

CONTHERM SCIENTIFIC LTD

TECHNICAL MEMORANDAM

PRODUCT : PLCS  
No : 0005

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FROM : Russell Kirkwood

DATE : 3/10/90

TO : All Agents

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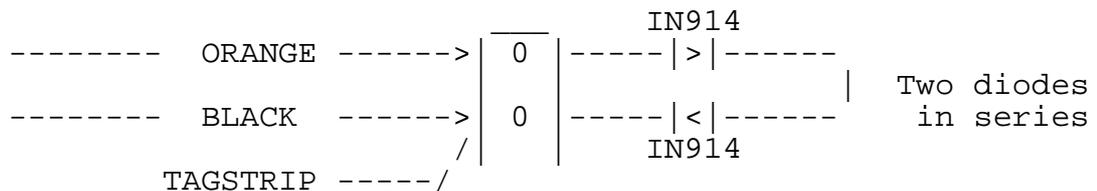
SUBJECT : PLCS Sensor Box Repairs.

A Sensor Box fault could be indicated by any of the following alarms. In the vast majority of cases if a problem is indicated with the Sensor Box, it is FAR EASIER to repair the problem by opening the Sensor Box and replacing the faulty component than by installing a new Sensor Box. When facing a possible Sensor Box failure, the following parts should be available:

- A) A suitable Wet & Dry Bulb Thermometer.
- B) A Digital Multimeter.
- C) An old type Wet Sensor (P.139)
- D) A new type RH Sensor.
- E) A CO2 Thermistor. (P.138)
- F) Four Type IN914 (IN4148) Signal Diodes.
- G) Soldering Iron and Solder.
- H) Clear plastic coat spray can.
- I) Philips Screwdriver.

The Sensor Box is easily dismantled by removing the four small PK screws holding on the front plastic grill and the top two rear screws, this will enable the Sensor Box to be separated into two halves, allowing easy access to the wiring. By tackling the problem direct at the Sensor Box the associated problems of overall calibration, removing covers and cables etc are avoided resulting in a much more efficient repair.

4 - - - : Temperature Sensor Failure. - The Temperature Sensor consists of two IN914 Diodes connected in series and these are connected to the ORANGE & BLACK wires in the Sensor Box.



Sometimes the Diodes can either crack OR absorb moisture - causing an intermittent fault - usually indicated by a NOISY temperature display.

After replacing any of the Diodes spray the Diodes AND newly soldered area on the tagstrip with a clear plastic sealant to keep out moisture.  
Also check that the ORANGE and BLACK wires are connected at the INTERFACE PCB.

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PRODUCT : PLCS

No : 0005a

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SUBJECT : PLCS Sensor Box Repairs (Continued).

TO REPLACE THE TEMPERATURE SENSING DIODES

- A) Turn all power to the cabinet off.
- B) Open the Sensor Box as already described.
- C) Unsolder Diodes from tagstrip adjacent to ORANGE & BLACK wires
- D) Fit new Diodes, (Ensure that they are connected the right way round).
- E) Spray area with clear plastic spray. (Avoid CO2 block).
- F) Reassemble, test and CALIBRATE.

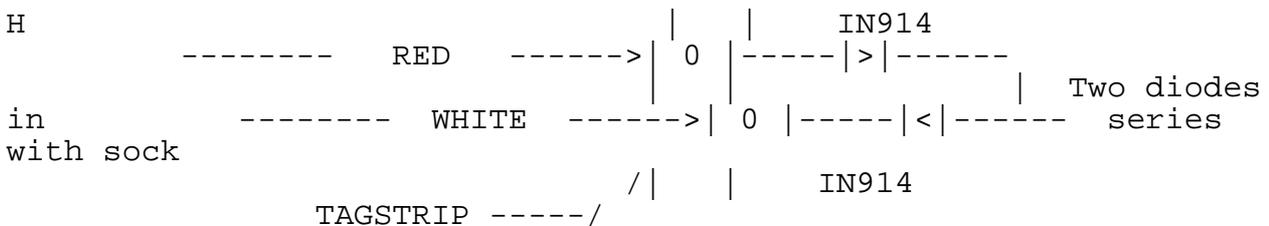
5 - - - : RH Sensor Failure. - There are now TWO types of RH Sensor.

1) OLD TYPE : - Consists of two IN914 Diodes connected in series (as per the Temperature sensor) and covered with a protective layer of heatshrink material with an outer sock to pick up moisture from the water bottle. (Our part number P.139).

2) NEW TYPE : - Capacitive sensor probe (small white Phillips Sensor, uses capacitive technique to sense amount of moisture in the air. (Our part number P. ).

There is NO water bottle to fill with this type of sensor.

OLD TYPE:



Sometimes the Diodes can either crack OR absorb moisture - causing an intermittant fault - usually indicated by a NOISY RH display.

After replacing the Sensor, spray the newly soldered area on the tagstrip with a clear plastic sealant to keep out moisture.

Also check that the RED and WHITE wires are connected at the INTERFACE PCB.

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TECHNICAL MEMORANDAM

PRODUCT : PLCS

No : 0005b

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SUBJECT : PLCS Sensor Box Repairs (Continued).

TO REPLACE THE OLD TYPE HUMIDITY SENSOR

- A) Turn all power to the cabinet off.
- B) Open the Sensor Box as already described.
- C) Unsolder the old Wet Sensor adjacent to RED & WHITE wires
- D) Fit new Sensor.
- E) Ensure wet sock is correctly fitted to enter water bottle and initially wet wick with water to help in absorbing moisture.
- F) Spray area with clear plastic spray. (Avoid CO2 Block).
- G) Reassemble, test and CALIBRATE.

