

# INSTRUCTION MANUAL

## XDS Xenon Delivery System

Model 36-103

SN 81136



\* Copyright 1978 — Nuclear Associates

8507150595 850417  
PDR FOIA  
BOWMAN85-238 PDR

## Table of Contents

	<u>Page</u>
I Introduction.....	1
II Functions.....	2
III Set-up Procedure.....	3
IV Operating Instructions.....	4
V Maintenance.....	6

## ILLUSTRATIONS

Electrical Schematic.....	7
Flow Schematic.....	8
Wiring Code.....	9



XDS Xenon Delivery System

Model 36-103

## I INTRODUCTION

The XDS is designed for the busy department that demands operating ease, speed and efficiency in the performance of ventilation and perfusion studies using xenon-133 or other radioactive gases. It offers the versatility and capabilities of more expensive systems.

The XDS performs single breath, equilibrium and washout studies quickly and efficiently. Sequential push-button switches program each cycle: System Fill, Patient Air, Equilibrium, Patient Washout, System Washout, and Off. Heavy-duty solenoid valves and blowers control the air/gas flow. Pushbuttons activate the valves and motors and provide separate flow circuits for each function. All controls are located on the front panel for easy access during studies. The technologist is in full control of each function at all times.

A dual blower system, which circulates a homogeneous air/oxygen/xenon mixture past the mouthpiece, permits resistance-free "pick-off" patient breathing. The mouthpiece port location allows the technologist to constantly observe the patient while on the system. Oxygen control is manual, and oxygen may be added at any time. The xenon injection port permits the injection of xenon, allowing direct bolus delivery. An in-line CO<sub>2</sub> absorber prevents CO<sub>2</sub> build-up. An exhaust port is included for discharging the effluent xenon/air mixture into a gas trap. The system utilizes a disposable 7+ liter "no-load volume" breathing

bag . Both the CO<sub>2</sub> absorber cartridge and the breathing bag may be easily changed through a large access door directly below the control panel.

## II FUNCTIONS

All XDS functions are initiated by front-panel switches. Each push-button cycle may be over-ridden at any time by the operator.



- A. Bag Fill. A blower-and-valve sequence causes air and/or oxygen to be admitted to the breathing bag, filling it to a pre-selected volume (7 liters). The blower then idles on bypass, maintaining a positive pressure on the bag.
- B. Patient Air. The patient is positioned to breath ambient air through the system and to adjust to the mouthpiece. Outside air is drawn through an external air inlet and delivered to the patient. The patient exhales through the washout circuit.

In this cycle, the breathing bag circuit is isolated from the system, and separate solenoid valves form a breathing circuit for the patient. This allows outside air to be admitted to the patient, and the patient's exhaled breath is routed via a blower-assisted exhaust circuit, to the exhaust vent at the rear of the XDS.

- C. Patient Equilibrium. This cycle is initiated as the patient exhales completely. Upon inhalation, the patient is placed on the blower-assisted equilibrium cycle (closed-loop bag circuit). The system maintains this steady-state condition until the operator switches to 'Patient Washout'. Oxygen may be introduced to the system from an external source. An internally-mounted, removable CO<sub>2</sub> absorber is included.

- D. Patient Washout. This cycle is initiated on patient Inhalation. The patient inhales ambient air and washes out through the system exhaust. When the camera count rate indicates that the patient is sufficiently free of xenon, the patient may be removed from the system. If a repeat study or a different view of the same patient is desired, the gas volume trapped in the breathing bag can be re-used by indexing the system back to "Patient Air" or "Equilibrium".
- E. System Washout. An internal blower flushes the entire system rapidly and guarantees that no residual xenon remains. Effluent gas is discharged through the external gas port located at the lower right rear of the cabinet. A hose should be attached to this port and directed to an approved vent or a xenon gas trap. The unit will discharge all internal gas within five minutes.
- F. Off. The system is indexed to "System Off" and is ready for the next study.
- G. Manual O<sub>2</sub> Switch. Oxygen from an external regulated source, such as a tank or wall supply system, can be added to the system by placing the O<sub>2</sub> switch in the On (up) position.

