SAINT LUKE'S HOSPITAL
EPISCOPAL—PRESBYTERIAN
232 S. WOODS MILL ROAD • CHESTERFIELD, MISSOURI 63017

DEPARTMENT OF RADIOLOGY
Sumner Holtz, M.D.
Thomas F. Egan, M.D.
John J. Lang, M.D.
Enrique Cubillo, M.D.
Ben R. Mayes, M.D.
Gerald K. Claycomb, M.D.
Gary Omell, M.D.
Naris Rujanavech, M.D.
Albert E. Hesker, M.D.

August 9, 1985

U. S. Regulatory Commission
Region III
Attention: Mike McCann
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Re: License #24-10570-03, Control #77392 License Renewal

Dear Sir:

This letter is to respond to your request for further documentation on our license renewal application as set forth in the telephone conversation with Bill Miller, Radiation Safety Technologist for the Department of Radiology. Our responses to your requests are set forth on the enclosures, including a revised Xenon study conducted by Michel M. TerPogossian, Ph.D., Radiation Safety Officer. Should further information be needed, please advise and we will try to respond in a timely manner.

Sincerely,

Sumner Holtz

Sumner Holtz, M.D.
Chairman
Department of Radiology

RECEIVED
AUG 16 1985
REGION III

Gary Olson

Gary Olson
Senior Vice President
St. Luke's Hospital

AUG 16 1985

8509170406 850905
REG3 LIC30
24-01570-03 PDR

License Renewal #24-01570-03

Item 1

St. Luke's Hospital ceased to operate the nuclear facility at Charter Hospital, 5535 Delmar Boulevard, as of midnight Sunday, June 30, 1985. A closeout survey was conducted on Monday morning, July 1 and a copy was forwarded to your office. Bill Adams of your office, informed Mr. Miller in a phone conversation on this date that Charter Hospital was being issued a new license under the number of 24-24518-01. Since we no longer have licensed users in this facility and no longer provide the services of nuclear medicine for Charter Hospital, we request that the name of St. Luke's East and address of 5535 Delmar be removed from our renewal application.

Item 2

The attachments labeled Item 2 consists of a letter from Dr. Carlos A. Perez, setting forth the privileges of six radiation oncologists who practice under the Washington University license. Dr. Perez would drop the names of Patrick Thomas, M.D., Bahman Emami, M.D., Bruce Walz, M.D., Todd Wasserman, M.D., James Marks, M.D., and Hsiu-san Lin, Ph.D., M.D., as these persons will not be assigned to the services at St. Luke's West. Enclosed also under label Item 2 are photocopies of the certificates for Drs. Garcia, Pilipech, and Devenini Rao.

Item 3

Thomas F. Egan, M.D., Chairman, Radiation Safety Committee, states that the Radiation Safety Committee has followed the ALARA concept from its inception and will continue to follow the ALARA program as outlined in Appendix "O" in the future.

Item 4

We have reviewed Regulatory Guide 10.8 dated October 1980 as provided by your office and believe we are in full compliance with Appendix B, D, F, G, H, K, and L. We will continue to comply with these regulations in our future operations. We have further reviewed Regulatory Guide 8.23 dated January 1981, furnished by your office and will follow its Guidelines for our surveys.

Item 5

We are in receipt of Regulatory Guide 8.20 dated September 1979 as furnished by your office and will follow the Guidelines for the Bioassays of I125 and I131.

Item 6

Delia Garcia, M.D., Radiation Oncologist, assisted by David Keys, M.S., Physicist, will serve as Cesium curator for the Brachytherapy services. The Cesium storage room is locked and posted at all times with a lock keyed differently than any other on this floor. Keys are given only to authorized persons such as radiation therapy technologists. The employees are required to return their key to the curator upon termination of their employment.

Item 7

See attachments labeled Item 7.

Item 8

Survey meters will be recalibrated by the factory of manufacture or through the services of Mallinckrodt Radiopharmacy or Syncor Radiopharmacy, or any calibrating service with approval on file with the Nuclear Regulatory Commission. The meters will no longer be calibrated in-house.

Item 9

As stated previously, we will follow Regulatory Guide 8.23 on Radiation Safety surveys. All personnel working with licensed nuclear materials are furnished with film badges and ring badges. All nurses working with Brachytherapy patients and patients receiving treatment doses of radionuclides are provided with film badges during the time they are involved with this procedure. The results from the film badge reports are entered into a computer which supplies a quarterly summary of exposures to all these persons who have been supplied with badges.

Item 10

The Cesium storage safe is a 3M model 8C9E, four drawer safe and is pictured on the enclosure labeled Item 10. Two carts from Radium Chemical Company are available for transport of the Brachytherapy sources. They are #500 and #50100 as shown on the enclosure labeled Item 10.

MALLINCKRODT INSTITUTE OF RADIOLOGY
AT WASHINGTON UNIVERSITY MEDICAL CENTER

DIVISION OF RADIATION ONCOLOGY

July 15, 1985

Sumner Holtz, M.D.
Chairman
Department of Radiology
St. Luke's Hospital
232 S. Woods Mill Rd.
Chesterfield, MO 63017

RE: Approval by Washington University Radiation Safety Committee of a staff radiotherapist use of radioactive materials.

Dear Sumner:

The following members of the staff of the Division of Radiation Oncology, who are also staff members at St. Luke's Hospital have been previously approved by the Washington University School Radiation Safety Committee for use of radioactive materials class IV, V and VI.

1. Dr. Delia Garcia
2. Dr. V.R. Devineni
3. Dr. David McNaney
4. Dr. Miljenko Pilepich
5. Dr. Carlos A. Perez
6. Dr. Joseph Simpson

All of the above are certified by the American Board of Radiology and copies of their certificates are on the hospital files.

If you have any questions, do not hesitate to contact me.

Sincerely,

Carlos

Carlos A. Perez, M.D.
Director
Division of Radiation Oncology

CAP:cld
cc: Mr. William Miller

Item #2
8/12/85

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

Delia May Garcia, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this third day of June, 1983
Thereby demonstrating to the satisfaction of the Board
that she is qualified to practice the specialty of

Therapeutic Radiology

THE AMERICAN BOARD OF RADIOLOGY
INCORPORATED IN THE DISTRICT OF COLUMBIA
1934

AMERICAN BOARD
MEDICAL SPECIALTIES

President

Secretary

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

Miljenko V. Pilepich, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this seventh day of June, 1975
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

THE AMERICAN BOARD OF RADIOLOGY · INCORPORATED IN THE DISTRICT OF COLUMBIA · 1934

Robert N. Cooley
President

C. Allen Good
Secretary

AMERICAN BOARD OF MEDICAL SPECIALTIES · EXCELLENCE

The American Board of Radiology

Organized through the cooperation of the
American College of Radiology, the American Roentgen Ray Society,
the American Radium Society, the Radiological Society of North America,
the Section on Radiology of the American Medical Association
and the American Society of Therapeutic Radiologists
Hereby certifies that

Devineni Venkata Rao, M.D.

Has pursued an accepted course of graduate study
and clinical work, has met certain standards and qualifications and
has passed the examinations conducted under the authority of
The American Board of Radiology
On this fifth day of June, 1981
Thereby demonstrating to the satisfaction of the Board
that he is qualified to practice the specialty of

Therapeutic Radiology

AMERICAN BOARD OF RADIO
INCORPORATED
IN THE
DISTRICT

AMERICAN BOARD
19 33
OF
MEDICAL SPECIALTIES
EXCELLENCE

PROCEDURES AND PRECAUTIONS FOR USE OF XENON-133
AT
ST. LUKE'S HOSPITAL, ST. LOUIS, MISSOURI

The following numbering system follows generally the pattern of Appendix

M.

1. Quantities to be used

   a. Patient information

      (1) Number of studies expected per week - 15

      (2) Average activity per patient - 15 mCi

   b. The desired possession limit is 2000 mCi

2. Use and Storage Areas

   a. The area where the xenon-133 is to be stored is Figure 1. The area where the xenon-133 is to be used is Figure 2. The room where the xenon-133 is to be used was originally designed for radiation therapy purposes and which is now used for nuclear medicine diagnostic procedures. The floor area of the room is 287 sq ft with a ceiling height of 9 ft.

   b. The ventilation of the area shown in Figure 2 consists of an input duct with a measured air flow, measured by an Alnor 8500 thermal anenometer of 280 cu ft/min and an exhaust duct with a measured outflow of 300 cu ft/min. The location of the ducts is as shown in Figure 2. Exhaust for imaging room located on 4th level (Mech. Equip. floor) on east end over entryway to employee parking lot. Nearest air intake around corner on south side of building 56 ft. away from exhaust. There are no expected changes in flow rates between heating and cooling season.

   c. The areas where xenon is to be used are under a negative pressure resulting from the difference of the input of 280 cu ft/min and the outflow of 300 cu ft/min. Measurements of flow will be carried out semiannually.

Item #7
8/12/85

3. Procedure for Routine Use of Radioactive Gases

Xe^{133} vials are stored in their original pigs in the fume hood in the hot lab. When needed, a vial is assayed and logged out of the radiopharmaceutical log book in the hot lab. Fifteen millicuries of Xe^{133} are used for ventilation lung scans. The vial(s) is taken to the scanning room in its original lead pig where it is injected into the gas delivery system. Our gas delivery system is a RADX Ventil-Con with a RADX Xenon trap. We use a Mallinckrodt Xenomatic II Xenon gas dispenser to transfer the Xenon from the vial to the delivery system. A FACE MASK OR MOUTHPIECE IS USED TO DELIVER THE GAS TO THE PATIENT.

4. Emergency Procedures

In the case of accidental release of 15 mCi of xenon-133 by a patient rebreathing into the room, the following situation will result: the volume of the room is approximately 2,583 cu ft or 73 x 106 ml3 and therefore the maximum permissible amount of xenon-133 in this restricted area is 0.73 mCi. Therefore, in the case of an accidental release of 15 mCi of activity, a rapid dilution of this air by a factor of 20.5 must be accomplished by means of the duct system. Since the rate of ventilation is 280 cu ft/min, a dilution by a factor of 20 will be accomplished in about 184 min. During the period of evacuation of the air, no personnel should remain in the room until the level of activity does not exceed 10 pico curies/ml^3.

