RADēCO, INC

"The Industry Standard in Air Sampling."

OPERATION AND MAINTENANCE MANUAL

AIR SAMPLER WITH AIR VOLUME TOTALIZER

MODEL H-810BL

17 West Pkwy
Plainfield CT 06374
(860) 564-1220
(860) 564-6631 Fax
WWW.RADeCOINC.COM

REV Preliminary

OPERATION AND MAINTENANCE MANUAL

AIR SAMPLER WITH AIR VOLUME TOTALIZER

MODEL H-810BL

CAUTION

CARE MUST BE TAKEN TO PREVENT THIS DEVICE FROM COMING INTO CONTACT WITH FOAM, LIQUID (INCLUDING WATER) AND OTHER FOREIGN SUBSTANCES. SUCH MATERIALS MUST BE PREVENTED FROM REACHING THE FAN SYSTEM INTAKE, MOTOR HOUSING AND ELECTRICAL COMPONENTS. FAILURE TO DO SO COULD RESULT IN AN ELECTRICAL SHOCK, WHICH MAY RESULT IN SEVERE BODILY INJURY OR EVEN DEATH IN EXTREME CASES.

TABLE OF CONTENTS

SPECIFICATIONS

Operational Range:	Up to 99999 cubic feet, of 99999 liters
Accuracy of Totalizer:	±5%
Readout of Totalizer:	LCD: 2 Lines, 16 Characters, backlit. Continuous display of cumulative volume + flow rate + elapsed time. Flash memory backed to recall sample data in the event of power loss.
Timer Circuit:	Microprocessor-controlled crystal oscillator
Operating Voltage:	115-220VAC, 50-60Hz, 1 Phase
Current Rating:	800-1200 Watts
Dimensions:	11" Wide, 8 1/2" Deep, 9" High
Weight:	17.5 pounds (8 Kg)
Air Mover:	Internally mounted; Brushless IntelliGen Blower
Motor:	1 HP, self-cooled, brushless
Eye Bolt:	Top mounted, for carrying or hanging sampler. Supplied with 2" wide, 6 foot long belt.
Air Flow Adjust Control	Recessed, to be set by calibration person. ON/OFF switch/circuit breaker controls AC power to unit.
Operating Conditions	For use in a dry environment
Keypad, 16 Key – Features:	**Start Key:** Initiate pre-programmed sample. **Stop Key:** Manually terminates sample. **Units Key:** Toggles display between liters and cubic feet units. **Set Key:** Allows user to change sample preset. **Numeric Keys:** Allows entry of numeric values in response to displayed menus.

Calibration: After sample has been cleared press Clear, enter the calibration code, 3434, then press Enter

Security: Keypad function can be selectively limited to Start/Stop and Units, in order to prevent changing of sample presets.

DESCRIPTION

The RADēCO Model H-810BL is a dependable, lightweight air sampler which incorporates the reliability, ruggedness, and technology of the Model H-810DM with an IntelliGen brushless blower for continuous high volume sampling as well as standard grab samples.

The H-810BL uses an Air Volume Totalizer composed of an enclosed air-turbine, which rotates at speeds proportional to the air velocity of the sampled air. The turbine's rotation is sensed by a reflective sensor/breaker disc. The microprocessor converts the signal to volume and displays the flow rate, total volume and elapsed time on the LCD readout.

The Model H-810BL may be operated in either the "Total Volume" mode or the "Total Elapsed Time" mode with the mode of operation selected during instrument calibration. The functions/parameters that are established during calibration may be locked-in using the "keypad security" feature. When keypad security is enabled, the SET function on the keypad is disabled, which prevents the operator from altering the sample presets.

The operation of the Model H-810BL is a very simple four-step procedure and the training time required is relatively short. Its operational procedure is:

1. Connect to an AC power source.
2. Install the sample holder with the filter media.
3. Turn power switch on.
4. Press the START key.

The Model H-810BL samples the environment until the desired total volume or total elapsed time has been reached and then turns itself off. The LCD readout indicates the total volume and elapsed sample time. A STOP key is provided to stop the sampling procedure at any point during the sampling period, and the total volume of air sampled, and elapsed time up to that point are indicated.

The Model H-810BL is supplied with a 2 inch wide, 6 foot long belt for carrying purposes or for hanging the instrument during sampling. The instrument is not designed to be suspended by the power cord.

