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TECHNICAL SERVICES BULLETIN #26

Date: March 31, 2009

To: All Dealers and Owners: Please distribute to applicable shop and purchasing personnel.

Subject: Pump Switch Current Capacity

We have received concern regarding the current capacity on our 700 series pump switch circuit, one incident resulting in an inoperable display. The following tests were performed by the designing engineer.

[QUOTE]
I have done extensive testing this morning (February 23, 2009) on the current capacity of the pump circuit on the 709PH. The test consisted of pulling a standard 709PH from inventory, and connecting the red wire (+12V) to the positive output of an HP6274B power supply and the yellow (pump) wire to the negative output of the power supply. The 709 panel was oriented in a vertical position on the test bench (the normal orientation of an installation), and the full length of the pigtail wires were retained. I also compared the data with calculations to verify the design rules that were used for the PCB track widths on the 709PH. The PCB track length in the pump circuit is 4.9 inches and the track width is 0.050 inches. A PCB trace width calculator found at this website http://www.geocities.com/capecanaveral/lab/9643/TraceWidth.htm was used to verify the observed results.

First test: Current limit on the power supply was set to 6.2 amps. The resulting voltage drop across the panel, measured at the white connector where the pigtail wires enter, was 0.26V. The test was run for 20 minutes. At the end of the test, the front of the panel was barely warm to the touch underneath the display window, and no visible change occurred to the front panel label. No odor was noted. The voltage drop across the rocker switch and associated jumper wires between the PCB and the switch terminals was 0.017V, leaving less than 0.25V drop across the PCB tracks. The rated copper weight used on the PCB is 1 oz/square foot before tinning. Using the calculator from the above web site, based on an external track width of 0.050 inches and the observed voltage drop, the actual effective copper weight is 1.35 oz/square foot including tinning and the temperature rise should be 36 °C/ 98.8°F above ambient (based on a 25°C/77°F ambient). This is consistent with the observed results.

Second test: The current limit on the power supply was increased to 7.3 amps. The resulting voltage drop was 0.33V across the panel, leaving about 0.31V across the PCB tracks. The test was run for 25 minutes immediately after the previous test, so the PCB had no chance to cool in between the tests. At the end of the test, the panel was noticeably warm to the touch, and at one spot at the lower left corner of the display window it was hot, but not uncomfortable to touch. Again, there was no visible change to the front panel label, and no odor. Based on the voltage drop, the copper weight was verified at 1.35 oz/square foot, and the predicted temperature rise was 52°C/125.6°F. This is still well within the temperature limits of the PCB and front panel materials.

Third test: The current limit on the power supply was increased to 10.0 amps, resulting in an initial voltage drop of 0.51V, rising to 0.525V at the end of the 15 minute test. The web site calculator again verified the copper weight, and predicted a temperature rise of 106°C/222.8°F. At the end of the test the panel was quite hot to touch, too hot to keep your fingers on it. The front panel label showed distortion.

There was no odor, so there was no combustion occurring. However, at this current the panel is definitely being stressed beyond the design limits. Operation at this current must be limited to less that a minute.

Fourth test: The current limit on the power supply was set to between 15 and 16 amps. After one minute, the front panel label was starting to melt. After 1.5 minutes, the label was bubbling and smoke started to appear, and a burning odor was noted. After 2 minutes, there was substantial burning of the label, accompanied by substantial smoke and odor. The test was stopped at this point. Clearly, operation at this current level or higher will result in rapid destruction of the 709PH panel, and must be limited to a few seconds at the most.
[END QUOTE]

If the pump controlled by the SeeLeveL display exceeds its rated current, the user may experience damage to the SeeLeveL display in conjunction with the amount of current drawn by the pump. We have revised our production builds for all 700 series displays with a pump switch to include a 7.5 amp inline fuse on the +12V red wire. This value of fuse was selected because of its availability to the customer. Existing stock will be modified before it is released. Customers that would like to add the inline fuse to their display can contact us and we will supply a fuse and fuse holder at Garnet's expence.

Please contact us to request parts or there are any questions you need answered.

Canada 1-800-617-7384
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