GENERAL DESCRIPTION

This monitor continuously measures air flow through fume hoods, and can be installed on the surface of a hood. It provides visual, audible, and remote alarms under abnormal air flow conditions. It features a column of lights to display air flow trends. It will operate from a battery back-up power source. The monitor must be calibrated in the field for accurate operation. Read this manual entirely before installing, calibrating, and using this monitor.

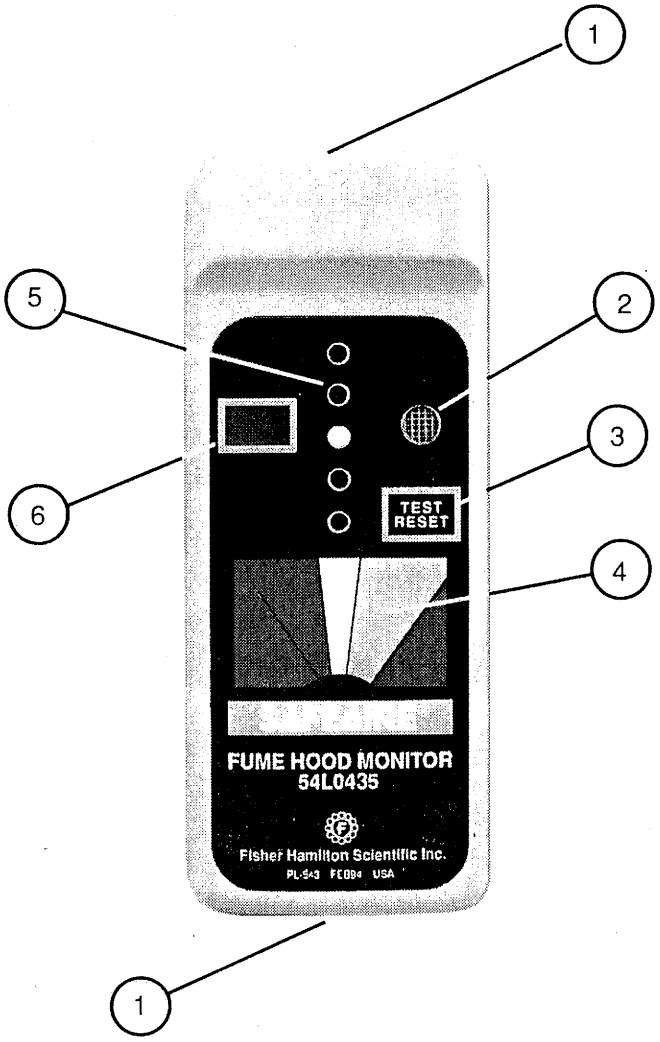

Figure 1.

MANUAL 54L435
fume hood monitor

Table 1. Description of the Front of the Monitor, reference figure 1.

Index	Name	Description
1	Mounting screws	Two screws secure the monitor to the back plate which is then secured to the fume hood.
2	Air Inlet	Guides air to sensors.
3	Test/Reset button	Pressing this button silences an alarm and tests display and audible and visual alarms.
4	Digital Display	Shows measurement in ft/m or cm/s.
5	Analog Display	Shows air flow measurement as a bar graph. Also shows an external alarm condition when it is blinking.
6	Visual Alarm	Indicates an air flow alarm when it is lit.

Table 2. Description of the Rear of the Monitor, reference figure 2.

Index	Name	Description
1	Cover holes	Two holes accept screws to secure the front of the monitor to the back plate.
2	Mounting holes	Two holes for screws to secure the back plate to the fume hood.
3	Back plate	Secures the monitor to the fume hood.
4	Flow tube hole	For the optional side wall air hose.
5	Power cord hole	For the power supply when routed through the rear of the monitor.
6	External interface	To connect external devices to the monitor.
7	Flow tube	Accepts optional air hose to the fume hood.
8	Communications port	Connects to printer or computer.
9	Power jack	Accepts power cord.
10	Power cord	From the power supply provided.
11	Wiring hole	Routes external wiring to the monitor.

INSTALLATION

Installation of the monitor requires drilling holes in the fume hood as shown in Figure 2. Additionally, many fume hoods will require a side wall adapter hose installation as shown in Figure 3.

