

Upgrade of Model 4870 Air Control Panel

Supplement to NAVSEA S9551-BG-MMA-010

Due to parts availability problems with the original design, we have modified the design of new Model 4870 air control panels with an improved dew point alarm controller. Until the technical manual can be updated, use the existing NAVSEA technical manual, with the following exceptions:

I. Repair:

¶6.2.1, last sentence: Delete "The controller has a lockable adjusting rheostat which determines the moisture level at which the alarm is activated."

¶6.2.2: Delete and replace with the following:

6.2.2 Calibrating the System.

6.2.2.1 Measurement. Measurements will be made by digitizing the capacitive sensor's reading and performing a linear interpolation using the five calibration points established during calibration.

The measurement calibration method will linearly interpolate between the two closest calibration points. This method is shown figuratively in Figure 1, curve A.

It is possible that the current reading might fall outside of the calibration points. In this case, linear approximation will be used. This method is shown figuratively in Figure 1, curve B.

6.2.2.2 Analog Output. The 4-20 mA analog output will be scaled from -60° F (4 mA) to 0° F (20 mA).

6.2.2.3 Errors. If an error occurs (open/shorted sensor or any other error), a fault (FL) error code will be displayed on the

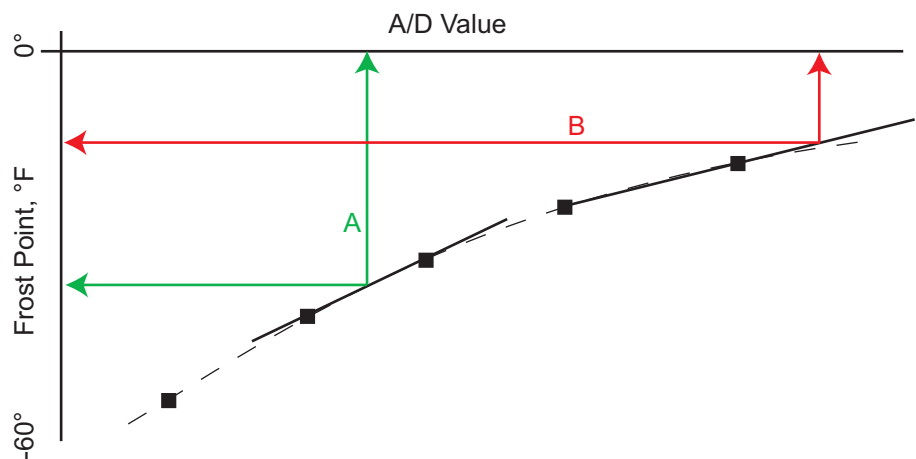


Figure 1. Linear Interpolation and Linear Approximation

front panel and the analog output will go to 0 mA. The following error codes are defined:

Fault Code	Description	Notes
FL 3	Bad +12V supply	
FL 4	Bad -12V supply	
FL 5	Sensor out of range, low	Open, grounded or shorted sensor or cable or the sensor capacitance is less than 1.0 nF (see section on calibration data values).
FL 7	Sensor out of range, high	The sensor capacitance is greater than 7.0 nF (see section on calibration data values).

6.2.2.4 Calibration. During calibration, five known results will be measured and stored in non-volatile memory for use in future dew point readings.

NOTE

The system will continue to monitor the dew point and update the analog output (using the existing calibration data) during the calibration process.

Howell Laboratories, Inc.

188 Harrison Rd.
Bridgton, Maine 04009

(207) 647-3327

(888) 744-8359

FAX (207) 647-8273

e-mail: contracts@howelllabs.com

web: www.howelllabs.com

- a. Set up:
- (1) Connect a source of air with variable, controllable moisture content to the air control panel. Operate the air control panel normally.
 - (2) Remove the air control panel's front cover. Locate the alarm lamp (Figure 6-1, 17), the calibration push button (Figure 6-1, 7), and the digital dew point display (Figure 6-1, 5).
 - (3) Attach a moisture-measuring instrument to the purge/test fitting or the bottom side of the air control panel. A Low Pressure Frost Point Indicator (LPFP) conforming to Military Specification MIL-I-24144 is the most desirable device to use. Open the purge/test valve. Read the frost point.
- b. Test Procedure:
- (1) Admit inlet air at -60° dew point maximum. Allow 60 minutes for the sensor to dry down to the test frost point.
 - (2) Using the inlet air moisture control, establish and measure a frost point of -60° F \pm 5° on the LPFP. Observe the digital dew point display; it will typically stabilize in 30 - 60 minutes. If the display reading has not stabilized in 30 - 60 minutes, use an LCD meter to monitor sensor capacitance until the capacitance stabilizes before proceeding. Record the stable capacitance value and the dew point reading on the external standard hygrometer.
 - (3) Press the calibration push button and hold for 5 seconds (but not more than 10 seconds), then release it. The system will enter calibration mode and the display will show (Figure 2) the calibration input number (blinking) and the setpoint value (not blinking - steady).

NOTE

In the preceding step, if the system immediately enters an "FL5" error state, the output air is too dry (the system thinks the sensor has failed). Open the metering valve just a little to raise the dew point into the -60° - 0° F range. Periodically, press the calibration push button briefly (do not hold it) until the FL5 error clears, then proceed.

