**Ground Fault Troubleshooting**

**Troubleshooting:**

1. Measure Volts DC between terminals **12** (Panel Negative) and terminal **30** (Ground)
   (Note: KP (-), zone (-) and polling loop (-) are all common. Any of these may be used.
   The exception to this is any zone that supports 2-wire smoke detectors, and the bell circuits.)

   Under normal conditions (no ground faults) you should read **1.0VDC** (+ or - .5VDC)
   A ground fault is sensed when some external input causes the voltage between terminal 12 (Panel Negative) and terminal 30 (ground) to either drop below .5 VDC or increase above 1.5 VDC

2. To determine where the ground fault is coming from, remove system wires until the voltage between terminal 12 and 30 returns to 1VDC. Note: as you remove each wire, leave it off until the problem is corrected. There may be more than one wire with a problem. Note: Leave the earth ground wire connected during this process.

3. As this progresses, you may eventually reach a point where all wires are removed except the battery and the earth ground. The next step is to remove the panel from the cabinet. Lay the PCB on a non conductive material (wood or cardboard). With the earth ground wire now disconnected the panel should give you 1VDC from terminal 12 to 30. If not, the panel is defective.

**Premise/Theory:**
The control panel internally causes its power negative to float 1 volt below earth ground as shown in the first diagram below. If any wire attached to the panel shorts to earth ground or a voltage source, it will become the same reference level as earth ground, causing the panel to see a ground fault.

![Diagram](image)

<table>
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<tr>
<th>Normal operation</th>
<th>Negative wire shorted to ground.</th>
<th>Positive wire shorted to ground.</th>
<th>Zone Positive shorted to ground.</th>
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<tr>
<td>1VDC measured from KP(-) to earth</td>
<td>0VDC measured from KP(-) to earth</td>
<td>13VDC measured from KP(-) to earth</td>
<td>6 VDC measured from KP(-) to earth</td>
</tr>
<tr>
<td>Panel not happy 😞</td>
<td>Panel not happy 😞</td>
<td>Panel not happy 😞</td>
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- If panel does not have a proper earth ground, it is unable to sense a short to earth ground.
- 1 VDC measured from KP(-) to earth.
- Panel is happy 😊
  (Despite the real ground fault!)
Common Questions:

1) I have a Ground fault on my display. Does this mean that I have a bad earth ground?
   Answer: No. This means that something in your system has a path to earth ground. In fact you must have a good earth ground to sense a system ground fault.

2) Can I assume that with the earth ground disconnected from terminal 30 that I cannot sense an earth ground?
   Answer: In general, you must have a good earth ground to properly sense a ground fault. However, if you remove the earth ground wire, your panel may still have a connection to earth ground through the cabinet and conduit connected. You may notice that the mounting screws for the panel are on a trace that is connected to the earth ground terminal. This is by design and allows the cabinet to be grounded through the panel.

3) What terminals can affect a ground fault?
   Answer: Any wire connected to the control can cause ground fault except the auxiliary relay terminals (these are dry contacts) Sources of problems include: keypad wires, polling loop, bell circuits, zone circuits, peripheral devices, powered devices J-connectors, phone lines, PS-24, battery connections, transformer, auxiliary power supplies, radio backup devices….

4) Can other boards or peripherals (Power supplies, LRR radios, etc) cause a ground fault?
   Answer: Yes. Any device wired to the control panel can cause a ground fault.

5) Can induced voltage cause an earth ground fault?
   Answer: Yes. Anything that affects the voltage potential between earth ground and the rest of the system would cause the system to report an earth ground fault, even though there is not, in fact, a real earth ground fault. In this case, the “false” earth ground message still alerts you to a system problem.

6) Can conduit (that is usually grounded) affect ground fault?
   Answer: Conduit can provide another path to earth ground. As mentioned in note#2 above, the panel mounting screws provide an electrical path between the earth ground terminal (30) and the panel cabinet. This would allow an earth ground to be sensed through the conduit even with nothing connected to terminal 30. This is not a bad thing. Some peripheral devices (7835C for example) Use a common negative to their chassis. In this case, if the cabinet is grounded or has conduit that is grounded, an earth ground fault would be sensed through the other connections to the device.

7) Does grounding the metal can affect ground fault?
   Answer: As noted above, the panel mounting screws provide an electrical path between the earth ground terminal (30) and the panel cabinet. Grounding the cabinet should not cause any problems.