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# EVALUATION OF THE CNS AND CARDIOVASCULAR EFFECTS OF PROLONGED EXPOSURE TO BROMOTRIFLUOROMETHANE ($CBrF_3$)



Submitted to:

NASA/Johnson Space Center
Houston, Texas

Period Covered
March 1, 1980-May 1, 1981

**SOUTHWEST FOUNDATION for RESEARCH and EDUCATION**

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Bexar County • 21st Congressional District

Report on

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## I. INTRODUCTION

During the past 10 years, the proposed use of bromotrifluoromethane ($CBrF_3$) as a fire extinguishant in aircraft, spacecraft and submarines has stimulated increasing interest and research in the toxicological properties of this compound. As a result of this research, it is universally recognized that the principal toxicological effects of $CBrF_3$ are on the central nervous system (CNS) and the cardiovascular system. From human experimentation with this haloalkane, the concentrations at which CNS effects can result from acute exposure is well established. As a result of animal experimentation, $CBrF_3$ is known to be capable of sensitizing the heart to the effects of epinephrine and causing cardiac arrhythmias and ventricular fibrillation. To date, all of the human and animal research on the CNS and cardiovascular effects of this compound has been conducted under acute exposure conditions, which are consistent with the anticipated usage of the compound for fire extinguishment. However, in the spacecraft, because of its unique recirculating life support system, the introduction of $CBrF_3$ by leakage or intentional discharge, will result in continuous exposure of crewmen to low concentrations of this compound for periods of up to 7 days, or possibly even longer. Experimental data to enable assessment of the risks associated with exposure of this duration are unavailable at the present time. The proposed research was designed to investigate the effects of low concentrations of $CBrF_3$, under continuous exposure conditions, on the CNS and cardiovascular systems of animals to enable an assessment of these risks.

Bromotrifluoromethane can either stimulate or depress the CNS to produce effects ranging from tremors and convulsions to lethargy and unconsciousness. For example, Van Stee and Back (1) reported that dogs exposed to 20% or greater concentrations of $CBrF_3$ became visibly agitated within 1-2 min and that the severity of agitation increased with increasing concentrations of the compound. Within 1-3 minutes generalized muscular tremors could be observed. When the concentration was increased to 50% $CBrF_3$, convulsions appeared after 12-min exposure and, when exposed to 80% $CBrF_3$, the onset of convulsions took place within 3-4 minutes. These epileptiform convulsions were seen in about 50% of the unanesthetized dogs exposed to 50-80% $CBrF_3$. In contrast, conscious monkeys exposed to $CBrF_3$ in this same study exhibited signs of cortical depression, such as lethargy and tranquilization of normally aggressive behavior. In another study, Carter et al. (2) exposed monkeys to concentrations ranging from 10.5% to 42.0% $CBrF_3$ and reported significant performance decrements on conditioned avoidance tasks at concentrations of 20-25%, without visible signs of CNS depression or analgesia. Concentrations of $CBrF_3$ at 10.5 to 20% did not impair performance on these tasks and concentrations higher than 25% caused the animals to cease performance.

The second major toxicological effect of $CBrF_3$ is its ability to sensitize the heart to the effects of epinephrine. The interaction of halogenated alkanes with pressor amines to cause cardiac arrhythmias has been known since Levy (3,4) first made the observation with chloroform and epinephrine at the turn of the century. He showed that the intravenous injection in cats of a quantity of epinephrine that alone was nonhazardous would, during chloroform inhalation, cause ventricular fibrillation. Since then, this interaction, not only with epinephrine, but also with norepinephrine, ephedrine, phenylephrine and other compounds, has been demonstrated for a lengthy list of unsubstituted and halogenated hydrocarbons including aerosol propellants, fire extinguishants and refrigerants (5). Van Stee and Back (1) reported that anesthetized dogs exposed to $CBrF_3$ at a concentration of 80% developed ventricular fibrillation and cardiac arrest after intravenous injection of 10 μg/kg of epinephrine. In this same study, monkeys and baboons developed spontaneous arrhythmias within 40 seconds of exposure to $CBrF_3$ at concentrations of 20-80%. Dogs did not appear as sensitive as the primates to the spontaneous formation of arrhythmias during $CBrF_3$ exposure; in the former animals arrhythmias began within 2 minutes of exposure to 40% or greater $CBrF_3$. These authors reported the death from ventricular fibrillation of one dog that was exposed to 40% $CBrF_3$ and not given any additional drugs. Hine et al. (6) attempted to model the physiological effect of stress when they exposed dogs to $CBrF_3$ and then frightened them by means of stroboscopic lights and noise. Ventricular fibrillation was not observed in any of the animals in this study. This same technique was employed more recently by Reinhardt et al. (7) in evaluating the cardiac sensitizing ability of a number of fluorocarbons, but not including $CBrF_3$.

Human exposure experimentation, under acute conditions, has also been conducted with $CBrF_3$. As in the studies of acute exposures of animals, the primary observations in human studies have been CNS and cardiovascular effects. Hine et al. (6) reported that exposure to 10-15% $CBrF_3$ decreased the subject's performance of 5 of 6 psychomotor tasks and that 15% caused feelings of impending unconsciousness. During a 3-minute exposure to 4 and 7% of $CBrF_3$, Call (8) reported only a slight increase in reaction time in human volunteers. In another study, by the Haskell Laboratory (9), volunteers exposed to Halon 1301 at concentrations below 7% did not notice any effects during or after a 4-minute exposure period. However, at levels of 7 to 10%, definite effects occurred. These included light-headedness and difficulty in mental concentration with a suggestion of a slight disturbance in balance and reaction time. These effects increased in intensity with increasing concentrations of Halon 1301 up to about 15%. As for cardiac effects, neither Call (8) nor Smith and Harris (10) detected any cardiac arrhythmias during human exposure to $CBrF_3$. In Call's study, human volunteers were exposed to 4 or 7% $CBrF_3$ for 3 minutes in hypobaric chambers. Smith and Harris exposed flight crews to 5 to 7% $CBrF_3$ for five minutes at pressurized altitudes of 1,000-20,000 feet in aircraft flight tests. Hine et al. (6) monitored cardiac electrical activity during exposure of human volunteers to nominal concentrations of from 5 to 17% $CBrF_3$. Cardiac arrhythmia was reported in only one individual, who was exposed to $CBrF_3$ at 13% for 5 minutes.

Studies of the effects of prolonged exposure of $CBrF_3$ in animals have been limited in scope and have generally investigated only gross signs of toxicity (11). The data from these studies indicate that a $CBrF_3$ concentration of 5% in air, under prolonged exposure conditions, would not produce effects on blood chemistry nor cause pathologic alterations. In none of these studies, however, were effects on the CNS or cardiovascular system investigated.

## II. OBJECTIVES

The proposed research utilized nonhuman primates and operant techniques to evaluate the potential of $CBrF_3$, under prolonged exposure conditions, to produce behavioral changes and impairment of performance and to cause abnormalities in cardiac rhythm during stress. The data from these studies allows for an assessment of the risks associated with prolonged exposure of crewmen to low concentrations of $CBrF_3$ during their normal duties as well as during unanticipated stressful situations.

The first objective of this study was to evaluate the potential of $CBrF_3$, under continuous exposure conditions, to cause behavioral changes and to impair performance in crewmen during spacecraft missions. This objective was accomplished utilizing a nonhuman primate model and sensitive operant behavioral methodology.

Studies in this laboratory have demonstrated that the selected primate model (juvenile baboons) and operant methodology (match-to-sample discrimination task) are most appropriate for accomplishing the first objective. The baboon is recognized as a surrogate of man and an animal of choice for inhalation toxicological problems because its lung structure, immunological system and physiological systems closely approximate those of man. It is particularly desirable for use in behavioral studies because it is an intelligent animal and, unlike many other primate species, has proven to be a rapid learner and, under minimal food deprivation conditions, can be trained to press a lever for food reinforcements. The juvenile baboon is nonaggressive, relatively tame and can be handled without restraining devices, obviating the necessity for harsh procedures which often upset primates emotionally and influence behavioral measurements.

The match-to-sample discrimination task provides measures of mental acuity, discrimination, memory and reaction time. This task also records extra responses or intertrial responses (responses made by the animal when stimuli are not activated) which are considered to be an indication of the state of "jitteriness" of the animal. Once the animal is trained on this discrimination task, a perfect discrimination score is almost invariably maintained by the animal during subsequent daily testing sessions. Another advantage of the animal model and methodology is that it is not necessary to use separate experimental and control animals since each animal serves as its own control. Large numbers of animals are not required because of the extreme sensitivity of the behavioral task to disruption of CNS function by low levels of CNS-active drugs and atmospheric contaminants.

Studies conducted by this laboratory have shown that this animal model and methodology are excellent for extrapolation of behavioral effects to man. In these studies, performance impairment by chemical agents and environmental pollutants has been detected at concentrations equivalent to or below those reported to affect human performance. For example, significant changes in behavior on the match-to-sample task have been demonstrated for young baboons exposed to one-half the threshold limit values (TLVs) of methyl ethyl ketone, methyl isobutyl ketone or carbon monoxide.

The second, but equally important, objective of this study was to evaluate the potential of continuous exposure to low concentrations of $CBrF_3$ to cause cardiac abnormalities in crewmen during spacecraft missions and, particularly, during stressful situations, when the release of endogenous epinephrine is stimulated. This objective was accomplished also utilizing a nonhuman primate model and an operant behavioral method that has been shown to elicit a typical "alarm" or "fright" response in animals (12,13, 14).

In this phase of the study, cardiac electrical activity of cynomolgus monkeys was monitored during continuous exposure to $CBrF_3$ over a 30-day period, during periods of normal animal activity as well as during periods of induced stress. In our opinion, the conditioned emotional response (CER) method proposed herein for inducing "typical" stress is physiologically more valid in duplicating sympathoadrenal activity than the IV infusion of epinephrine. In stressful situations, not only is epinephrine liberated from the adrenal medulla, but also there is release of catecholamines from sympathetic nerve endings within the heart. Also, the volumes of distribution of endogenous and exogenous catecholamines are not identical.

Cynomolgus monkeys were selected as the experimental animal for the second objective because of our previous experience with the CER procedure using these animals. In these studies, problems in the training of cynomolgus monkeys and in conducting the CER were minimal and the results were excellent. In addition, for the proposed program, it was necessary to maintain the primates in restraining chairs during the experimental period. We have conducted numerous studies that required the maintenance of primates in restraining chairs and have found that cynomolgus monkeys readily accommodate to these chairs, can be trained to remain in these chairs for long periods without struggling and violent reactions and perform behavioral tasks in a manner comparable to unrestrained animals.

## III. METHODS

### A. Exposures

Modification of our existing flow-through exposure chamber was required in order to convert it to a recirculating system. This was accomplished under a sub-contract to Southwest Research Institute. The modification is described in detail in Appendix A.

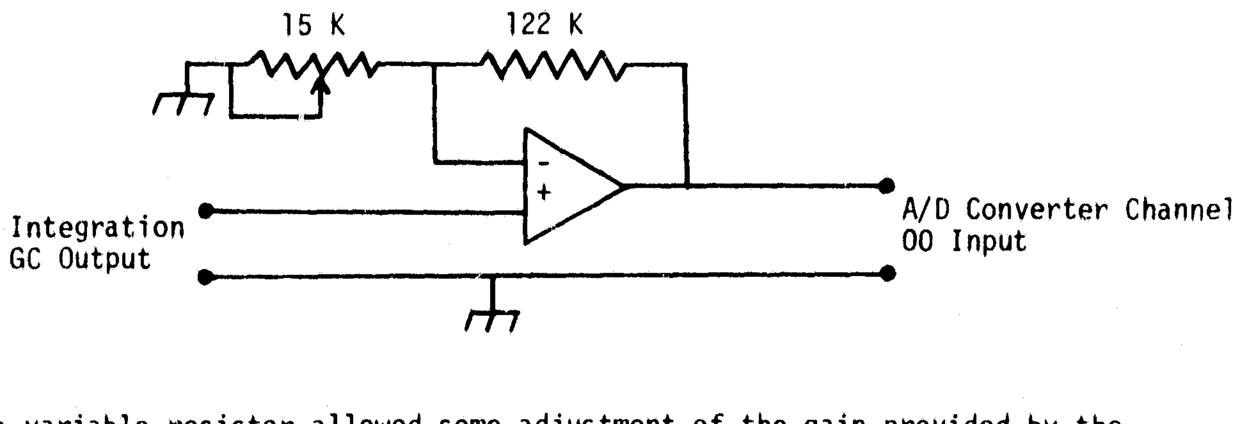
The system used to produce the 2.8% atmosphere of $CBrF_3$ consisted of a flow controller attached to a cylinder of the gas equipped with a dual stage pressure regulator. The gas, obtained in 99% purity from DuPont De Nemours and Co., was directed through the flow controller to the air return duct of the chamber recirculation system. The gas was turned off when monitoring indicated that the proper concentration of $CBrF_3$ in the chamber had been reached.

A Carle Instruments model 211S flame ionization gas chromatograph (GC) was used to monitor the concentration of $CBrF_3$ in the exposure chamber. The valve sequencer on the instrument was programmed to automatically inject and analyze chamber air samples every 15 minutes. The resulting chromatograms were compared with a standard curve and the concentration determined. Appropriate action was taken as indicated by the results of these analyses.

During off duty times automatic monitoring was accomplished with the aid of a Motorola M6800 microprocessor based computer system. The computer system consisted of a Southwest Technical Products Corporation (SWTPC) 6800 computer with 12K bytes of random access memory, a SWTPC CT 64 interactive display terminal, a Percom Data Corporation CIS 30 cassette/terminal interface, a Teletype Corporation model 33 teletype and an analog to digital (A/D) converter. The function of the computer system was to sample the signal output voltage of the gas chromatograph at the time when the chromatogram was being recorded, determine the peak height and based on the value obtained, take appropriate action. In addition, the computer also stored in a reserved area in memory a digital value equivalent to the peak height of each peak recorded. A description of how the computer system was implemented follows.

The A/D converter circuit is the same as used by Zimmer (15). The circuit uses an Analog Devices AD571 integrated circuit to convert a 0 to 10 volt analog signal at its input to a digital value between 0 and 1024. The digital value is directly proportional to the input voltage at the time of conversion. The device is capable of performing a 10-bit A/D conversion in as little as 25 microseconds. Also included in the circuit is a LM310 operational amplifier used as a voltage follower and an Analog Devices AD7501 multiplexer. The AD7501 allows the computer to select any one of eight different signals to be sampled for A/D conversion. A Motorola 6821 peripheral interface adapter integrated circuit is used to interface the AD571 A/D converter to the M6800 computer data bus lines. The components were wire wrapped on a prototype board supplied by Micro Works of Del Mar, California, which plugs directly into the Southwest Technical Products Corporation microcomputer.

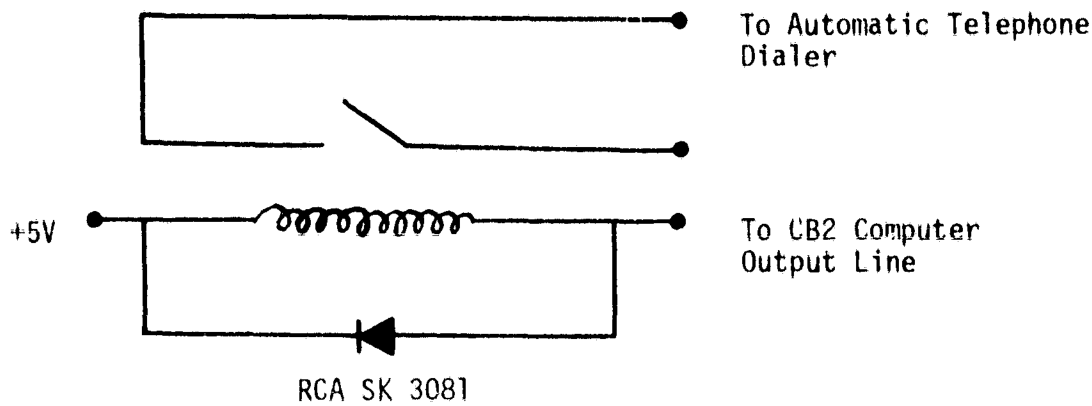
Interfacing the Carle Instruments gas chromatograph to the A/D converter required an amplification stage to be included on the Micro Works prototype board. A 741 operational amplifier was used to amplify the GC signal by a factor of 11. The circuit used is shown below.




The variable resistor allowed some adjustment of the gain provided by the operational amplifier. Since the voltage used by the 741 was taken from the integration output, this allowed the GC 1 mv output to be used in the normal fashion, as an input to a strip chart recorder. This arrangement also allowed the GC range setting switch to be used as an attenuator. This last feature proved useful when testing the monitor computer program for proper operation.

A second modification was necessary in order to provide the computer with the information necessary to determine when a peak was being recorded. A simple two-pole, double throw, 110 volt relay was used for this purpose. The GC value sequencer was programmed to activate the normally open contacts of the relay 15 seconds after a sample was injected. One set of relay contacts activated the strip chart recorder chart drive function while the other set of contacts provided a +5 volt signal to input channel 01 of the A/D converter. After the peak was recorded, power was removed from the relay.