WARNING
ALWAYS WEAR EYE PROTECTORS WHEN USING POWER TOOLS. ALSO, OBSERVE ALL NECESSARY PRECAUTIONS WHEN INSTALLING OR REPAIRING MONITORS IN THE VICINITY OF ELECTRICAL EQUIPMENT.

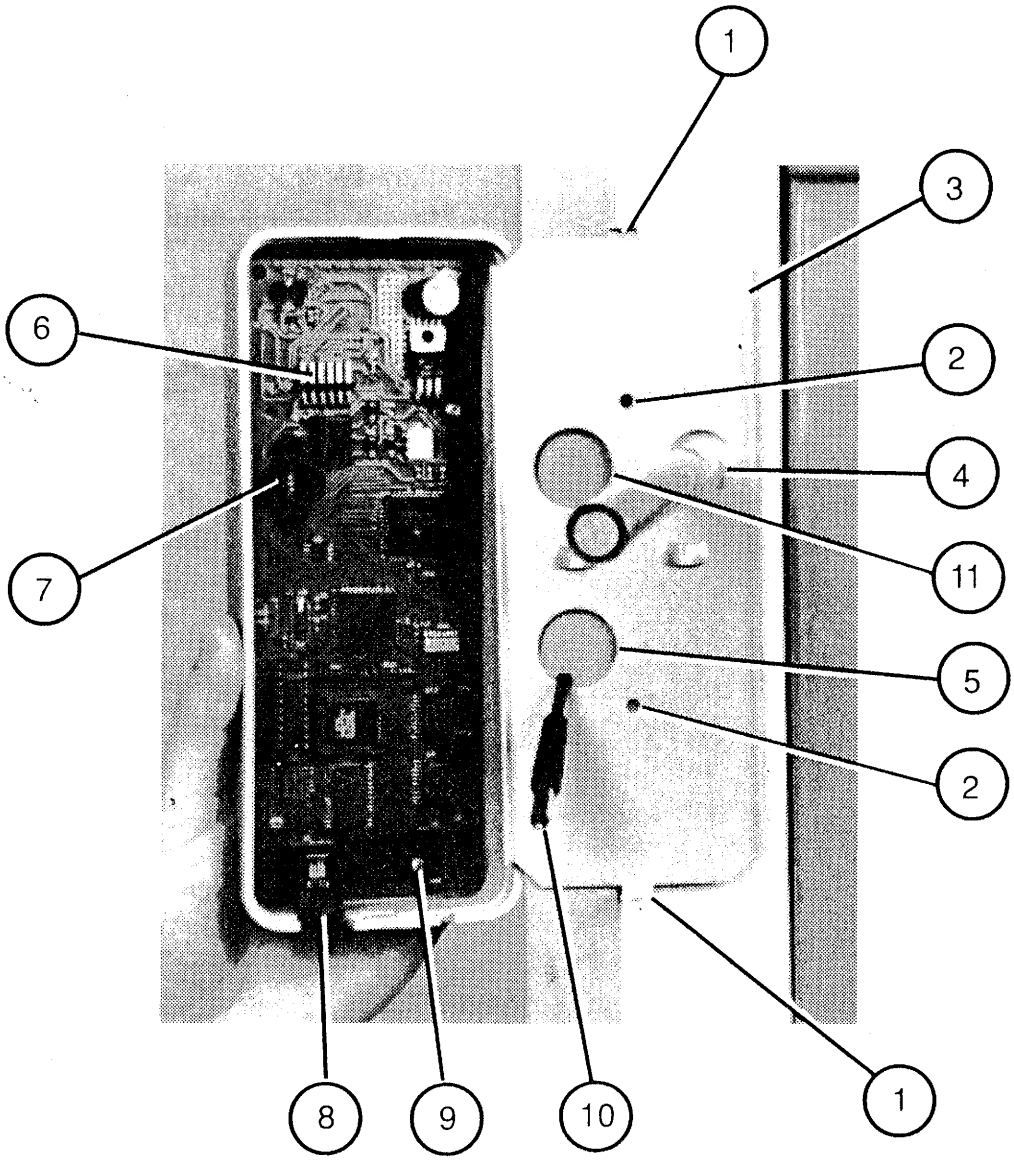

Figure 2.

PROCEDURE

Step 1: Detatch the back plate from the monitor by unscrewing the top and bottom screws (figure 1, item 1) .

Step 2: Use the back plate (figure 2, item 3) as template to drill 2 holes, 0.104″ diameter, (figure 2, item 2) to secure the back plate to the fume hood.