5. With the exception of the emergency procedure described above, the air concentration of xenon-133 in the restricted area due to loss of xenon during normal administration to the patient is assumed to be 20%. The following calculation follows the example shown in Appendix M.

$$A = \frac{15 \text{ mCi}}{\text{patient}} \times \frac{15 \text{ patients}}{\text{week}} = \frac{225 \text{ mCi}}{\text{week}} \text{ or } \frac{225 \times 103 \text{ uCi}}{\text{week}}$$

Assuming a loss of 20%

$$V = \frac{A \times f}{10^{-5} \text{ uCi/ml}} = \frac{2.25 \times 10^{5} \text{ uCi/week} \times 0.2}{10^{-5} \text{ uCi/ml}} = 0.45 \times 10^{10} \text{ ml/week}$$

Requiring ventilation rate:

$$\frac{0.45 \times 10^{10} \text{ ml/week}}{2{,}400 \text{ min/week}} = 0.187\ 10^{7} \text{ ml/min}$$

or

$$0.187\ 10^{7} \text{ ml/min}$$

or

$$\frac{0.187\ 10^{7} \text{ ml/min}}{28.317 \text{ ml/ft}^{3}} =$$

$$\frac{18.7 \times 10^{5} \text{ ml/min}}{28\ 10^{3} \text{ ml/ft}^{3}} = 66 \text{ ft}^{3}\text{/min}$$

This calculation shows that the required ventilation rate is 66 cu ft/min for a loss of 20% of the activity administered to the 15 patients per week for 15 mCi or xenon-133 administered per patient. In the light of the fact that the ventilation rate in the area where the xenon-133 is to be administered is 280 cu ft/min, it is clear that this ventilation is quite sufficient to meet the requirements of Paragraph 20.103 of 10 CFR Part 20.

Hot Lab St. Luke's West Nuclear Medicine

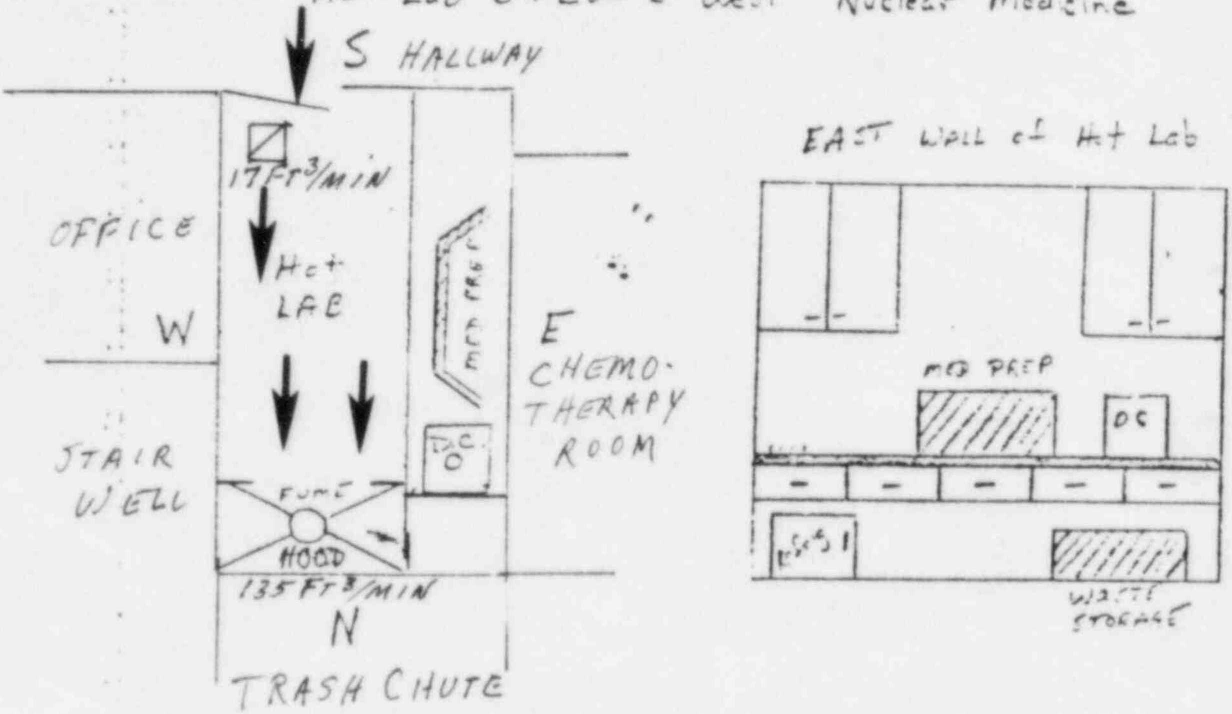
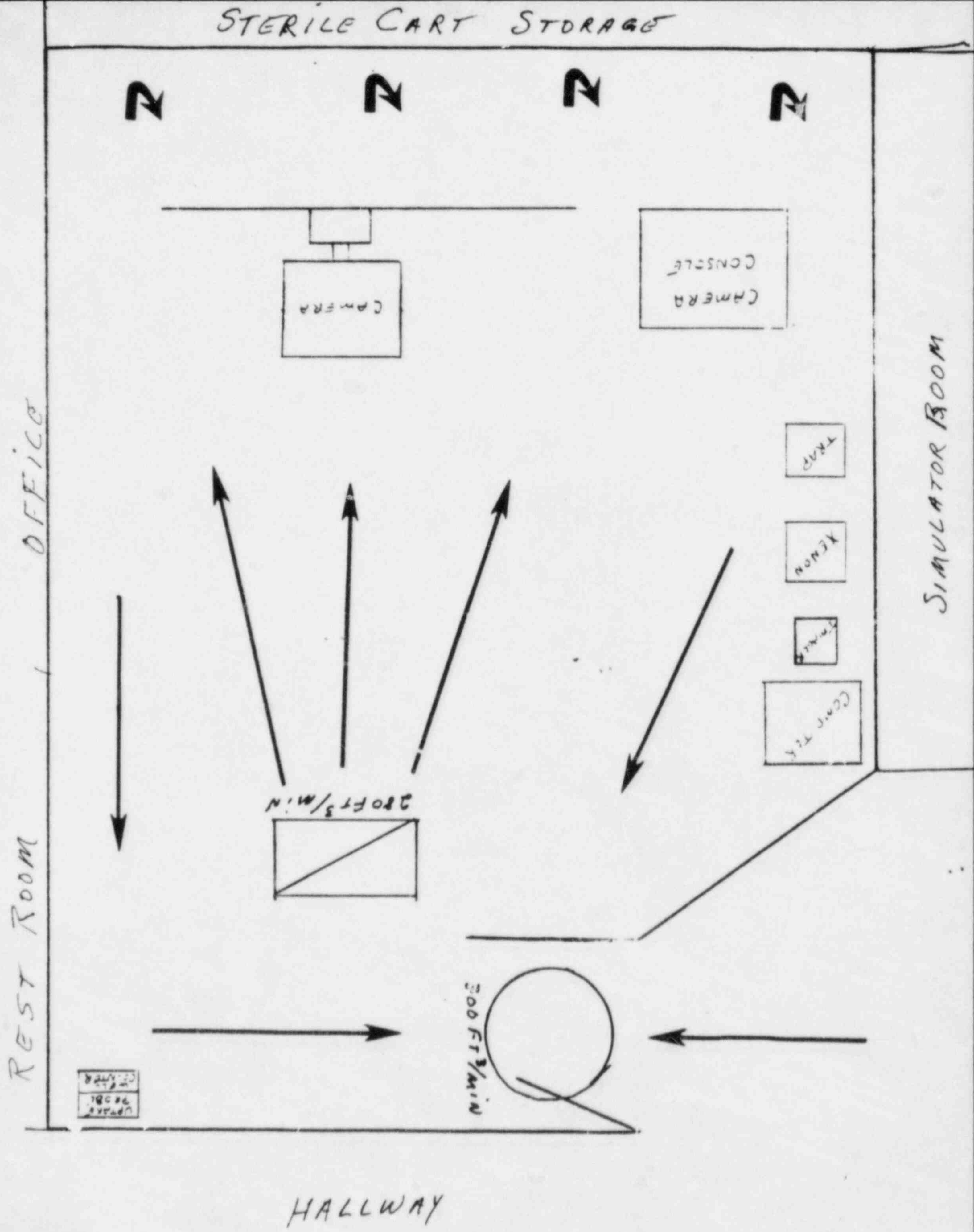


Figure 1



STERILE CART STORAGE
OFFICE
REST ROOM
SIMULATOR ROOM
HALLWAY
CAMERA
CAMERA CONSOLE
TRAP
XENON

Figure 2

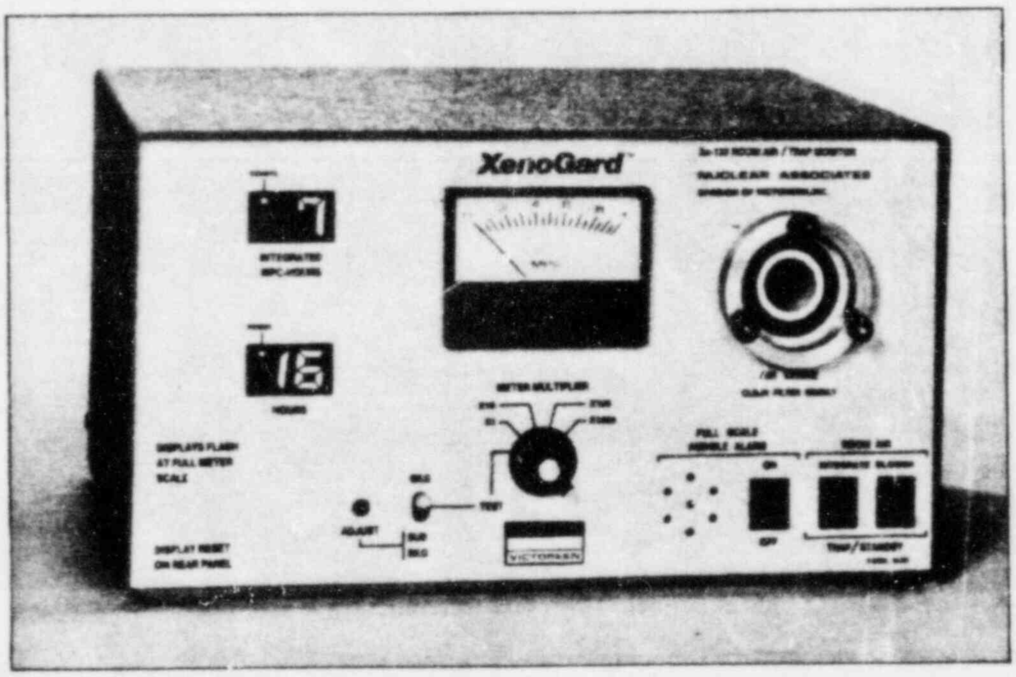
This XenoGard device is used to monitor air and trap following manufacturer's instructions as shown on attached material.

Instruction Manual

XenoGard™ *

Xenon Room Air and Trap Monitor

Model 36-751



TM VICTOREEN, INC.

U.S. PATENT 4,286,155

VICTOREEN

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Division of VICTOREEN, INC.
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Victoreen, Cleveland
216-795-8200

Contents

I. INTRODUCTION

The XenoGard Monitor is designed to measure and integrate the concentration of xenon-133 in room air. Its wide range also permits measurement of the xenon-133 concentration in the exhaust air of xenon gas traps. This serves as an indicator of the condition of the trap's filter cartridges.