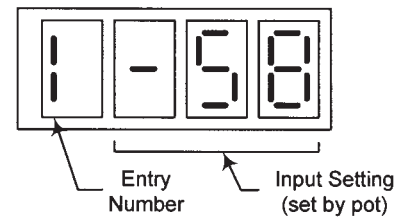


Figure 2. Typical 1st Calibration Display

- (4) Record the dew point reading on the external standard hygrometer. Use the potentiometer to set the display to that value (the -58 in Figure 2).
- (5) Once the setting is made, press the calibration push button to record that calibration point. The system moves to the second calibration point and the leftmost digit changes to "2."
- (6) Establish and measure a frost point of -45° F \pm 5° on the external standard hygrometer. After the dew point has stabilized, allow 30 to 60 minutes, as in step e above, for the sensor(s) to stabilize before proceeding.
- (7) Repeat steps b through g for calibration points 3, 4, and 5 at dew points of -30° F \pm 5° , -15° F \pm 5° , and 0° F \pm 5° respectively.

NOTE

The more evenly spaced the data points are, the more accurate the calibration will be.

- (8) When you press the calibration button to accept the fifth and final reading (Figure 3), the system will indicate a successful calibration run by flashing "ACC." (accepted), as shown in Figure 4. Press the button one more time to clear the accepted indication and return to normal operation.
- (9) If the calibration fails for any reason, a "FAIL" indication will flash. Press the button one more time to clear the failure indication and return to normal operation. In this case, the new calibration data will be discarded and the old data used.

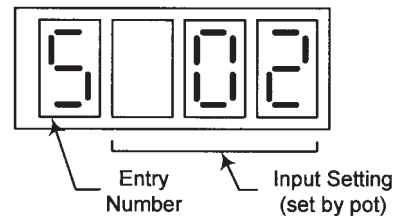
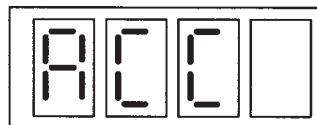


Figure 3. Typical 5th Calibration Display



OR

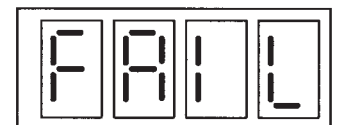


Figure 4. Accept and Fail Displays

NOTE

To exit the calibration procedure at any time, press and hold the push button for five seconds. The failure indication will be shown. Press the button one more time to clear the failure indication and the system will return to normal operation. The new calibration data will be discarded and the old data used.

- c. Recalling the Calibration Data. To display the calibration data, press (quickly) the calibration push button while the system is in normal operation. The display will show "C1" for the first calibration point. Press the push button to display the A/D (Analog-to-Digital) value, a four-digit number. Press again to display the corresponding dew point. Press the push button repeatedly to display the remaining four setpoints. Record the A/D values and the dew points for future reference.

6.2.2.5 Relay Setpoint Adjustment. The relay will trip at a particular setpoint. It is energized if the dew point is above this setpoint and not energized if the dew point is below it.

- a. Press the calibration push button and hold for 10 seconds. The system will enter setpoint mode and the display will show the current relay setpoint (blinking), as shown in Figure 5.
- b. Use the potentiometer to readjust the relay setpoint to the desired value. Record the setpoint value for future reference.
- c. Once the setting is achieved, press the button to record that relay setpoint. The system will indicate a successful completion by flashing "ACC." (for accepted), as shown in Figure 4. Record successful calibration..
- d. Press the button one more time to clear the accepted indication and return to normal operation.

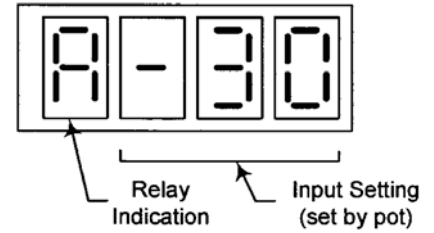


Figure 5. Typical Setpoint Mode Display

If the setpoint adjustment fails for any reason, a fail indication will flash. Press the button one more time to clear the failure indication and return to normal operation. In this case, the new setpoint will be discarded and the old setpoint used for operation.

II. Parts List.

Table 7-1, item 2-1/3 & 6-1: Delete, including sub-items, and replace with the following:

2-1/3 & 6-1	5219-G501	Module, Humidity Alarm Control	22501
6-1/3	8345-G502	Circuit Board, Dew Point Alarm Assembly	22501
6-1/4	8351-G501	Harness, Sensor & 4-20 mA	22501
6-1/5	8342-G502	LED Display Board, 4-POS Assembly	22501
6-1/6	8341-01	Window	22501
6-1/7	8343-G501	Push Button	22501
6-1/8	8353-G501	Potentiometer, 1-ohm	22501
6-1/10	4901-01	Flasher, Solid State, P/N FS126	21424
6-1/11	8252-FH01	Holder, Fuse	71400
6-1/12	8252-MDL-01	Fuse, 1-A, P/N MDL-01	71400
6-1/13	8344-03	Clamp, Transformer with Spacer	22501
6-1/14	8344-04	Clamp, Transformer	22501
6-1/15	8338-02	Transformer, 115 VAC/24VDC, 400 mA, P/N P8396	1TN99
6-1/17	3907-G503	Lamp, Red, P/N 9000-S6202-F-73907 Pc No. 10, Red	82241
6-1/18	5000-03	Terminal Board, P/N GDI-30F	COTS
6-1/19	3917-03	Switch, Lamp-Test, P/N 71-2010-104	04426
6-1/24	MS3452W-12S-3P	Receptacle	96906
6-1/26	RCR42G682JS	Resistor, MIL-R-39008	96906
6-1/44	8352-G501	Cable, Ribbon	22501

III. Illustrations.

Figure 6-1: Replace with new Drawing No. 5219D.