One final circuit was required to provide a computer controlled switch closure. This circuit consisted of a computer compatible reed relay and a clamping diode. The circuit is shown below.




Outputting a 0 to the CB2 line caused the normally open contacts of the reed relay to close. The clamping diode bypasses voltage surges appearing at the CB2 line when current through the relay coil is turned off.

A M6800 assembly language computer program, utilizing the hardware circuits just described, was written to provide the computer with the automatic monitoring function described earlier. The program starts by sampling channel 01 at a rate of about 60 A/D conversions per second. Approximately 15 seconds after the value sequencer injects a sample into the GC the relay switch connected to channel 01 is activated. This causes a +5 volt signal to be applied to the channel 01 input to the A/D converter. As soon as the computer senses a voltage greater than 1 volt on channel 01 it starts sampling channel 00 in addition to channel 01. The computer also outputs a zero character to the display terminal after each conversion indicating that channel 00 is being actively sampled. The program continues in this manner until a voltage greater than 0.275 volts is detected on channel 00. Any time the 0.275 volt threshold voltage is exceeded the zero character display is terminated and the result of A/D conversion on channel 00 is stored in sequential locations in memory. The result is a memory array of values corresponding to a digital representation of the peak recorded. After the peak is recorded the GC value sequencer switches to a

10-minute waiting period before recycling. The relay is deactivated, removing the +5 volt signal from channel 01. The computer detects this transition and searches the memory array for the largest value. The value found corresponds to the peak height of the chromatographic peak just recorded. (Using a calibration curve, peak height values can be directly related to the $CBrF_3$ concentrations.) The program then stores the peak height value in a table and then tests it to determine if it is within limits. If the value is within limits, the program returns to the start and continues execution. If the value is not within limits, a flag is set from zero to one indicating a first failure. The program then returns to the start and continues execution. If the very next peak is within limits, the flag is reset to zero. If the very next peak fails also, then the computer outputs a zero to the CB2 line causing the computer controlled switch to close. This action causes the automatic telephone dialer to play a pre-recorded message to security personnel notifying them that an emergency condition exists in the exposure chamber. Security personnel, on duty 24 hours a day, then contact competent personnel who are on call to handle emergency situations.

A graph of the concentration profile for a typical day of the first exposure is shown in Figure 1. Each point represents the concentration of $CBrF_3$ at 15-minute intervals for a 24-hour period from 8:00 AM on one day to 8:00 AM the following day. The variation seen during the normal work day is a result of opening and closing of the exposure chamber doors necessitated by experimental procedures. The large drop in concentration noted in the morning and late afternoon is due to the normal animal care given the animals at these times. Such chores as providing food and water, removal of wastes and general sanitation functions were performed daily at approximately 8:30 AM and 4:30 PM. Medical attention, when required, was administered in the late afternoon. The concentration was raised about 10% high at the end of the day and allowed to drop to about 10% low during the night. After the morning animal care was provided the concentration was raised to 2.8% and maintained at that level during the day. Appendix B contains the data used to plot Figure 1 and also data for the remaining 29 days of the experiment. Figures 2 and 3 are graphs of the average daily concentration of $CBrF_3$ alotted versus day number. Each point is the arithmetic mean of the 15-minute reading taken during each day of exposure. The vertical line at each point represents the standard deviation in Figure 2 and the standard error in Figure 3. The data used to plot these figures are also contained in Appendix B.

For the first experiment, 72% of all readings were within 10% of the 2.8% $CBrF_3$ concentration. Ninety-seven percent of the readings were within 20% of the same concentration value.

For the second experiment, similar information is provided by Figures 4, 5 and 6. Figure 4 is a graph of the concentration profile for a typical day while Figures 5 and 6 are graphs of the average daily concentration versus day number. The standard deviation at each point is depicted in Figure 5 and the standard error at each point is shown in Figure 6. Data used to obtain these plots is contained in Appendix B.

Seventy-nine percent of all concentration determinations during the second exposure were within 10% of the desired concentration value of 2.8%

Figure 1

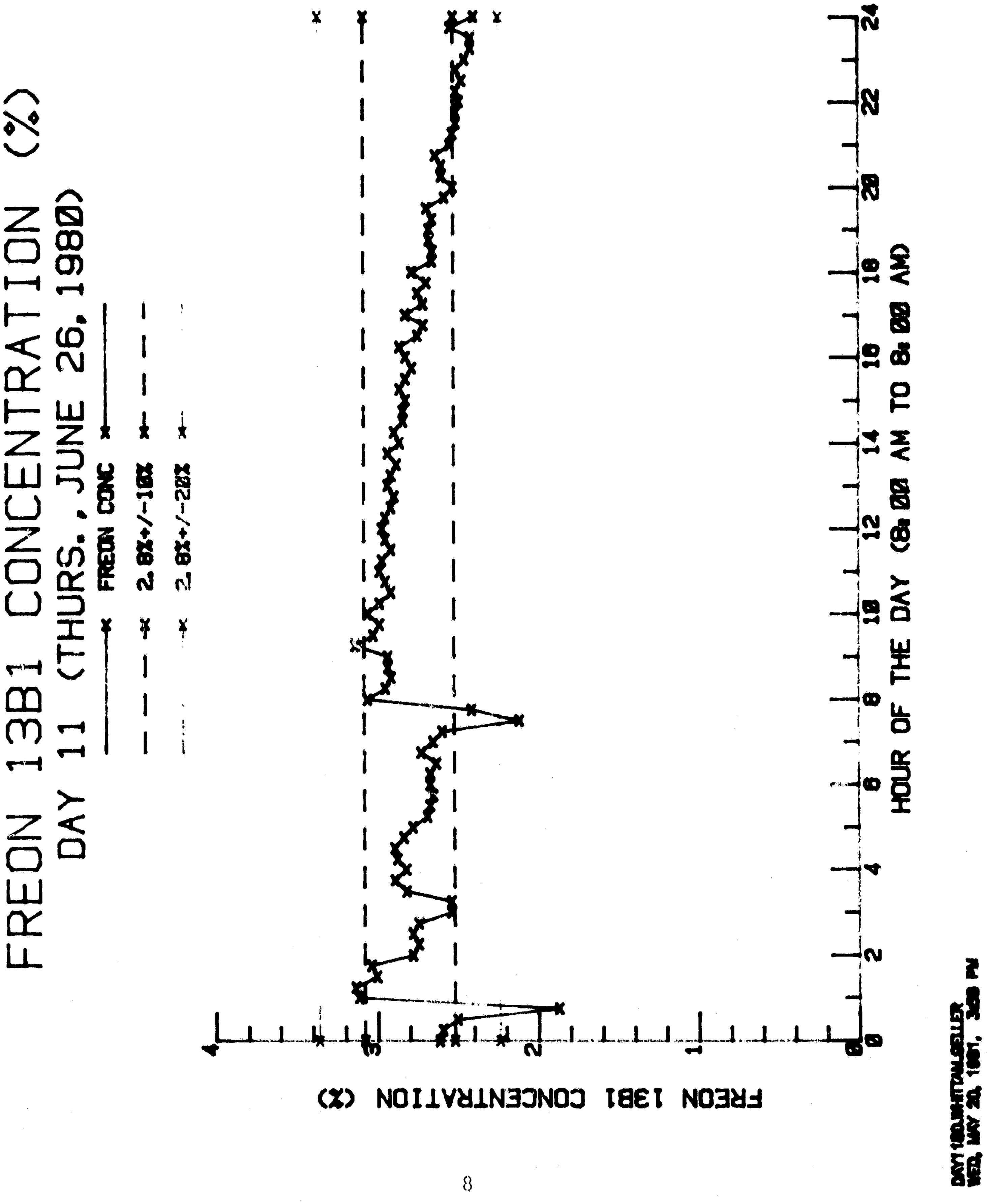

FREON 13B1 CONCENTRATION (%)
DAY 11 (THURS., JUNE 26, 1980)
FREON CONC
2.8%+/-10%
2.8%+/-20%
HOUR OF THE DAY (8:00 AM TO 8:00 AM)
0
2
4
6
8
10
12
14
16
18
20
22
24
FREON 13B1 CONCENTRATION (%)
0
1
2
3
4

Figure 2

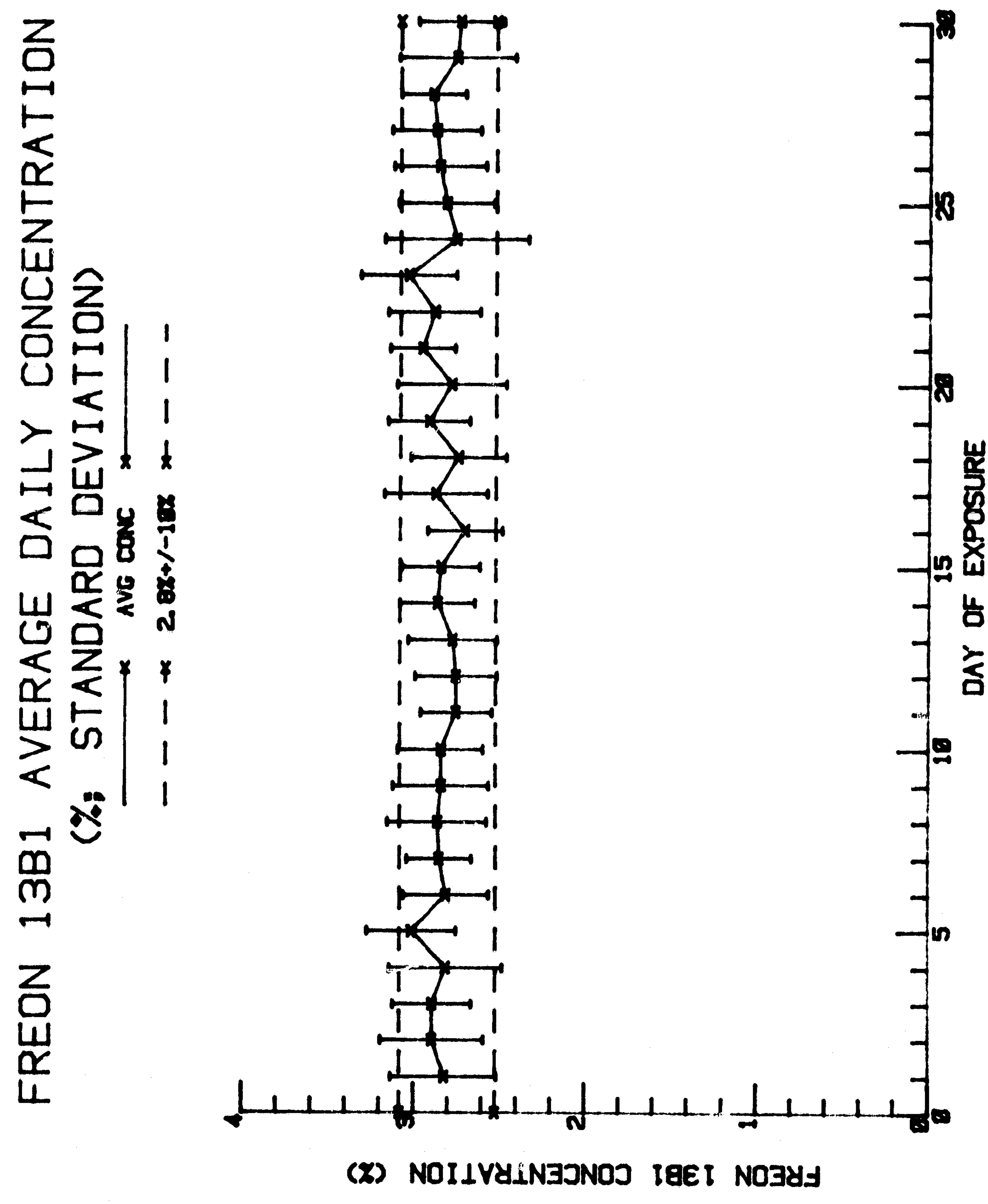

FREON 13B1 AVERAGE DAILY CONCENTRATION
(%; STANDARD DEVIATION)
AVG CONC
2.8%+/-10%
DAY OF EXPOSURE
FREON 13B1 CONCENTRATION (%)
0
5
10
15
20
25
30
4
3
2
1

Figure 3

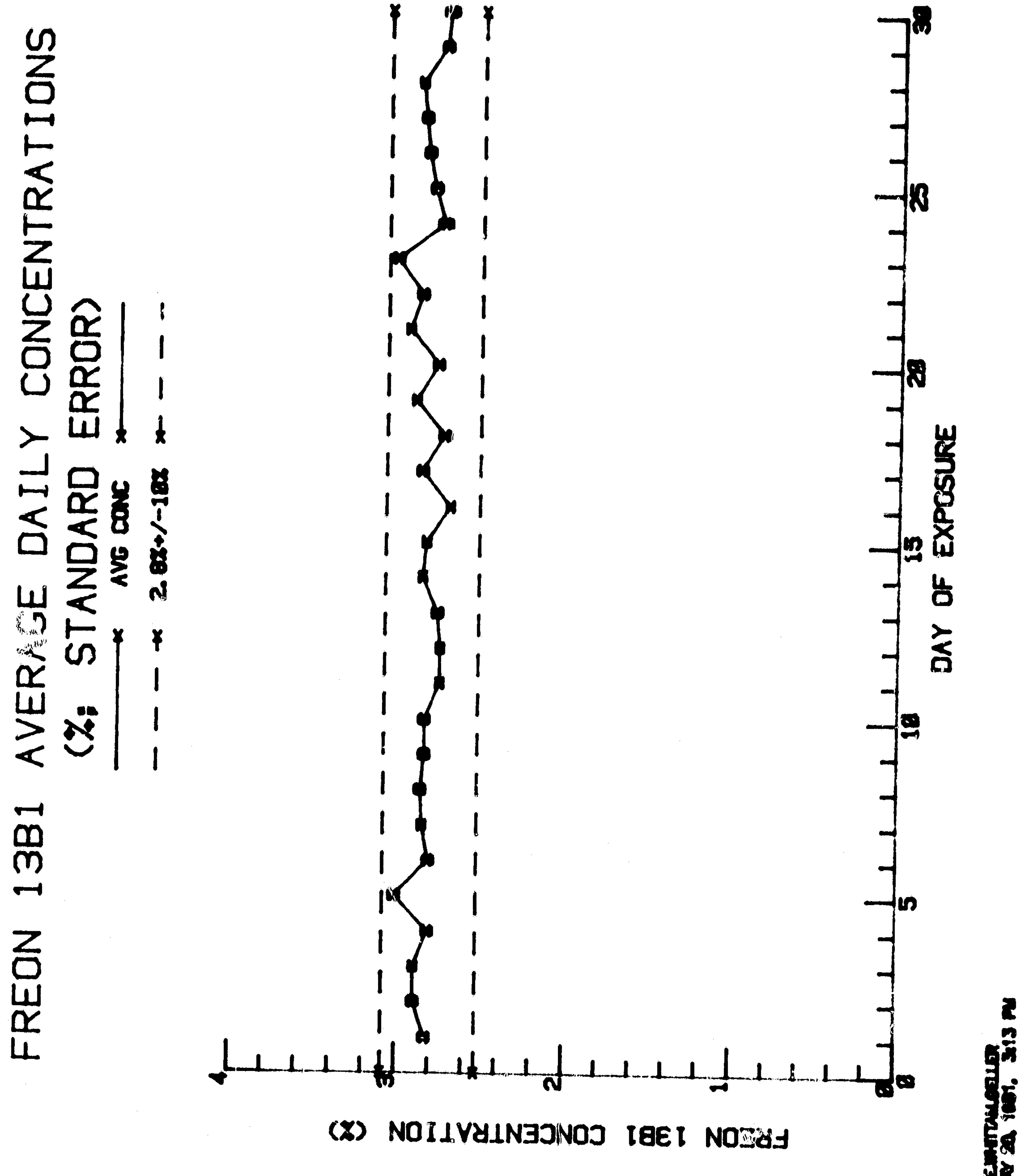

FREON 13B1 AVERAGE DAILY CONCENTRATIONS
(%; STANDARD ERROR)
AVG CONC
2.8%+/-10%
FREON 13B1 CONCENTRATION (%)
DAY OF EXPOSURE
0
1
2
3
4
0
5
10
15
20
25
30