Room Air Monitoring

The Code of Federal Regulations (10 CFR 20.103) limits the quantity of xenon-133 that an individual may inhale, in any calendar quarter, to that which would result from inhaling a uniform concentration of 10^{-5} μCi/ml for 40 hours per week for 13 weeks. This quantity is called the Maximum Permissible Concentration (MPC). If the concentration is expressed in units of MPC, then the integrated concentration is in units of MPC-Hours. The average value of this concentration should not exceed 40 MPC-Hours per week.

The XenoGard indicates the xenon-133 concentration in MPC units (1 MPC = 10^{-5} μCi/ml) on an analog meter. At the same time, it integrates the concentration and displays it as MPC-Hours. Also displayed are the total number of hours over which the integration has taken place.

To comply with the Code, your XenoGard MPC-Hours must be less than 520 for any consecutive 13-week period. MPC-Hours should be recorded and examined on a weekly basis (See Sample Log, page 11). An MPC-Hours reading of less than 40 per week indicates that your accumulation rate (if it remains constant) is below that which would result in a total of 520 MPC-Hours for the 13-week period (40 x 13 = 520). While a reading greater than 40 during any week does not mean that you have exceeded the limit, it does indicate that you should investigate the source and exercise stricter adherence to safety procedures in the department.

The XenoGard provides a means of checking the concentration of xenon-133 according to the Code of Federal Regulations. Whenever there is the possibility of exposure to xenon-133, a XenoGard should be operating close by. If more than one person normally works with xenon-133, an individual log of the XenoGard MPC-Hours information may be kept (see page 8)

Gas Trap Monitoring

The performance of charcoal filter cartridges used in all xenon gas traps may degrade with use. Therefore, it is desirable to measure the xenon-133 concentration in the effluent air directly at the trap's exhaust port. This measurement allows the user to determine trap performance and assess its effect on the xenon-133 concentration in the total room air volume. The XenoGard can be used to determine the activity in the trap effluent; (see pages 7-11).

Left: "XenoGard monitors room air during ventilation study. Right: Gas trap output is displayed in MPC units.

II. DESCRIPTION

The XenoGard's detector is a large-area, thin-window GM tube, mounted in a chamber through which air is constantly circulated by a blower. The monitor is calibrated to display the count rate in MPC units and the total accumulated counts in MPC-Hours. The counting chamber is shielded by 3/8" of lead to minimize the effect of background radiation on the count rate. In addition, a background-subtract circuit is provided to subtract the background count rate for both the MPC meter and the integrated MPC-Hours readings.

A visual alarm (both digital registers flash once per second) is activated when the meter reaches full scale on any range. An audible alarm (intermittent tone), selected by a front-panel switch, goes on when a full-scale meter reading is reached on any range. A constant tone is produced when the MPC-HOURS register reaches 80. When the instrument is not in use, a standby circuit retains the MPC-HOURS reading in memory and suspends further integration until both the INTEGRATE and BLOWER switches are returned to ON or ROOM AIR. A reset button returns both the MPC-HOURS and HOURS readouts to zero.

The AIR INTAKE has a particulate-matter filter and a fitting for attaching a hose when checking a gas trap. The trap's exhaust is monitored (without adding to the integrated MPC-HOURS reading) by placing both the INTEGRATE and BLOWER switches in the TRAP/STANDBY position.

III. OPERATING CONTROLS AND INDICATORS

INTEGRATE. This switch controls the integration of MPC-HOURS. It is ON when monitoring room air and OFF during gas trap monitoring or standby.

BLOWER. This switch turns the blower on. The blower must be ON when monitoring room air in order to move air past the detector. It is interlocked to the INTEGRATE switch and must be on for integration of MPC-HOURS to take place. It is placed in the OFF position when doing gas trap monitoring or during standby. It should be turned on for 5 minutes after gas trap monitoring, but before turning the integrator on, in order to blow the xenon out of the instrument.

FULL-SCALE AUDIBLE ALARM ON/OFF. A front-panel switch gives the user the choice of whether or not the alarm will sound when the analog meter reaches full scale on any range.

METER MULTIPLIER. Determines the meter scale factors and allows the user to select the appropriate range. Generally, the lower ranges (X1 and X10) are used for room air monitoring while the higher ranges (X100 and X1000) are used for gas trap monitoring.

TEST: Allows the user to observe and adjust the background reading. When the associated toggle switch is placed in the BKG position, the meter displays the background count rate. In the SUB BKG position, a screw-driver adjustment is used to enter the background count rate. In normal operation, only the net count rate from xenon-133 is displayed on the analog meter or integrated in MPC-Hours.

AIR INTAKE: A 1" I.D. hose (model #36-754) may be attached for gas trap monitoring. Three thumbscrews permit access to a coarse, reusable filter which should be cleaned or replaced weekly. Air leaves the instrument through a rear exit port.

COUNT INDICATOR. A light-emitting diode (LED), located in the upper left corner of the MPC-HOURS digital register, will flash for alternate detector pulses.

POWER INDICATOR. A single LED, located in the upper left corner of the HOURS digital register, flashes once per second when the XenoGard is integrating MPC-HOURS and recording total HOURS. The LED remains lit when the XenoGard is not integrating or recording HOURS (such as in STANDBY or when making gas trap measurements). If the indicator does not light at all, the XenoGard is not receiving power and should be checked immediately.

RESET: This button, located at the rear of the instrument, resets the MPC-HOURS and HOURS display to zero.

Note: When MPC-HOURS reaches 80, the alarm sounds continuously and is stopped only by pushing the reset button.

IV. SPECIFICATIONS

Detector: Pancake, thin-window GM tube.

Accuracy: ±20% at full scale.

Reproducibility: ±5%.

Counting Chamber: Shielded with 9.5 mm (3/8") lead.

Air Exchange System: Axial blower exchanges air more than 3 times per minute.

Air Intake Port: 2.5 cm (1") O.D. front-panel port with particulate-matter filter.

MPC Analog Meter: Ranges are 1, 10, 100, 1000 MPC, full scale.

Calibration Factors (full scale): X1 = 10^{-5} μCi/ml. X10 = 10^{-4} μCi/ml. X100 = 10^{-3} μCi/ml. X1000 = 10^{-2} μCi/ml.

Time Constants: 40 sec on X1, 4 sec on X10, 0.4 sec on X100, and 0.04 sec on X1000.

MPC-HOURS Register: Range 0-99. Two-digit light-emitting diode (LED).

Hours Register: 0-80; 2-digit LED.

Visual Alarm: MPC-HOURS and HOURS registers flash once per second at full scale on all meter ranges.

Audible Alarm: User-selectable. Intermittent tone will alarm at full-scale meter readings on all ranges.

Emergency Audible Alarm: Continuous tone on reaching 80 MPC-Hours. Integration and data accumulation continue to 99 MPC-Hours.

Background Subtract Circuit: Activated by moving range switch to TEST. Allows meter display of background count rate or internal subtracted background count rate. Enables user to adjust subtracted background.

Reset Function: Rear-panel pushbutton resets MPC-HOURS and HOURS to zero.

Standby Function: Switch suspends data integration when xenon studies are not in progress. Accumulated data remains in memory.

Power: 115V, 60 Hz, 25W (230V, 50 Hz on special order).

Accessories Supplied: Screwdriver. Instruction Manual.

Chart Recorder Output: 1 mA, 100-ohm load, miniature phone jack, accepts Switchcraft 750 plug.

V. SET-UP AND OPERATION

ROOM AIR MONITORING

1. To protect the plastic air inlet tube from shipping damage, the XenoGard comes with this short tube installed in reverse. Remove the 3 black thumbscrews from the air inlet, and place the porous air filter in the air inlet recess. Install the plastic flange so that it's flat side is against the porous filter and the air inlet tube faces out.

2. Plug unit into 115V AC line. Turn INTEGRATE and BLOWER switches on, that is, to the "Room Air" position.

3. Place METER MULTIPLIER switch on TEST. To adjust background, place toggle switch in BKG position. WAIT 4 minutes, and record the background reading as it appears on the meter. Place the toggle switch in SUB BKG position. WAIT AT LEAST 2 MINUTES for the meter reading to stabilize and then, using the screwdriver supplied, slowly turn the ADJUST screw until the meter reads the same as it did in the BKG position. WAIT AT LEAST 1 MINUTE between each adjustment for the meter reading to stabilize.

4. Place the METER MULTIPLIER switch in the X1 position. AFTER FOUR MINUTES the meter should read between zero and 0.1 MPC. The background has been subtracted from both the meter reading and the digital readout.

   Note: Background radiation may affect your xenon-133 measurements and may change from time to time due to the presence of other isotopes in the room or in the patient being imaged. Check the background-subtract circuit periodically and adjust it as necessary. The background should never exceed 0.5 MPC.

5. Place a radioactive source, such as Model 62-103, Cs-137 Check Source (label down), on top of the instrument, directly over the label which reads: "Place Check Source Here". Be sure the printed side of the source faces up. The meter should read approximately 2 MPC with this particular source. Record the meter reading with the check source in place. Check the instrument with the check source at least weekly to make sure it is still operational. Any significant change in the reading may indicate a need for recalibration.

6. Press the RESET button on rear of instrument. MPC-HOURS and HOURS should read zero.

7. Place AUDIBLE ALARM switch in ON position, if desired.

8. The XenoGard is now ready to monitor and integrate the xenon-133 concentration in room air. Place the unit as close as possible to where you will be working with xenon.

9. At the end of the working day, place the instrument on standby by turning the INTEGRATE and BLOWER switches to TRAP/STANDBY. Record the readings in your logbook (see page 8).

10. At the start of each week, or at 80 MPC-HOURS (whichever occurs first), reset the XenoGard to zero.

    Note: Do NOT unplug the XenoGard from its power source. Accumulated data is LOST when power is removed.

GAS TRAP MONITORING

1. To measure the concentration in the effluent from a gas trap, place one end of a 1" I.D. hose on the XenoGard's air intake and the other end over the gas trap exhaust port. Gas trap measurements should be made while xenon is being trapped, such as during the washout phase of a ventilation study.

2. Place the INTEGRATE and BLOWER switches on TRAP/STANDBY.

3. Place the METER MULTIPLIER switch on X1000. Proceed with the wash-out procedure and observe the MPC meter reading. If it reads less than 100 MPC, place the switch on X100.

4. Determine the activity (A) in the trap effluent by using the formula:

   $$A = MPC \times 10^{-5} \times V \times T$$

   where A = effluent activity in µCi.
   MPC = reading from analog meter.
   10^{-5} = 1 MPC in µCi/ml.
   V = trap flow velocity in ml/minute.
   T = washout time in minutes.

5. Remove the gas trap hose connection.

6. Turn on the BLOWER until the MPC meter reads zero, which indicates that all the xenon from the trap is out of the XenoGard. This should take about 5 minutes.