### III SET-UP PROCEDURE

- A. Carefully remove the XDS from its shipping container. Inspect it for any physical damage to the case, door window, control panel or inlet/outlet ports. If shipping damage is discovered, IMMEDIATELY report it to your receiving department so that a claim may be filed.
- B. Place the XDS on the 36-105 XDS Cart Base or any appropriate stand.
- C. Open the front door to examine the breathing bag and the CO<sub>2</sub> absorber canister. The breathing bag should be attached to the port protruding from the compartment ceiling. If it is not attached, install the bag by sliding its open end over the tube port.
- D. The CO<sub>2</sub> absorber cartridge is removed for filling by grasping the canister near the top and pulling out. The top of the canister will then disengage from its port. Lift the bottom of the canister out of the receptacle. Unscrew the canister top, carefully fill with an appropriate CO<sub>2</sub> absorbent (such as Nuclear Associates Model 36-008 Bara-lime Absorber), and re-install.



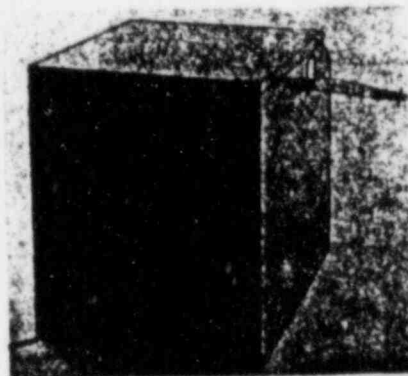
- E. Using a narrow-gauge  $O_2$  breathing circuit, attach an  $O_2$  source to the  $O_2$  inlet port at the rear of the XDS, adjacent to the exhaust port. If using an  $O_2$  tank system, a pressure-type regulator should be used. Adjust the manifold pressure to between 3 and 5 PSIG maximum.

**Caution:** Never exceed 7 PSI of  $O_2$  as this will result in blowing the tubing from the inlet port. An adequate flow rate will be obtained with a nominal pressure of 3 to 5 PSIG.

When a terminal  $O_2$  supply is used, set the flow rate as low as possible; these systems deliver  $O_2$  by demand up to 50 PSIG. Minimum flow will be required to add  $O_2$  to the XDS.

- F. Test the XDS in the following manner:

- 1) Make sure that the main power switch and the  $O_2$  switch are in the Off (down) position. Depress the "System Off" pushbutton. Close and latch the door.
- 2) Plug the XDS into any convenient 110V, 60 Hz outlet.
- 3) Place the power switch in the On (up) position. The power indicator light should illuminate.
- 4) Press the "Bag Fill" switch. The breathing bag will automatically fill to a 7-liter volume and stop inflating. This expansion may be observed through the closed door window.
- 5) Press the "Patient Air" switch. A click will be heard, followed by the sound of a blower. The breathing bag volume will remain the same.
- 6) Press the "Equilibrium" switch. Again, a click and the sound of a blower will be heard. The breathing bag air volume will decrease very slightly, due to the open mouthpiece port which allows venting of the air mixture to the atmosphere.
- 7) Activate the  $O_2$  switch. A metallic click should be heard. Turn the  $O_2$  switch off.
- 8) Press the "Patient Washout" switch. Again, a click will be followed by the sound of another blower. A steady flow of air blows out of the exit port at the rear of the system.
- 9) Press the "System Washout" pushbutton. The breathing bag will deflate completely in about 30 seconds.
- 10) Depress the "System Off" pushbutton. Turn the power switch off.





#### IV OPERATING INSTRUCTIONS

- A. Connect the system washout port (at the bottom rear of the cabinet) to an approved venting system or a xenon gas trap, such as the 36-023 'Nonex' Gas Trap.
- B. Press the 'System Off' pushbutton. Flip the system power switch to the On (up) position.
- C. Add air and/or oxygen to the system.

1) For Air Only: Press the 'Bag Fill' pushbutton. The breathing bag will fill automatically to 7 liters of air.

