



## Fixed System Troubleshooting



## Gather Information

- To repair a fixed system you need to determine first what the problem is.
- Identify Customer's complaint.
- Could the problem be an actual gas leak?
- If the problem is an alarm condition, has the customer tested the space with a portable?





## Gather Information

- Get Serial Number of the controller and/or transmitters in question.
- This provides background information on what equipment the customer has.
- Evaluate type of problem:
  - Intermittent alarm
  - Trouble alarm
  - Unstable output
  - Can't calibrate
  - Can't zero
  - No power
  - No relay activation
  - Other...



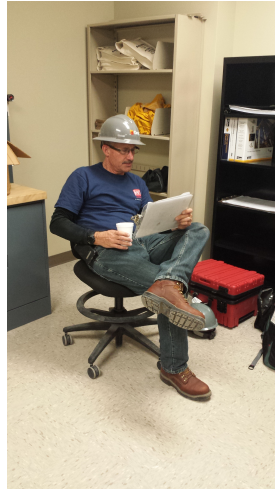
## Gather Information

- What types of sensors are affected?
- What is the environmental conditions?
  - Temperature
  - Pressure
  - Airflow
  - Moisture
- Is this a new problem or on-going?
- Is the system wired to a fire alarm panel?
- Process shut down?
- BMS?
- PLC?



## Prepare

- Always bring the manual or technical information on the instrument you are servicing.
- Bring appropriate tools and test gas that will be needed to service the system.



## Prepare

- If problem is sensor/transmitter related, bring the parts necessary to repair or replace what ever may be damaged.
- Example: M2A problem
  - Bring replacement sensor
  - Replacement Terminal Relay Board
  - Replacement pre-amp (if applicable)
  - Replacement display



## Prepare

- If problem is controller related, it may be required that you bring a complete system to the site.
- In this case the motherboard was bad and required replacement.



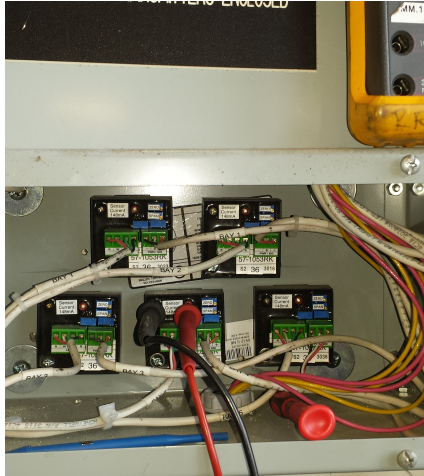
## Exchange Method

- If sensor is suspect, attach exchange sensor to transmitter and see if problem is resolved. If not then exchange amplifier.
- Continue to exchange parts until defective part is identified.





## Wiring



- Verify proper wiring or if problem is related to a specific cable.
- Wire sensor/amp to controller using a short piece of cable to confirm proper operation.



## Wiring



- Make sure that detector and AC wires are not run in the same conduit.
- Do not run external load conductors in the same conduit as sensor or transmitter wires.



## Wiring

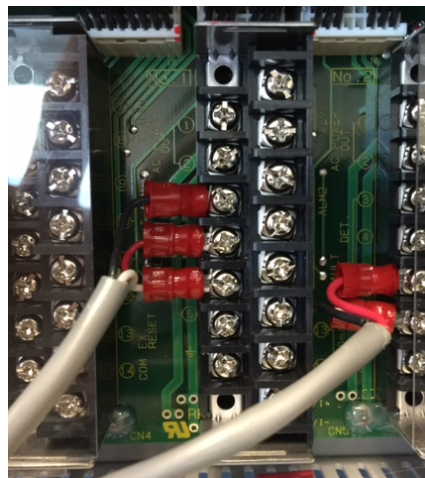


- Cable can be damaged during installation
- Ringing out wiring to controller may be required.
- Measure resistance from each conductor to conductor and to ground.



## Wiring

- Look for wiring errors such as transmitters wired to improper channels.
- Loose or frayed wires.
- Loose terminal connections.
- Improper wire type or gauge.





## Moisture & Corrosion



- Moisture can damage electronics.
- Inspect each installation for moisture intrusion.
- Seal conduit to prevent moisture damage
- Remove corrosion.



## Vibration



- Excessive vibration can damage sensors.
- Isolate sensors from vibration as needed.