Figure 4

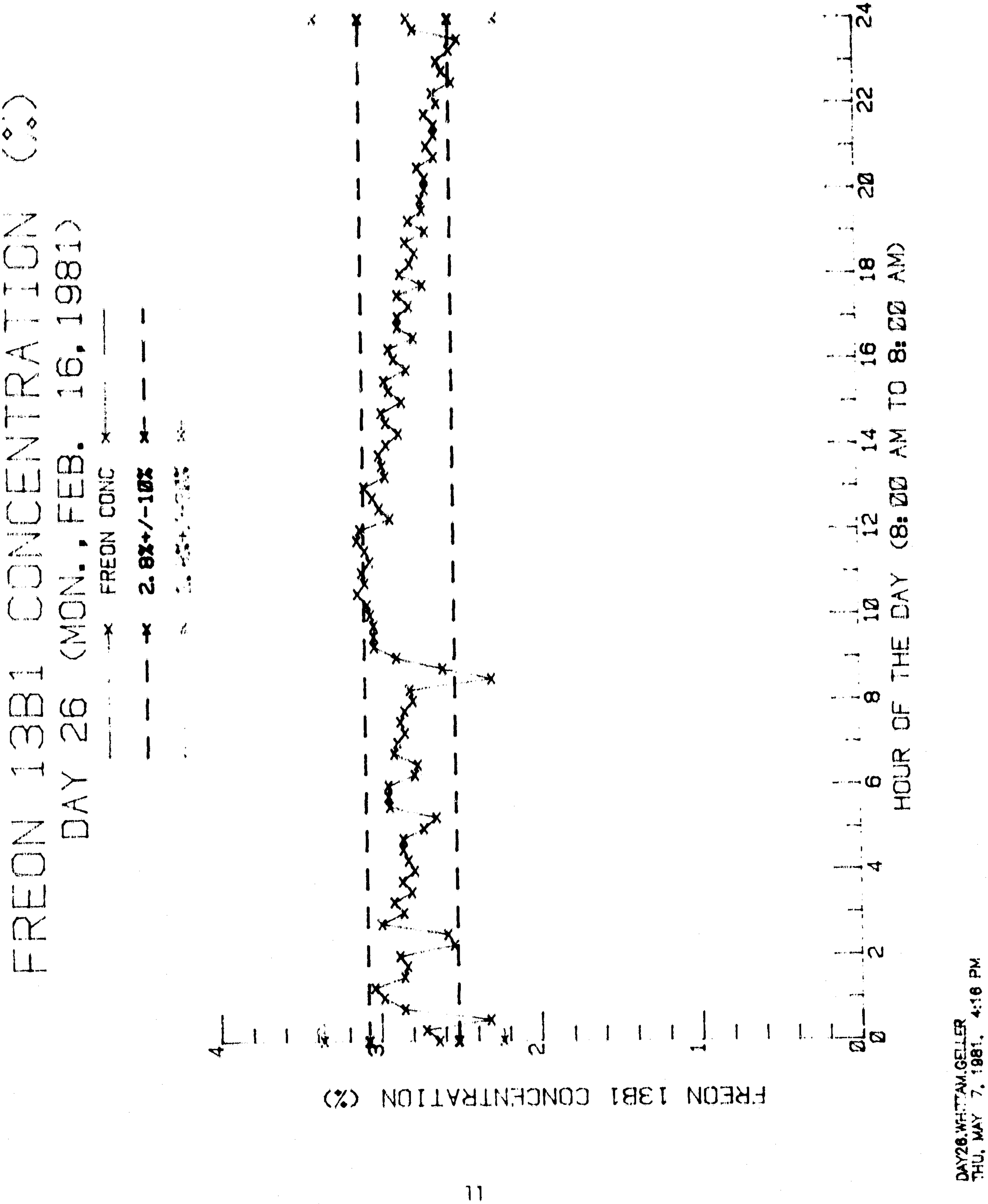
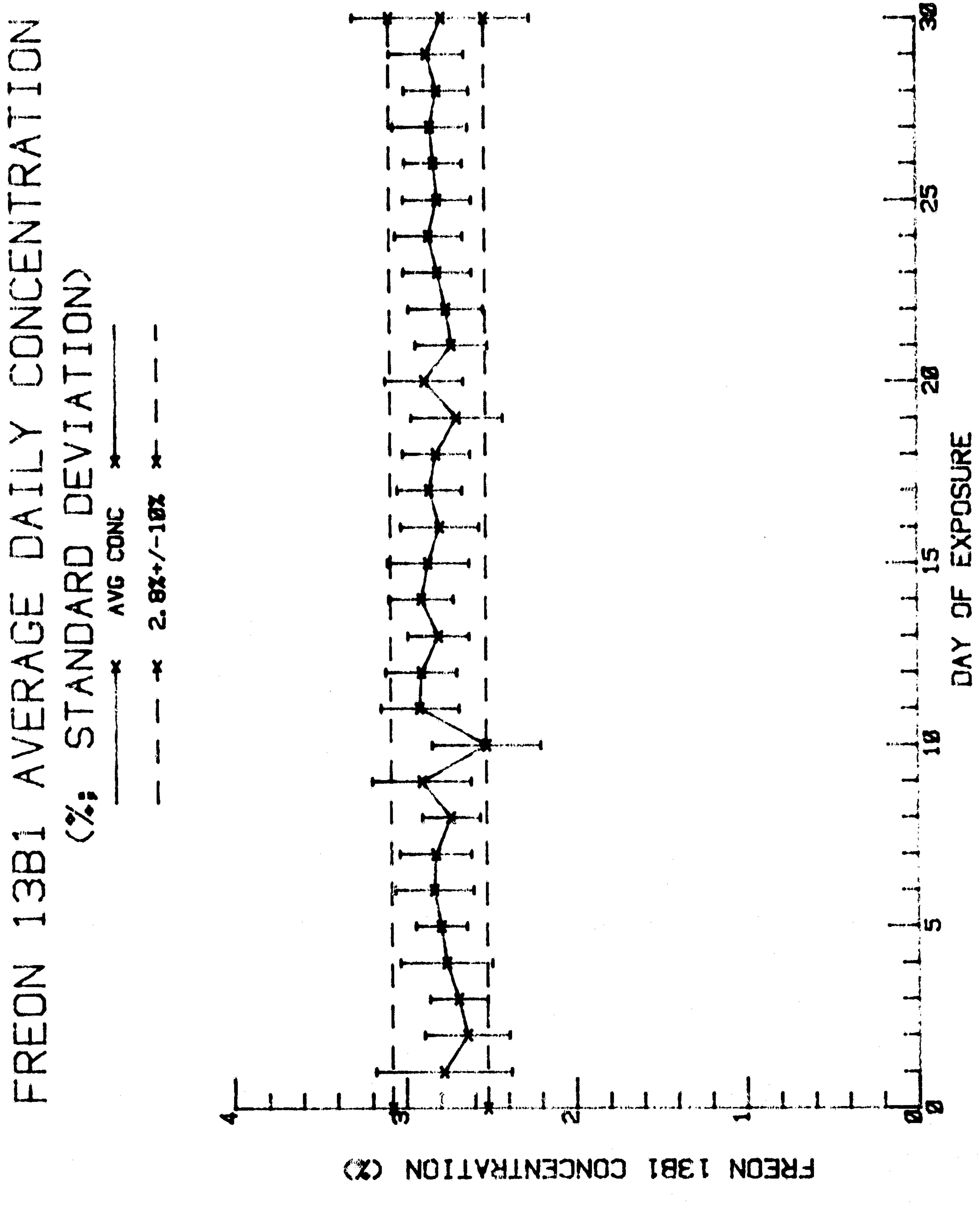
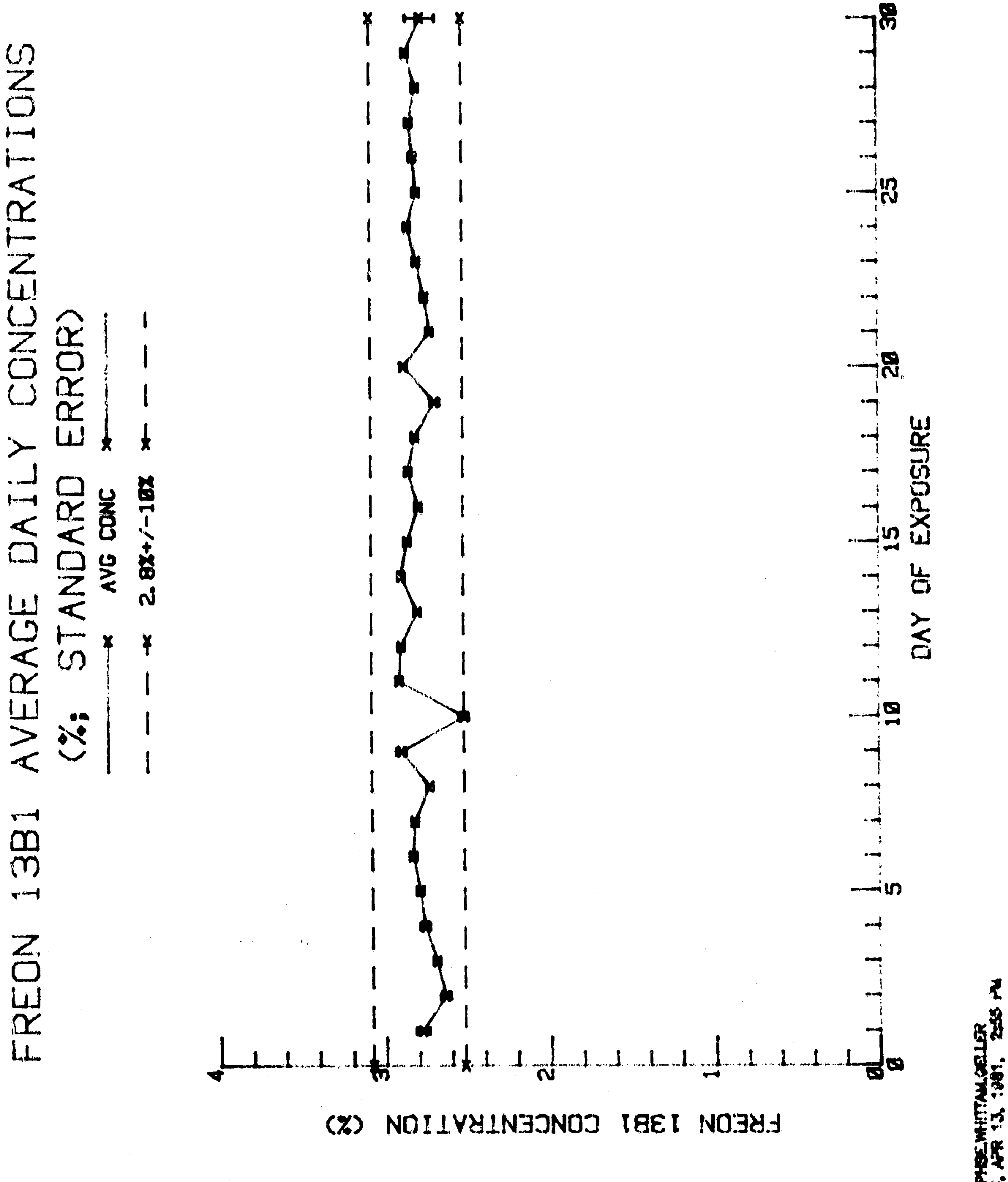

FREON 13B1 CONCENTRATION (%)
DAY 26 (MON., FEB. 16, 1981)
FREON CONC
2.8%+/-10%
FREON 13B1 CONCENTRATION (%)
HOUR OF THE DAY (8:00 AM TO 8:00 AM)
0 2 4 6 8 10 12 14 16 18 20 22 24
0 1 2 3 4
THU, MAY 7, 1981, 4:16 PM

Figure 5




GRAPH,WHITTAM,GEILER
MON, APR 13, 1981, 2:22 PM

Figure 6


FREON 13B1 AVERAGE DAILY CONCENTRATIONS
(%; STANDARD ERROR)
AVG CONC
2.8%+/-10%
FREON 13B1 CONCENTRATION (%)
DAY OF EXPOSURE
0
1
2
3
4
0
5
10
15
20
25
30
GRAPHSE.WHITTAL.GELLER
MON, APR 13, 1981, 2:55 PM

$CBrF_3$. As in the first experiment, 97% of the determinations were within 20% of the desired concentration value.

Air contaiminants generated by the animals in the chamber were controlled through the use of cannisters of solid absorbents. Animal odors were removed using Purafil® Chemisorbant pellets. The pellets are self-indicating, changing from purple to brown to black as they become deactivated. The Purafil® was changed when the pellets in the upper layers of the cannister were brown and those in the lower levels were black. For the removal of carbon dioxide ($CO_2$) Baralyme®, a form of granulated barium hydroxide, was used. Although the Baralyme® does change color as it reacts with $CO_2$, special instruments were used to monitor the concentration of $CO_2$ in the exposure chamber. During normal working hours a Carle model 211S gas chromatograph was used. The technique is based on the conversion of $CO_2$ to methane which can then be detected using a conventional flame ionization detector. Initially the sample is injected onto a silica gel/Molecular Sieve 5A column which separates carbon containing gases from nitrogen and oxygen. As soon as the oxygen is detected (it appears as a small artifact peak on the chromatogram) the sample is backflushed through a Carbosieve B column. The Carbosieve B column separates methane, carbon monoxide and carbon dioxide before passing the gases to the instrument methanizer. The methanizer contains catalyst maintained at 400°C which converts carbon monoxide and carbon dioxide to methane which is then detected by a flame ionization detector. The concentration was determined by comparison with a standard curve. At other times, the concentration of $CO_2$ was determined by Southwest Research Institute personnel using a Horiba infrared analyzer model A1A23. A sample was withdrawn from the chamber by a small vacuum pressure pump and passed into the instrument long path infrared gas cell. The instrument output was recorded for 10 minutes on a strip chart recorder. The concentration was determined by comparison of the maximum reading recorded with a table of standard values. The instrument was calibrated before and after each sample was taken using a 4,195 ppm standard sample.

The frequency of sampling was determined from the rate at which $CO_2$ was generated by the animals in the chamber in the absence of any Baralyme . This determination was necessary because of a phenomenon known as channeling. When channeling occurs the air circulating through the cannister bypasses the bulk of the Baralyme® absorbent and follows preferred paths called channels. These channels, usually situated along the walls of the cannister, are quickly deactivated resulting in a rapid build up of $CO_2$ in the exposure chamber. Since channeling can occur at any time, periodic monitoring is necessary. For the exposure using the four juvenile baboons the rate of $CO_2$ build up was found to be 0.14% per hour. The maximum allowable concentration of $CO_2$ in the chamber was chosen as 0.5%. This value was chosen because no effects have been observed in humans exposed to this level of $CO_2$ for extended periods of time (16). Since the 0.5% level would be exceeded in 4 hours, a sampling period with a safety factor of two was chosen. Samples were analyzed every 2 hours and fresh Baralyme® added when the concentration of $CO_2$ in the chamber approached 0.40%. For the exposure using the six cynomolgus monkeys the rate of $CO_2$ build up was 0.10% per hour. Because of the satisfactory performance of the Baralyme cannister during the first 30-day exposure, a sampling time of once every 4 hours was chosen for the second experiment. As an additional precaution, Baralyme® was changed at a $CO_2$ concentration of 0.15% instead of the 0.40% value used for the first experiment. Should channeling occur, keeping the $CO_2$ concentration at this low level would require at least 3-1/2 hours for $CO_2$ generated at 0.10% per hour to reach the 0.5% value.

The graphs of $CO_2$ concentration as a function of time are shown in Figures 7 and 8. Although more readings were taken during the first experiment, each point on both graphs represents a determination of $CO_2$ concentration every 4 hours.

B. Behavioral

1. Experiment 1

Match-to-Sample Discrimination Task

A match-to-sample behavioral task was used to assess the effects of $CBrF_3$ on behavior and performance and to provide measures of alterations by $CBrF_3$ on the animal's reaction time, perceptual acuity and discrimination performance. Each animal was tested during a 60-minute session on Monday through Friday of each week during the 30 days of exposure. In addition, animals were tested prior to exposure to obtain baseline performance data and after exposure to follow any post-exposure effects. For this behavioral task, the juvenile baboons were trained to press one of two keys as the correct match to a probe stimulus presented earlier on a third key in order to obtain a solid food reward in the form of a banana pellet. The three keys were translucent discs mounted on the wall of the experimental panel. Behind each key was an electronic projection device which was programmed to project one of 12 possible symbols, such as a red circle, green square, +, etc., on each key at any time. A variable interval (VI) tape programmer was used to program the discrimination trials at irregular intervals on the average of one every 3 minutes. This served to prevent learning by the animal of the timing of trial presentations. Each trial began with the projection of one of the stimuli on the center key (disc). This stimulus was terminated automatically at the end of a 30-second period or earlier by the animal's pressing of the key. At the end of the 30-second period, a timer was activated for a fixed period of time, in this case 120 seconds (delay interval). At the end of the delay interval, two symbols, one of which was identical to the symbol presented earlier on the center key, were projected on the two keys adjacent to the center key. The correct matching stimulus (symbol) was varied between the two adjacent keys during each trial in a mixed order. Pressing by the animal of the correct key (stimulus matches center key stimulus) terminated the stimuli, activated the feeder and produced a banana pellet food reward. Responses on the incorrect key simply terminated the stimuli and set the VI programming tape in motion. Correct, incorrect and intertrial responses and response times were automatically recorded, compiled and analyzed by an MSI 6800 microcomputer system.