7. Return the INTEGRATE switch to ON or ROOM AIR in order to continue monitoring room air.

8. Record the results (see page 8).

The graph on page 11 shows the total amount of xenon-133 that could excape from all sources and the total air flow volume that would be necessary to keep the average concentration for 40 HOURS below 10^{-6} µCi/ml or 0.1 MPC. Integrated over a 40-HOUR week, this would be equivalent to 4 MPC-HOURS. For example, if 34 mCi escaped during the course of a week, and the air flow volume of the room was 500 cubic feet per minute, the average concentration would be 10^{-6} µCi/ml or 0.1 MPC, which would correspond to 4 MPC-HOURS.

MAINTENANCE

Particulate-Matter Filter (36-753): It should be replaced or cleaned with soap and water once a week to prevent it from becoming clogged. Three front-panel thumbscrews permit access to the filter.

XENOGARD ROOM AIR LOG

Week of ______________________________

Day	No. of Studies	No. of mCi		MPC HRS	HRS
1.			Start		
			Finish		
			Difference		
2.			Start		
			Finish		
			Difference		
3.			Start		
			Finish		
			Difference		
4.			Start		
			Finish		
			Difference		
5.			Start		
			Finish		
			Difference		
6.			Start		
			Finish		
			Difference		
7.			Start		
			Finish		
			Difference		

XENOGARD ROOM AIR LOG

SAMPLE

Week of Nov. 13, 1980

Day	No. of Studies	No. of mCi		MPC HRS	HRS
1. Mon. 11/13	3	30	Start	0	0
			Finish	3	8
			Difference	3	8
2. Tues. 11/14	2	20	Start	3	8
			Finish	5	16
			Difference	2	8
3. Wed. 11/15	5	50	Start	5	16
			Finish	15	24
			Difference	10	8
4. Thurs. 11/16	1	15	Start	15	24
			Finish	16	35
			Difference	1	11
5. Fri. 11/17	2	25	Start	16	35
			Finish	25	45
			Difference	9	10
6. Sat. 11/18	–	–	Start		
			Finish		
			Difference		
7. Sun. 11/19	1	10	Start	25	45
			Finish	26	46
			Difference	1	1

XENON GAS TRAP MONITORING LOG

$$A = MPC \times 10^{-5} \times V \times T$$

Date	MPC (10^{-5} µCi/ml)	V (ml/min)	T (min)	A (µCi)