2) For Oxygen Only: To fill the breathing bag with  $O_2$  only, press the 'Patient Air' pushbutton. Move the ' $O_2$ ' switch to the On (up) position. Using the flow rate setting on the oxygen tank regulator as a guide, add 7 liters of oxygen to the system. Return the  $O_2$  switch to the Off (down) position.

Caution: Do not overfill the system. Fill the breathing bag to capacity by visual observation.

3) For a Mixture of 1/2 Air and 1/2 Oxygen:

(a) Press 'Patient Air'.

(b) Turn the ' $O_2$ ' switch on, and add oxygen until the bag looks half filled: 3.5 liters.

For a more accurate fill, set the  $O_2$  flow rate at 1000 cc/minute and inflate for 3.5 minutes.

If using a pressure-type regulator, set the secondary gauge to 3 PSIG. With the  $O_2$  switch on (up), fill the bag to half its volume (by visual observation).

(c) Turn the  $O_2$  switch off (down). Press 'Bag Fill'. The system will automatically add 3.5 liters of air to the 5 liters of oxygen.

- D. Position the patient for a posterior view. Attach a 6' breathing hose, with a mouthpiece or facemask, to the patient breathing port located on the side of the XDS.

Note: For supine patients, cut a longer length from the roll of disposable tubing (36-108) supplied.

- E. Press 'Patient Air'. Place the mouthpiece in the patient's mouth, and make sure that his lips form a seal with the



mouthpiece. Allow the patient to adjust to the system. Then seal the patient's nose with a nose clip.

- F. 1) If a bolus delivery is desired, proceed to Step F-3).
- 2) For a homogeneous gas mixture, press "Patient Air". Lift the shield that covers the serum cap injection port (located next to the mouthpiece port). Inject the desired xenon dose into the system. Wait 15 seconds for the charge to be homogeneously mixed.
- 3) Advance the system to "Equilibrium". If desired, add O<sub>2</sub> using the O<sub>2</sub> switch, and preset the flow to 150-300 cc/minute on the O<sub>2</sub> regulator. Lift the shield that covers the serum cap injection port. Advise the patient to exhale completely, then inhale and hold his breath. As he begins this inhalation, inject the xenon-133 through the serum cap injection port with a syringe or injection gun (18g needle, 1-1/2" long). Have the patient hold his breath for as long as possible while the data is being collected (See F. 4).
- 4) When the patient reaches equilibrium (by camera count rate), have the patient exhale completely. Switch to "Patient Washout" and begin collecting the washout data. Turn the O<sub>2</sub> switch off (down). Allow the patient to wash out completely (to 6K-12K CPM). If satisfied with the study, remove the patient from the system.
- 5) If the study is to be repeated for the same or a different view, proceed again from Step E.
- G. When the study is complete, press "System Washout". Upon deflation of the breathing bag, allow the system to flush into a gas trap or external vent for a minimum of five minutes. Press the "System Off" pushbutton. The system will be ready for the next study.

TO PERFORM A PERFUSION STUDY, PROCEED AS FOLLOWS:

- 1) Follow Steps A to E.
- 2) Place the patient on "Equilibrium". Inject the xenon/saline solution intravenously at will, and let the patient breathe into the system.
- 3) Proceed from Step F-4).

Note: After the patient has washed out, you may perform a ventilation study as detailed in Step F-2), with the gas trapped in the breathing bag.