Four juvenile male baboons were housed in individual stainless steel cages to which a behavioral test panel was attached just prior to each experimental session. The cages were kept in a cylindrical stainless steel exposure chamber, 9 feet in diameter and 9 feet high. The chamber was

Figure 7

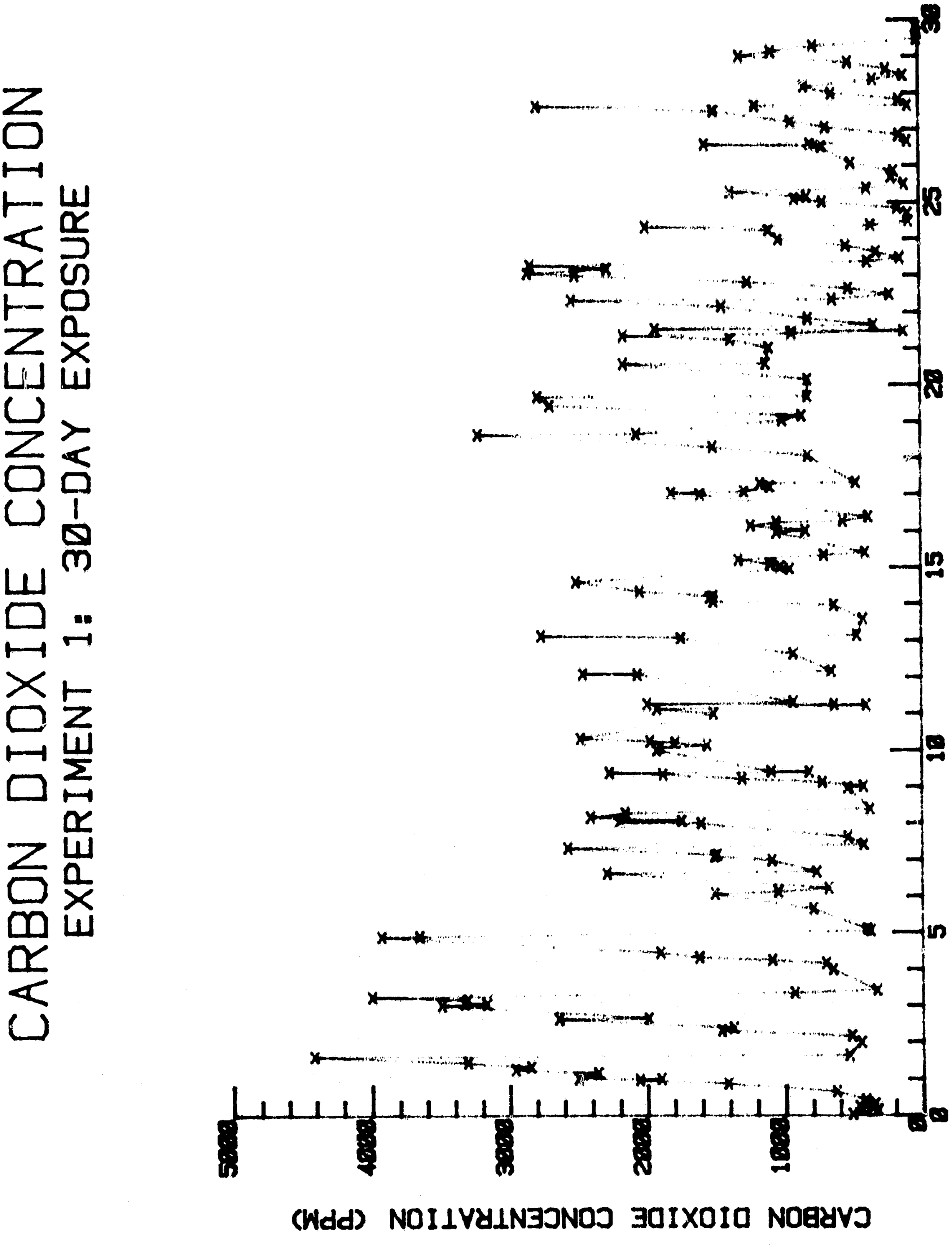
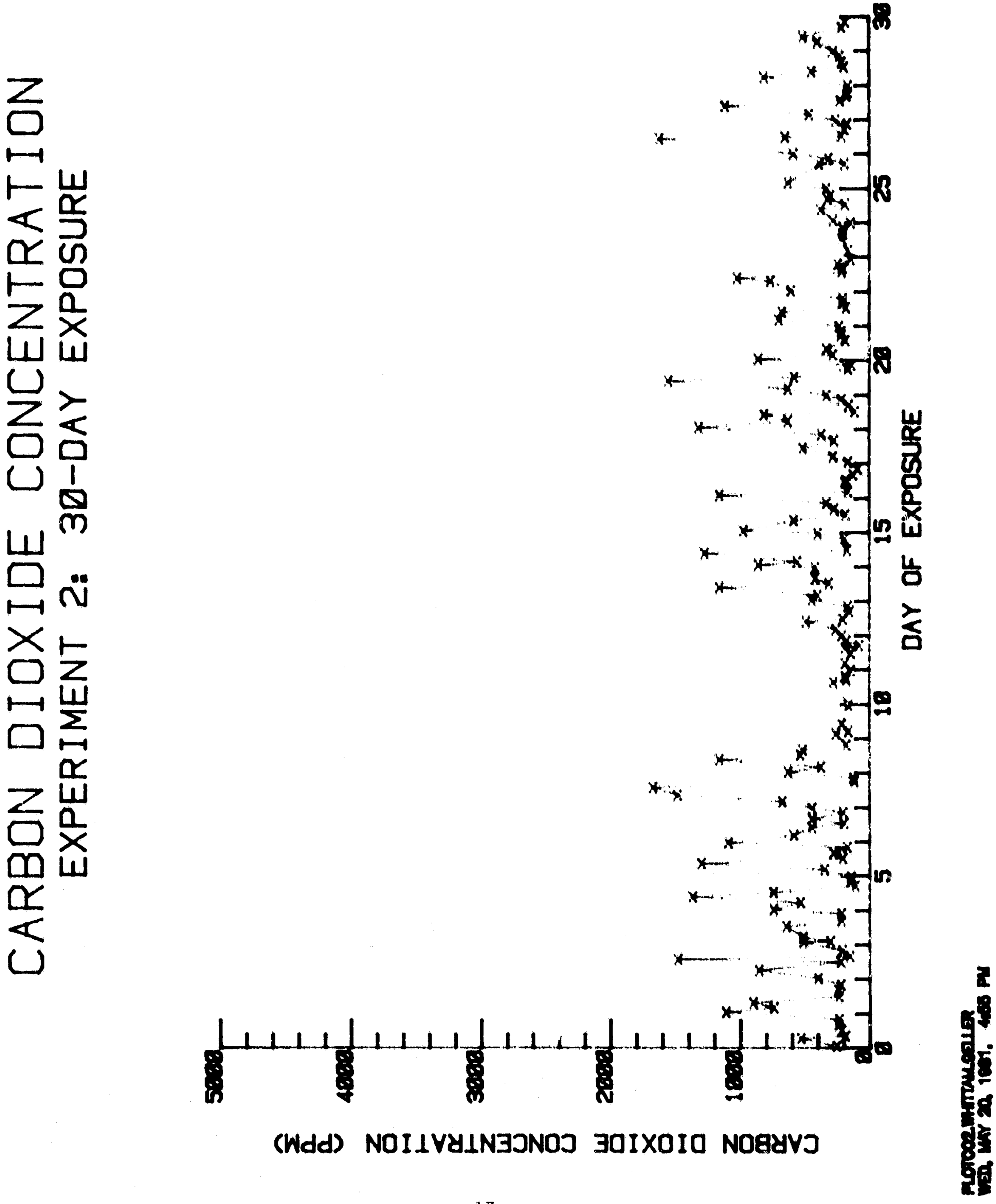

CARBON DIOXIDE CONCENTRATION
EXPERIMENT 1: 30-DAY EXPOSURE
CARBON DIOXIDE CONCENTRATION (PPM)
DAY OF EXPOSURE
0
1000
2000
3000
4000
5000
0
5
10
15
20
25
30

Figure 8


CARBON DIOXIDE CONCENTRATION
EXPERIMENT 2: 30-DAY EXPOSURE
DAY OF EXPOSURE
0
5
10
15
20
25
30
CARBON DIOXIDE CONCENTRATION (PPM)
0
1000
2000
3000
4000
5000

modified from a flow-through into a recirculating system as already described.

Behavioral data were obtained during 30-day pre-exposure control period. The four baboons were then exposed to the $CBrF_3$ at 2.8% for days. Behavioral data were obtained during the exposure period as well as during a 30-day control period following the exposure.

Results and Discussion

Figure 9 shows the mean number of responses during the delay intervals for each subject under the gas and during the pre- and post-exposure periods. The effects were significant for all animals (two-tailed student t). However, the changes in response rates were not systematic in that IX-2409 and IX-2706 showed increased response rates while IX-2410 and IX-2708 showed a decrease in rates. During the 30 days post exposure none of the animals' baselines returned to the pre-gas control levels. Figure 10 shows the percent responses to the center probe stimulus. Under the gas the mean responses to the center sample increased for all animals. This measure increased further for IX-2708 during the 30-day post-exposure period. Data for the other animals indicate a return toward pre-exposure control levels. Figure 11 shows that the animals improved in the number of correct responses during the exposure and post-exposure periods. These data indicate an improvement probably attributable to a practice effect. Figure 12 contains data on the number of trials attempted by each animal. Under the gas, there was a decrease in the number of trials attempted by all animals. This effect was significant for IX-2410. Figure 13 contains data on the mean duration times of the left and right samples. A slowing of the animals' reaction times would be reflected in an increase in this measure. This measure was increased for all animals during the exposure period. The effect was significant for IX-2409 and IX-2410. During the post-exposure period, these values decreased in the direction of the pre-exposure control levels. Direct observation of the baboons throughout the course of the study revelaed that the animals became less aggressive during exposure to $CBrF_3$.

It should be noted that a low level of ammonia was present in the closed exposure chambers throughout both the controls and exposure periods. However, it is doubtful that this had any effect on the behavior of the animals in view of a previous report (17) that the health of acclimated human workers was not adversely affected by exposures to 100-150 ppm concentrations of ammonia. Exposure to these and higher concentrations did not impair the workers' physical and mental abilities in the performance of their jobs.

The observed slowing of reaction times in all animals is in agreement with the data of Call (8) who found a significant increase in complex reaction time to psychomotor tests in human subjects exposed to 4% or 7% Halon 1301.

Figure 9

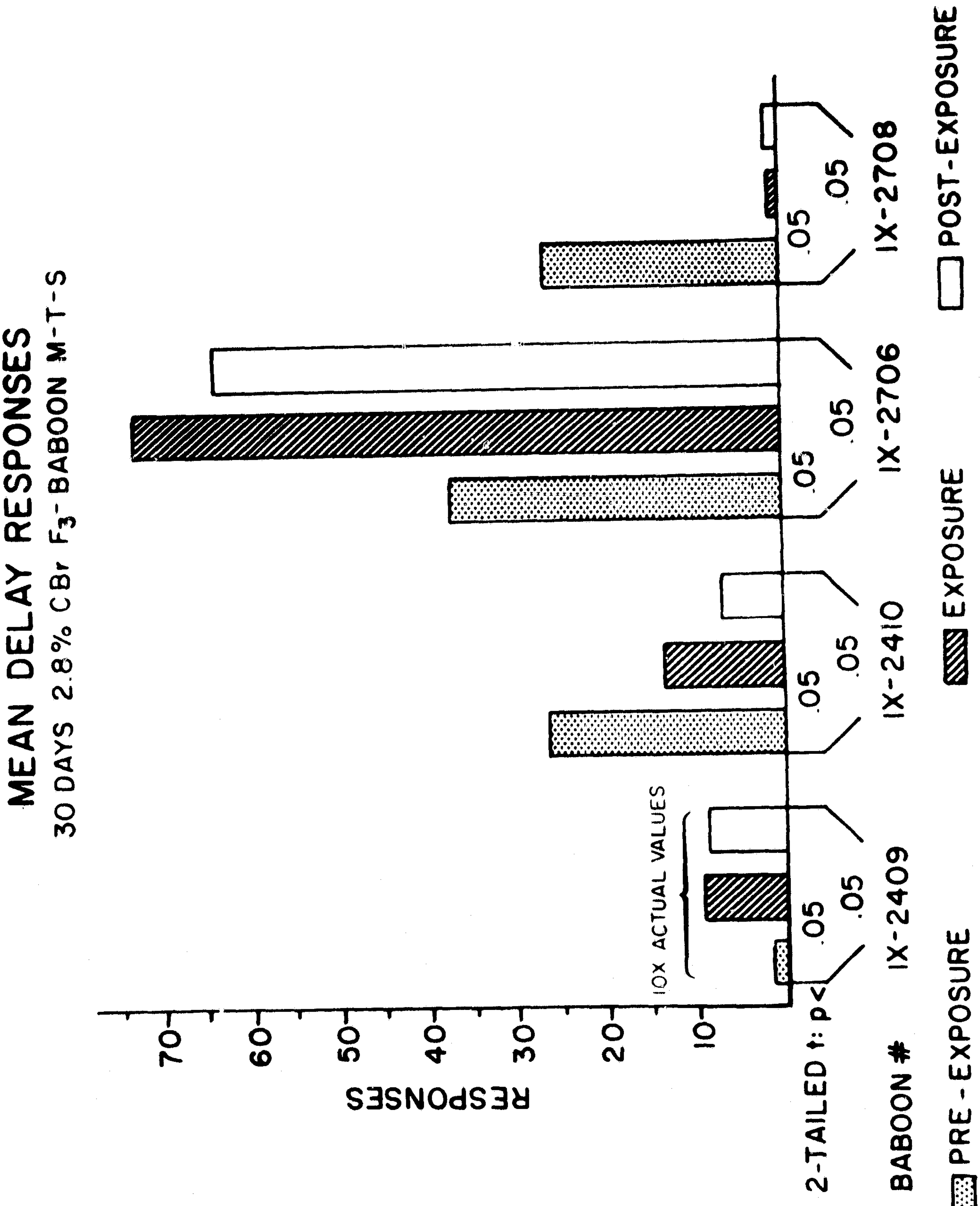
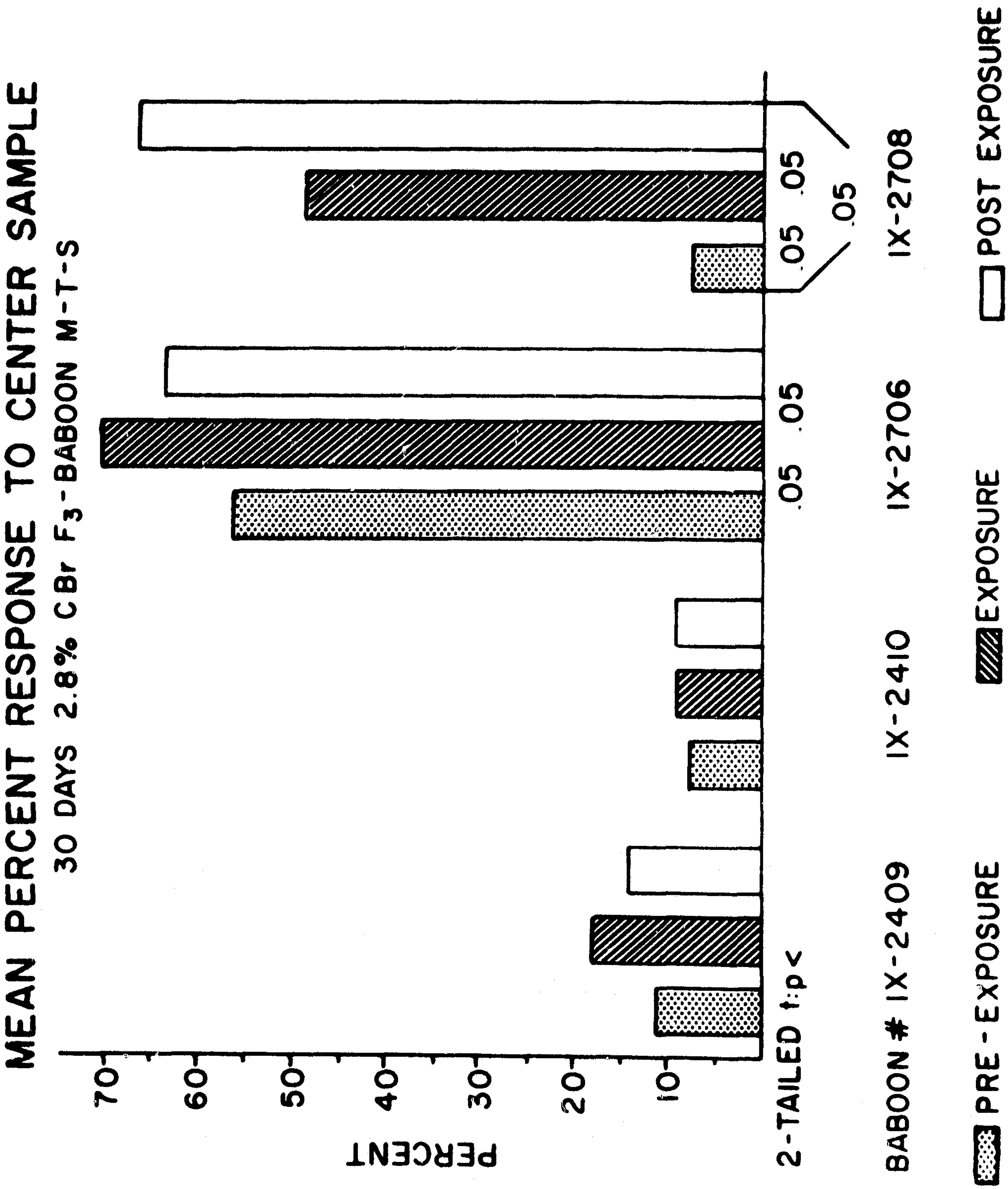