METHOD OF OPERATION

Operation of the H-810BL is simplified through the use of English-language prompts on a digital display. After turning the unit ON, the display will prompt for the calibrated range desired. After selecting either 1, 2, or 3 the selected calibration range will be displayed (note: 1, 2, or 3 will only appear if a multi-calibration unit was purchased). Pressing CLEAR at this point will return to the select calibration 1, 2, or 3 display. Pressing any other key on the keypad will cause the unit to indicate the current preset volume or time. At this point a sample may be initiated by pressing the START key, or the preset may be changed by pressing the SET key. i.e.:

CALIBRATED RANGE to 1, 2 or 3?

Calibrated Range 4.0 to 6.0 CFM	to	**Target Volume: 1000 ft3**	or	**Target Run Time: 10:00**

After pressing the SET key, the display will prompt for a new target time or volume, depending on the current mode of operation selected during the last calibration. i.e.:

Enter Target Time: 00:00	or	**Enter Target Volume 0 ft3**	or	**Enter Target Volume 0 lit**

Enter a new value using the digit keys followed by ENTER, or press ENTER to cancel changing the target.

The H-810BL is equipped with KEYPAD SECURITY. With this feature enabled, the SET function on the keypad is disabled, preventing the operator from altering the preset sample time or volume. This feature also inhibits the display of the current calibrated range upon power-up.

Upon pressing the START key, the motor will turn on, and the display will indicate the "warm-up delay", if enabled. The display will then indicate the current totalized volume, the current flow rate, and the elapsed time (volume mode) or remaining time (time mode). i.e.:

ft3	CFM	Time	or	lit	LPM	Time
123.4	4.5	12:34		12345	123	12:34

If the FLOW RATE reading is blinking during sample collection, it is because the unit is running at a flow rate outside of its calibrated range. This can be corrected by recalibrating the unit.

The unit will continue to sample unit the target time or volume has been reached, or until the STOP key is pressed. Upon completion or termination of a sample, the display will indicate the final time/volume of the sample. i.e.:

Volume: 123.4 ft3
Run Time: 12:34

NOTE: In the event that power is disconnected or turned off prior to completion of a sample, the elapsed time/volume will be displayed upon power-up. The CLEAR key must be pressed to clear the last run and again display the originally set target volume.

When using the Model H-810BL with the optional tripod for breathing zone sampling applications (See Appendix C), please note the adaptor or tripod mounting block may be installed on the bottom or the front of the unit. When the adaptor is mounted on the front, the keypad display is most accessible.

PRINCIPLE OF OPERATION

The principle of operation of the air volume totalizer is very simple and basic in nature. Theoretically, a fan mounted on a freely turning shaft will rotate at a rate proportional to the velocity of the air passing the fan. This velocity is proportional to the flow rate, assuming the pressure differential across the filter media stays constant, and the ambient air temperature/pressure stays constant. By measuring the fan RPM for a number of flow rates, a nearly linear response can be generated between the airflow rate and the fan speed.

RADēCO tested the above principle and learned that the above was true within limits. We found that for each filter media, the turbine speed was close to linear, but only over a limited flow range. The CFM versus RPM curve also varied depending on the pressure drop of different filter media. For any given filter media, we found that by using a three

Point calibration we could very closely track the CPF/RPM curve with linear approximations over a relatively wide flow range. The microprocessor determines all calibration constants required based on operator-entered flow rates and measured turbine RPM during the calibration process. These constants are permanently stored in Flash memory or until overwritten. Recalibration is only required if or when a different type of filter media is to be used.

The Model H-810 has been designed using the latest in technology. The unit is microprocessor-based with Flash memory to permanently store operational parameters until overwritten. The microprocessor keeps track of turbine RPM by counting pulses from a reflective sensor/breaker disk located in the head adapter.

INSPECTION AND MAINTENANCE OF FLOW SENSOR

1. Carefully remove front barrel (See Figure 2, Item 2) by turning counterclockwise.

2. Inspect six holes in barrel focusing plate and clean holes with isopropyl alcohol if there is any dirt present.

3. Inspect fan for wear around edges and the presence of dirt. This is a compression fitted fan, which may be readily removed from the shaft for cleaning or replacement.

4. Check space setting between front of bearing support and rear of fan. This should be 0.5 inches.

5. Verify that fan turns freely without binding and is free of wobble, which may indicate a bent fan shaft.

6. Replace barrel and cinch down tight. Again verify that the fan turns freely by blowing into the barrel. The fan should come to a stop gradually and without resistance.