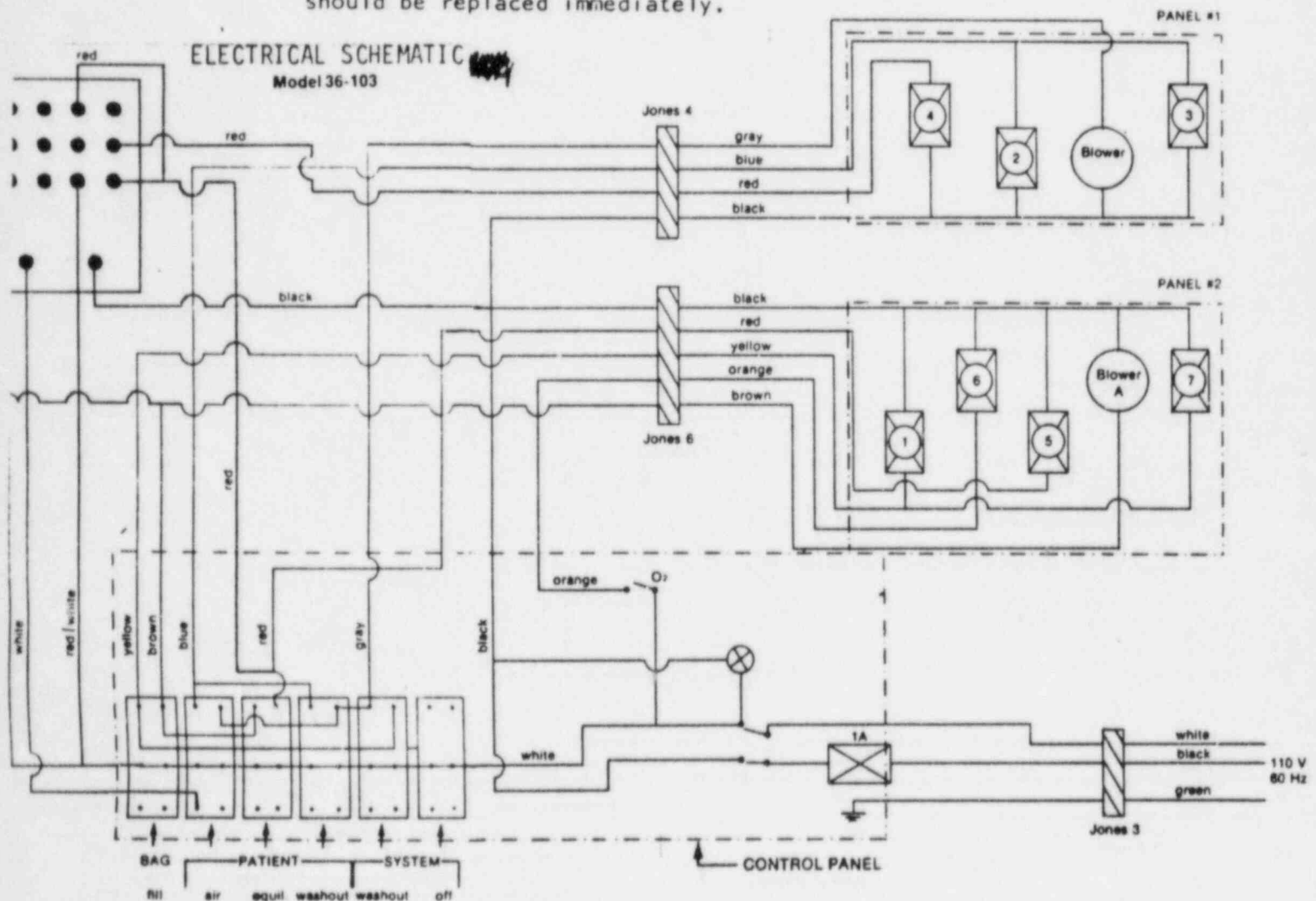
## V MAINTENANCE

- A. Cleaning - If mouthpieces are to be re-used, clean them by standard hospital sterilization techniques.



