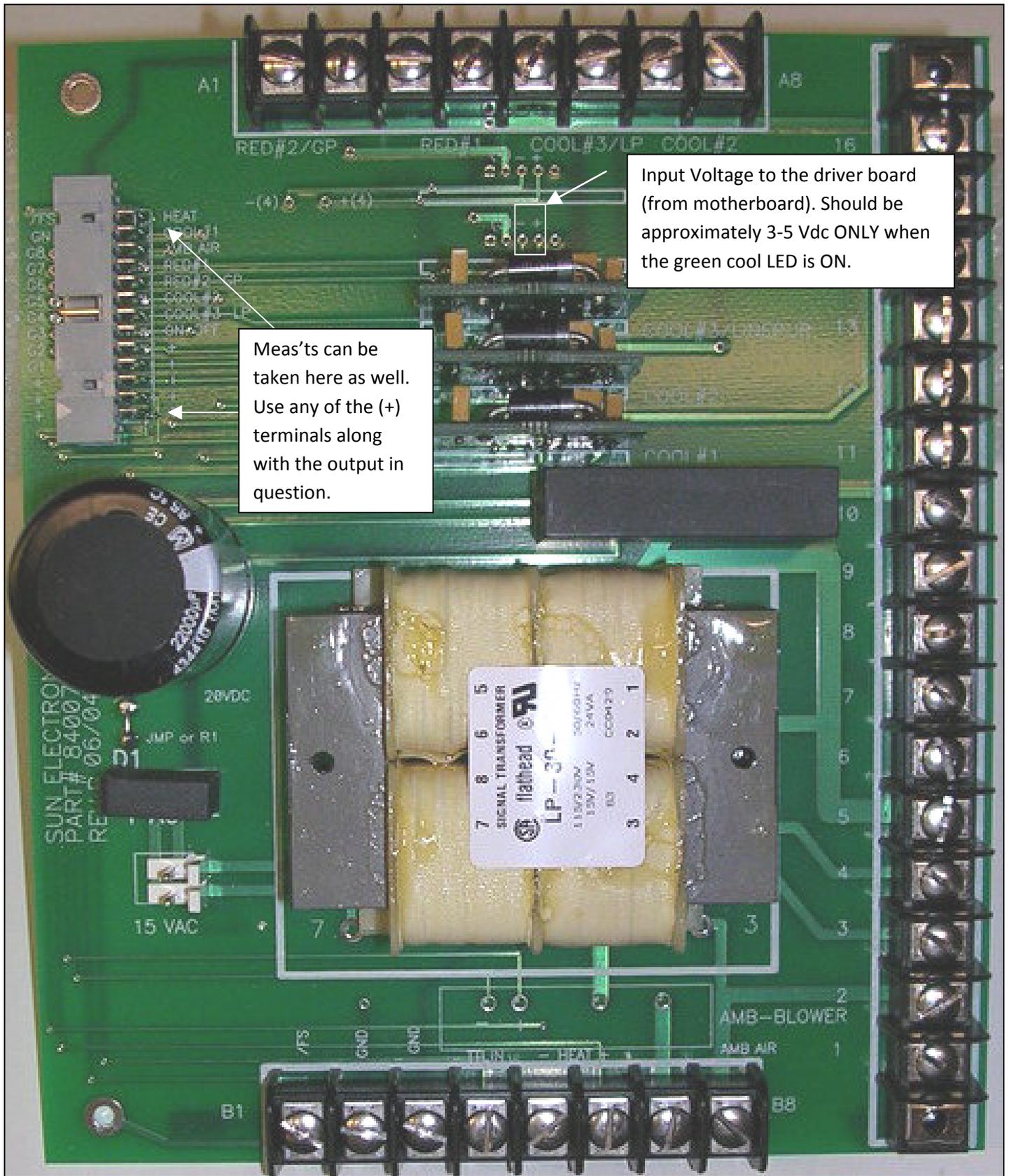
If you are confident that the chamber is receiving a liquid supply:

