WALCHEM
IWAKI America Inc.

Troubleshooting WMB Controllers

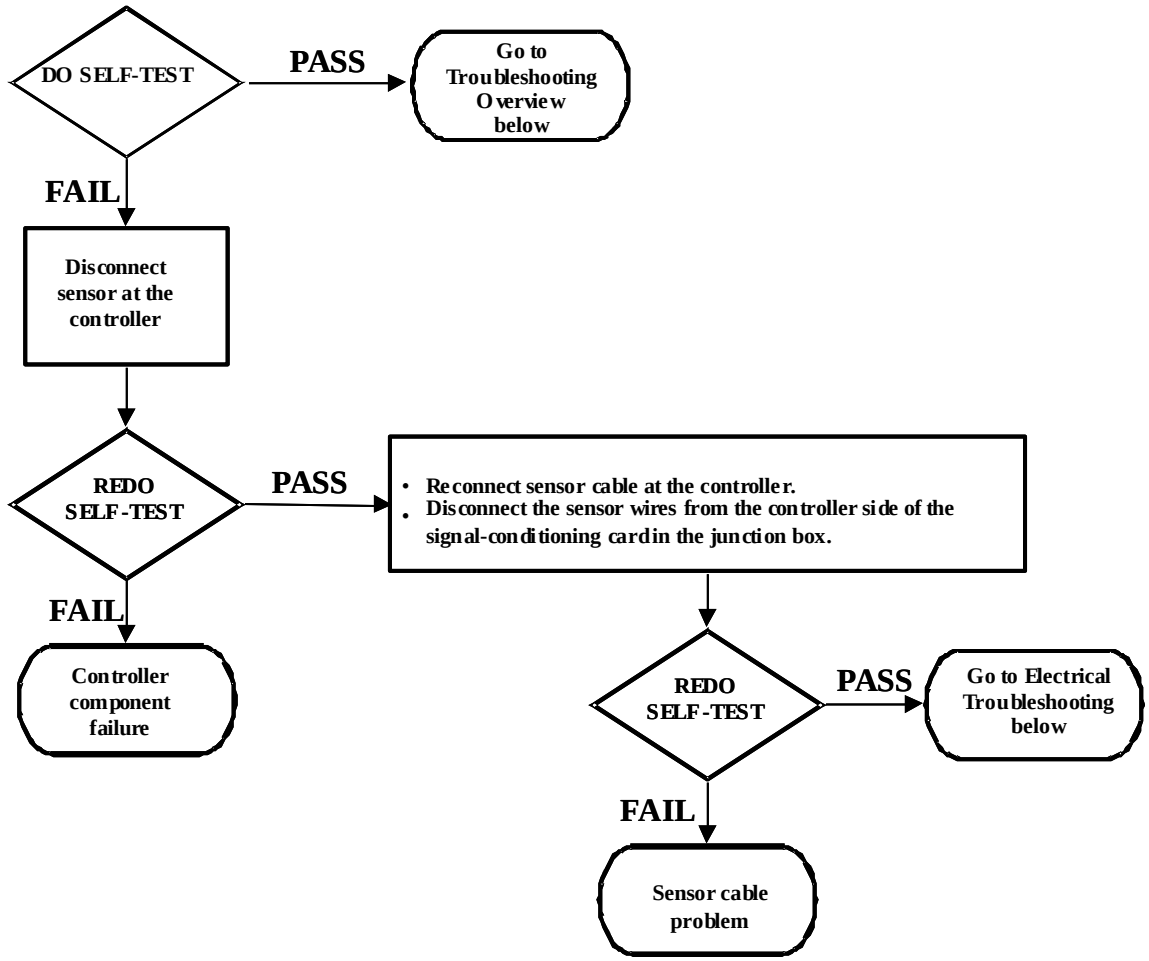
CAUTION: There are live circuits inside the controller even when the power switch is in the OFF position! Servicing and troubleshooting the controller must be performed by Qualified Service Personnel.

Scope

This is a supplement to general troubleshooting of boiler controllers, specifically WMB controllers. The focus of this supplement is to narrow down the possible cause(s) of calibration problems in WMB controllers.

