XENON TRAP MONITOR

OPERATION MANUAL

136-752

BIODEX

This manual contains installation and operation procedures for the following:

136-752   Xenon Trap Monitor

INTRODUCTION
The Xenon Trap Monitor is designed to act as a Xenon-133 trap monitor and to provide an audio/visual alarm when the concentration in the Xenon trap exhaust port exceeds a certain value (usually set for 99 pCi/ml).

NOTE: *NRC and state regulatory commissions restrict Xe-133 concentration in restricted areas to less than 10 pCi/ml.*

The Xenon Trap Monitor may also be used as a room monitor, but it is not equipped with a fan or blower system. Diffusion will allow sampling of room air with a response time of a few minutes. The threshold level should be set to 10.0 pCi/ml. If the trap were releasing Xenon-133 with a concentration of 99 p/Ci ml, then assuming the trap is turned off at the end of each study, and with an assumed release of 50 L of exhaust gas (10 minutes washout at 5 L/min), the room must have a minimum volume of 0.5 cubic meters to meet regulatory requirements.

Obviously, most rooms have a much larger volume than this (a 10' x 10' x 8' room contains 22.56 m^3). The threshold level thus could be set much higher. However, the main function of the Xenon Trap Monitor is to alert the user to when the trap must be replaced. It is a characteristic of activated charcoal traps that once they start leaking, the concentration in the exhaust port grows exponentially with a very short half-time. The threshold level of 99 pCi/ml is chosen because this is a level well above the leakage from a good trap. If the exhaust trap reaches a concentration level of 99 pCi/ml, then the trap is definitely near failure and should be monitored for replacement.

INSTALLATION INSTRUCTIONS
General Installation

NOTE: *Skip to the next section if installing your Xenon Trap Monitor on a Biodex Pulmonex System.*

The Xenon Trap Monitor comes factory-calibrated and is already set for an alarm threshold level of 99 pCi/ml. To install the Xenon Trap Monitor:

1. Position the Xenon Trap Monitor in a stable position on your Xenon System (attached to a shelf is preferable).

2. Connect the 22 mm exhaust hose supplied to the monitor hose fitting and to the external exhaust port of your xenon trap.

3. Plug the AC adapter into a 110 VAC socket, and connect the opposite end of the cord into the socket marked PWR on the front of the Xenon Monitor. The POWER ON LED should light and the unit will respond with a one-second-long beep.

Installing the Xenon Trap Monitor on the Pulmonex System

The Xenon Trap Monitor comes factory-calibrated and is already set for an alarm threshold level of 99 pCi/ml. To install the Xenon Trap Monitor on a Biodex Pulmonex System, refer to Figure 1 and the following instructions.

NOTE: On older Pulmonex units, you will need to plug the Xenon Trap Monitor power cord into a wall socket instead of the Pulmonex.
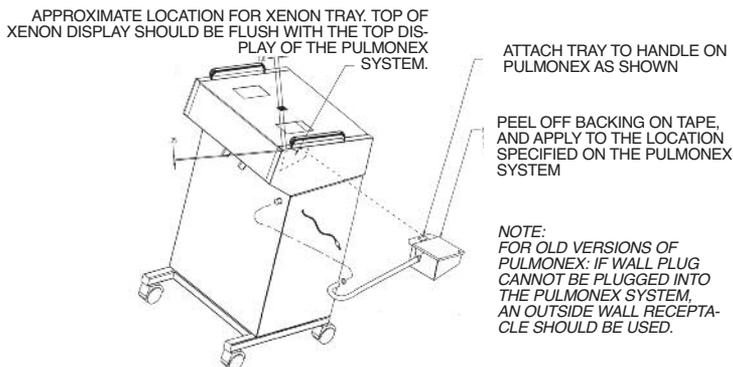
APPROXIMATE LOCATION FOR XENON TRAY. TOP OF XENON DISPLAY SHOULD BE FLUSH WITH THE TOP DISPLAY OF THE PULMONEX SYSTEM.

ATTACH TRAY TO HANDLE ON PULMONEX AS SHOWN

PEEL OFF BACKING ON TAPE, AND APPLY TO THE LOCATION SPECIFIED ON THE PULMONEX SYSTEM

NOTE:
FOR OLD VERSIONS OF PULMONEX: IF WALL PLUG CANNOT BE PLUGGED INTO THE PULMONEX SYSTEM, AN OUTSIDE WALL RECEPTACLE SHOULD BE USED.

Figure 1. Xenon Trap Monitor installation.

NOTE: Unplug the Pulmonex System from the wall socket before beginning the installation procedure.