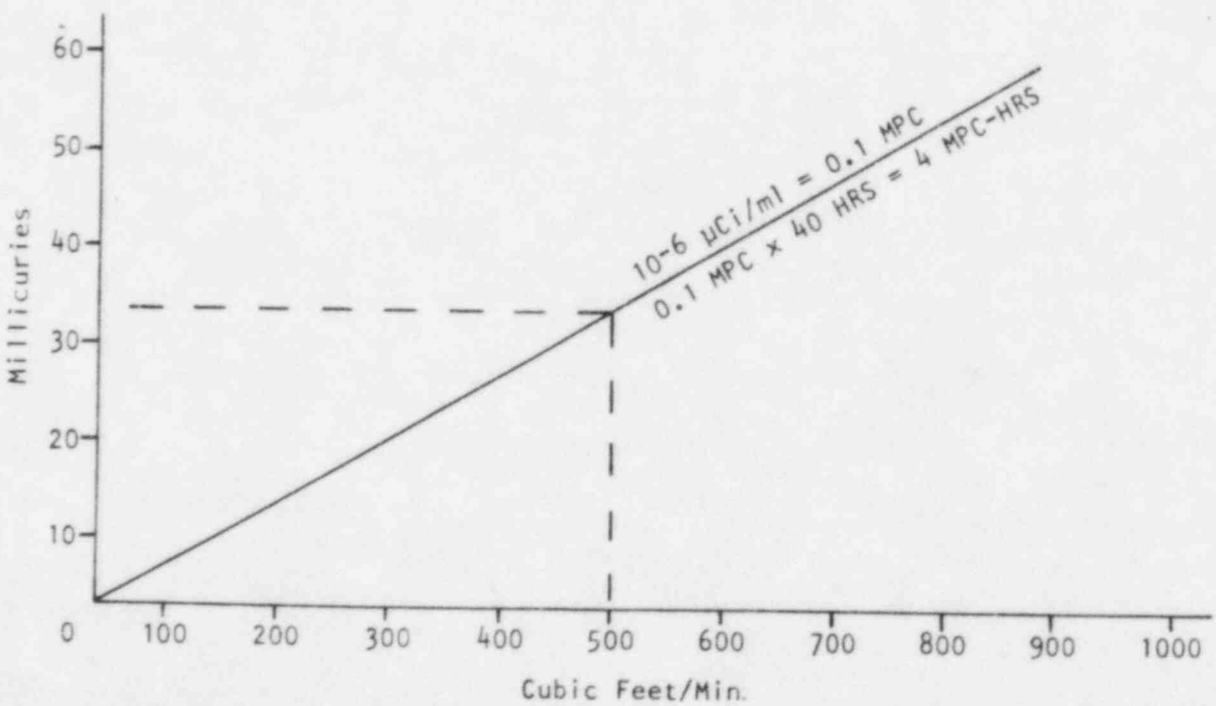
SAMPLE

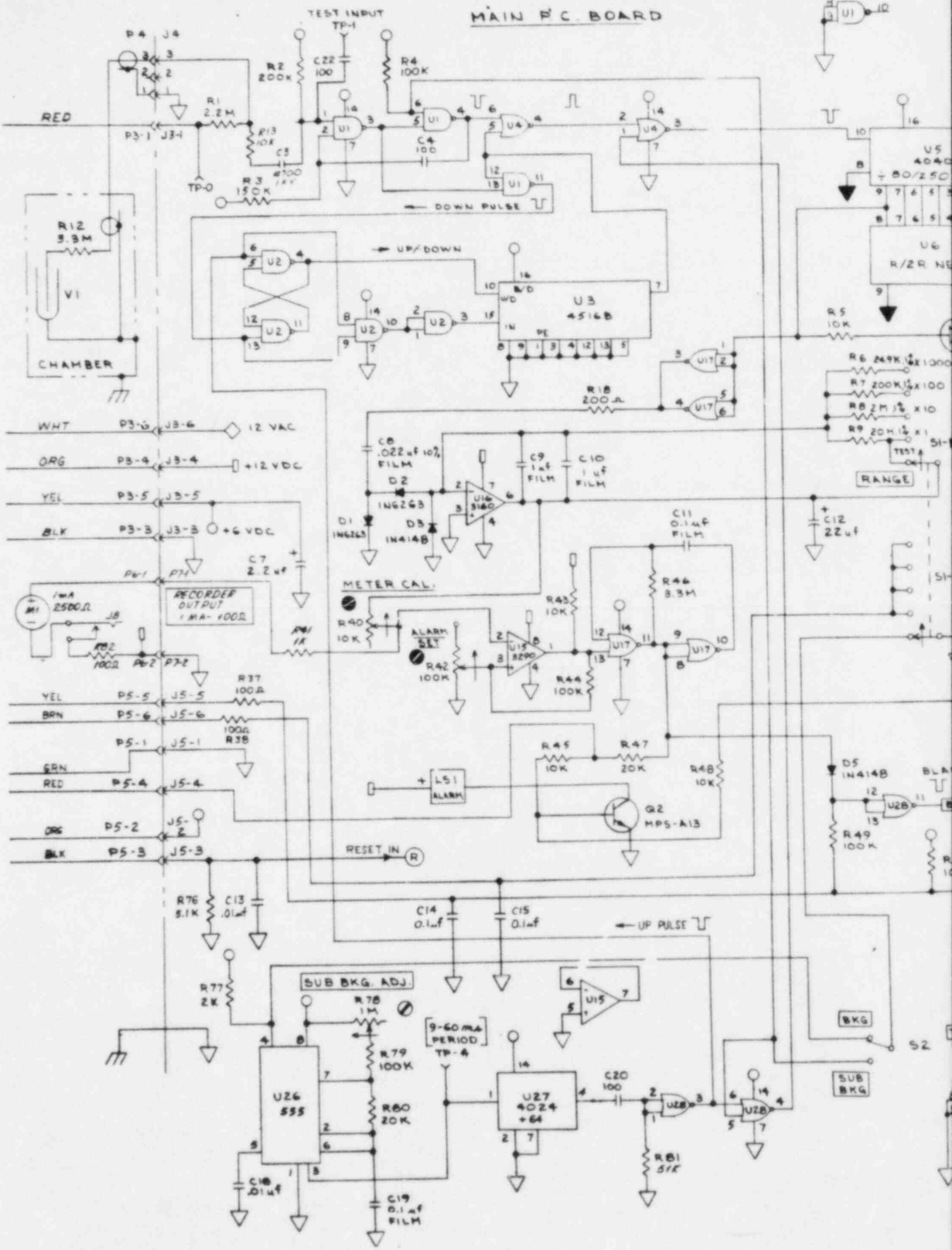
XENON GAS TRAP MONITORING LOG

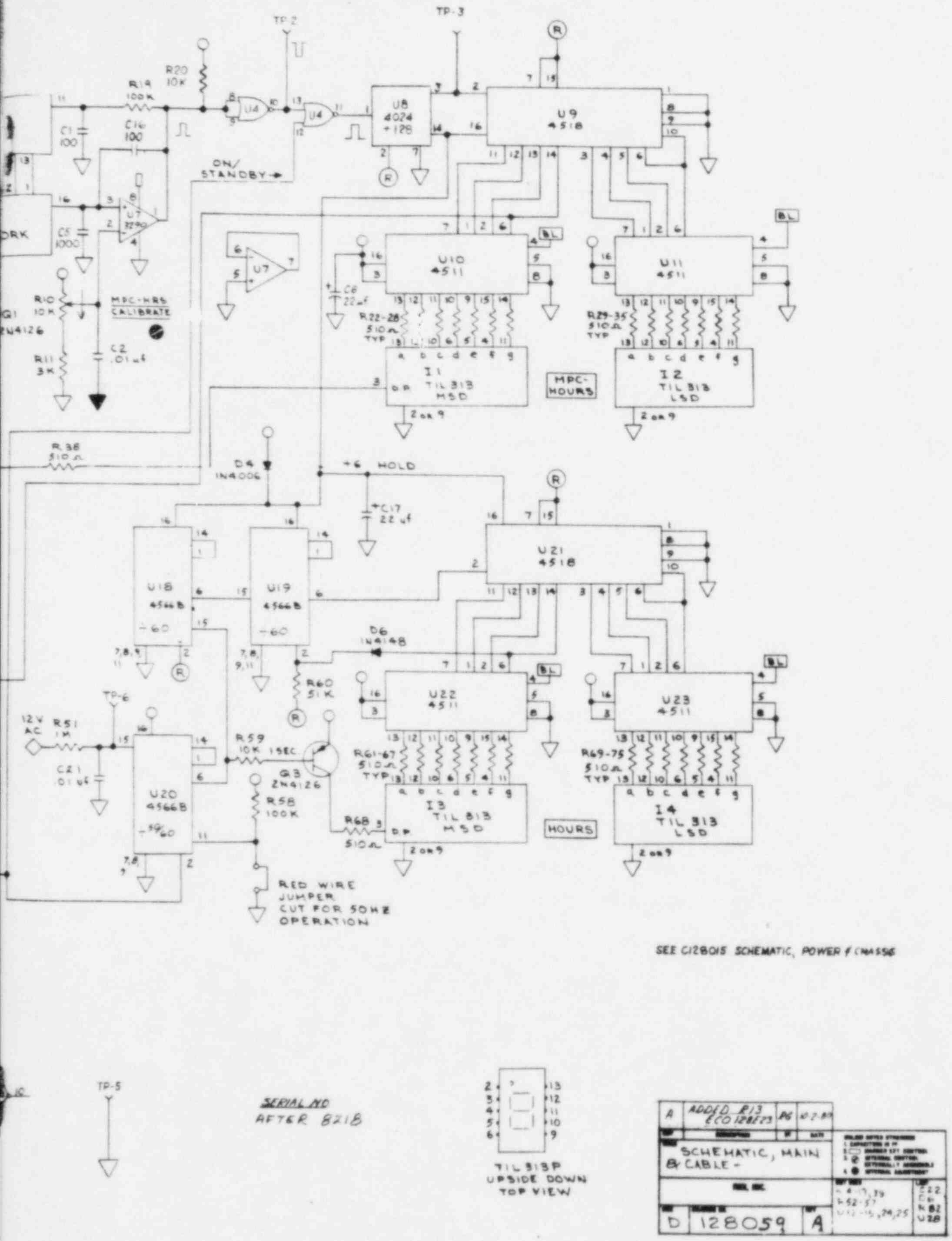
$$A = MPC \times 10^{-5} \times V \times T$$

Date	MPC (10^{-5} µCi/ml)	V (ml/min)	T (min)	A (µCi)
11/11/80	500	5000	5	125
11/18/80	400	5000	5	100

ACTIVITY-AIR FLOW VOLUME

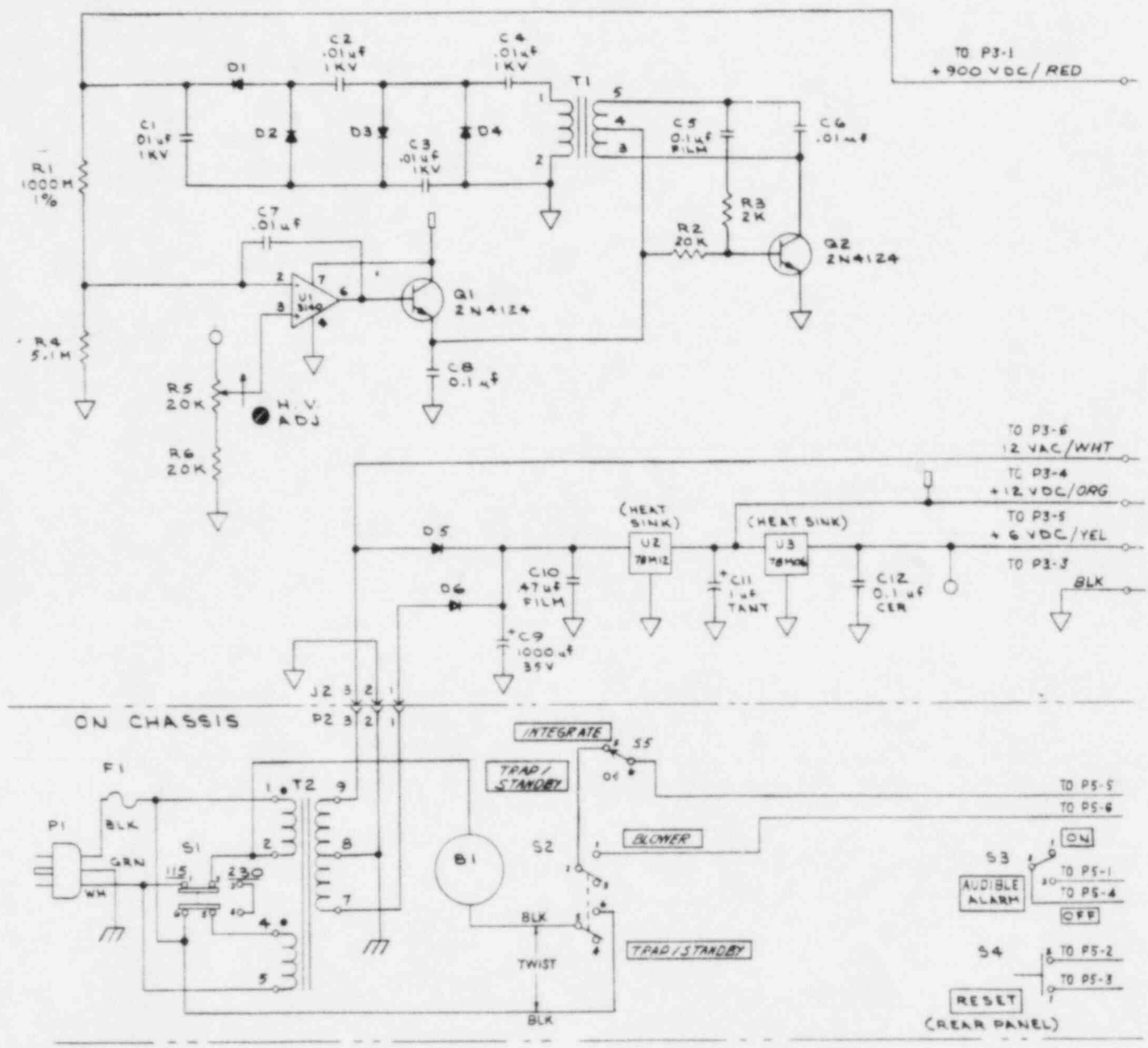



MAIN P.C. BOARD
TEST INPUT TP-1
RED
WHT
ORG
YEL
BLK
CHAMBER
12 VAC
+12 VDC
+6 VDC
RECORDER OUTPUT 1 MA - 100Ω
METER CAL.
ALARM SET
UP/DOWN
DOWN PULSE
UP PULSE
RESET IN
SUB BKG. ADJ.
9-60 ms PERIOD TP-4
RANGE
BKG
SUB BKG
S2



TP-2
TP-3
R20 10K
R19 100K
C1 100
C16 100
C5 1000
U4
U7
U8 4024 ÷128
U9 4518
ON/ STANDBY
R10 10K
R11 3K
C2 .01 uf
Q1 2N4126
MPC-HRS CALIBRATE
U10 4511
U11 4511
C6 22 uf
R22-28 510Ω TYP
R29-35 510Ω TYP
I1 TIL 313 MSD
I2 TIL 313 LSD
MPC-HOURS
BL
R38 510Ω
D4 1N4006
+6 HOLD
C17 22 uf
U18 4566B ÷60
U19 4566B ÷60
U21 4518
D6 1N4148
R60 51K
U22 4511
U23 4511
TP-6
12V AC
R51 1M
C21 .01 uf
U20 4566B ÷50/60
R59 10K
1 SEC.
Q3 2N4126
R58 100K
R61-67 510Ω TYP
R69-75 510Ω TYP
R68 510Ω
I3 TIL 313 MSD
I4 TIL 313 LSD
HOURS
2 or 9
RED WIRE JUMPER CUT FOR 50HZ OPERATION
SEE C128015 SCHEMATIC, POWER & CHASSIS
TP-5
SERIAL NO AFTER 8218
TIL313P UPSIDE DOWN TOP VIEW
A ADDED R13 ECO 128223
SCHEMATIC, MAIN & CABLE -
D 128059 A

POWER P.C. BOARD



C	C5 WAS 1uf ECO 128E		
B	SEE ECO128E13		
A	SEE ECO128E10		3-19-9

D.H. Allid 78

SCHEMATIC, POWER & CHASSIS

C12
D6
R6

C 128015 C

NOTES:

1. ALL DIODES ARE IN4006 UNLESS OTHERWISE SPECIFIED.
2. SEE D128015 FOR MAIN P.C. BOARD AND CABLE SCHEMATIC.

CAUTION: Service should be done only by qualified personnel. Any damage to or modification of this instrument during attempts to service it will void the warranty (see page 25).

CIRCUIT THEORY

Reference is made in the following discussion to two separate schematic diagrams: C128015, covering the high voltage and low voltage power supply printed circuit board and main chassis wiring, and d128059, covering the meter connections, counting chamber, and main printed circuit board.

Power Printed Circuit Board - This board contains a regulated 900V power supply together with a +6V and +12V regulated power supply to operate the main printed circuit board and the gieger tube.

The +900V power supply, which operates the GM tube, consists of a blocking oscillator T1 and Q2. Rectification and production of the 900V output is provided by a voltage multiplier on the secondary of the transformer, consisting of diodes D1 thru D4 and capacitors C1 thru C4. Regulation of this power supply is provided by a feedback voltage divider consisting of R1 and R4, a 1000 Meg and a 5.5 Meg resistor. The voltage divider tap is fed into an operational amplifier U1 with an adjustable high voltage reference obtained from the +6V power supply through R5, the high voltage adjustment potentiometer. The output of U1 is then fed into an emitter follower, Q1, which supplies the promary power to the blocking oscillator power supply. The output voltage may be checked at the junction of R1, the 1000 Meg resistor, and D1/C1. Since very little current is supplied by the poer supply, it is necessary to use a high voltage probe with an input impedance of at least 1000 megohms. If the 900V output varies by more than 2% from its nominal value, the potentiometer, R5 (on the top of the printed circuit board) can be adjusted to provided proper output voltage.

The low-voltage power supply consists of a conventional split-primary power transformer with a voltage selector switch, S1, which is used to select an input voltage of either 115V or 230V, 50/60 Hz. The voltage selector switch is on the lower right chassis lip, which is exposed after removing the top cover of the instrument. If the unit is to be used on 50 Hz, it is necessary to cut the exposed red wire on the back of the main printed circuit board so that the time base is corrected for 50 Hz input rather than the 60 Hz input used when the red wire is in place.

The blower, B1, operates always on115V by its connection across one of the primary windings of the power transformer, T2. The blower is controlled separately by switch S2, which also terminates count integration when the blower is off.

The +6V and +12V regulated supplies are conventional, using a full-wave rectifier consisting of diodes D5 and D6, a 12V regulator, U2, and a 6V regulator, U3.

Main Printed Circuit Board and Chassis - Refer to schematic D128059 which shows all the wiring on the main board together with the GM tube detector and meter. The circuit theory will be traced from the detector input through the displays.