MEAN DELAY RESPONSES
30 DAYS 2.8% CBr $F_3$- BABOON M-T-S
RESPONSES
70
60
50
40
30
20
10
10X ACTUAL VALUES
2-TAILED t: p<
.05
.05
BABOON #
IX-2409
IX-2410
IX-2706
IX-2708
PRE-EXPOSURE
EXPOSURE
POST-EXPOSURE

Figure 10



MEAN PERCENT RESPONSE TO CENTER SAMPLE
30 DAYS 2.8% CBr F3-BABOON M-T-S
PERCENT
70
60
50
40
30
20
10
2-TAILED t:p <
.05 .05
.05 .05
.05
BABOON # IX-2409
IX-2410
IX-2706
IX-2708
PRE-EXPOSURE
EXPOSURE
POST EXPOSURE

Figure 11

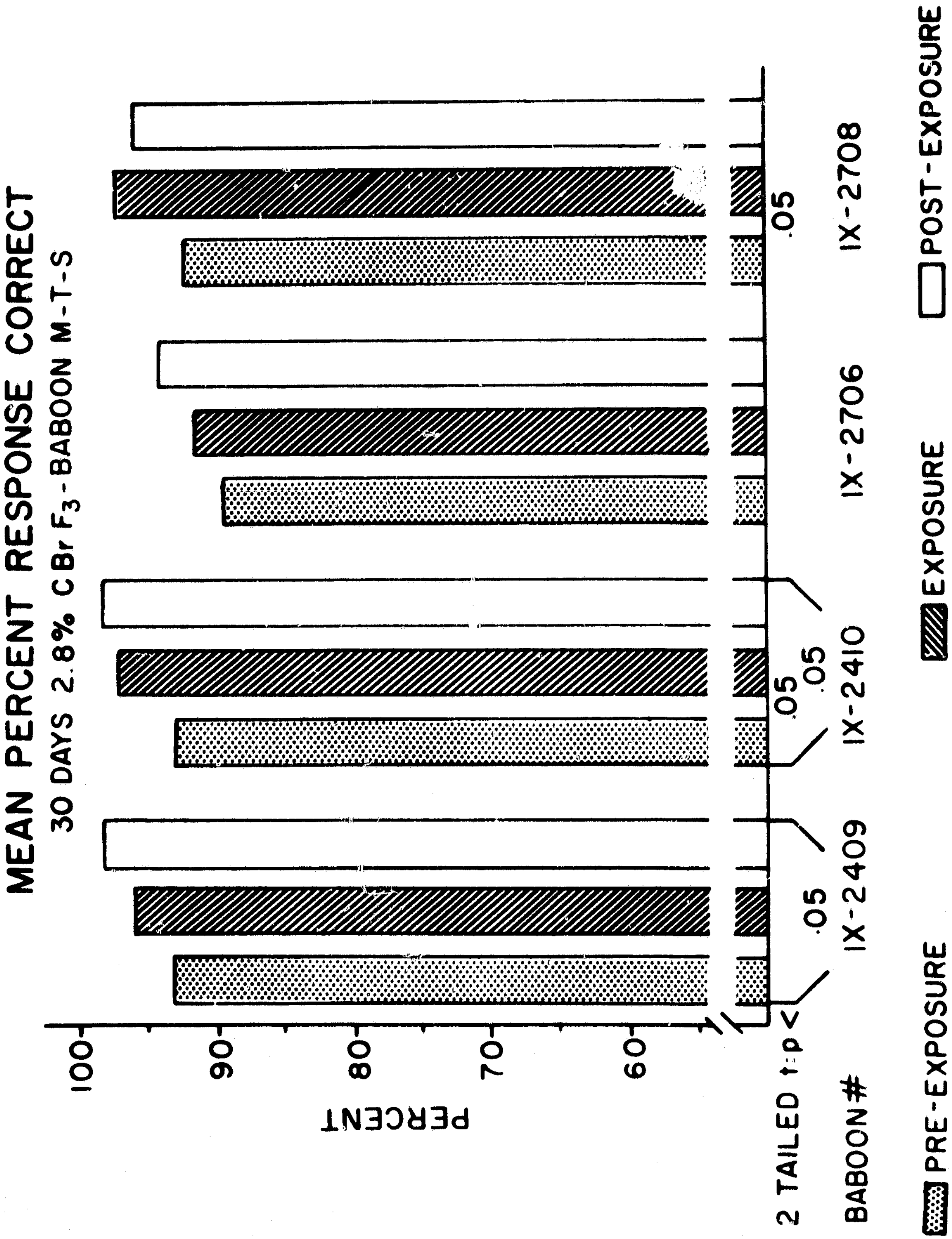
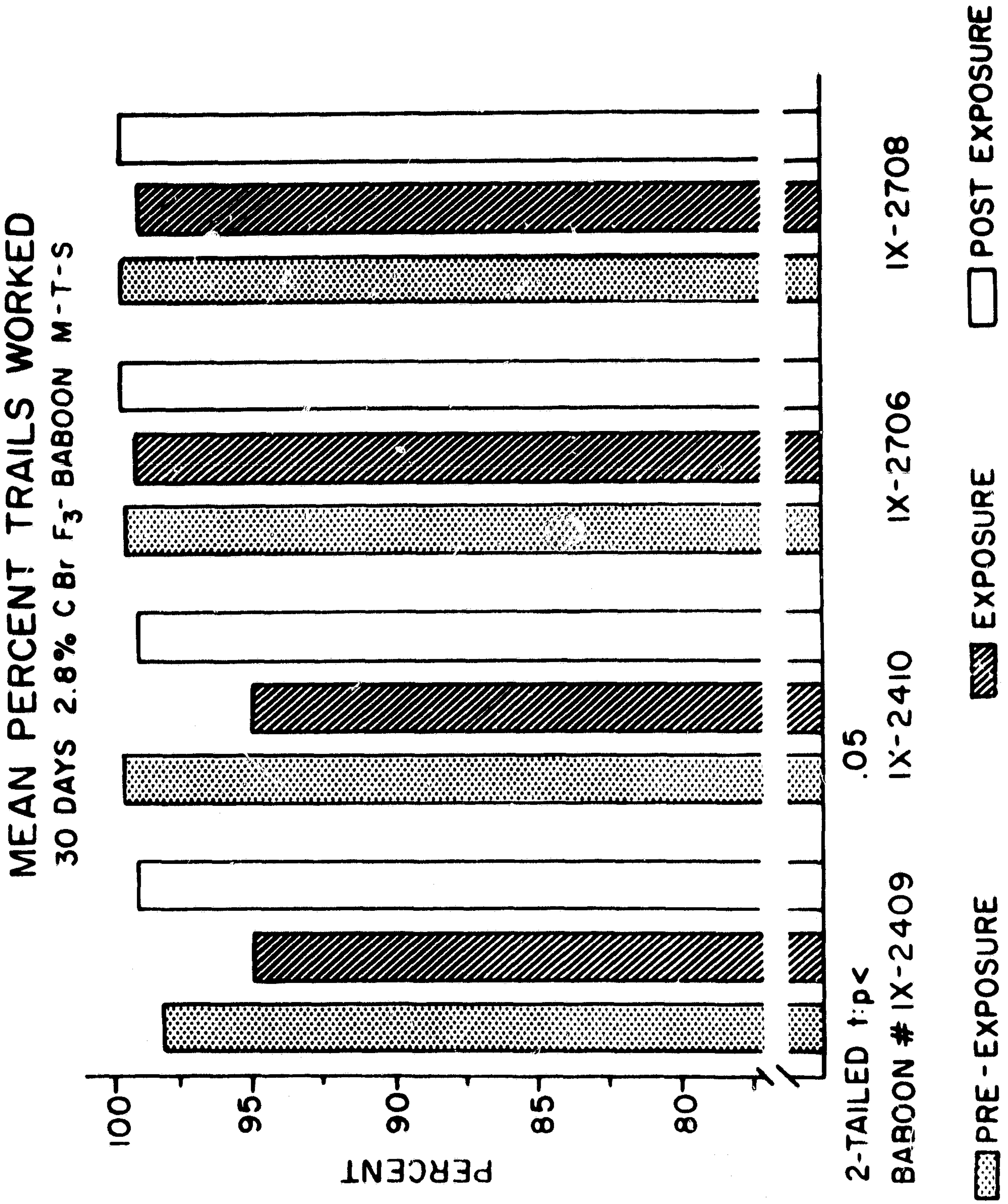
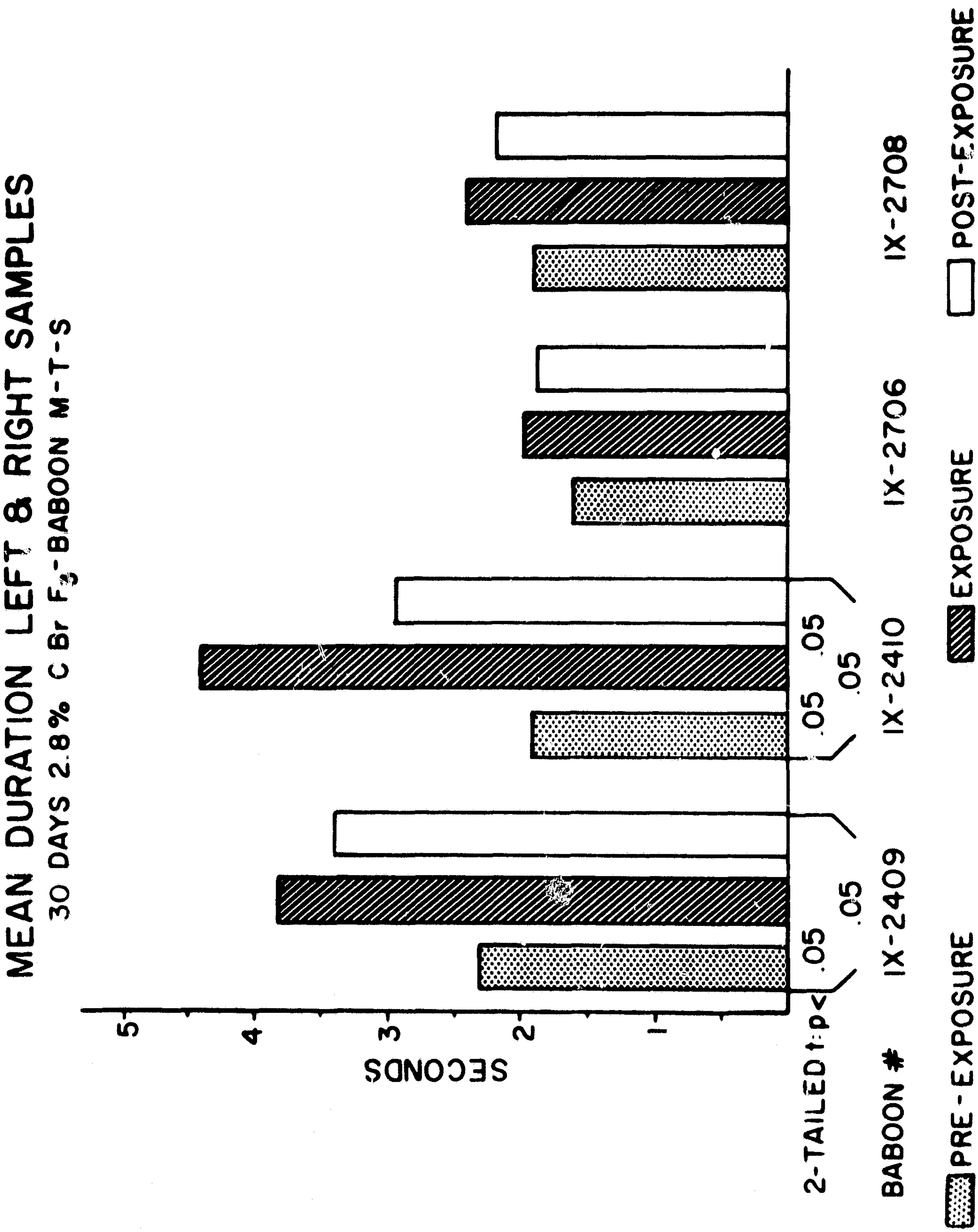

MEAN PERCENT RESPONSE CORRECT
30 DAYS 2.8% CBr $F_3$ - BABOON M-T-S
PERCENT
100
90
80
70
60
2 TAILED t: p <
.05
.05
.05
.05
BABOON #
IX-2409
IX-2410
IX-2706
IX-2708
PRE-EXPOSURE
EXPOSURE
POST-EXPOSURE

Figure 12



MEAN PERCENT TRAILS WORKED
30 DAYS 2.8% C Br F3- BABOON M-T-S
PERCENT
100
95
90
85
80
2-TAILED t:p<
.05
BABOON # IX-2409
IX-2410
IX-2706
IX-2708
PRE-EXPOSURE
EXPOSURE
POST EXPOSURE

Figure 13


MEAN DURATION LEFT & RIGHT SAMPLES
30 DAYS 2.8% C Br F3-BABOON M-T-S
SECONDS
1
2
3
4
5
2-TAILED t:p<
.05
.05
.05
.05
.05
BABOON #
IX-2409
IX-2410
IX-2706
IX-2708
PRE-EXPOSURE
EXPOSURE
POST-EXPOSURE

## 2. Experiment 2

Effects of $CBrF_3$ on Cynomolgus Monkeys Trained on a Conditioned Emotional Response (CER); Potential for the Production of Cardiac Arrhythmias

The cynomolgus monkeys were trained to press a lever for a banana pellet reward which was obtainable on a 2-minute variable interval schedule (2-min VI). When lever pressing rates stablized the visual stimulus was introduced (a red light flashing at a rate of 10 per second). The stimulus of 3-minute duration was terminated contiguously with a 600 volt shock of .25-seconds duration delivered to the animal's legs through 2 dime-sized silver electrodes strapped to the gastrocnemius muscles. Records were kept of the number of lever responses made by each subject during the stimulus periods as well as during the 3-minute periods just preceding the onset of the flashing light. Quantitation of the conditioned suppression (the amount of "anxiety") was accomplished by calculating a ratio of the lever responses during the tone periods in relation to the lever responses during the 3-minute pre-tone periods. When this value (suppression ratio) reached 0.10 or less for two consecutive days, the conditioned suppression was considered to be established.

Six cynomolgus monkeys were sedated with ketamine/atropine and maintained under gaseous anesthesia (halothane/nitrous oxide/oxygen) for the duration of surgery. The surgery was conducted by Alan Samuels, Ph.D., Gary Moore, D.V.M., and Richard Haines, D.V.M. Approximately 1 week was required for the completion of the surgery in all animals. Arterial and venous catheters were implanted in the right common carotid artery and the right internal jugular vein, respectively, through a 4 cm incision parallel to the right of the midline. For the EKG monitoring three 2 cm incisions were made: a. 1 cm above the right nipple, b. 8 cm lateral to the midline and just below the rib cage and c. 8 cm lateral to the midline and 3 cm below the rib cage on the right ventral surface. The material used was teflon-coated stainless steel, 50 strands of 50 gauge. The internal end was stripped for ca. 0.5 cm and the last 5 cm coiled to form a loop. The loop of each wire was secured with 2-0 silk to skeletal muscle in the incision site, and the respective leads tunneled subcutaneously to the neck incision with a stainless steel sound. The two catheters and the three EKG leads were exteriorized via a trocar channeled S.C. exiting through the scalp 4-8 cm behind the brow through a single exit site. All implantation sites were closed with continuous 4-0 gut S.C.

The first of the surgically implanted monkeys died within 48 hours after surgery. The clinical diagnosis for this animal was cardiovascular shock. A second animal died approximately 9 days after surgery during the recovery period that followed the surgery. This was believed to be due to a clot formation in one of the cannulae which was inadvertently washed back into the animal.

Four implanted animals and two non-implanted animals were used for the 30-day exposure to $CBrF_3$. All six monkeys were trained to criterion on the CER procedure.

Following the post-surgery period, the animals were transferred to restraining chairs and were maintained on heparinized saline (5 IU/ml) at a flow rate of 50 cc per catheter per day. The animals were kept in a large recirculating exposure chamber where they were exposed to $CBrF_3$ (2.8%) for 24 hr per day during a 30-day period. Sampling of the chamber atmosphere was accomplished automatically every 15 minutes and the concentration levels were determined by gas chromatography.