7. To clean photo sensor, remove right case half (four screws). Remove photo sensor circuit board assembly (two screws). Clean photo sensor using a soft cloth or cotton swab and reassemble.

CALIBRATION

1. Install a sample holder assembly containing the filter or combination filter and cartridge normally to be used for air sampling into the front of the barrel and connect inlet to air flow calibrator (RADēCO Model C-828 or C-8528, depending on filter media, with adaptor). See Figure 5.

2. Plug unit into AC power supply.

3. Press CLEAR and enter the calibration code "3434" then press ENTER

4. If Step 3 has been done correctly, after approximately five seconds the display will prompt:

   CALIBRATE FLOW?
   1= YES, 0= NO

   Press "1" for Yes.

5. Display will read:

   VOLUME UNITS?
   1= ft3, 0=liters, 2= m3

6. Display will read:

Adjust Flow For High Flow Rate	then	**Enter high Flow Rate: 0.0 CFM**

   Adjust flow to high point of calibration range by using a small flat head screw driver and adjusting the potentiometer located on the side of the unit (Example: 3-4-5 CFM, 3 = LOW POINT, 4 = MID POINT, 5 = HIGH POINT) Enter the high flow rate using the keypad and then press "ENTER". Keep flow constant for 10 seconds.

7. Display will read:

Adjust Flow For Mid Flow Rate	then	**Enter Mid Flow Rate: 0.0 CFM**

   Reduce flow to mid point of calibration range. Enter rate using keypad and then press "ENTER". Keep flow constant for 10 seconds.

8. Display will read:

Adjust Flow For Low Flow Rate	then	**Enter Low Flow Rate: 0.0 CFM**

Reduce flow to low point of calibration range. Enter rate using keypad and then press "ENTER". Keep flow constant for 10 seconds.

9. Display will read:

Verify Linearity
Rate: 0.0 CFM

Adjust flow to various points within the calibration range to verify calibration accuracy. Press ENTER to accept calibration or CLEAR to reject. At this point the motor will shut off.

NOTE: If display reads "BAD CALIBRATION", or "TURBINE FAILURE" then inaccurate flow data has been entered, or the turbine speed sensor requires service.

10. Display will read:

Default Run Mode
0=Vol, 1=Time:

Select mode of operation. Select "0" for TOTAL VOLUME, select "1" for TOTAL TIME.

NOTE: During normal operation, both volume and time are displayed.

11. Display will read:

Enter Target Time: 00:00	or	**Enter Target Volume 0 ft3 or 0 liters or 0 m3**

Enter default sample time or volume using the keypad.

NOTE: This is the default target that will be displayed each time the unit is turned on. If keypad security is disabled, this number may be temporarily changed using the SET function, described above.

12. Display will read:

Altitude & Temp
1=Actual, 0=Standard

Select either "0" for no automatic altitude and temperature correction or "1" if you would like the unit to use correction factors for the temperature and atmospheric pressure of where you will be taking samples. Enter desired altitude in feet, press ENTER, and then enter temperature in degrees F, press ENTER

NOTE: This information must be entered Imperial Units, to get to Imperial Units select "0" then finish calibration steps 13 and 14. Then press the UNIT key to toggle to "CFM". Now you can re-enter press CLEAR, enter the calibration code, and cycle through the prompts until you are back too "Altitude & Temp". Units may be changed back by pressing the UNITS key before a sample is taken.

13. Display will read:

Warm-Up Delay In
Seconds (0-9):

Enter the time desired for the unit to come up to speed, before actual sampling totalizing period begins (typically two seconds).

14. Display will read:

Keypad Security?
0= OFF, 1= ON:

Select either "0" for OFF or "1" for ON. When keypad security is on, all keys on the keypad are disabled with the exception of the UNITS, START and STOP keys. These keys will allow the user to start the run or toggle the display readout from CFM, LPM, or M3units using the UNITS key.

NOTE: To change these default run parameters without recalibrating flow, follow steps 3 and 4. On step 4: CALIBRATE FLOW, enter "0" for NO. For RPM TEST MODE, enter "0" for NO. Display will prompt for "VOLUME UNITS". Select desired units of measure per the menu prompts, and continue through steps 12 through 16.

TROUBLESHOOTING:

The H-810BL has capabilities for checking the performance of the turbine sensor and the battery monitor.