The detector consists of a thin-window geiger tube, V1, and series resistor, R12, located within the counting chamber. The cable from the counting chamber with plug, P4, connects to jack, J4, on the main printed circuit board. The geiger tube input pulse, which is negative, triggers a one-shot multi-vibrator consisting of two sections of U1, producing a negative output pulse at Pin 4.

Because the geiger tube, V1, has a background count rate due to ambient radiation, it is necessary to have a digital background subtraction circuit so that the output pulses counted are zero with no Xenon-133 in the counting chamber. This is done by generating a synthetic background pulse rate in a 555 oscillator, U26. The background rate is set by a front-panel control, R78. The output from U26 will have a period of from 9 ms to 60 ms as measured at TP4 with control R78 in the two extreme positions. U27 divides the oscillator rate by a factor of 64. This oscillator pulse, which is present on the buffer, Pin 3, U28, is fed to an up-down counter, U3. The background oscillator counts U3 up. If U3 has any counts in it, the input pulse from the detector will be disabled and not pass through U4, Pin 4. All input pulses from the detector count the up-down counter in a downward position. If the input pulse rate exceeds the background subtract rate, the up-down counter, U3, will be in its most downward position during most of the time. This will enable (via the output Pin 7 of U3) the input pulse to pass to an adjustable frequency divider, U5. The first stage of this counter (output Pin 9) passes to a buffer, U17, and then to a rate-meter circuit consisting of diodes D1, D2, and capacitor C8, which feed a current into U16, thereby producing an output voltage (at Pin 6, U16) proportional to counting rate. Scale range is adjusted by means of selecting various feedback resistors, R6 thru R9, by means of the range switch. The output of the rate meter is fed directly to an external meter, M1, through a meter-calibrating resistor, R40, and then through a normally-closed recorder output jack. The recorder output should have an impedance of 100 ohms if it is to be used. This recorder output will produce 1mA full scale across its 100 ohm impedance. If a voltage recorder is used, the voltage across an external 100 ohm resistor will be 100 mV.

The input pulse to U5 represents a measure of the total Xenon-133 activity. The digital calibration for each individual instrument is provided by resetting the 12-stage binary counter, U5, at a count of between 80 and 250. This is done by utilizing a digital-to-analog converter, U6, and sensing the output voltage from Pin 16. The calibrating voltage, which is the master digital calibration of the instrument, is provided by R10. This voltage is compared to the voltage generated by the digital-to-analog converter by comparator, U7. The output of U7 then resets U5 thru Pin 11. At the same time, this positive output pulse is fed into a divider, U8, and to a dual decade counter, U9, which (through display drivers, U10 and U11, and displays I1 and I2) display the total integrated MPC-hours.

The total hours display is obtained by counting the power line frequency. This input, either 50 Hz or 60 Hz, comes through Pin 6 of P3/J3 as 12VAC. It is fed into a 50/60 divider, U20. If Pin 11 of U20 is grounded, U20 will divide by 60 for a normal 60 Hz power line. If Pin 11 is ungrounded, by cutting the red jumper wire on the back of the main printed circuit board, it will then divide by 50 for 50 Hz operation.

The output of U20 is then divided by 60 by U18 and then divided by 60 again by U19, providing one pulse per hour to the input Pin 2 of the

dual-decade counter, U21. U21 and U9 are fed into two display drivers and two displays, I3 and I4, which display the total accumulated hours.

Both the MPC-hours display and the hours display can be reset by the rear-panel reset pushbutton, S4 (schematic 128015) connected to J5-3. Notice that the digital displays are turned upside down so that decimal point, which normally appears in the lower right-hand position, appears in the upper left-hand poistion. The two left-hand display digits on the MPC-hours displays are connected in the following manner. The MPC-hours indicating decimal point is attached to the collector of Q1 so that it will turn on or off with every other input pulse. This display indicates that the geiger tube is counting. The other inverted decimal point on the hours display is connected to the collector of Q3. When the unit is integrating MPC-hours, this decimal point flashes on and off once each second. If the unit is not integrating MPC-hours, the inverted decimal point is continuously on, showing that AC line power is applied to the instrument.

Various interlocks are provided so that integration takes place only when the blower is on and the range switch, S1, is in a position other than the test position. This first position of the range switch selects the test mode wherein (via switch S2) the front-panel analog meter will either read background or the synthetically-generated background produced by oscillator U26. In actual operation, switch S1 is put in a test position, and switch S2 is put in the background position. After a period of time, the actual background is noted on the meter, and switch, S2, is then placed in the subtract background position. Thereupon, the background subtract oscillator adjustment, accessible through the front panel, R78, is adjusted so that the meter indication is identical to that obtained when measuring background only. After this is done, switch, S1, on any range should read less than 0.05 MPC.

FIELD CALIBRATION AND ADJUSTMENTS

The most obvious adjustment which might be necessary to the XenoGard is the master calibration. This consists of adjustment of MPC-Hours calibration control, R10, for the digital section, and the adjustment of the meter calibration control, R40, for the analog section. Unfortunately, it is very difficult to introduce a known calibrated volume of Xenon into the chamber (see page 22). If the HV supply is set correctly to +900VDC and the geiger tube in the counting chamber has not been changed, there should be no reason for the overall calibration of the instrument to change. As outlined in the instruction manual, day-to-day consistency checks, using a small Cs-137 source, will assure continued consistency of sensitivity. If any question arises concerning the overall calibration accuracy of the XenoGard, THE UNIT SHOULD BE RETURNED TO THE FACTORY FOR RECALIBRATION. Alternatively, follow the procedure on pages 22-24.

REPLACEMENT PARTS

INSTRUMENT XENOGARD - Main Assembly MODEL NO. 36-751 ISSUE DATE 7/79

STARTING SERIAL NO. 8218

SCHEMATIC REFERENCE C128015C (pg. 14)

Unless otherwise noted on the schematic, resistors are .25W, 5% carbon film; non-polarized capacitors are ceramic disk type, 20% tolerance, 100VDC; and capacitors marked "FILM" are 10% tolerance, 100VDC.

The above items are considered readily available and are not listed in the replaceable parts list.

If it is necessary to order non-listed replacement parts, specify the model, schematic reference designation or description, and instrument serial number.

SCHEMATIC REFERENCE	DESCRIPTION	PART NUMBER
S2,S3,S5	Switch, DPDT Paddle	530011
	Air Inlet Cover	128031
	Machine nuts, #6/32 thumb nut, Nylon black	948401
M-1	Meter, 1mA	400010
	Fuse holder body for AGC fuse; Black	760006
	Fuse holder cap; White	760007
T-2	Transformer, PRI 115/230V Sec. 28 VCT @ 1.1A	700012
	Filter, Foam	128045
S-4	Switch, N.O. P.B. momentary	570001
J-8	Jack, recorder (not used before #8218)	780005
B-1	Blower	740004

REPLACEMENT PARTS

INSTRUMENT XENOGARD - Power P.C. Board MODEL NO. 36-751 ISSUE DATE 7/79

STARTING SERIAL No. 8218

SCHEMATIC REFERENCE C128015C (pg. 14)

Unless otherwise noted on the schematic, resistors are .25W, 5% carbon film; non-polarized capacitors are ceramic disk type, 20% tolerance, 100VDC; and capacitors marked "FILM" are 10% tolerance, 100VDC.

The above items are considered readily available and are not listed in the replaceable parts list.

If it is necessary to order non-listed replacement parts, specify the model, schematic reference designation or description, and instrument serial number.

SCHEMATIC REFERENCE	DESCRIPTION	PART NUMBER
C1,2,3,4	Capacitor, ceramic, 0.01uf, 20%, 1000FDC	201031
C9	Capacitor, al. electrolytic, 1000uf; 35VDC	221081
C12, C8	Capacitor, ceramic, 0.1uf, -20 +80%, 12VDC Y5S	201041
C11	Capacitor, tantalum, 1.0uf, 20%, 35VDC W	231061
D1-6	Diode, 1 N4006, 800 P.I.V.:	600001
Q1, Q2	Transistor - NPN, 2N4124	620001
R1	Resistor, Precision, 1000M, 1%,	341082
R5	Potentiometer, Trim. 20K, 20%, 0.5w, 1 turn	392032
T1	Transformer, H.V. osc;	700003
U1	Operational Amp 3140	640014
U2	Positive Regulator, 12V, 5%, 500 ma	640007
U3	Positive Regulator, 6V, 4%, 500 ma	640001
J2	Connector, 3-pin; P.C. board mtg.	780038
P3	Connector, Cable, 6-pin	780002

REPLACEMENT PARTS

INSTRUMENT XENOGARD - Main P.C. Board MODEL NO. 36-751 ISSUE DATE 7/79

STARTING SERIAL NO. 8218

SCHEMATIC REFERENCE D128059 (pg. 12)

Unless otherwise noted on the schematic, resistors are .25W, 5% carbon film; non-polarized capacitors are ceramic disk type, 20% tolerance, 100VDC; and capacitors marked "FILM" are 10% tolerance, 100VDC.

The above items are considered readily available and are not listed in the replaceable parts list.

If it is necessary to order non-listed replacement parts, specify the model, schematic reference designation or description, and instrument serial number.

SCHEMATIC REFERENCE	DESCRIPTION	PART NUMBER
C3	Capacitor, ceramic, 4700pf, 20%, 1KV	204721
C7	Capacitor, Tantalum, 2.2uf, 20%, 16VDC	232252
C6,12,17	Capacitor, Tantalum, 22uf, 20%, 15VDC	232261
D1,2	Diode, 1N6263;	600019
D3,5,6	Diode, Silicon, 1N4148	600003
D4	Diode, 1N4006, 800 PIV	600001
Q2	Transistor-NPN, MPS-A13; Darlington	620002
Q3,Q1	Transistor-PNP, 2N4126	622001
LS1	Aural alarm; 8-16VDC, P.C. pins	710024
R40	Potentiometer, Trim, 10K, 20%, 0.5w, 1 turn	391034
R42	Potentiometer, Trim, 100K, 20%, 0.5w, 1 turn	391043
R78	Potentiometer, Trim, 1M, 20%, 0.5w, 1 turn	391052
U6	Resistor, Ladder Network, 8-Bit	352531
R10	Potentiometer, Trim, 10K, 10%, 15-20 turns	391031
S1	Switch, rotary, 2P5 pos.	560003

SCHEMATIC REFERENCE	DESCRIPTION	PART NUMBER
S2	Switch, DPDT Toggle; P.C. Mtg.	530010
U1,2	Quad Nand Gate 4011B	630002
U3	4-bit, up/down Counter 4516B	630023
U4,17,28	Quad Nor Gate 4001B	630001
U5	12-Stage Binary Counter 4040	630008
U7,15	Dual comparator, 3290	640021
U8,27	7-Stage Binary Counter, 4024B	630009
U9,21	Dual BCD Counter	630007
U10,11,22,23	BCD to 7-segment decoder/driver 4511B	630011
U16	Operational Amplifier CA 3160	640017
U18,19,20	Time Base, 50/60 Divider, 4566B	630024
U26	Timer, Low Power, 7555	640028
I1,2,3,4	Digit Display; 7-seg. common cathode	680019
J3,J5	Connector, P.C. male, 6-pin straight	780001
J4	Connector, 3-pin; P.C. board mtg.	780038
P7	Plug, 2-pin, Cable; female housing	780046

CALIBRATION

CAUTION: Calibration should be performed only by qualified personnel. Any damage to or modification of this instrument during attempts to calibrate it will void the warranty (see page 25).