Step 3: Use the back plate (figure 2, item 3) as template to drill 1 hole, 0.75″ diameter, (figure 2, item 4) for air flow from the monitor to the fume hood.

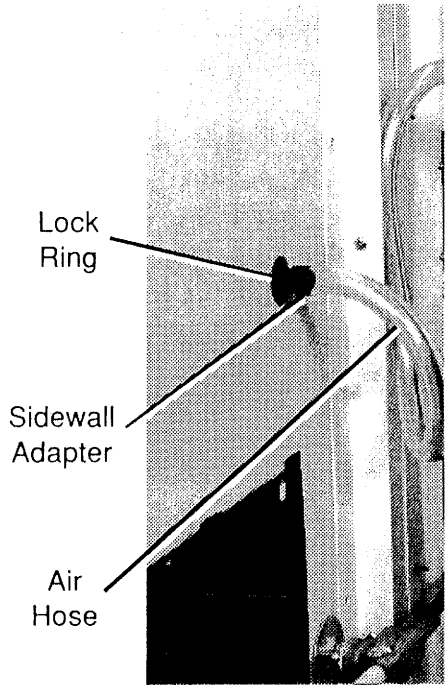

Figure 3.

Step 4: If the power cord is routed through the face of the fume hood, use the back plate (figure 2, item 3) as template to drill 1 hole, 0.875″ diameter, (figure 2, item 5) to route the power cord from the back of the hood to the front. The power cord can be also routed from the front of the monitor, in which case this hole is not needed.

Step 5: If the monitor will be connected to external devices (such as a relay indicator), then use the back plate (figure 2, item 3) as template to drill 1 hole, 0.875″ diameter, (figure 2, item 11) to route external wires to the "external interface" (figure 2, item 6) of the monitor.

Step 6: In some applications, leaving the flow tube exposed to the interior of the fume hood will provide good results. However, many installations will require using a side wall adapter to guide air flow from the monitor to the fume hood as shown in Figure 3. In these cases, drill a 0.515″ hole in the side wall of the fume hood, approximately 6" behind the sash and even with its bottom when fully open. Insert the side wall adapter from the inside of the hood and lock with the lock ring.

Step 7: If a side wall adapter is used, connect the supplied air hose between the side wall adapter (figure 3) and the flow tube (figure 2, item 7) through the back plate orifice (figure 2, item 4). Secure hose firmly, and cut to length as necessary, to prevent accidental kinks and bends which can affect calibration.

Step 8: Mount back plate to fume hood and assemble grommets into wiring holes.

Step 9: Connect the power cord (figure 2, item 10) to the power jack (figure 2, item 9). The power cord is shown routed from the rear of the fume hood, but may be also routed from the front side.

Step 10: Secure the monitor to the back plate using a screw on the top, and a screw at the bottom (figure 1, item 1). If front power cord routing is used, be careful to place the cord into the notch provided in the bottom of the front cover before securing the screws.

Step 11: Plug the power supply to a power source. See Specifications section for ratings.

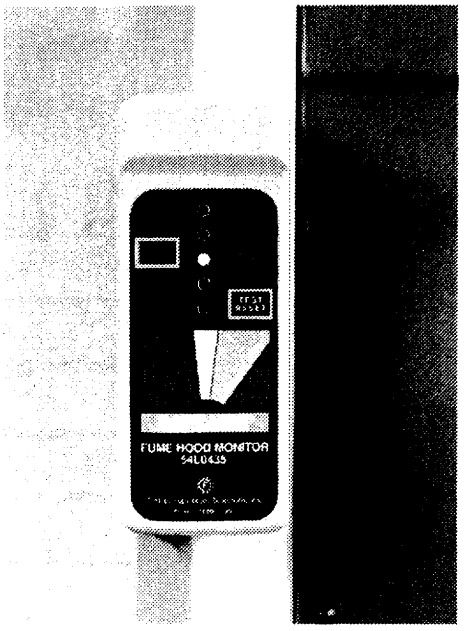

Figure 4.

The installation of the monitor is complete. The instrument should look as shown in Figure 4. Proceed now to the Calibration section.

CALIBRATION

Field calibration must be performed with each monitor because each hood installation is unique. This calibration procedure will program the monitor to operate between a low flow set point and a high flow set point. Both set points must be within the range of the monitor.