- Separate control section from chassis.
- Verify that the gray ribbon cable from controller to I/O board is securely seated on both ends.
- Set chamber to cool. When the green cool LED is on, the cool SSR should send out an AC voltage approximately equal to the line voltage supplied to chamber (110VAC or 220VAC) on terminals 15 and 16 of the I/O board.
- If no voltage is present, then the SSR, controller or gray I/O ribbon cable could be at fault. To verify if which one is at fault, verify that the 3-5Vdc cool control voltage from the motherboard is getting to the cool relay. This control signal is present between the SSR + and – leads. If the signal is present, then cool SSR is most likely at fault. If this signal is not present, then replace ribbon cable to see if problem clears. If not, the controller is most likely at fault and should be sent in on an RMA. Contact Sun to get an RMA number.

TROUBLESHOOTING AN ECOX REV F CHAMBER WITH A VALVE STUCK OPEN

If the green cool LED is off, the chamber's valve should not allow coolant into the chamber. If it is off and continues to allow coolant into the chamber, UNPLUG the chamber from the outlet. If coolant continues to rush into the chamber with no power applied to the chamber, then the valve is at fault (Contact Sun for replacement part). If problem clears then the electronics is at fault. To determine if problem lies with controller, I/O flat ribbon cable or DC driver board (AC SSR):

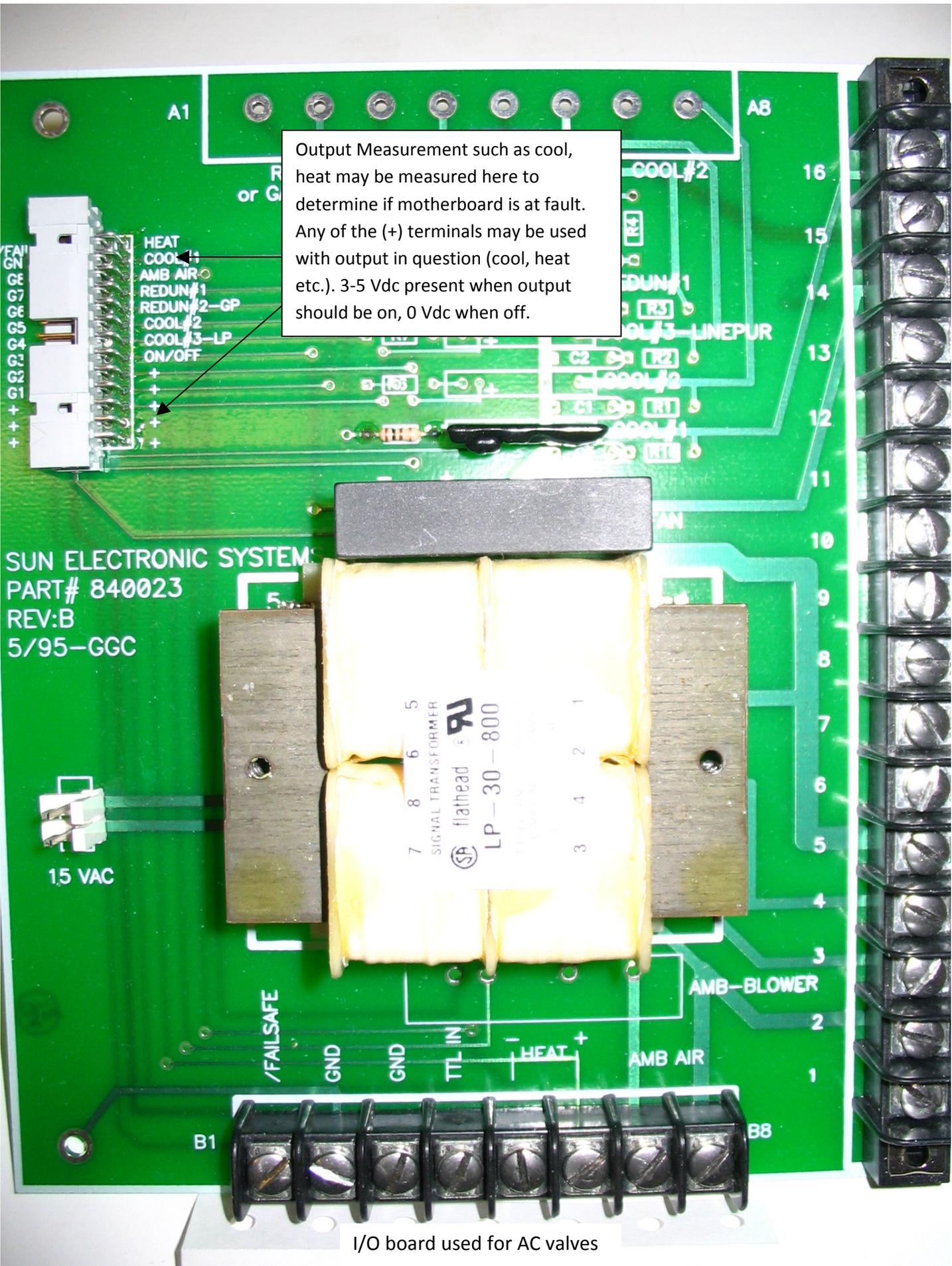
- Separate control section from chassis.
- Swap out ribbon cable with known good ribbon cable. The ribbon cable used by the chamber's front panel may be used. If problem clears, ribbon cable was faulty. Contact Sun for replacement part. If problem persists:
- Verify that NO voltage is present on terminals 15 & 16 (or on optional valves, terminal strip is labeled). For DC valves you should measure close to 0VDC and for AC valves, close to 0VAC. If a voltage is present, then either the DC driver board (SSR) or the motherboard is at fault. To determine if the controller is erroneously sending out a voltage to the driver board (SSR), measure the DC voltage to the input of the driver board (SSR) (See I/O photo below). Measurement should be taken from the (+,-) pads for the driver board in question. The measurement may also be taken from the 26-pin gray connector. Use any of the (+) leads along with the output in question. If no voltage is present from motherboard then the driver board (SSR) is at fault. If a voltage is present at the input to the DC driver board (or AC SSR), then the controller is at fault. Contact Sun for an RMA or replacement part (s).