The procedure described may be used for calibrating all monitors having serial numbers 6417 and higher.

In order to calibrate the XenoGard, a known activity of xenon-133 must be put into the known volume of the instrument, thus providing a known concentration of xenon-133.

PREPARATION:

The XenoGard cover is held in place by four screws, two on each side of the unit. When these are removed, the cover is removed by pulling it upward. With the front of the unit facing the operator, the main PC circuit board is in a vertical position, close to the front panel. The rear of this circuit board has three potentiometers which can be adjusted with a small screwdriver. The one on the right sets the alarm and should require no adjustment. The center one is the meter-adjust potentiometer, the one whose setting determines the calibration being discussed here. The left potentiometer adjusts the MPC-HRS reading (see Figure 1).

VOLUME:

The volume used is the total internal volume of the instrument's gas handling system, consisting of the entrance nozzle, a flexible tube leading to the GM chamber, the chamber itself, the outlet plenum leading to the blower, and the blower itself. The total volume is 1284 cc. To seal off this volume (see Figure 1), use masking tape (or other non-porous type) to tape a non-porous card (plastic, metal, or similar material) over the 3-inch diameter outlet opening in the back panel of the XenoGard. Be careful in taping to close off all cracks, slits or other openings. If the blower protective grid is removed to provide better access to the opening, replace the screws before taping begins since they are also used to tighten the blower against the back panel. At the front panel of the machine, remove the filter from the inlet, replacing the nozzle. The opening may then be sealed by a rubber or cork stopper, size #4. Since it will be necessary to inject gas into the system, we suggest forcing a long, heavy needle (1½", 15 gauge) through the stopper before pushing it into the nozzle.

ACTIVITY:

It is necessary to deliver a small, accurately-known amount of activity into the machine's interior. This can be obtained by dilution of a larger amount of activity, using a 20-cc syringe and a valve fitting between the syringe and the needle.

1. Draw some xenon-133 into the 20-cc syringe and close the valve. Assay in an accurate dose calibrator. We shall assume you have 400 μCi.
2. Open the valve and pull back the plunger, filling the syringe to 20 cc with air. Close the valve.

3. Mix by shaking.

4. Open the valve and expel 19 cc of the gas, being careful to expel it into a gas trap or an acceptable exhaust system (20 µCi remain in the syringe).

5. Repeat 2, 3, and 4, (leaving 1 µCi in the syringe; actually, the desired range of activity is between 1/2 and 2 µCi).

6. Fill the syringe with air again (giving a concentration of 1 µCi in 20 cc or .05 µCi/cc). Note that if the original activity was other than 400 µCi, the final concentration may be different from .05 µCi/cc. Alternatively, the final air intake to the syringe may be other than 19 cc, so that the final concentration may be adjusted to a convenient value.

PROCEDURE:

Note: Before taking any quantitative readings, always make sure that the XenoGard has been on at least four minutes to warm up.

1. Using another syringe and valve attached to the needle in the stopper of the XenoGard's input nozzle, remove about 5 cc of air from the sealed chamber to create a negative pressure. Close the valve and remove the syringe, leaving the needle and valve.

2. Connect the syringe containing the xenon to this point; you should have both valves in series. Open both valves.

3. Inject 1 cc of air containing xenon into the sealed volume. Close one valve. Turn on the blower fan for 1 or 2 seconds to thoroughly mix the xenon in the sealed volume. If the syringe has .05 µCi/cc xenon concentration, the sealed volume will now have a concentration of .05 µCi/1284 cc = 3.89×10^{-5} µCi/cc or 3.89 MPC Injection of a different amount will, of course, yield a different concentration.

4. Take a reading of the concentration on the XenoGard meter. Turn on the blower again for a second. If the reading shows a change, the xenon is insufficiently mixed in the chamber. In that case, run the blower for 1 to 2 seconds again, take another reading, and repeat until two successive meter readings are identical. If this reading is different from the known concentration in the unit, adjust the middle potentiometer on the main PC board to correct the readings.

5. Calibration is complete. The seals may be removed and the blower operated for a short time to clear the XenoGard.

MPC-HRS CALIBRATION:

1. Place a Cs-137 check source on top of the GM tube chamber, reasonably close to the center. If the source is approximately 10 µCi Cs-137 (Nuclear Associates Model 62-103 Check Source or equivalent), the reading should be somewhere on scale when the selector is on X10.

2. Take careful readings of the meter. Divide 60 minutes by this meter reading in MPC units. This gives the number of minutes required for the MPC-HRS counter to change by one unit. Turn on the Integrate switch and the blower switch to activate the integration system, noting the time carefully. Allow the XenoGard to run, and watch for the exact time between one-digit changes of the MPC-HRS counter. If the time for change is inaccurate, correct it by touching up the setting of the left-most potentiometer.

3. If the exact position of the check source is marked on the GM tube chamber with paint or tape, and the exact reading of the meter in MPC is noted, future calibrations can be facilitated since the cesium source may be used for the purpose instead of using xenon of known concentration. Cesium decay should be taken into consideration.

CAUTION:

The XenoGard has been factory calibrated and is exceedingly stable. Calibration, as described above, should not be necessary often. Since it depends on difficult-to-measure quantities, such as gas dilution and activity of a very small aliquot of xenon gas, a caution is in order: A careless calibration procedure may leave the XenoGard less accurate than before.

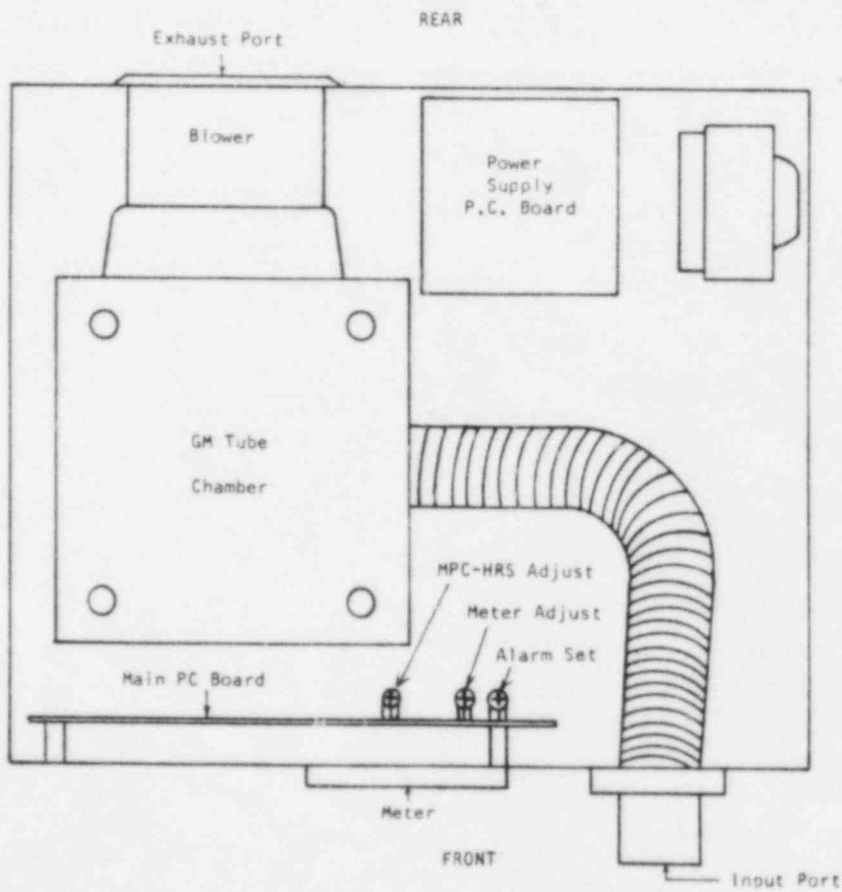


Fig. 1. Top view of XenoGard with cover removed.

WARRANTY

This instrument and its accessories, excluding those accessories listed below, is warranted by VICTOREEN INC., against defects in materials and workmanship for a period of one year* from the date of original shipment. During the warranty period, VICTOREEN will repair or, at its option, replace, at no charge, an instrument containing such defect, provided that it is returned, transportation prepaid, to the VICTOREEN repair facility listed below or other VICTOREEN authorized facility. Instruments repaired in warranty will be returned transportation prepaid within the United States.

*Specific mechanical products may have a more limited warranty period as stated in the front of this manual.

In addition, the calibration of each instrument is warranted to be within its specified accuracy at the time of shipment. If an error in this initial calibration is discovered, the instrument will be recalibrated at no charge, provided it is returned as described above. This does not apply to any calibration deviation that may result from normal use.

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS, WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THIS EXPRESS WARRANTY EXCLUDES COVERAGE OF AND DOES NOT PROVIDE RELIEF FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND OR NATURE, INCLUDING BUT NOT LIMITED TO LOSS OF USE, LOSS OF SALES OR INCONVENIENCE. THE EXCLUSIVE REMEDY OF THE PURCHASER IS LIMITED TO REPAIR, RECALIBRATION OR REPLACEMENT OF THE INSTRUMENT AT VICTOREEN'S OPTION.

This warranty does not apply if the product, as determined by VICTOREEN, is defective because of normal wear or accident or misuse, or as a result of service or modification by other than an authorized VICTOREEN repair facility. This warranty is void if the unit is subjected to temperatures above 55°C., or contaminated with radioactive material.

This warranty specifically excludes the following items which are covered by their original manufacturers' warranty: photomultiplier, geiger and proportional tubes, crystal and other solid state detectors, batteries and major ancillary items of instrument systems, such as, but not limited to, recorders, printers and display devices.

NON-WARRANTY SERVICE

If repairs or replacement not covered by this warranty are required, a repair estimate will be submitted for approval before proceeding with the repair or replacement.

REPAIR SERVICE - Return the product, prepaid, to:

VICTOREEN INC./FLORIDA DIVISION
415 Pineda Court
Melbourne, FL. 32935

- or call (305) 259-6862

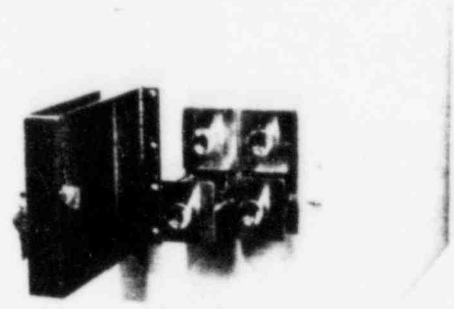
> IMPORTANT: In order to expedite your repair, please supply the following: 1) Complete detailed description of problem, 2) Purchase Date, 3) Name of Vendor, 4) Order Number. Also, indicate which, if any, accessory items (batteries, carrying case, check source, voltage converter, etc.) are included in the return.