Arterial pressure was monitored through a Micron MP pressure transducer, with the dome modified to permit continuous flush. A modified lead II EKG was used for cardiac electrical monitoring, with an in-line 60-cycle notch filter. Despite the use of the notch filter, the EKG signal quality was lower than desired and frequently noisy. This is perhaps attributable to animal movement (bar pressing), the shock electrodes and magnetic fields of undetermined origin. Both signals were recorded on an 8-channel Gould 3800 recorder. The pressure signal was received by a Gould blood pressure computer, which allows the recording of pulsatile and mean pressure, as well as filtered heart rate. The data were recorded at 2 mm/sec throughout each CER, with high speed runs at 50 mm/sec for 20 sec before CER, during CER and immediately after delivery of the shock. The beginning and end of the CER were recorded on an additional channel to permit exact matching of biological and behavioral data.

Blood samples were drawn throughout the course of the study to be used for SMAC/CBC, catecholamine levels and levels of $CBrF_3$.

Blood $CBrF_3$ Analysis:

Blood concentrations of $CBrF_3$ were determined using a modification of the technique described by Mullin et al. (18). The indwelling venous catheter was cleared by withdrawing 10 ml of blood, after which 0.2 ml of blood was collected in a 1.0 ml tuberculin syringe and immediately placed in a 12 x 150 mm tube containing 50 mg sodium chloride. The tube was tightly stoppered and placed on ice until analysis (within 60 min).

To analyze the blood concentration of $CBrF_3$, 10 ml of pesticide grade hexane was injected through the stopper, and the tube briefly vortexed. One microliter aliquots of the organic phase were analyzed for $CBrF_3$ by electron capture gas chromatography under the following conditions: Varian 3700 gas chromatograph equipped with a $^{63}Ni$ electron capture detector; column 4 ft x 2 mm i.d. nickel column packed with 3% OV-1 one 100/120 gas chrom Q; methane (5%) in argon carrier gas flow rate of 30 ml/min; injector temperature 230°C; detector temperature 280°C; column temperature 55°C. With these conditions the retention time of $CBrF_3$ was 0.76 min and that of hexane 3.68 min.

Plasma Catecholamine Analysis:

Noradrenaline and adrenaline were extracted from plasma samples using an alumina slurry technique. Two ml of plasma were added to a 5.0 ml Reacti Vial® (Pierce Chemical Co.) containing 50 mg of acid washed alumina (19) and 2.5 mg of the internal standard, 3,4-dihydroxybenzylamine (Aldrich Chemical Co). One ml of TRIS buffer (pH 8.6) was added, the vial vortexed briefly and shaken immediately for a period of 5 min on a reciprocating shaker.

After the catecholamines had adsorbed, the supernatant fluid was aspirated and the alumina washed with two 5.0 ml aliquots of distilled water. The alumina was then suspended in 1.0 ml of water, transferred to a micro centrifuge tube (Bio Analytical Systems) containing a 0.2 µm filter assembly and centrifuged to dryness (30 sec at 1,000 x g). Perchloric acid (200 µl, 0.1 N) was then added, the tubes vortexed briefly, allowed to stand for 5 min, vortexed again and then centrifuged at 1,000 x g for 1 min.

Aliquots (50 µl) of the 200 µl perchloric acid eluate were then injected into the SpectraPhysics 8000 liquid chromatograph for quantitative estimation of catecholamine concentrations. The chromatographic conditions were:

Mobile phase: 0.15 M monochloracetic acid, 0.12 M sodium hydroxide, 0.1 M disodium EDTA, 100 mM sodium octylsulfonate

Column temperature: 35°C

Detector: Bas model LC-4A electrochemical detector; electrode maintained at +0.75 V vs Ag/gCl reference electrode.

With these conditions the relative retention time (vs the internal standard) was 0.69 for noradrenaline and 0.9 for adrenaline.

## Results and Discussion

Figure 14 shows the blood $CBrF_3$ concentrations obtained from 3 experimental subjects following 29 days of continuous exposure to an atmosphere containing 2.8 $\pm$ 0.56% of the contaminant. Actual chamber concentrations of $CBrF_3$ are also represented in this Figure. As can be seen, blood levels of the gas are lowest in the morning, corresponding to somewhat decreased chamber levels and increase during the day with the highest levels observed between 1630 and 1700 hours.

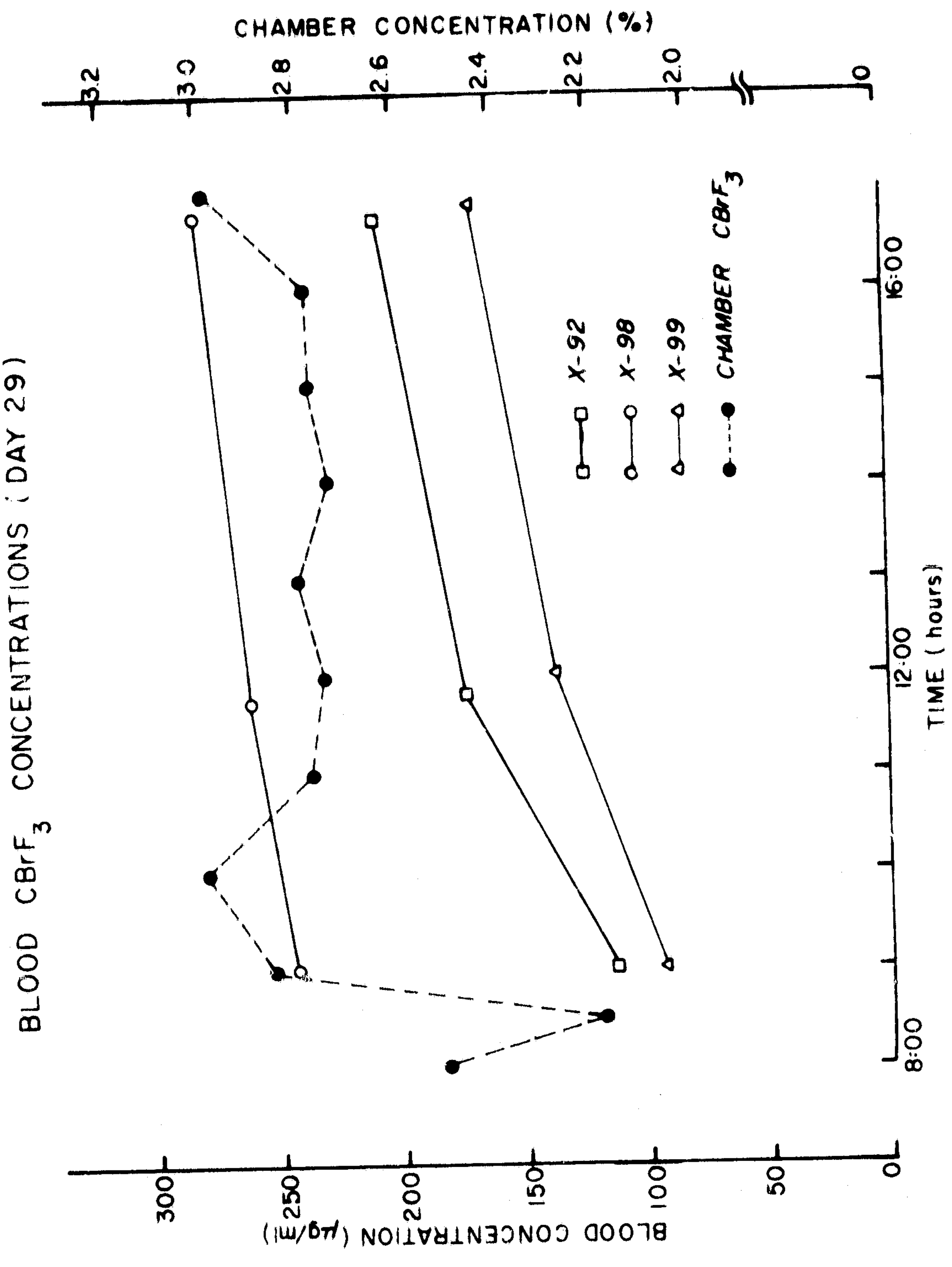
Figure 15 shows the disappearance of $CBrF_3$ from blood after the chamber is cleared of the gas. The elevated levels at the 5-min time point probably represent tissue efflux of $CBrF_3$ in response to the changing air. blood:tissue equilibrium. The rate of disappearance of $CBrF_3$ from venous blood is very rapid even after 30 days of continuous exposure; similar to the results obtained by Mullin et al. (18) after 60-min exposure.

Mean blood pressure and heart rate data for individual animals are shown in Appendix C. The dashed lines show heart rate expressed as beats per min. The dotted lines show mean blood pressure expressed as mm of Hg. Note that the two CER periods occurred during each experimental session at 15-18 min and at 45-48 min, with the shock being administered at 18 min and at 48 min.

The pattern for each monkey is relatively constant but differs between animals. In the case of animals X-96 and X-99 blood pressure and heart rate fell during the CER period, while for X-98 blood pressure and heart rate increased during the CER period.

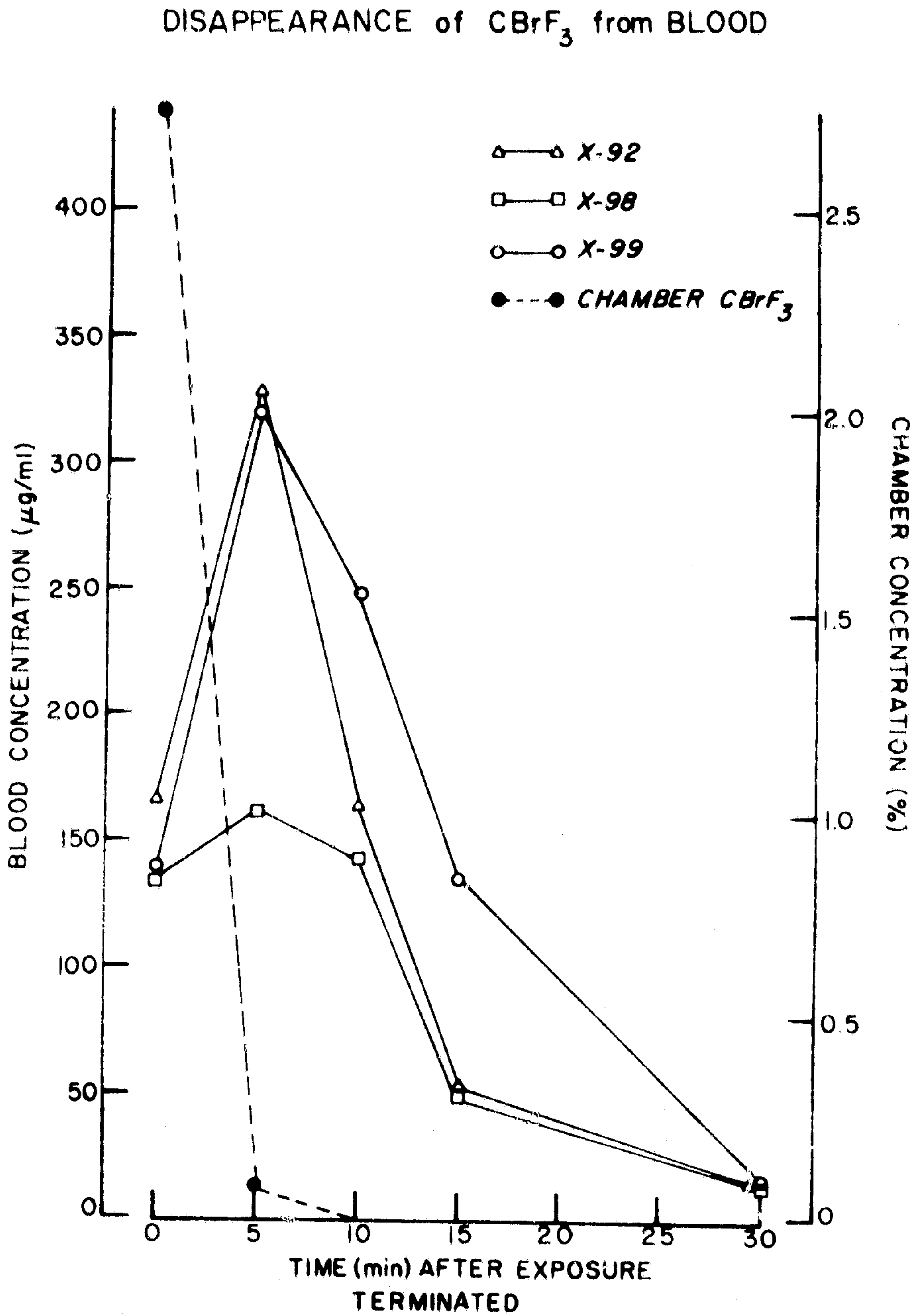
Other investigators have reported that during conditioning of a CER and in the presence of the conditioned stimulus, heart rate, blood flow and

Figure 14



BLOOD $CBrF_3$ CONCENTRATIONS (DAY 29)
CHAMBER CONCENTRATION (%)
3.2
3.0
2.8
2.6
2.4
2.2
2.0
0
X-92
X-98
X-99
CHAMBER $CBrF_3$
BLOOD CONCENTRATION (µg/ml)
300
250
200
150
100
50
0
8:00
12:00
16:00
TIME (hours)

Figure 15



DISAPPEARANCE of $CBrF_3$ from BLOOD
X-92
X-98
X-99
CHAMBER $CBrF_3$
BLOOD CONCENTRATION (μg/ml)
400
350
300
250
200
150
100
50
0
CHAMBER CONCENTRATION (%)
2.5
2.0
1.5
1.0
0.5
0
0
5
10
15
20
25
30
TIME (min) AFTER EXPOSURE TERMINATED

respiration increased in the monkey (14) and heart rate decreased in the rat (20,21). Similarly, Brady et al. (22) found increases and decreases in heart rate during training of monkeys on a CER procedure. The decrease in heart rate occurred during the early stages of conditioning and once the CER was established, it was followed by an acceleration of heart rate.

Comparison of the data of the present study with those of Brady et al. is not possible since our animals received extensive training on the CER procedure prior to surgery and monitoring of their heart rate and blood pressure. Nevertheless, several interesting relationships are evident when one compares the heart rate and blood pressure data with the observed catecholamine changes. These will be discussed below.

The raw data for the plasma NA and EPI concentrations obtained during this experiment are presented in Tables 1-4 (Appendix D). During the CER period, three blood samples were taken: one prior to the onset of the light (sample 1); one during the three minutes the light was flashing (sample 2); and one immediately after the shock was administered (sample 3). It is important to note that as the mechanics of the blood sampling procedure (i.e., clearing the line, changing syringes, drawing sample) required 1 to 3 minutes, catecholamine concentrations cannot be considered to represent instantaneous levels, but rather an average over the 1-3-min sampling period. Therefore, a direct comparison of plasma catecholamine levels with the real-time instantaneous blood pressure and heart rate measurements cannot be made. While a high correlation of plasma catecholamine levels with blood pressure and heart rate might reasonably be expected when blood samples are taken during periods in which the BP and HR are stable, this condition was not generally obtained during this study. The CER procedure produced fluctuations in both BP and HR during the sampling period, and therefore the plasma catecholamine values found represent, in some experiments, the sum of short periods of high and low levels of sympathetic activity.

Nonetheless, when the percent change in plasma NA and EPI levels over the three sampling periods (Figures 16-19) are compared with the average change in BP and HR for that same period, the correspondence is excellent. This is especially true for X-98 and X-99 for which the most BP and HR data are available. Animal X-98, for example, shows increases in both BP and HR over the CER-shock period and the catecholamine levels increase as well; X-99, whose BP and HR decrease during the CER-shock period demonstrates corresponding depression of plasma catecholamines. (On February 16, the BP and HR increased, as did the catecholamines.)

This correlation between the average changes in BP and HR and the alterations in plasma catecholamine levels (which are also "average" values) indicates the involvement of the sympathetic system in producing the physiologic disturbances induced by the CER procedure. It is also evident that under the conditions of this experiment the catecholamine concentrations were not sufficient to induce cardiac arrhythmias even after 30 days exposure to $CBrF_3$.