Input Voltage to the driver board (from motherboard). Should be approximately 3-5 Vdc ONLY when the green cool LED is ON.

Meas'ts can be taken here as well. Use any of the (+) terminals along with the output in question.

I/O board used for DC valves



Output Measurement such as cool, heat may be measured here to determine if motherboard is at fault. Any of the (+) terminals may be used with output in question (cool, heat etc.). 3-5 Vdc present when output should be on, 0 Vdc when off.

SUN ELECTRONIC SYSTEM
PART# 840023
REV:B
5/95-GGC

15 VAC

B1

B8

I/O board used for AC valves

TROUBLESHOOTING AN ECOX CHAMBER (REVE AND EARLIER) WITH HEATING AND COOLING ISSUES

Note: ECOX chambers mfg before 2001 will have the REV E style controller. This is a 3-stack controller that uses a 16 position terminal strip mounted on the chamber's firewall. Check the serial label on the back of the chamber to determine controller Rev.

TROUBLESHOOTING AN ECOX REV E CHAMBER NOT HEATING

- Separate control section from chassis by removing screws along top/bottom of right side of chamber.
- Verify all wiring to terminal strips are secure.
- With the RED heat LED on, verify line voltage is present on terminals 11 and 9 (110 VAC) and 11 & 10 (220 VAC) of terminal strip on firewall.
- If no voltage is present, check F2 25A fuse (located on top power supply board to left of transformer) for continuity/corrosion and replace if faulty/corroded. Check fuse holder for corrosion and clean if necessary.
- If fuse is ok, then 25A heater triac is most likely at fault. Contact Sun for RMA or replacement part.
- To verify that heater elements are OK, you can measure the total equivalent resistance at the points listed in the table. The value measured should be within a few ohms of the value listed in the table.