3M CESIUM ACCESSORIES

PROTECTIVE EQUIPMENT

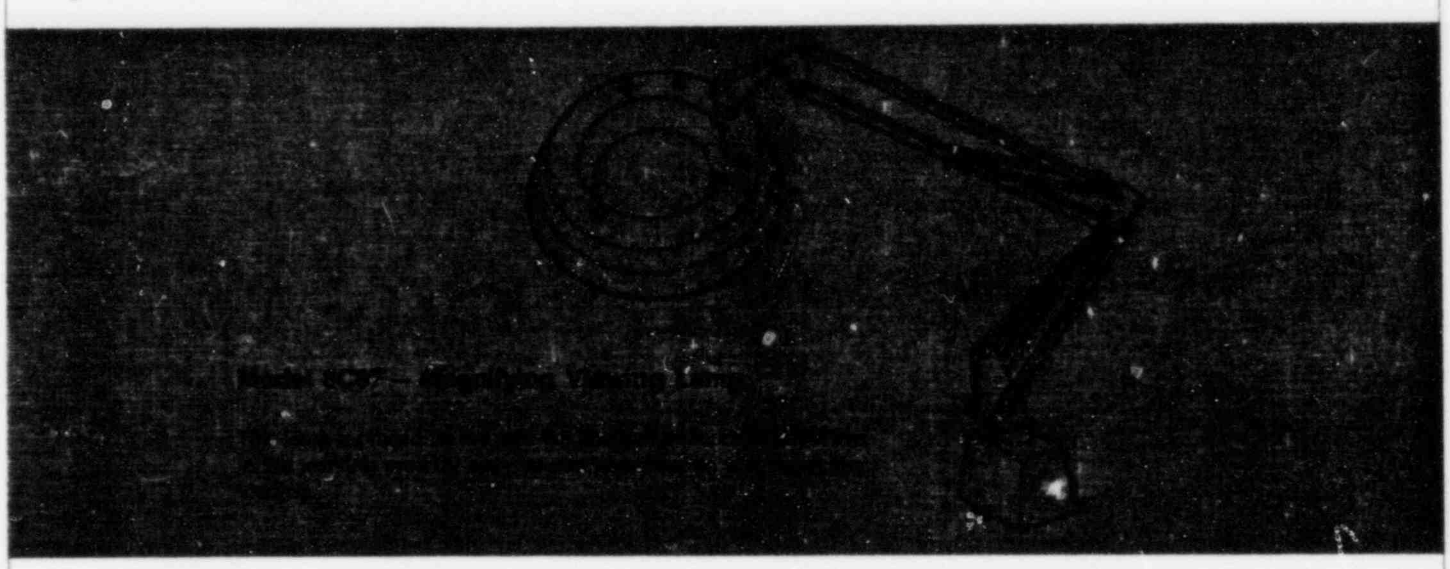
Model 8C9E — 4 drawer safe

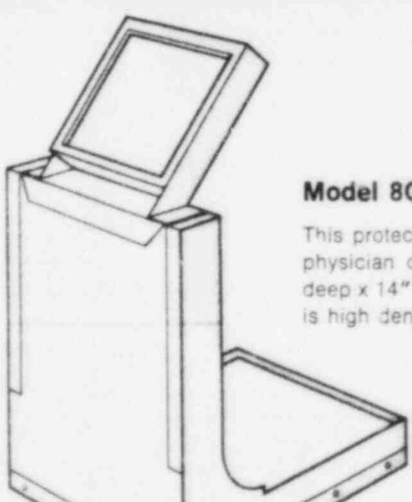
CLOSED VIEW



OPEN SIDE VIEW

This locking 4 drawer safe will safely hold more than 500 milligrams of radium equivalent cesium. The drawers will be drilled to your specifications at no charge. Dimensions are 11" x 11" x 12½" deep. The shipping weight is about 600 pounds.

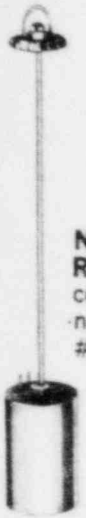




Model 8C9G — Protective "L" Block

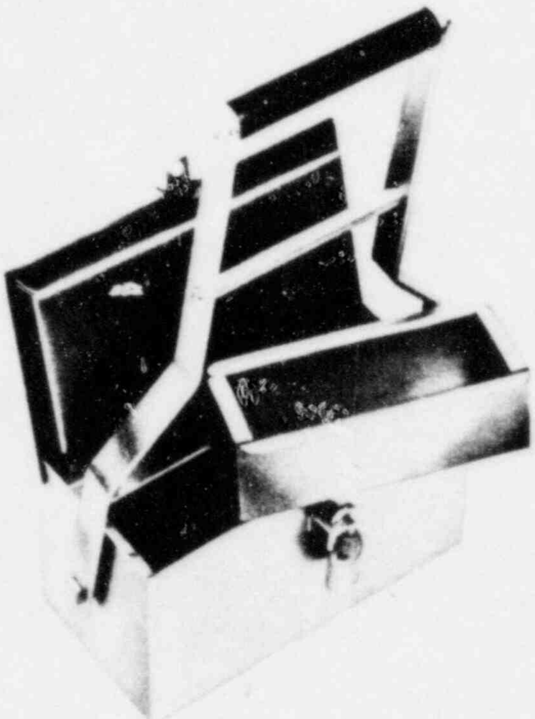
This protective "L" block provides necessary protection for the physician or technician in the storage room. The size is 14" deep x 14" wide x 16½" high x 1¾" thick. The viewing window is high density glass. Shipping weight is about 325 pounds.

Item #10
8/12/85

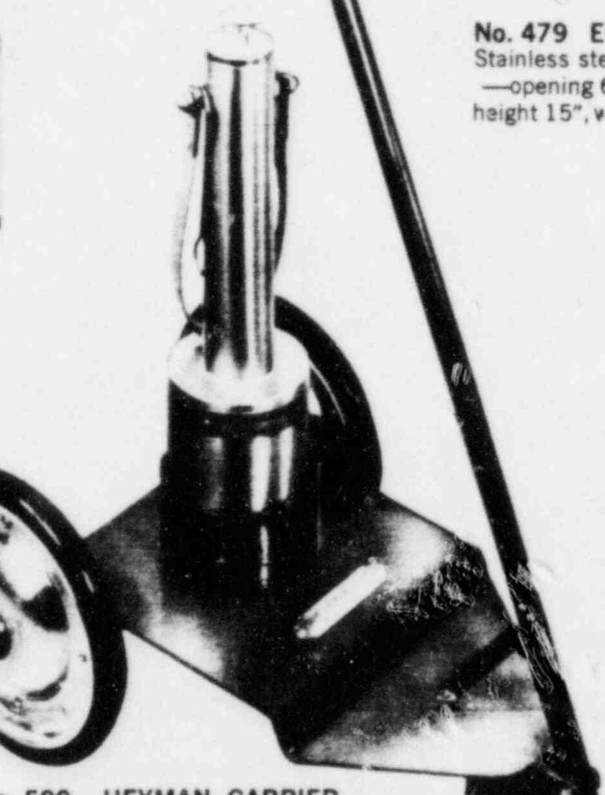


No. 421 NEEDLE RACK—Lead filled core for 12 threaded needles. (use with #500)

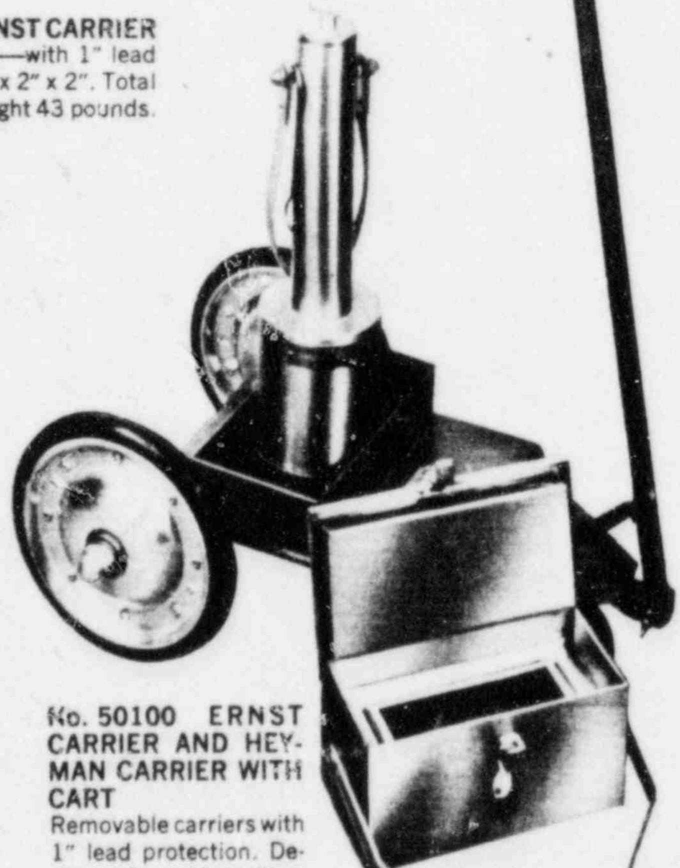
No. 612 FLETCHER-SUIT—After-load carrier core. (use with #500)



No. 479 ERNST CARRIER Stainless steel—with 1" lead —opening 6" x 2" x 2". Total height 15", weight 43 pounds.



No. 500 HEYMAN CARRIER AND CART Removable 2" diameter stainless steel carrier with 1" lead. Has removable core to hold 12 Heyman capsules to sterilize and prevent wire tangling. 8" wheels, 3" caster, and 10" handle.
(Also available with 3" diameter)



No. 50100 ERNST CARRIER AND HEYMAN CARRIER WITH CART Removable carriers with 1" lead protection. Designed for cold sterilization and rapid transportation of loaded applicators.

CONVERSATION RECORD

TIME	DATE
10:15am	23 July 1985

TYPE

☐ VISIT ☐ CONFERENCE ☐ TELEPHONE

☐ INCOMING

☐ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO.
Bill Miller	St. Luke's Hosp. St. Louis Mo	(314) 361 1212

SUBJECT

C/N 79326

SUMMARY

Mr Miller hasn't received xenon information from their consultant or experience statements from a sample doctors preceptors yet. He requested a 2-3 week extention.

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
Mike McCann	George W. McCann	07/23/85

ACTION TAKEN

SIGNATURE	TITLE	DATE