SMAC/CBC data are presented in Appendix E. No consistent changes were found in the cellular or biochemical constituents of the blood. However, there were variable changes in hepatic enzymes. The animals tended to have

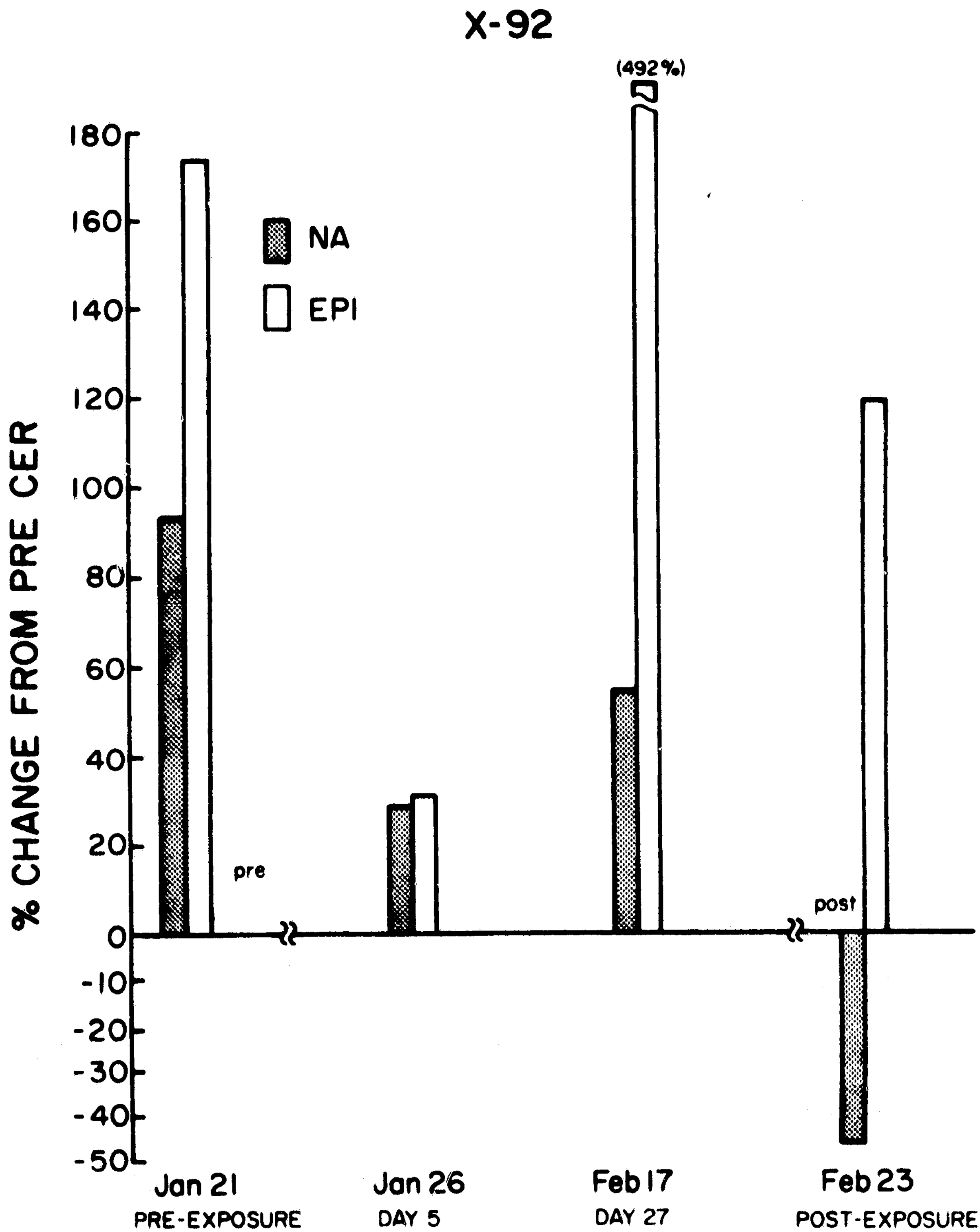



Figure 16. Percent change in plasma NA and EPI between sample 1 and either sample 2 or sample 3 (i.e., largest difference) for animal X-92.

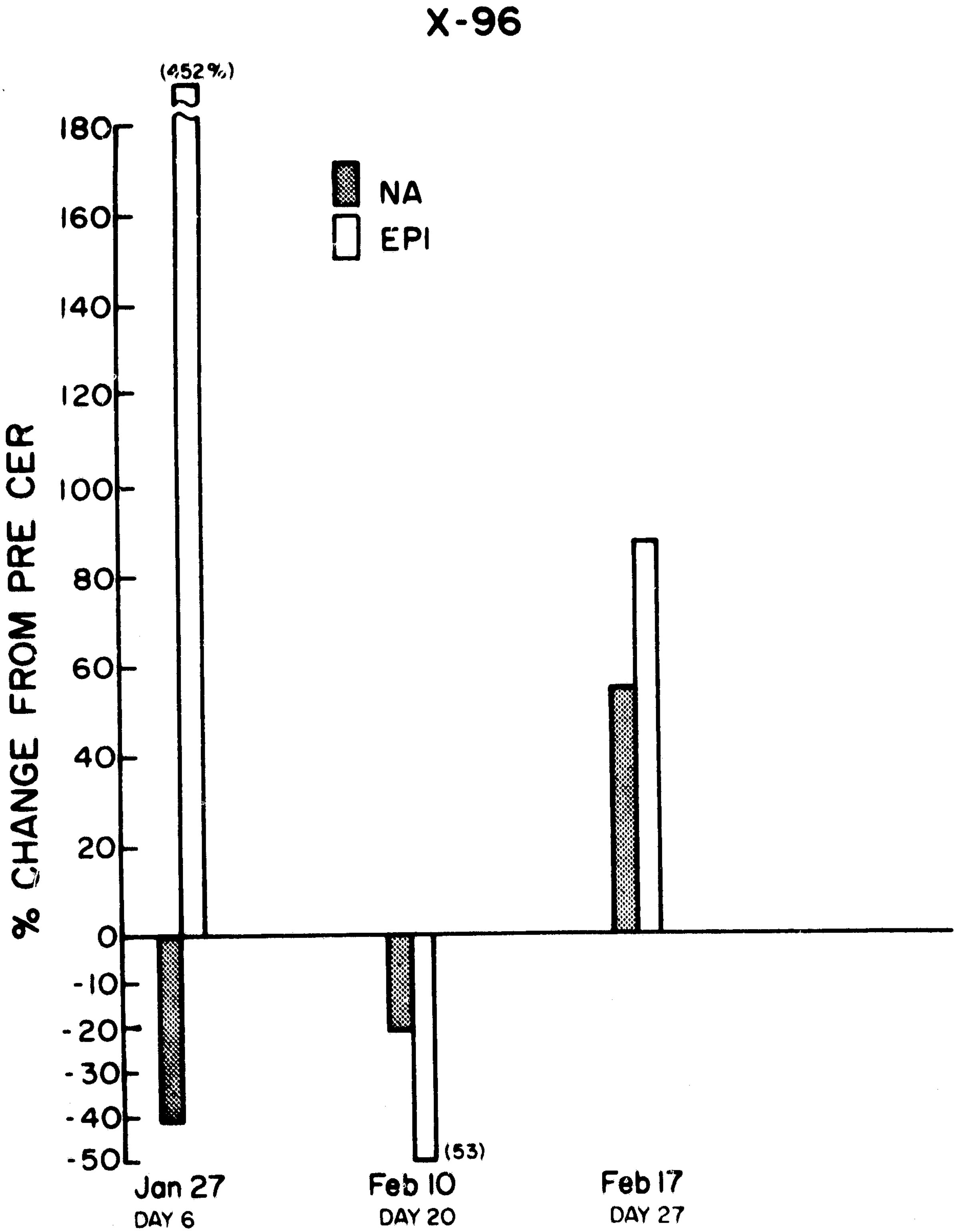



Figure 17. Percent change in plasma NA and EPI during CER for X-96. These results are included for completeness only as this animal was quite ill (dying on day 28) and the absolute values for plasma NA are twice those of the others (see Table 2).

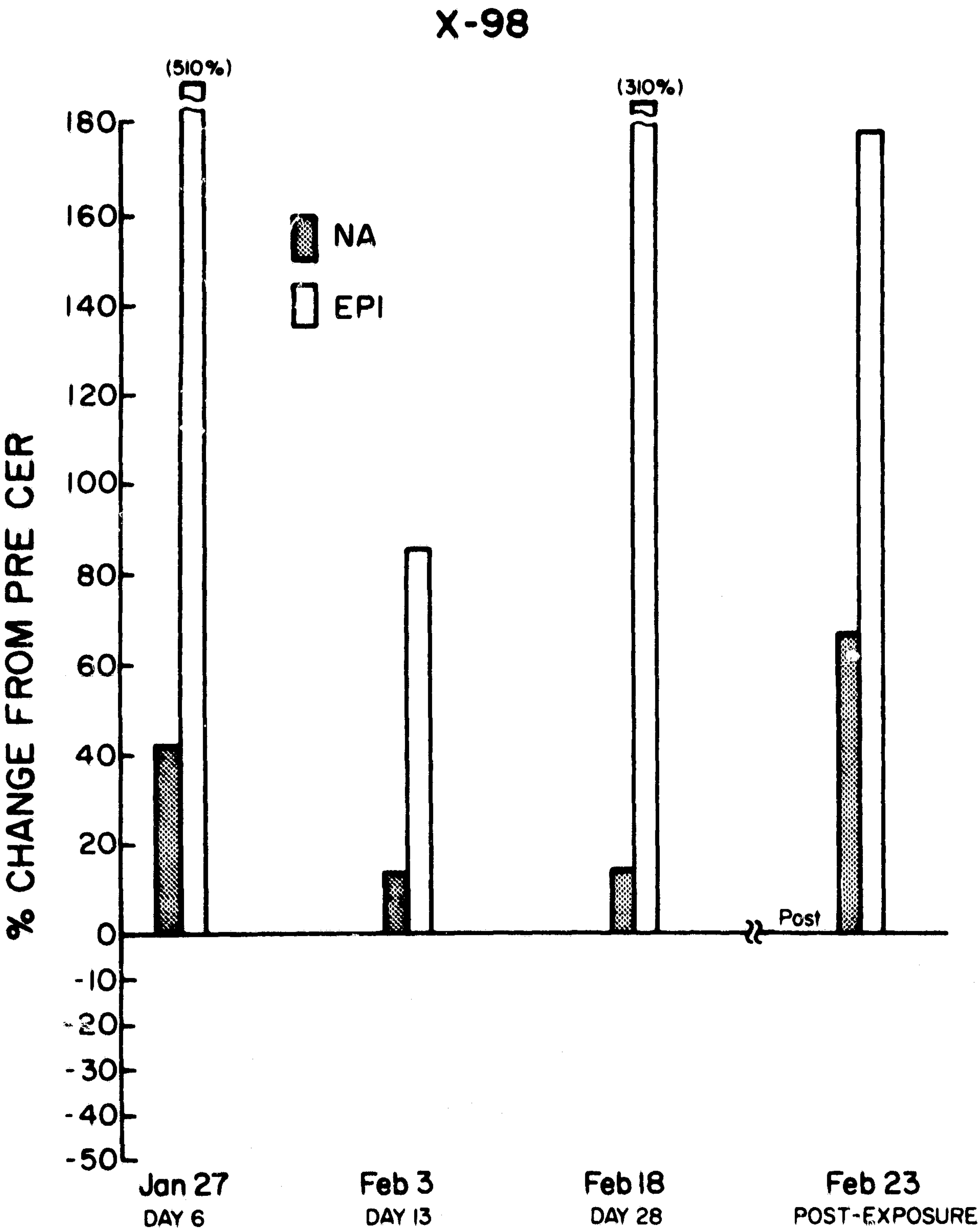



Figure 18. Percent change in plasma NA and EPI during CER for X-98. Note that the HR and BP tracings (Appendix D) increase during CER-shock as do plasma catecholamines. *EPI not detected during pre-CER period (i.e. $\leq$ 10 pg/ml). Therefore, 10 pg/ml was assigned as the plasma value and the percent change thus represents a MINIMUM change.

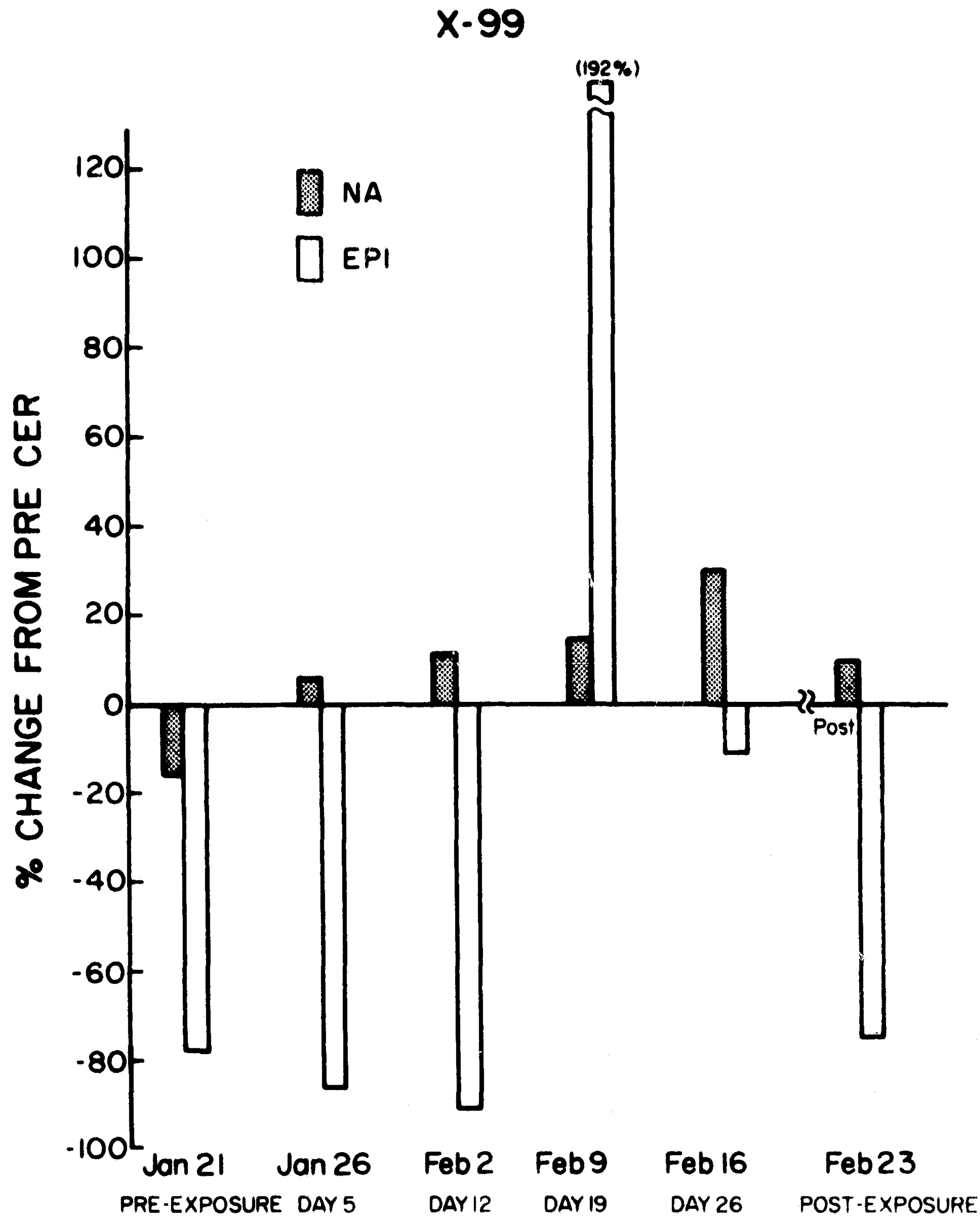



Figure 19. Percent change in plasma NA and EPI during CER for X-99. In contrast to X-98, this animal generally showed decreases in BP and HR over the experimental period (Appendix D) and plasma catecholamines are depressed as well.

a low hematocrit throughout the study (high 20's to low 30's), but these values are only slightly lower than the published normal values for this species. Iron was administered to eliminate the possibility of iron deficiency anemia, and was reflected in normal to elevated serum iron values. It should be noted that no electrolyte changes which could predispose to arrthymias (potassium, calcium) were noted. A slight progressive rise in BUN was noted in X-99; BUN remained normal in the other animals. Occasional elevations in glucose and triglycerides are found, and may be attributable to infusions.

The EKG data were read blind by G. Musgrave, Ph.D., of the University of Texas Health Science Center of San Antonio. Dr. Musgrave could not detect any arrhythmias in these animals that would not be otherwise observed in the normal animal. He noted that occasional premature atrial contractions, sinus block, AV block with junctional escape and premature ventricular contractions are all normal events. Nothing in the EKG data suggests that the treatment increased the frequency of these events. He also notes that QT prolongation usually occurs just prior to the onset of hydrocarbon-induced arrhythmias, and this was not observed in any of the tracings. He therefore concluded that no indication of sensitization of the myocardium to catecholamines was evident.

Since the stress of the experiment caused two of the subjects to become ill toward the end of the 30-day exposure period, it was decided not to attempt to induce arrhythmias through epinephrine administration but rather to sacrifice the subjects for gross pathology and histopathology to look for possible heart or other organ damage resulting from the exposure to $CBrF_3$ during stress. These studies were conducted by Chester A. Gleiser, a board certified veterinary pathologist.

Pathologist's reports are included in Appendix F. The pathologic changes generally associated with fluorinated hydrocarbon exposure include myofibril fragmentation and vacuolization, loss of cross-striation, depressed myocardial contractility, cardiac enlargement, pneumopericardium, sinus bradycardia progressing to AV dissociation and escape rhythms, with termination in asystole or ventricular fibrillation. The analysis of the experiment was complicated by unanticipated difficulties encountered during the exposure. X-95, for example, managed to reach and sever his catheters, causing hemorrhage, shock and death prior to gas exposure. Two animals, as noted previously, had clotted catheters, which upon clearing, resulted in apparent severe embolization with a loss of not only conditioned behavior but also eating behavior; gastric intubation with force feeding was necessary, but emaciation still occurred. Abrasion of the cheek pouch while the animal was chaired resulted in production of a fistula, requiring the removal of one animal from the chamber for 7 days. With the above observations noted, the more significant findings are:

1. X-92 and X-99 both were found to have widening of spaces between myofibrils. Some myofibril fragmentation was observed in X-99, while vacuoles were noted in myocardial fibers in X-92. These could be related to gas exposure; however, such microscopic changes may be observed in a variety of conditions.