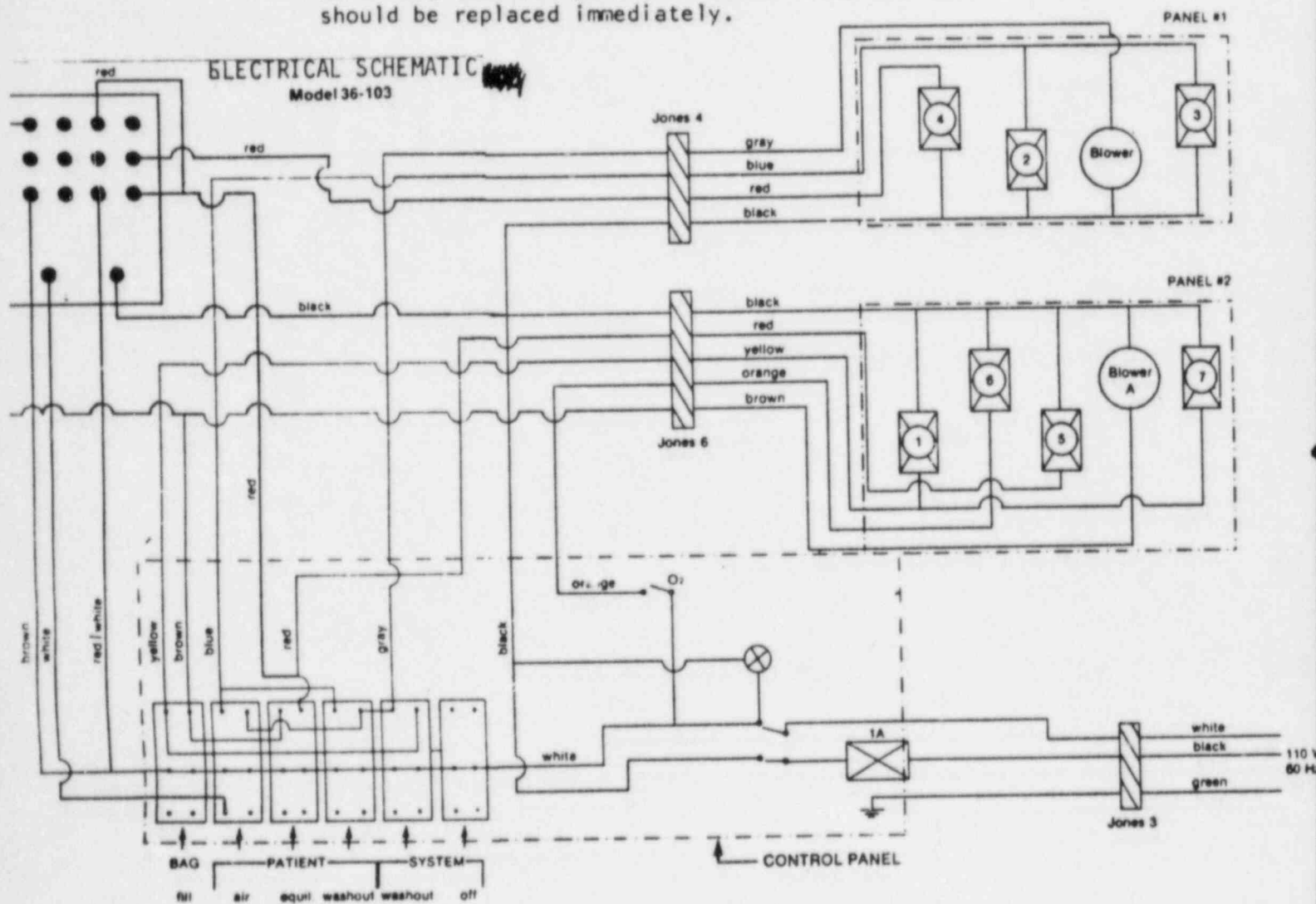
B. Bacteriostatic Filters - If desired, a disposable Bacteriostatic Filter (Model 36-009), or a re-usable type, can be used in line with the mouthpiece port to prevent contamination of the system. The filter is placed on the mouthpiece port with the supplied adapter, and the mouthpiece is positioned at the end of the filter.

C. CO<sub>2</sub> Absorbers - The CO<sub>2</sub> absorber should be checked periodically (after every 2-3 studies). A lavender-purple color indicates the need for replacement. See Set-Up Procedure (Step D) for replacement instructions. The CO<sub>2</sub> absorber cartridge and its associated screen, located in the base of the cartridge, should be examined on a regular basis (when the charge is changed) to insure that clogging and/or corrosion do not affect its ability to allow flow-thru. If the screen is clogged, tap lightly to dislodge adhering particles, or wash in a mild soap solution and dry. If there are any breaks or gaps in the screen through which CO<sub>2</sub> absorber particles could flow, the section should be replaced immediately.



