

## Troubleshooting WBL Controllers

### Scope

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This document is a guide for troubleshooting conductivity reading/calibration problems in WBL and WDB boiler controllers.

### Self-Test

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The first step is to check the electronics by performing a self-test on each sensor input. On WBL/WDB controllers, this is found in the conductivity sub-menu. With all wiring in place, perform the self-test following the instructions below.

To find out if the sensor or the controller is faulty, step through the Self-Test menu, as described in the manual. The display should read  $1000 \pm 20\mu\text{S/cm}$  if the sensor cable is 10 feet long. If the cable has been extended, the self-test value will drop by 1 for each additional foot of cable. For example, if the cable has been extended 100 feet, the self-test should read  $900 \pm 20$ . This indicates that the controller is OK and the problem is in the sensor or its connections. If the conductivity reading is not within this range, disconnect the sensor wires from the controller and recheck the self-test. If it does not read  $1000 \pm 20$ , the front panel is faulty. If the self-test is now OK, the problem lies with the sensor.

To evaluate the sensor, you should first check the wiring from the sensor to the terminal strip in the junction box, and from the junction box to the terminal strip in the controller. Make sure the correct colors go to the correct terminals, and that the connections are tight. Restore power and see if the conductivity is back to normal. If not, replace the sensor.

### Troubleshooting

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If the Self-Test passes and the controller is not reading conductivity properly, remove the sensor and verify that it's clean. If necessary, clean the sensor using a dilute acid until it stops fizzing. Reinstall and check reading.

If the conductivity reading is still low or unstable, flashing is the likely cause. To check for flashing, close a valve downstream of the sensor. If the reading climbs and stabilizes over the next several minutes, then the sample is flashing. To correct, verify that the sensors are installed in the blowdown line as per Walchem recommendations (see diagrams in instruction manual):

1. Make sure the minimum water level in the boiler is at least 4-6 inches above the skimmer blowdown line. If the skimmer line is closer to the surface, it is likely that steam will be drawn into the line instead of boiler water. The skimmer line must also be installed above the highest tube.
2. Maintain a 3/4-inch minimum pipe ID with no flow restrictions from the tap for the boiler skimmer blowdown line to the sensor. If the ID is reduced below 3/4 inch, then flashing will occur beyond that point and the conductivity reading will be low and erratic. Minimize the usage of tees, valves, elbows or unions between the boiler and the sensor.
3. A manual shut off valve should be installed so that the sensor can be removed and cleaned. This valve must be a full port valve in order to avoid a flow restriction.
4. Keep the distance between the tap for the boiler skimmer line to the sensor as short as possible, to a maximum of 10 feet.
5. Mount the sensor in the side branch of a 3/4" cross in a horizontal run of pipe (see diagram in manual). This will minimize entrapment of steam around the sensor and will allow any solids to pass through. **DO NOT INSTALL USING A REDUCING BUSHING IN A 1" OR LARGER CROSS.**

6. There **MUST** be a flow restriction after the sensor and/or control valve in order to provide backpressure. This flow restriction will be either a flow control valve or an orifice union. The amount of the flow restriction will affect the blowdown rate as well, and should be sized accordingly.
7. Install the motorized ball valve or solenoid valve per the manufacturer's instructions.
8. For best results, align the hole in the conductivity sensor such that the direction of water flow is through the hole.

If the sensor is clean, the sample is not flashing, the plumbing is correct, but the conductivity is not reading properly, perform the following steps:

1. Remove the sensor and place in a beaker of boiler water with a known conductivity value.

**Note:** the controller will read conductivity only when it's sampling. If the controller is in an intermittent sampling mode, you must start the calibration procedure to activate the bleed valve for the controller to begin reading the conductivity.

2. If the conductivity reading matches the sample, connect a wire between the beaker of water and the pipe (skimmer line). If the value changes (usually lower), there is a ground loop and there may be a problem with the sensor wiring, front panel, or option card. Contact the factory for assistance.

## **Other Checks**

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**Wiring:** Verify that all sensor wiring is correct as shown in the instruction manual. Assure that all connections are good and that the cable shield wire is terminated to the GND stud on the controller side only (the shield must not be connected in the sensor junction box). Sensor cables must not be in the same conduit as AC power and must be physically separated from AC power by a minimum of 6 inches. The conductivity sensor should be placed as close to the controller as possible, to a maximum distance of 250 ft. Less than 25 ft is recommended.

**Temperature element:** If the temperature reading is the problem, disconnect the WHITE and GREEN wires from the terminal strip in the junction box and measure across the WHITE and GREEN wires coming from the sensor. Reading should be 1000 ohm + 3.85 ohms per degree C above 0°C. If reading is incorrect, the temperature element in the sensor is bad. If this reading is good, reconnect at the terminal strip and disconnect at the controller end and check the reading between WHITE and GREEN wires. If the resistance is good, yet it still reads incorrectly, the problem is with the front panel or option card.

**Sensor leaking:** Occasionally the sensor could leak boiler water into the internals of the sensor. Carefully examine the sensor and junction box for signs of leakage.

**Grounding issues:** Even though all wiring may be properly installed, a potential problem with the controller ground may be the cause of the calibration problem. Have a qualified electrician check to see if the power panel the WBL is connected to is properly grounded. Removing the sensor from the process and placing overnight in a beaker of standard solution can also verify this. If the reading drifts, improper grounding of the controller may be the problem. If it does not drift, the process itself may be poorly grounded.