WARNING

CALIBRATION OF THIS MONITOR MUST BE PERFORMED ONLY BY QUALIFIED PERSONNEL. PROPER GUIDELINES FOR MONITORING ANY VENTILATION APPARATUS ARE ESTABLISHED ON THE BASIS OF TOXICITY OR HAZARDS OF THE MATERIALS USED, OR THE OPERATION CONDUCTED WITHIN THE VENTILATION APPARATUS. PERSONNEL CALIBRATING THIS MONITOR MUST BE COMPLETELY AWARE OF THE REGULATIONS AND GUIDELINES SPECIFIC TO ITS APPLICATION.

EQUIPMENT REQUIRED:

Use a calibrated ALNOR thermoanemometer (ALNOR 8500, 8575, APM360) or similar instrument capable of displaying air flow in "feet per minute".

PROCEDURE

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PROCEDURE:

Step 1: Confirm that the monitor was installed properly.

Step 2: Apply power to the monitor and wait at least 10 minutes for the monitor to reach a stable operating condition.

Step 3: Set the fume hood to a low air flow, usually around 50 to 100 ft/m.

Step 4: Using the calibrated thermoanemometer, determine the velocity through the face of the hood by taking a detailed velocity traverse. Divide the face area of the hood into equal increments. A six inch grid area is recommended for an accurate traverse. Compute the average velocity for this area. For this example, assume that the traverse resulted in an average velocity of 62 ft/m.

Step 5: Press and hold the Test/Reset button until only the center LED is lit in the Bar Graph.

This process will take at least 5 seconds.

Step 6: Release the Test/Reset button while the center LED is lit on the Bar Graph.

The monitor will be ready for field calibration of a low set point, and a high set point.

Step 7: The analog display will increment from 50 to 250 ft/m by moving the needle from left to right. The left most position is 50 ft/m. The red-yellow boundary is 100 ft/m. The yellow-green boundary is 150 ft/m. The green-red boundary is 250 ft/m. Press the Test/Reset button for 1 second when the displayed value approximates the set point value ("62" in this case).

Step 8: The monitor will wait at least 5 seconds to allow the user to step away from the face of the hood.

Step 9: The monitor will then measure air flow at the low set point for approximately 20 seconds.

Step 10: Now set the fume hood for a high air flow, usually 120 ft/m or higher, but not to exceed the range of the monitor. Using the calibrated thermoanemometer, determine the velocity through the face of the hood by taking a detailed velocity traverse. Divide the face area of the hood into equal increments. A six inch or smaller grid area is recommended for an accurate traverse. Compute the average velocity for this area. For this example, assume that the traverse resulted in an average velocity of 124 ft/m.

EXTERNAL INTERFACE

Step 11: The analog display will increment from 50 to 250 ft/m as in Step 7. Press and hold the Test/Reset button for 1 second when the displayed value approximates the set point value ("124" in this case).

Step 12: The monitor will wait at least 5 seconds to allow the user to step away from the face of the hood. During this time, it will sound the audible alarm about once per second.

Step 13: The monitor will then measure air flow at the high set point for approximately 20 seconds.

Step 14: The monitor will sound the audible alarm 3 times to indicate that the measurements were completed.

Step 15: The monitor will compute a new field calibration. This process takes approximately 30 seconds.

Step 16: If the field calibration was successful, the monitor will operate with the new calibration. Otherwise, it will sound the audible alarm once per second. In this latter case, press the Test/Reset button for 1 second to terminate the field calibration procedure and allow the monitor to continue operating with factory default settings. Check that the monitor was installed properly and that the fume hood is operating correctly. Then repeat this calibration procedure.

NORMAL OPERATION

Local Alarm Silencing

The audible alarm can be silenced by pressing the Test/Reset button. The audible alarm will remain silenced until the air flow condition is corrected. The visual and remote alarms cannot be acknowledged; they remain active until the alarm condition is corrected.

Remote Alarm Silencing

The audible alarm can be silenced by joining the "remote alarm silence input" pins in the external interface connector. The audible alarm will remain silenced until the alarm condition is corrected.

Alarm Test

The audible and visual alarms can be tested by pressing and holding the Test/Reset button for up to 4 seconds. During this time, both alarms will be cycled on-off in 1 second intervals.

MAINTENANCE

The outside of the monitor may be wiped clean with mild

Remote Alarm Output

The remote alarm activates a relay to signal a remote location. This alarm can not be silenced and remains active while the alarm condition exists.