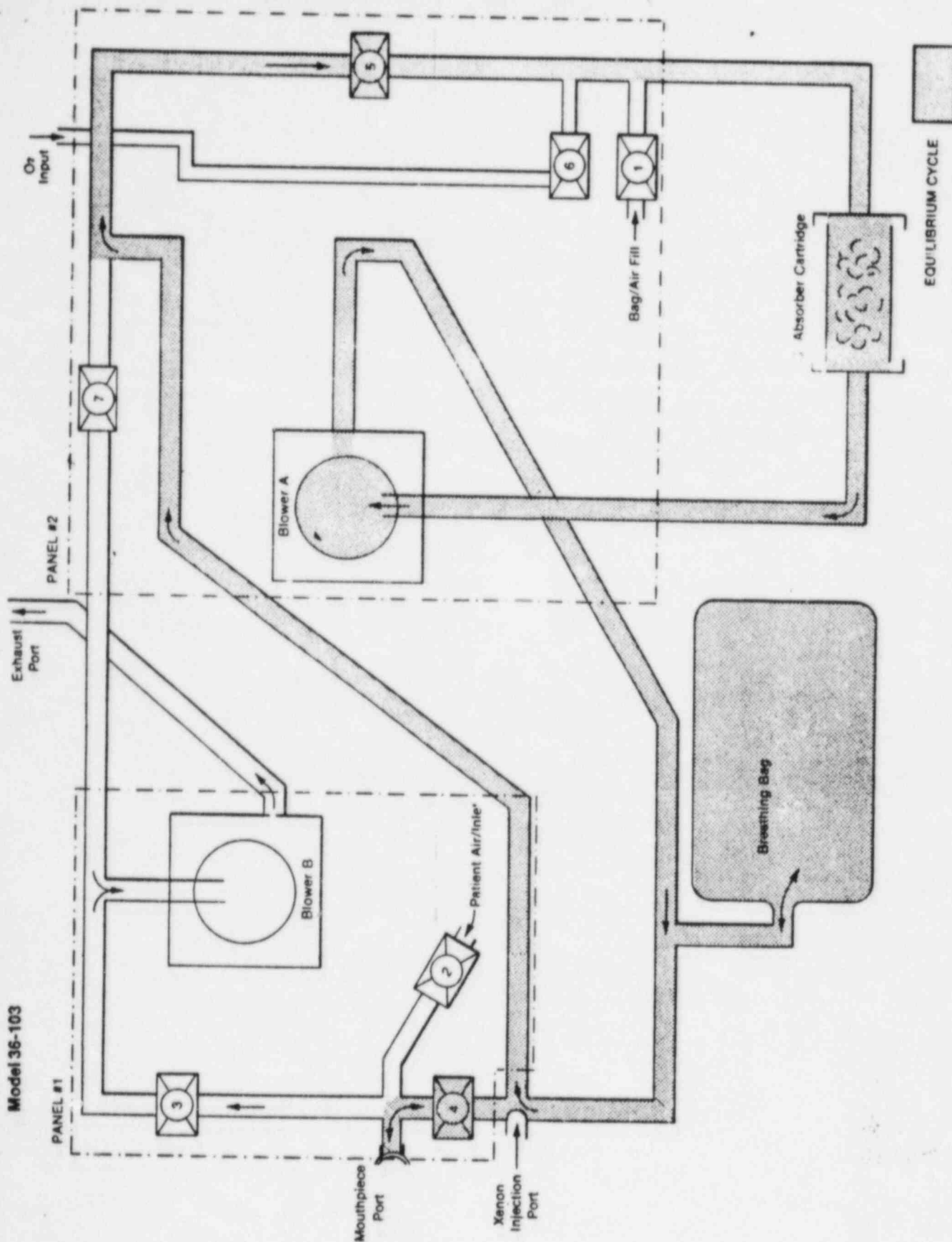
B. Bacteriostatic Filters - If desired, a disposable Bacteriostatic Filter (Model 36-009), or a re-usable type, can be used in line with the mouthpiece port to prevent contamination of the system. The filter is placed on the mouthpiece port with the supplied adapter, and the mouthpiece is positioned at the end of the filter.