1. Peel off the backing from the double-sided tape on the side of the Xenon Trap Monitor tray.

2. Attach the tray to the side of the Pulmonex System as illustrated. The slot in the tray fits around the Pulmonex handle. When attaching the tray, be careful to hook it around the handle before allowing the tape to come in contact with the Pulmonex side panel (tilting the Xenon Trap Monitor tray toward the Pulmonex will help). The long end of the tray top goes toward the patient side of the Pulmonex.

3. Place the Xenon Trap Monitor into the Xenon Trap Bracket. Ensure the hose fitting faces toward the patient side of the Pulmonex.

   NOTE: When installed, the top of the Xenon Trap Monitor display should be flush with the top of the Pulmonex system.

4. Attach the Xenon Trap Monitor exhaust hose to the exhaust port on the back panel of the Pulmonex System.

5. Open the large door on the Pulmonex and plug the supplied power pack into the plug socket. The plug socket is located at the bottom of the Pulmonex on the top of the transformer box.

NOTE: Older Pulmonex Systems do not have this plug socket. For older units, plug the power pack into an external plug socket.

6. Remove the black cap plug, located below the tray, from the hole in the side of the Pulmonex.

7. Run the small, plug-end of the power wire through the hole directly beneath the Xenon Monitor tray in the side of the Pulmonex cabinet.

8. Connect the small plug to the front of the Xenon Trap Monitor at the PRW label.

9. Set the proper length of power cord, install the new strain relief bushing onto the cable, and install in the hole in the Pulmonex cabinet.

10. Plug the Pulmonex back into the wall socket. The power should come ON and the Xenon Trap Monitor LED should light. The unit should also emit a one-second beep at this point. The system is now ready for operation.

OPERATION
Background
A background measurement must be taken before the Xenon Trap Monitor will be able to operate properly.

NOTE: A new background reading must be made each time power to the Xenon Trap Monitor is turned ON. When power is removed, a new background reading is always required before a count can be made.

To measure background:
1. Press the <BKGND> button. The system will begin a background check. Once the background measurement is complete, the system emits a short beep.

NOTE: The background check will take 20 minutes to complete.

Using the Xenon Trap Monitor
Following the background measurement, the Xenon Trap Monitor should be fully functional. Follow the procedure below to begin operation.

1. Press <Count>. The <Count> button LED will light and the unit will emit an occasional short beep. The beep indicates the end of a statistical counting cycle, and the amount of time between beeps will vary based on the threshold level chosen.

2. Check the threshold level. Press the <Threshold> button to view the current threshold setting. The threshold level should be 99.0. To change the threshold level use the <Up> and <Down> digit buttons. Press <Enter> to lock in the new threshold level. The unit will beep, confirming that the new threshold value has been accepted and the device will reset to confirm to the new threshold level.

3. Press <Count> to continue after resetting the threshold level.

4. If a measurement is made which exceeds the threshold value, the device will beep seven times and display the measured concentration. After seven seconds, the device will continue counting. If the Xe-133 concentration is consistently higher than the threshold, the alarm will beep nearly constantly indicating that the activated charcoal trap needs to be replaced.

5. To verify CAL factor, after Step #2, press <Enter>. It should be "0" (default CAL factor). Press <Threshold> to exit.

   NOTE: *When decimal point (DP) is displayed, system is in pCi/ml mode. The Xenon Trap Monitor must be in this mode to change the threshold. There is no DP in the Scaler mode.*

To change modes from pCi/ml to Scaler or Scaler to pCi/ml:
1. Press and hold <Count> button.
2. Press and release <Reset> button, then release <Count> button.
3. The unit is now in the other mode.

RECORD KEEPING
After installing the Xenon Trap Monitor, a 10.0 microcurie Cs-137 check source (#101-103) should be used to record a measurement. Periodic measurements will produce a log over time, which will indicate the device is operating properly. This log can also include trap measurement results. A new trap should not cause an alarm during a ventilation study. This can be recorded as a "Pass Level". A dirty Xenon trap will cause values to be displayed that indicate Xenon is passing through. These values can be recorded as a "Fail Level".

When using the check source, hold it directly on top of the overlay word "TRAP". Press the TEST key and the Xenon Trap Monitor will count for 60 seconds. The displayed value will be the number of counts, neglecting the decimal point (example: 25.3 means 253 counts were recorded in the 60-second period). Record the number of counts.

OPERATOR INTERFACE
NOTE: *The pass/fail LEDs are not used on this system.*

PWR: Power port, plug power converter in this port to turn the Xenon Trap Monitor ON.