Alarm Disabling

Alarms can be disabled through the Test/Reset button. See the Custom Monitor Configuration Through Keypad section of this manual.

Analog Display

The analog display shows air flow from 0 to the high alarm value set during Calibration. The scale is divided as follows:

Left red area:	0 to 40% of H.A.V.
Yellow area:	40 to 60% of H.A.V.
Green area:	60 to 100% of H.A.V.

where H.A.V. means "high alarm value". If the high alarm value equals 250 ft/m, then the yellow-red boundary corresponds to 100 ft/m, and the green-red boundary corresponds to 250 ft/m.

Bar Graph Display and External Alarm Input Indicator

The bar graph consists of 5 LEDs displaying air flow trends. The bottom LED corresponds to the low flow set point, and the top LED corresponds to the high flow set point. Set points are defined as 50 and 250 ft/m at the factory, but may be altered during field calibration. The bar graph also works as the indicator for the external alarm input. When the external alarm input pins in the external interface connector are separated or "open", the bar graph segment in use will flash. When the external alarm input pins are joined or "closed", the bar graph segment in use will remain lit constantly.

Alarm Delay Timing

The monitor will time its reaction to alarms. It waits for an alarm condition to exist for a period which exceeds the "Delay Phase". Then it will activate all alarm outputs.

SPECIFICATIONS

AIR FLOW MEASUREMENT

CUSTOM MONITOR CONFIGURATION THROUGH KEYPAD

Pressing and holding the Test/Reset button for more than 5 seconds activates a custom configuration menu. Choices are:

Disable/enable the audible alarm

Perform field calibration

Disable/enable high flow alarms

End configuration menu

Choices are shown one each second by enabling a segment in the bar graph. To execute a choice, release the Test/Reset button when the desired choice is displayed.

Disable/Enable Audible Alarm

This choice corresponds only to the second bar graph LED (from the bottom) being lit. This choice toggles the audible alarm output from active to inactive, and vice versa. The monitor will sound the audible alarm three times to indicate an active audible alarm or sound the audible alarm once to indicate an inactive audible alarm.

The audible alarm is enabled each time power is applied to the monitor.

Perform Field Calibration

This choice corresponds only to the center bar graph LED being lit. This choice activates the field calibration procedure described in detail in the Calibration section of this manual.

Disable/Enable High Flow Alarms

This choice corresponds only to the top bar graph LED being lit. This choice toggles the monitor's interpretation of high air flow as alarm or normal flow condition. The monitor will sound the audible alarm three times to indicate high flows will activate alarms, or sound the audible alarm once to indicate high flows will not activate alarms.

End Configuration Menu

This choice corresponds only to the bottom bar graph LED being lit. The monitor returns to normal air flow measurement mode.

EXTERNAL INTERFACE

External electrical connections can be made to the monitor using the "external interface" (figure 2, item 6). External wires are routed through the back plate (figure 2, item 11), and terminated with a 12-position socket carrier (supplied). The socket is then connected to the "external interface" of the monitor (figure 2, item 6). Figure 5 shows the pin numbers of the external interface connector. Additionally, pins 1 and 2 are identified on the printed circuit board. Refer to the Specifications sections for ratings. Functions available are:

REMOTE ALARM SILENCE INPUT:	Positive input at pin 2. Negative input at pin 1.
USER ALARM INPUT:	Pins 3 and 4. Must be driven by isolated relay contacts (normally closed).
BACK-UP POWER INPUT:	Signal at pin 12. Ground at pin 11.
RELAY ALARM OUTPUT:	Normally-open contacts: pins 7 and 8. Normally-closed contacts: pins 7 and 6.

Caution: Do not disturb existing wiring to pins 9 and 10.

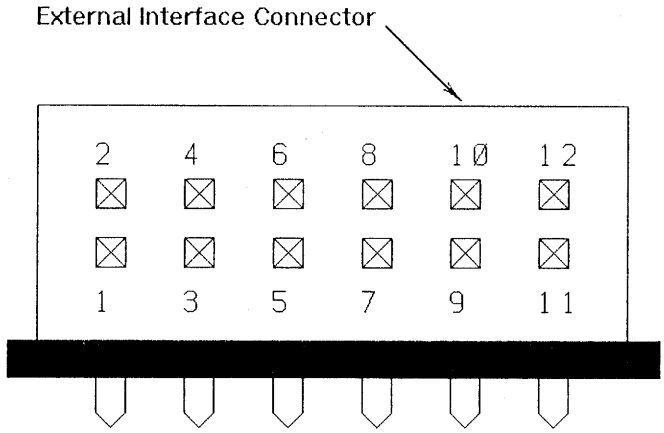

Figure 5.