C. CO<sub>2</sub> Absorbers - The CO<sub>2</sub> absorber should be checked periodically (after every 2-3 studies). A lavender-purple color indicates the need for replacement. See Set-Up Procedure (Step D) for replacement instructions. The CO<sub>2</sub> absorber cartridge and its associated screen, located in the base of the cartridge, should be examined on a regular basis (when the charge is changed) to insure that clogging and/or corrosion do not affect its ability to allow flow-thru. If the screen is clogged, tap lightly to dislodge adhering particles, or wash in a mild soap solution and dry. If there are any breaks or gaps in the screen through which CO<sub>2</sub> absorber particles could flow, the section should be replaced immediately.



# FLOW SCHEMATIC

Model 36-103



# WIRING CODE

Component Wiring Code  Function Mode	Valve #1 Yellow/Black	Valve #2 Blue/Black	Valve #3 Blue/Black	Valve #4 Red/Black	Valve #5 Red/Black	Valve #6 Orange/Black	Valve #7 Yellow/Black	Blower A Brown/Black	Blower B Grey/Black
Bag Fill	x						x	x	
Patient Air		x	x		x			x	x
Equilibrium				x	x			x	
Patient Washout		x	x						x
System Washout	x						x		x
Off									
Oxygen						x			

## 3-Pin Jones Plug Main Power

White  
Black  
Green

## 4-Pin Jones Plug Panel 1

Grey  
Blue  
Red  
Black

## 6-Pin Jones Plug Panel 2

Black  
Red  
Yellow  
Orange  
Brown  
Blank

30-01325

FREEDOM OF INFORMATION ACT  
ACT REQUEST

FOIA-85-238

rec'd 4/8/85

413 WEST GRACE STREET  
RICHMOND, VA 23220  
MARCH 29, 1985

MR. JOSEPH M. FELTON  
DIRECTOR, DIVISION OF RULES AND RECORDS  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555

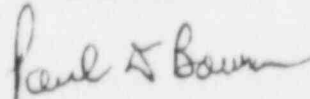
DEAR MR. FELTON:

I WOULD LIKE TO REQUEST UNDER THE FREEDOM OF INFORMATION ACT  
THE FOLLOWING:

ALL LICENSE APPLICATIONS, AMENDMENT REQUESTS AND SUPPORTING  
DOCUMENTS FOR THE WASHINGTON HOSPITAL CENTER IN WASHINGTON D.C.  
NRC LICENSE# 08-03604-03 EXPIRES 3/31/87

THANK YOU FOR YOUR TIME IN THIS MATTER.

SINCERELY,



PAUL D. BOWMAN  
SYNCOR INTERNATIONAL CORPORATION  
(804) 643-1062

8506180498

30-01325

FREEDOM OF INFORMATION ACT  
ACT REQUEST

FOIA-85-238

rec'd 4/8/85

413 WEST GRACE STREET  
RICHMOND, VA 23220  
MARCH 29, 1985

MR. JOSEPH M. FELTON  
DIRECTOR, DIVISION OF RULES AND RECORDS  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555

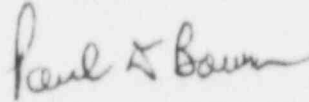
DEAR MR. FELTON:

I WOULD LIKE TO REQUEST UNDER THE FREEDOM OF INFORMATION ACT  
THE FOLLOWING:

ALL LICENSE APPLICATIONS, AMENDMENT REQUESTS AND SUPPORTING  
DOCUMENTS FOR THE WASHINGTON HOSPITAL CENTER IN WASHINGTON D.C.  
NRC LICENSE# 08-03604-03 EXPIRES 3/31/87

THANK YOU FOR YOUR TIME IN THIS MATTER.

SINCERELY,



PAUL D. BOWMAN  
SYNCON INTERNATIONAL CORPORATION  
(EO4) 643-1062

8506180498