NEW TYPE HUMIDITY SENSOR:

Before replacing this Sensor, check that no moisture has condensed on the PCB around the White Capacitive Sensor Probe, the PCB has been sprayed with a clear lacquer in this area give some protection to the probe if moisture should condense. If there are signs of moisture, dry off by blowing air over Probe.

TO REPLACE THE NEW TYPE HUMIDITY SENSOR

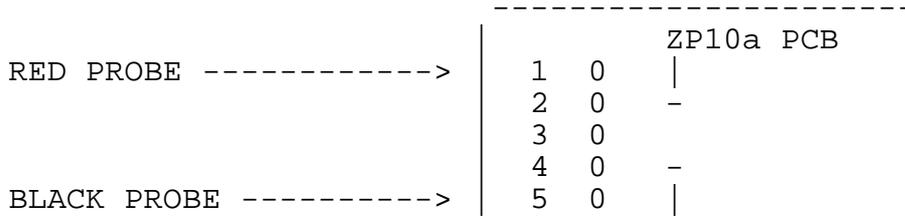
- A) Turn all power to the cabinet off.
- B) Open the Sensor Box as already described.
- C) Unsolder the Capacitive Sensor (white round sensor) from the ZP10a PCB.
- D) Solder the NEW Capacitive Sensor in its place.
- E) Apply power to the cabinet so that the new humidity Sensor can be CALIBRATED.

TO CALIBRATE THE NEW TYPE HUMIDITY SENSOR

NB: After replacing a new type Humidity Sensor, there SHOULD BE NO NEED to adjust the gain potentiometer on the ZP10a PCB, The ONLY adjustment should have to be made to the little GREEN trimmer Capacitor on the ZP10a PCB directly behind the Capacitive Sensor.

Connect the Digital Multimeter (using say a 0 - 2 VOLT DC range) so that the BLACK probe connects to the green wire on the ZP10a

PCB and the RED wire connects to the resistor in line with the #1 on the ZP10a PCB.



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**SUBJECT : PLCS Sensor Box Repairs (Continued).**

Measure the voltage between these two points (It must be between 0.0 and 1.00 volts). Lets says the reading was 0.572 VOLTS. This would indicate that the current RH in the cabinet is 57.0% RH, the P.L.C.S Controller should read 57.0 %. If the P.L.C.S does NOT read this value, ADJUST the Centre Potentiometer on the P.L.C.S (the RH cal pot) until it does.

Now read the relative humidity from the tables given by the readings on the Wet and Dry Bulb Thermometer and ADJUST the GREEN trimmer Capacitor on the ZP10a PCB until the desired calibration is achieved, only small final adjustments to the Humidity Calibration should be carried out by using the Centre Potentiometer on the P.L.C.S system (+- 5%).

If the ZP10a PCB cannot be adjusted correctly see TECHMEMO 0004 for the method of calibrating the ZP10a PCB.

7 - - - : CO2 Sensor Failure. - The Thermistor Sensor in the CO2 Block has failed.  
NB: Whenever a failure is indicated on the CO2 Sensor the HUMIDITY Sensor should first be checked for correct operation as the output of the Humidity Sensor feeds into the CO2 Sensor and a failure (Esp intermittant) of the Humidity Sensor can sometimes fool the P.L.C.S into thinking that the CO2 Sensor has failed. The CO2 Compensating Thermistor must also be checked, as should the connections to the CO2 Sensor be checked for both continuity and for any signs of leakage resistance to ground.

The CO2 Sensing Unit consists of a Stainless Steel Block with two holes in which are situated the main CO2 Measuring Thermistor

(P.138) and the CO2 Compensating Thermistor (P. ).

The main CO2 Thermistor has a resistance at room temperature (20.0oC) of about 10K ohms, and the Compensating Thermistor has a resistance of about 200K ohms.

The first step in isolating a CO2 Sensor Failure is to measure the RAW VOLTAGE output from the CO2 Sensor. Turn the cabinet OFF, open up the P.L.C.S unit and disconnect the battery, Turn the cabinet back on and select CO2 as the permanent display, the voltage MUST be between 40.0 and 160.0. If not then a CO2 Sensor fault is present.

Disconnect the CO2 Sensor Wires from the Interface PCB by unplugging at the Interface PCB.

Using a Multimeter, check the FOUR CO2 Sensor Wires (PINK, BLUE, YELLOW, BROWN) for any signs of being connected to ground. Check for a reading on the Sensors by measuring between the appropriate wires (YELLOW & BROWN = 10k OHM, PINK & BLUE = 200k OHM)

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**SUBJECT : PLCS Sensor Box Repairs (Continued)**

If either of these indicates an open circuit then either:

- a) The Sensor is faulty or
  - b) The wire to the sensor has broken or become disconnected.
- Replace any fault sensor found.

**TO REPLACE A CO2 SENSOR**

- A) Turn all power to the cabinet off.
- B) Open the Sensor Box as already described.
- C) Unsolder the appropriate wires from the faulty Sensor Wires
- D) Remove the old Sensor by CAREFULLY withdrawing it from the hole in the Stainless Steel Block.
- E) Fit new Sensor.
- F) Spray soldered area with clear plastic spray (avoid CO2 Block)
- G) Reassemble, and test.
- H) Check raw voltage reading (as previously described)
- I) Ensure battery has been reconnected before closing P.L.C.S unit finally.

The special Thermistor for measuring the CO2 is a VERY delicate

unit and the fine wire connecting to the Thermistor Bead is EASILY broken. The Thermistor must be carefully fitted into the Stainless Steel Block so that it does not touch the sides (causing a short to ground). The leads of the Thermistor should be checked after it has been fitted to the Block (do the nut up FIRMLY but DO NOT OVERTIGHTEN) to see if there is continuity and that there are no shorts to ground.

The Compensating Thermistor is a MUCH more robust unit and will rarely cause failure.