MODEL	VOLTAGE	MEAST. TERMINALS	OHMS	HEATER ELEMENTS
EC0A/01	110 VAC	11 & 9 ON TERMINAL STRIP	10	(2) 600 WATTS
EC0A/01	220 VAC	11 & 10 ON TERMINAL STRIP	40	(2) 600 WATTS
EC02/12	110 VAC	11 & 9 ON TERMINAL STRIP	8	(2) 800 WATTS
EC02/12	220 VAC	11 & 10 ON TERMINAL STRIP	32	(2) 800 WATTS
EC03/13	220 VAC	11 & 10 ON TERMINAL STRIP	20	(4) 600 WATTS

- If a much higher resistance is measured, then a poor connection to a heater element exists or there is an open heater element.

To determine if a poor connection exists:

- Remove the chamber back plate and set aside fiberglass insulation. Inspect wiring to heater elements and check that nuts are tight, there are no charred connectors, or cracked/broken ceramic insulators. Repair as needed.

To determine if a heater element is open:

- Remove wiring to heater element and use ohmmeter to measure resistance of each heater element.

TROUBLESHOOTING AN ECOX REV E CHAMBER HEATING ALL THE TIME

With chamber powered on and the RED heat LED off, the chamber should not heat up at a fast ramp rate. The residual heat from motors, however, will cause a very slow increase in temperature of the chamber.

If the chamber is heating at all times:

- Separate control section from chassis by removing screws along top/bottom of right side of chamber.
- Set meter to AC and measure voltage across heater elements (terminal 11 and 9 of terminal strip).
- If the red heat LED is off, there should be ~ 0VAC across elements. If line voltage is measured, then 25A heater triac on control stack's power supply is most likely internally shorted.
- Otherwise, there is most likely a heater terminal shorted to ground via a broken ceramic insulator or has opened up and is making contact with chamber (ground).
- To determine if a short from terminal to ground exists, remove the backplate of the chamber and set aside fiberglass insulation. Inspect for broken ceramic insulators, charred or loose wiring. Measure the resistance from each heater terminal to ground (inner chamber). It should read a very high resistance. If not, then heater element is faulty and should be replaced. Contact Sun at 321-383-9400 for part numbers or assistance.

TROUBLESHOOTING AN ECOX REV E CHAMBER THAT IS NOT COOLING

If the green cool LED IS coming on and the chamber is not cooling:

- Separate control section from chassis.
- Verify wiring from valve to terminal strip and from terminal strip to control stack are secure.
- Set chamber to cool. When the green cool LED is on, the cool triac should send out an AC voltage approximately equal to the line voltage supplied to chamber (110VAC or 220VAC) on terminals 13 and 16 of the terminal strip.
- If no voltage is present, then cool triac is most likely faulty. Contact Sun for RMA or replacement part.
- If a voltage IS present on 13 & 16 of the I/O board, verify LN2 supply pressure is within 25 psi of the rated pressure listed on back of chamber. If the valve continues to not open, valve is faulty. Contact Sun for an RMA or replacement part.

TROUBLESHOOTING AN ECOX REV E CHAMBER WITH A VALVE STUCK OPEN

If the green cool LED is off, the chamber's valve should not allow coolant into the chamber. If the green cool LED is off and continues to allow coolant into the chamber, UNPLUG the chamber from the outlet. If coolant continues to rush into the chamber with no power applied to the chamber, then the valve is at fault. If problem clears then the cool triac is at fault. Contact Sun for replacement part.

If you would like an RMA, need replacement parts, or assistance of any kind with troubleshooting your chamber, please contact us at:

Sun Electronic Systems, Inc.

1845 Shepard Dr.

Titusville, FL. 32780

Email: info@sunelectronics.com

Phone: 321-383-9400