GROUND @ # 10 PIN provide 0 to 5 volt signal

second intervals.

MAINTENANCE

The outside of the monitor may be wiped clean with mild soap (dish washing detergent) and water on a damp cloth to remove finger marks, oils or residue. Do not use abrasives or solvents. Do not immerse the monitor or allow liquids to enter the case. Dry the instrument thoroughly after cleaning.

TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE and CORRECTIVE ACTION
No display	Power supply not plugged into live AC outlet. Plug power supply into live outlet.
No Audible Alarm	Audible alarm has been disabled. Enable the audible alarm feature.
Display drifted	Blower speed has changed. Check for hose kinks or movement if a hose is used. Check for blockage in the flow tube and air inlet. Check blower speed. Adjust if required. Perform traverse to verify that the calibration has not changed. If the calibration is suspect, recalibrate monitor as instructed in the Calibration section.
Bar graph display blinking	Monitor is signaling an active external alarm. Correct external alarm source.
Alarm not activated immediately	The alarm condition must persist for a predetermined time period (see Specifications section) before it is interpreted as a true alarm by the monitor.
Alarm inactive at high flows	High flow alarm feature disabled. Enable the high flow alarm feature.

5410435

SPECIFICATIONS

AIR FLOW MEASUREMENT:	
RANGE:	50 to 250 ft/m (25.4 to 127 cm/s)
ACCURACY:	±10% of reading or ±10 ft/m, whichever is greater.
ANALOG DISPLAY:	Analog meter with color coded background, scaled to high alarm set point.
BAR GRAPH DISPLAY:	5-segment light bar.
ALARM SET POINTS:	Anywhere within measurement range. Factory settings are: Low Alarm: 50 ft/m (25.4 cm/s) High Alarm: 250 ft/m (127 cm/s)
ALARM DELAY TIMING:	
Delay Phase:	10 seconds.
USER ALARM INPUT:	Accepts normally-closed relay contacts. Triggers with open contacts.
REMOTE ALARM SILENCE:	Requires external source of +9 to +11 VDC, 15 mA maximum. Connects to external interface.
ALARM OUTPUTS:	2200 Hz, 85 dB (at 10 cm) buzzer. 0.75 x 0.5 in. red indicator. 120 VAC or 24 VDC, 0.3 A, form C relay. Flashing bar graph LED display for external alarm.
POWER SOURCE:	120 or 230 VAC 50/60 Hz, depending on model. 9 VDC output. Polarity: (+) tip, (–) sleeve.
BACK-UP POWER SOURCE:	User provided 9 VDC, 300 mA source.
STORAGE CONDITIONS:	–40 to 160°F (–40 to 71°C), non-condensing environment.
OPERATING CONDITIONS:	55 to 86°F (13 to 30°C), non-condensing environment.
DIMENSIONS:	7.8″ x 3.2" x 1.8″.

SAFETY

All necessary precautions must be observed when installing or making repairs in the vicinty of electrical equipment. If cutting an opening into a hood for the monitor, use proper eye protection. Use only the power source that is delivered with the monitor.

TRADEMARKS

The following are trademarks of the ALNOR Instrument Company:

BAD AIR IS BAD BUSINESS

AIRGARD	**DIGICON**	**PYROPOINT**
ALNOR	**DIGITHERM**	**PYROTAC**
AL-TEMP	**MICROPRINTER**	**PYROTROLLER**
BALOMETER	**PYROCON**	**THERMOCON**
COMPUFLOW	**PYROLANCE**	**VELOMETER**
DEWPOINTER	**PYROMATIC**	**VELOMETER JR.**

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DEWPOINTER	**PYROMATIC**	**VELOMETER JR.**

WARRANTY AND REPAIR INFORMATION

Alnor Instrument Company (Alnor) warrants this product to be free of defects in material and workmanship for a period of one year from the date of original purchase. If the product should become defective during the warranty period, Alnor will repair it or elect to replace it free of charge under the following conditions:

1. Product is returned postpaid.

2. Owner submits proof of original date of purchase.

3. Alnor will inspect the product for defects in material and workmanship.

   Alnor's decision as to existence of defect, and in the case of defect, to repair or replace will be final.