POWER ON LED: This LED indicates when power is supplied to the monitor. Power-up diagnostics occur during a short interval after power is supplied. A long audio "beep," followed by a short beep indicates the diagnostics test is complete. The PASS/FAIL LEDs are also on during the diagnostics test. The decimal point should remain visible on the display to indicate the pCi/ml measurement mode.

RESET: Press this button to manually reset any function in progress. Pressing reset causes the system to restart and run the diagnostics test again.

BKGND: Press this button to initiate continuous background measurement mode. The LED will turn on and total counts will be saved every 20 minutes, indicated by a short beep. At least one 20-minute background measurement must be made before initiating TEST or COUNT modes. BKGND mode may be terminated without losing the most recent background information by pressing the TEST or COUNT buttons.

TEST: This function can be used following an error to perform a one-minute count. If the TEST button is pressed the unit counts for 60 seconds and should, display a value between .7 and 1.5 when no radiation source is present. The TEST button can also be used to check calibration, using a 10 microcuries check source as described under "Record Keeping."

MAINTENANCE
As required, wipe the Xenon Trap Monitor with a clean, damp cloth.

SPECIFICATIONS
Dimensions: 6" w x 7" l x 4" h (15.2 x 17.8 x 10.2 cm)
Lead Shielding: .5" thick (1.3 cm)
Input: 22 mm hose adapter
Detector: Halogen Quenched GM Tube, 1.1 cm dia, 2 mg/cm2 mica window
Voltage: 500 volts regulated
Buttons: Background, Test, Count, Reset, Display Test, Data Entry Mode, Threshold and Up and Down for Threshold
Display: Four-digit LED
Readings: pCi/ml
Speaker: Internal, beeps when displays result
Background Count Time: 20 minutes
Power: 18 volts, UL approved, external; 115 VAC power adapter
Weight: 4.5 lb (2.1 kg)

Authorized European Community Representative: Prothia, Paris, France

TROUBLESHOOTING INFORMATION
When both the red and green lights blink continuously, there has been some kind of detected failure. A failure code will be displayed. A list of possible failure causes follows:
1. After Power ON, - Xenon Trap Monitor failed self-diagnostic test. The failure indication will be preceded by 1 to 6 beeps indicating the following problems:
    1 beep – GM tube in continuous conduction
    2 beeps – GM tube voltage not within limits
    3 beeps – Count flip-flop is not responding to reset
    4 beeps – Count registers are not responding to reset
    5 beeps – Count register does not respond to test count interrupt
    6 beeps – Program memory Checksum has changed since manufacture

2. After Background Error Interpretation
   1.0 GM Tube is in continuous conduction
   1.1 Background count greater than limit. Try to lower background by removing any sources in the area or relocating the Xenon Trap Monitor to another location. Repeat the background test.
   1.2 Background test less than the limit which may indicate a defective tube.

3. After Calibrate Error Interpretation
   2.0 GM Tube is in continuous conduction.
   2.1 GM count too high, use a lower activity source.
   2.2 Invalid background value is stored in memory making it impossible to determine sensitivity. Return to step 1 and perform the background test, then redo Calibration.
   2.3 Calibration count rate is less than the background rate. Return to step 1 and perform the background test, then redo Calibration.

4. After Threshold Error Interpretation
   4.0 Threshold times sensitivity too large, lower threshold.
   4.1 Threshold times sensitivity too large, lower threshold.
   4.2 Count time is undefined, increase threshold.
   4.3 Threshold times sensitivity too large, lower threshold.
   4.4 Threshold times sensitivity too large, lower threshold.
   4.5 Count time greater than 30 minutes, increase threshold.

5. After Count Error Interpretation
   3.0 Gm Tube in continuous conduction.
   3.1 Count rate is less than the background count rate. Return to step 1 and perform the background test, then redo calibration.
   3.2 Invalid background value is stored in memory making it impossible to determine the kdpm. Return to step 2 and perform the calibration measurement.
   3.3 Invalid calibration factor is stored in memory, making it impossible to determine kdpm. Press ENTER and a number will be displayed. This number should be zero in order for the XTM to apply the correct default calibration factor. If this number is not zero, change it to zero using the Up/Down digit buttons, then press THRESHOLD to save it. Press RESET, and try to count again. If the number is zero and this error still occurs, a manual recalibration is required.
   5.0 GM count overflow, increase threshold to decrease time
   5.1 Decrease threshold
   5.2 Decrease threshold

6. Service information: If the failure indication occurs at item 1 above, the Wipe Test Counter should be returned for service. To return the system, or for additional service help/information, contact:

   Biodex Medical Systems, Inc.
   Service Department
   20 Ramsay Road
   Shirley, NY, 11967-4704
   Phone: (800) 224-6339
   FAX: (631) 924-8355

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