Self-Test

Before proceeding, the first step is to check the electronics by performing a self-test on each sensor input. On WMB, this is found on the conductivity page. With all wiring in place, perform the self-tests following the flow diagram, below:



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Troubleshooting Overview

At this point, additional troubleshooting will be required in order to narrow down the possible cause(s) for calibration problems. Probable causes include:

Sensor coating or leaking

1. Incorrect plumbing (flashing)
2. Incorrect cable or sensor wiring
3. Component failure
4. Temperature element failure
5. Other installation issues such as grounding problems, cable shielding problems, electrical noise interference, etc.

Installation Troubleshooting

If the controller is not reading conductivity properly, the first step is to remove the sensor and verify that it's clean. If necessary, clean the sensor using a dilute acid until it stops fizzing. Re-install 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 sensor is installed in the blowdown line as per Walchem's 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 ¾ 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 ¾ inch, then flashing will occur beyond that point and the conductivity reading will be low and erratic. Minimize use 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 a side branch of a ¾" 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 flow restriction after the sensor and/or control valve in order to provide backpressure. This flow restrictor 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 in accordance with the manufacturer's recommendations.

8. For best results, align the hole in the boiler 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 blowdown 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 conductivity value changes (usually lower), there is a ground loop and there may be a problem with the sensor wiring. Contact the factory for assistance.

3. If the installation is satisfactory, proceed to Electrical Troubleshooting.

Electrical Troubleshooting

First, verify that all sensor wiring is correct as shown in figure 5, Detail "C" of the WM1 Instruction Manual. Sensor cable MUST BE 6 conductor, 24 AMG shielded low capacitance (15 pF/ft) twisted pair such as Walchem 102535 (Beldon 9680) or equivalent. 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. Electrical troubleshooting will help identify if any problems exist with the sensor, signal-conditioning card, or the sensor input card.

Core Interface Board/Sensor Input Card/Signal Conditioning Card

At the sensor input card terminal block, check the following connections:

1. Terminal +5 to Terminal –IN (should read +5 VDC)

2. Terminal –5 to Terminal –IN (should read –5 VDC)

If no voltage is observed, there is either a problem with the sensor input card or the core interface board. If voltage is present, check the readings at the signal-conditioning card in the junction box:

1. Terminal +5 to Terminal –S (should read +5 VDC)

2. Terminal –5 to Terminal –S (should read –5 VDC)

If there is no voltage, problem is with the wiring between the controller and the junction box

NOTE: The green LEDs on the relay board in the controller verifies that the power supply is putting out all voltages or not. The big ribbon cable between the relay board and the core interface board could be at fault is the power supply is good, yet none of the sensor inputs have –5V. If no +5V, then nothing on the front panel would have power.

Continue electrical troubleshooting for possible bad signal-conditioning card. At the signal-conditioning card terminal block in the junction box check:

- Terminal + to Terminal - (should reading less than 75 mVDC)

If the voltage reading is too high, the sensor input card or the sensor is leaking. Disconnect the 4 sensor wires from the signal-conditioning card in the junction box and recheck this voltage. A reading greater than 75 mVDC with the sensor disconnected indicates a bad signal-conditioning card. Also check the VAC between these two terminals. Reading should be 2.3 VAC, RMS. If not, signal-conditioning card is bad. (Note, if multimeter does not have RMS, multiply the reading by 0.707 to get VAC, RMS).
On the sensor input card terminal strip in the controller, check the following connections:

- Terminal IN- to Terminal IN+ (should reading between –1.3 and 1.3 VDC)

This reading corresponds to the conductivity reading value after the signal has been conditioned. Zero conductivity will read close to –1.3 VDC while a conductivity of 10,000 µS will read close to 1.3 VDC. If the value is incorrect, check the voltage between Terminal –S and +S on the signal-conditioning card in the junction box. If the voltage is incorrect, the signal-conditioning card is bad. If the voltage is correct at the signal-conditioning card but incorrect at the sensor input card, the wiring from the sensor to the controller is bad.

Other Checks

1. ***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.

2. ***Temperature element:*** If the temperature reading is the problem, disconnect the WHITE and GREEN wires from the signal-conditioning card 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 0ºC. If reading is incorrect, the temperature element in the sensor is bad. If the reading is good, re-connect wires at the signal-conditioning card and disconnect at the controller end and check the reading between the WHITE and GREEN wires. If the resistance is good, yet it still reads incorrectly, the problem is with the sensor input card or core interface board.

3. ***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 WMB 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.