   THIS WARRANTY IS EXCLUSIVE. THERE ARE NO OTHER WARRANTIES EITHER EXPRESSED OR IMPLIED. SPECIFICALLY AND WITHOUT LIMITATION, THERE IS NO WARRANTY, EXPRESSED OR IMPLIED, OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

This warranty is void if product is misused, used contrary to procedures set forth in the owner's manual, or if product is serviced by anyone other than Alnor's authorized service. This warranty does not cover consumables such as light bulbs, paper, batteries, etc.

Alnor' s liability for this product is limited to the above stated warranty and shall not in any event exceed the cost of the product. In no event will Alnor be liable for any direct or consequential damages, including but not limited to lost profits, loss of use, inaccuracies, loss of data, dismantling or reinstallation.

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Manual No. 116-159-100 Rev.1

CALIBRATION PROCEDURE FOR 54L0435 FUME HOOD MONITOR

1. Prior to calibrating the monitor, **measure the face velocity of the hood at the full open sash** position **and with the sash open 12 inches**. Use a piece of tape or other marker to identify the 12 inch opening. The full open position and the face velocity is the low flow set point and with the sash set to the 12 inch opening and the coresponding face velocity is the high set point

2. If the monitor is unplugged, plug it in and allow a **minimum of 5 minute warm-up**.

3. Open the sash to **the full open position prior to calibrating** the monitor.

4. **Depress and hold the test/reset pad** on the front of the alarm. A menu of items (4) will be available. The menu choice c**oresponds to the** illuminated bar graph that consists of five leds (light emitting diodes). The **center led coresponds and places the monitor in the calibration** mode once the test button is released when the center led is illuminated.

   The top led represents the on/off of the **high** alarm signal
   The second from the bottom repr**esents the on/off of the low alarm signal.**
   The bottom led represents the ending of the configuration menu and returns the monitor to the normal air flow measuring mode.

5. The **release of the test/reset pad at the CAL menu,** immediately & I mean immediately, puts the monitor in the **calibration mode**. You will see the needle on the display gauge ratchet from the left to the right. Press **the test button at the color band that best represnts the face velocity recorded earlier, when the sash was full open.**

6. The gauge of color bands represent the following values; the red band on the far left represents velocities of zero to 65 fpm., with zero at the far left and 65 at the far right of the red band. The yellow represents 65 fpm., to 85 fpm., and the green band is 85 to 150 fpm.. Any reading above 150 to the maximum 250 is represented by the red band at the far right of the gauge.

7. After pressing the test butto**n a count down** squence begins with an audible beep of one per second. No obstruction is to get in the way of the sash opening and the sash position should **not** be altered duing the next 25 seconds..

8. After the 5 second warning, the monitor will count down **another 20 seconds**. This 20 second time interval allows the monitor to record and memorize data collected at this sash position.

9. **Immediately, after the 20 second count down, the monitor will revert back to the neddle adva**ncing forward. This ratchet motion represents velocities in 5 fpm., increments.

10. **When the monitor reverts back to reading face velocities (the needle moves forward) lower the sash to 12 inches.**

11. Now, be ready to **push the test/reset pad when the display reaches the value you had recorded** earlier, at the 12 inch opening. You are now setting the high calibration point.

10. With the test/reset pad depressed and released at the desired velocity, sash open 12 inches, the calibration is just about complete.

11. After the test/reset pad is depressed, and released, the monitor will warn you with 5 beeps that there is five seconds to remove any items blocking the entrance to the hood. After the 5 seconds, the monitor will count down another 20 seconds (20 beeps) and record and memorize the high flow and beep again. After 10 to 15 seconds the monitor will beep 3 times, which indicates that the monitor accepted the calibration. If the monitor repeats the beeping sound, the calibration was not accepted and the process of calibrating the monitor will have to be repeated.

MENU

The menu selection is activated by beeping sounds. When the option or menu item is selected from the bar graph the monitor will beep three times, which lets you know that it is active or ON. To turn off or deactivate the menu selection one beep is heard. Pressing the test reset button and holding it down at various time intervals will toggle the on or off option. This is done through a series of beeps, one beep for off and three for on, or activated.