TURBINE TEST MODE

The H-810BL has a built in diagnostic tool to test your H-810BL turbine.

1. Make sure you have your flow rate set to maximum with no filter media installed.

2. Press "1" and the pump will turn on, and the diagnostic will start

3. Results will display on the screen

- High RPS
- Low RPS
- Span of RPS
- Average RPS
- Spin down time

Signs of a bad turbine include a difference between the high and low of more than 20 RPS or a spin down time of less than 5 seconds.

To exercise the turbine, select NO at the CALIBRATE FLOW? prompt, then YES at the RPM TEST MODE? prompt. The display will indicate the RPM rate as sensed by the reflective sensor circuit. This rate is nearly proportional to flow, and the range is affected by the filter media and the turbine barrel hole configuration.

COMPATIBLE RADēCO SAMPLE HOLDERS AND OPTIONAL EQUIPMENT

FOR H-810BL

Model No.	Open Face
2500-23	2” Diameter Filter
2500-33	47mm Diameter Filter
	Open Face Combination
2500-19	2” Diameter Filter / RADēCO Cartridge
2500-27	2” Diameter Filter / Scott Cartridge
2500-34	47mm Diameter Filter / RADēCO Cartridge
2500-39	47mm Diameter Filter / Scott Cartridge

FOR H-810BL-2

Model No.	Open Face
2500-25A	4” Diameter Filter

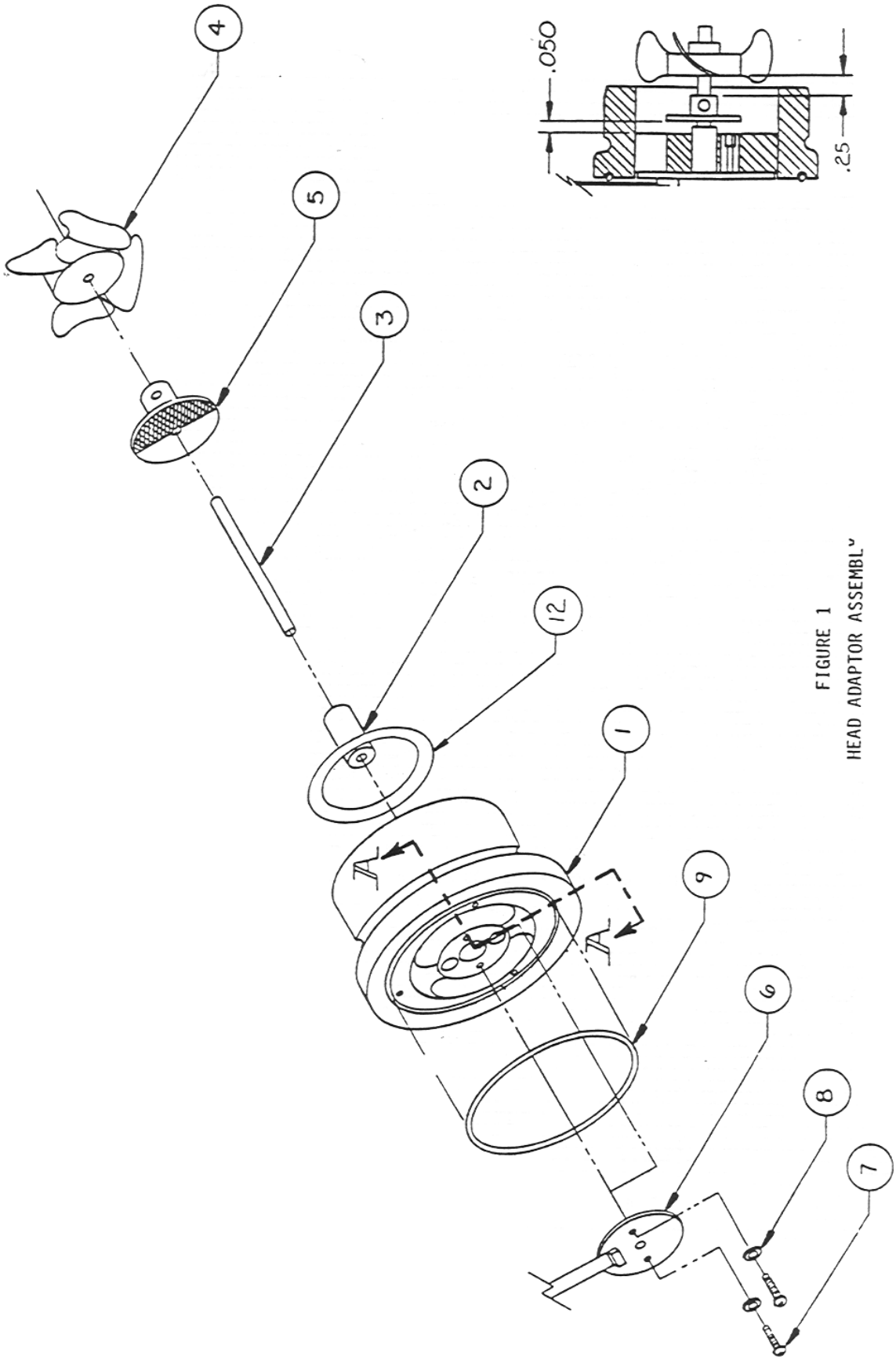
Available Filter Papers

Model No.	Diameter	Type
0750-02	47mm	HD-2064
0750-03	2”	HD-2064
0750-09P	4”	HD-2064
0750-36	47mm	LB-5211
0750-37	2”	LB-5211
0750-49	4”	LB-5211

Tripod

Model TRP-2 (with Adaptor) See Appendix C

FIGURE 1



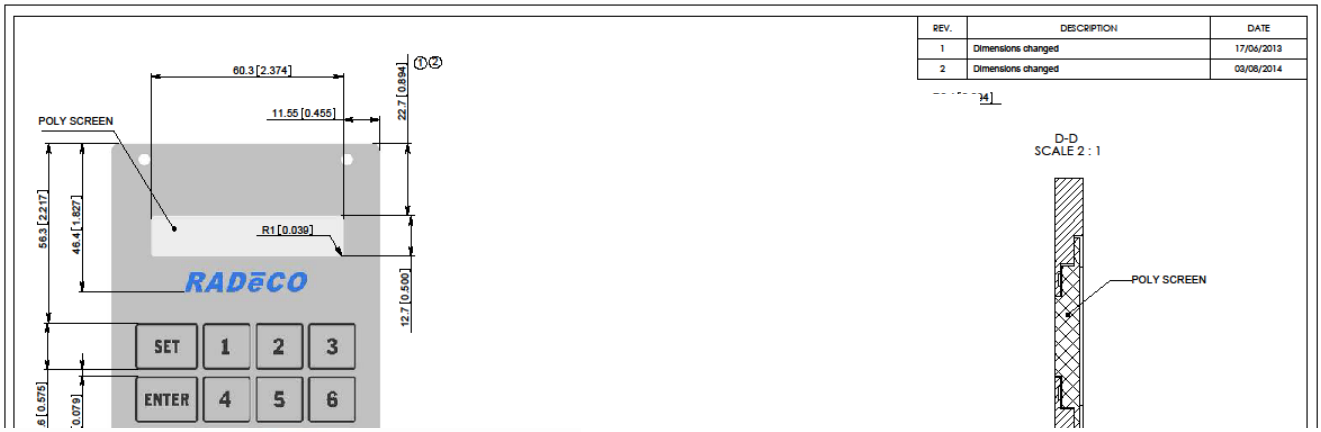
LEGEND-FIGURE 1

HEAD ADAPTOR ASSEMBLY

ITEM	PART NO.	DESCRIPTION
1	106010-1, -2, -3	Head Adaptor
2	7000-03	Cartridge Bearing
3	S2-16	Ultra Precision Shaft
4	6050-49	Fan Blade
5	106013-1	Sensor Disc
6	106004-1	Photo Sensor PCB Assembly
7	1350-22	Screw, 4-40 x .25 Pan Head
8	1550-88	Washer, Fiber, #4
9	2201-11	O-Ring
12	2201-09	O-Ring

FIGURE 4
PHOTO SENSOR CIRCUIT BOARD ASSEMBLY

FIGURE 5
APPENDIX A
KEYPAD AND DISPLAY CONFIGURATION



TRIPOD – P/N TRP-2

38” to 61” Weight 10 ½ LBS

Machined aluminum head mates to TRP-adapter

Durable light weight aluminum legs lock in any position

Adjusts between 39 inches and 61 inches

Steal spur allows for a firm setup

Tripod adapter