## Troubleshooting Matrix

Symptom	Probable Cause	Corrective Action
<ul style="list-style-type: none"> <li>• LEL gas detector will not zero</li> </ul>	<ul style="list-style-type: none"> <li>• Open or high offset sensor</li> <li>• Open wire in sensor circuit</li> <li>• Defective LEL sensor amplifier (if applicable)</li> </ul>	<ul style="list-style-type: none"> <li>• Replace sensor</li> <li>• Ring out sensor wiring, especially if sensor is remote mounted from controller or amplifier. Replace wiring as needed.</li> <li>• Replace amplifier as required.</li> <li>• Note: To assist in troubleshooting, swap sensor and/or amplifier from a known working unit to confirm problem. Also, relocate sensor and/or amplifier and attach directly to main controller to confirm if wiring problem.</li> </ul>
<ul style="list-style-type: none"> <li>• LEL readings are unstable or random spiking up or downscale</li> </ul>	<ul style="list-style-type: none"> <li>• Sensor element bad or corroded</li> <li>• Loose wire</li> <li>• Noise created by EMI or RFI</li> <li>• Defective pre-amp</li> <li>• Defective amplifier</li> </ul>	<ul style="list-style-type: none"> <li>• Replace sensor</li> <li>• Tighten all wiring terminals</li> <li>• Make sure sensor wires are shielded and properly grounded.</li> <li>• Note: Do not attach ground wires in the transmitter housing and at the controller. Tape off drain wire in the amplifier housing and connect the drain wire at the ground terminal at the controller.</li> <li>• If shielded and grounded correctly, increase alarm delay as needed</li> </ul>
<ul style="list-style-type: none"> <li>• LEL sensor will not span with calibration gas</li> </ul>	<ul style="list-style-type: none"> <li>• Sensor catalyst depleted and/or sensor is contaminated</li> <li>• Incorrect test gas</li> <li>• Incorrect sensor type</li> <li>• Incorrect amplifier or LEL sensor current setting</li> </ul>	<ul style="list-style-type: none"> <li>• Replace sensor</li> <li>• Verify proper gas concentration and that gas is in air if using a catalytic bead sensor</li> <li>• Make sure that the sensor being calibrated is for the proper gas. Example H<sub>2</sub> specific sensor installed and calibrating using methane.</li> <li>• Make sure that amplifier current is properly</li> <li>•</li> <li>•</li> <li>•</li> </ul>



## Troubleshooting Matrix

<ul style="list-style-type: none"> <li>• Electrochemical toxic gas sensor will not zero in fresh air or with zero emissions air applied or will not span using calibration gas.</li> </ul>	<ul style="list-style-type: none"> <li>• Sensor is expired</li> <li>• Sensor pre-amp is bad</li> <li>• Amplifier (if applicable) is bad</li> </ul>	<ul style="list-style-type: none"> <li>• Replace sensor as required</li> <li>• Replace sensor pre-amp</li> <li>• Replace amplifier if needed.</li> <li>• Note: If there are other same sensors on the system that are working properly, swap components, such as sensor, then pre-amp then amp to determine what component has failed.</li> </ul>
<ul style="list-style-type: none"> <li>• Electrochemical toxic gas sensor will not span with test gas.</li> </ul>	<ul style="list-style-type: none"> <li>• Electrochemical sensor expired</li> <li>• Test gas expired</li> <li>• Incorrect test gas</li> </ul>	<ul style="list-style-type: none"> <li>• Replace sensor</li> <li>• Replace test gas</li> <li>• Verify that calibration gas is of the proper type and concentration</li> </ul>
<ul style="list-style-type: none"> <li>• Oxygen sensor can not be set to fresh air value (20.9%)</li> </ul>	<ul style="list-style-type: none"> <li>• Expired oxygen sensor</li> <li>• Sensor output too low</li> </ul>	<ul style="list-style-type: none"> <li>• Replace oxygen sensor</li> <li>• For partial pressure oxygen sensors, measure across the White and Green wires for output. Normal output in fresh air should be between 12 and 18 mV DC.</li> </ul>



## Troubleshooting Matrix

<ul style="list-style-type: none"><li>• Erratic or unstable readings</li></ul>	<ul style="list-style-type: none"><li>• EMI or RFI interference</li><li>• Transmitter wiring running in wire trays or conduit with other inductive loads</li></ul>	<ul style="list-style-type: none"><li>• Make sure that all transmitter wiring is shielded and installed in either conduit or properly grounded</li><li>• Separate transmitter or sensor wires from inductive loads</li></ul>
<ul style="list-style-type: none"><li>• Controller resets or reboots with alarm relays are activated or deactivated</li></ul>	<ul style="list-style-type: none"><li>• No noise suppressor installed on relays that are switching inductive loads.</li><li>• Customer has tapped into 24 VDC power supply to operate external devices.</li></ul>	<ul style="list-style-type: none"><li>• Make sure that proper noise suppressor is installed on any DC or AC external relay.</li><li>• Use separate 24 VDC power source for operating external devices such as horns, strobes, solenoids etc.</li></ul>
<ul style="list-style-type: none"><li>• Transmitters have low voltage to DC input.</li></ul>	<ul style="list-style-type: none"><li>• Wire gauge is too small for the length of wire run.</li><li>• Possible ground</li></ul>	<ul style="list-style-type: none"><li>• Make sure that wire gauge is correct for load.</li><li>• Make sure that there is no resistance go ground.</li></ul>



## Questions?





## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.