2. The "scattered discrete holes" in the cerebellum and basilar portion of the medulla reported in X-92 were probably secondary to embolization, rather than gas exposure.

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# Appendix A

Operating Procedures, Life Support System for NASA Chamber

**OPERATING PROCEDURES**

**LIFE SUPPORT SYSTEM**

**FOR**

**ENVIRONMENTAL TEST CHAMBER**

by
Robert L. Wilbur
Laurent J. Poirier
Southwest Research Institute

SwRI Project No. 03-5883

prepared for

Contract No. SFRE 9/10/311
SOUTHWEST FOUNDATION for RESEARCH and EDUCATION
P. O. Drawer 28147
San Antonio, TX 78284

June 1980

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO CORPUS CHRISTI HOUSTON

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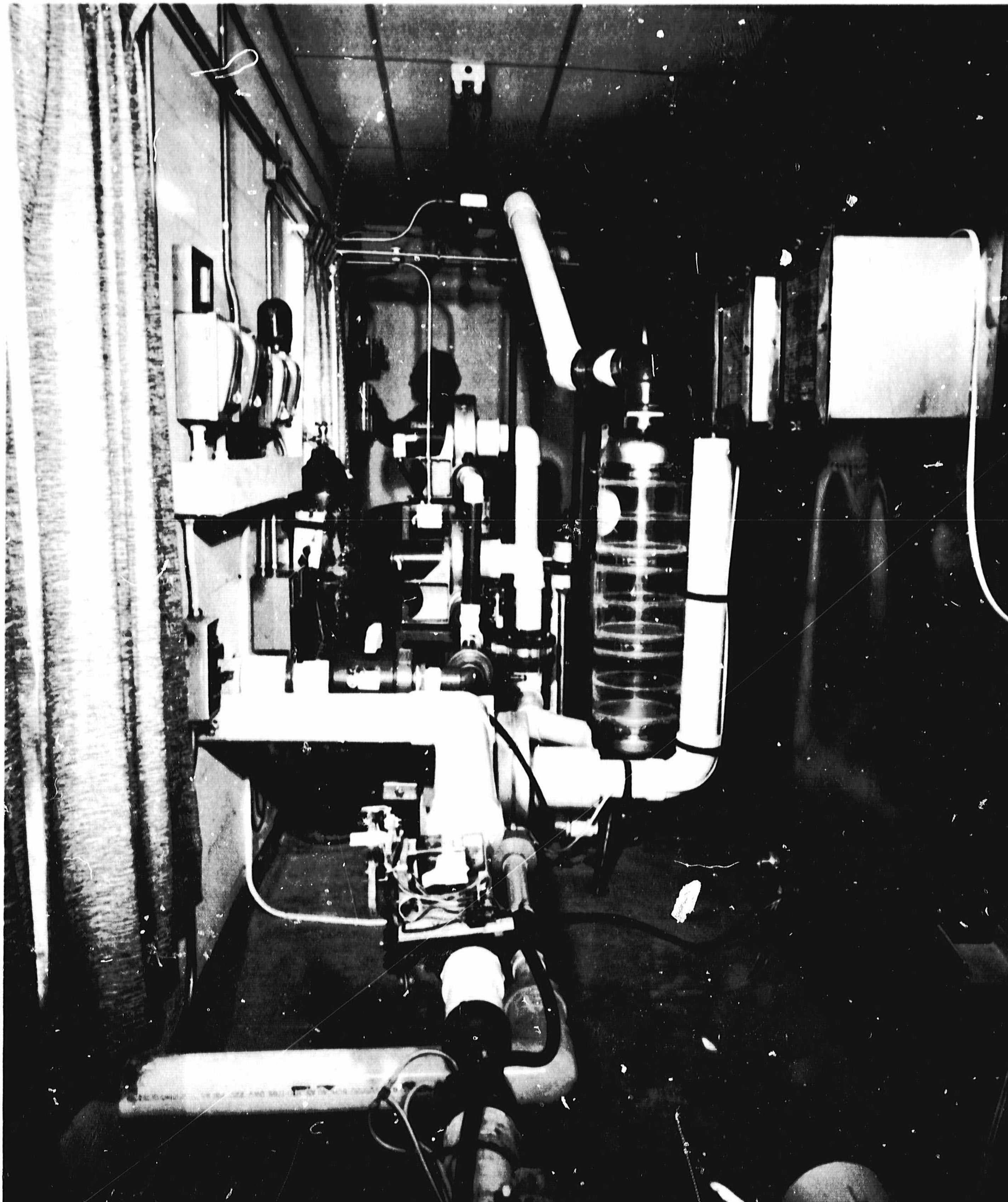
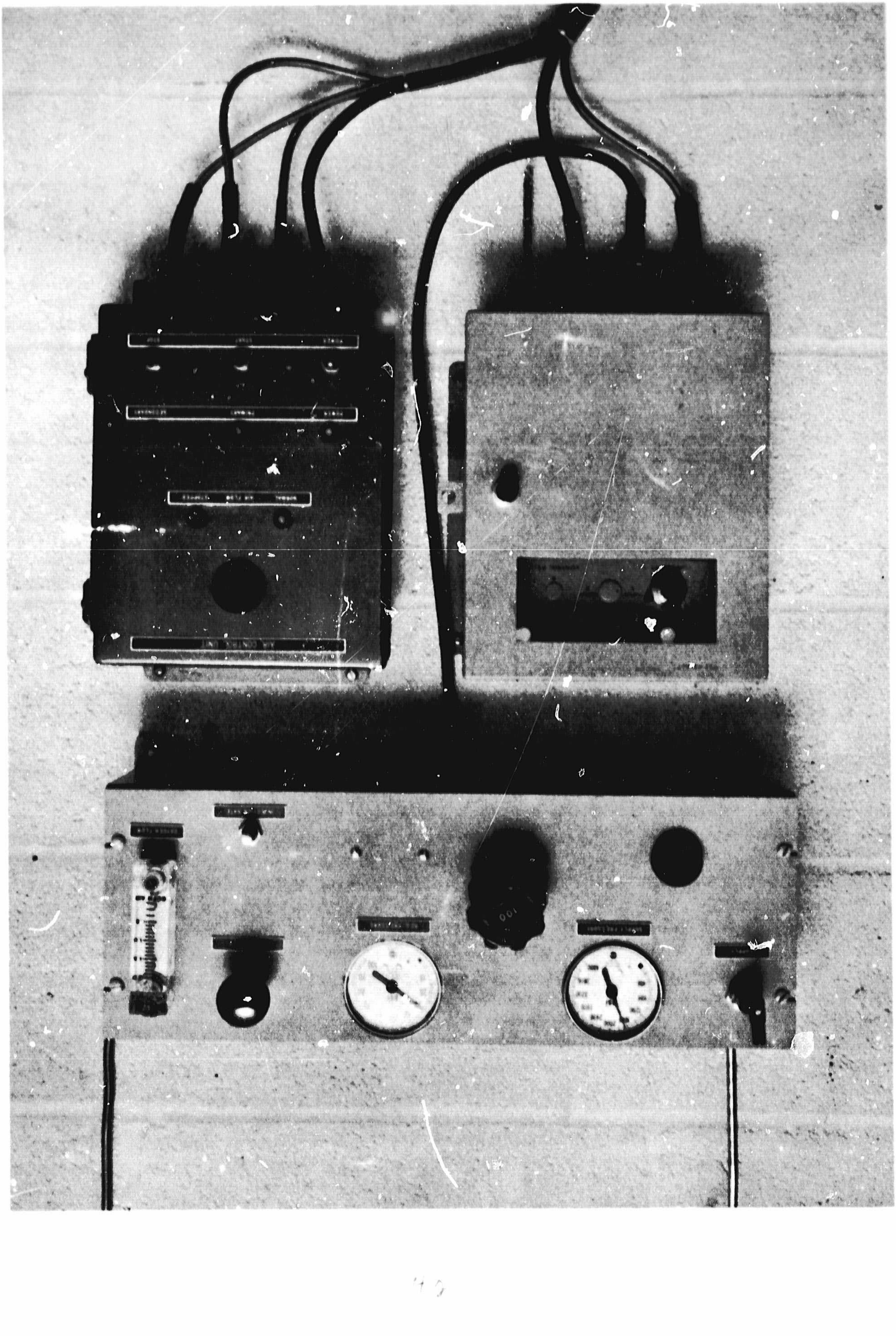
*June 1980*

*APPROVED:*

*Edward M. Briggs, Director*
*Department of Ocean Engineering*
*and Structural Design*





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# I. GENERAL INFORMATION

## A. Scope of Manual

This manual contains system description, specifications, operating instructions, and acceptance test results. Instructions include preparations for use and operating procedures. In conjunction with the drawing ensemble, this manual is the principal document for the Life Support System for the Environmental Test Chamber.

## B. System Description

The life support system is designed to provide atmospheric life support to an existing environmental test chamber. This system is a single atmosphere, one-half man rated, unit capable of removing contaminants, replenishing oxygen, and controlling the temperature for the occupants in the chamber.

The air is drawn through filtered plenums (2) near the floor of the chamber and passes through the operating blower. A venturi is used to sense the air flow. In the event of a pump failure, a pressure switch sends a signal to the air control unit which switches electrically over to the backup pump. Valving associated with pump switchover is pneumatically controlled from an air bottle. Status lamps on the air control panel indicate this switchover. Isolation valves facilitate replacement without shutdown to the system. (See Figure 1, System Block Diagram).

This air is now routed to the base of the scrubber/filter stack where its oxygen content is measured. As the air enters the scrubber from the bottom, it enters the first canister. This canister is normally filled with activated charcoal, but for the Halon studies, the can-

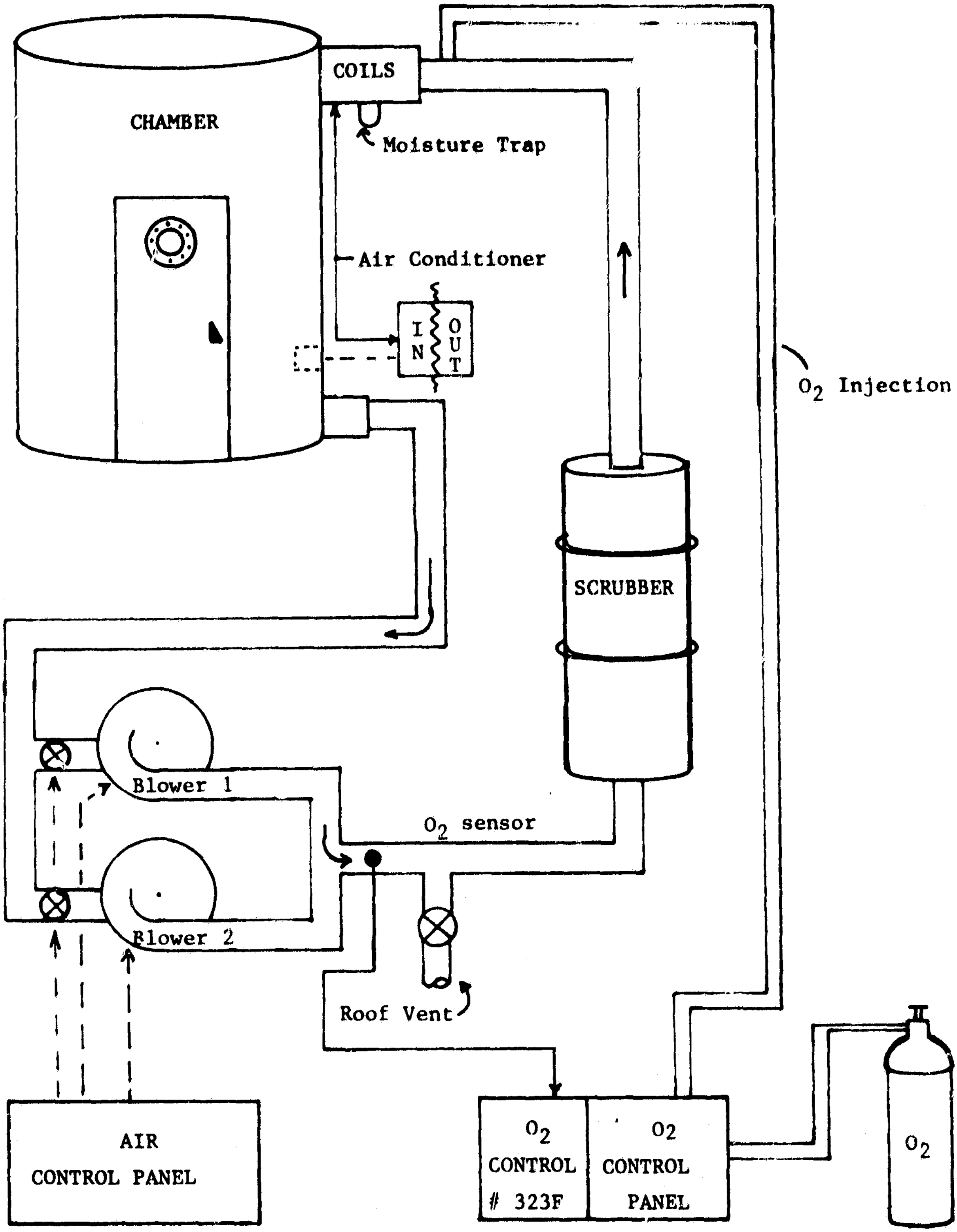



Figure 1. SYSTEM BLOCK DIAGRAM

ister may be left empty. The second canister is normally filled with Baralyme for $CO_2$ scrubbing. The top canister maybe filled with silica gel to remove moisture from the air as a backup to the air conditioner. The three canisters are stacked vertically and held together with "V" clamps to facilitate removal and subsequent replenishment of the above consumables. Procedures to accomplish scrubber maintenance are detailed in Section II, D. The scrubber unit has been generally designed for three day operation at the one-half man rated biomass load, however, with four baboons, it has a two day (48 hour) capacity.

Prior to reentry of the air into the chamber, fresh oxygen is injected into the airstream. This is controlled by the oxygen control unit which is monitoring the air before it enters the scrubber. The combination of scrubbed, dehumidified air and the fresh oxygen is injected into an air conditioner plenum near the top of the chamber. Here it passes through the air conditioner chilling coils prior to entry into the chamber. Cooled air enters at the top of the environmental chamber and warm air is withdrawn at the base of the chamber for best circulation. A water trap is located at the base of the air conditioning plenum. A line from this trap goes to a bottle located near the blower stand. As this fills, it may be discarded at the operators convenience.

As designed, the life support system was fabricated with ease of use in mind. In case of failure of blowers, a back-up blower is on line and ready to go.

A word of caution should be inserted at this point about the system in general pertaining to the lack of waste removal. At the one-half man rating, it is anticipated that the animals in the chambers will generate about 2 pounds of urine, 0.2 pounds of feces, and 0.05 $ft^3$ of flatus per day. Under the requirement of the Halon 1301 study, the activated charcoal bed will be omitted. The odor from the above will become overpowering and it will be necessary to remove the feces and urine from the floor of the chamber daily to reduce the inordinate load on the scrubber. Because of the absence of the activated charcoal bed, it is recommended that the silica gel as well as the Baralyme be discarded at the end of its useful life. While silica gel is normally rechargeable through heating, the lack of the activated charcoal places a much higher load on the silica gel.

Without automatic waste removal, some of the urine will vaporize creating a somewhat larger load on the silica gel and the refrigerative air conditioning.

C. System Specifications

1. Chamber

Volume - 9 ft. high x 9 ft. dia. = 572.5 $ft^3$

Material - Stainless steel

Biomass - 6 each 10-12 lb. monkeys or one-half standard man
4 each 15-25 lb. baboons or 2 standard men

2. Plumbing

Pipe - PVC 2 inch and 4 inch

Pump - Cincinnati PB-10 (2 each)

Air Flow - 25 CFM (min)

Pipe Glue - THF (68%), Cyclohexanone (18%), Carbon Black (3%)
PVC Resin (11%)

3. Oxygen Replacement

Source - Medical grade oxygen bottle - SFRE

Consumption - Approximately 2SCFH

Flow Capacity - 4SCFH

Concentration Band - 18% low alarm, 20.85
injection set point

4. Carbon Dioxide Removal

Source - 6 monkeys or 4 baboons, 1 standard man - 0.385 ft.$^3$/hr or .794 ft$^3$/hr (262 liters/day or 524 liters $CO_2$ generated)

Scrubber - passive filtration with dust filters

Active material - Baralyme

Absorption Rate - 15 liters/100 gms. - 8 lbs./day

Canister - Lucite - fabricated with acetone cement

Canister Size - 8 in. x 10-3/4 in. dia. - 924.5 in.$^3$-4 gallons

Canister Weight - net 24 lbs Baralyme

Capacity - 2-4 days/canister depending on biomass

Residence time - 1 second

Dust Filter - 20 mesh stainless steel

Flow Rate - 0.675 ft./sec.

5. Humidity Control

Source - 2 lbs. $H_2O$/day - one-half standard man

Desiccant - silica gel

Absorption Rate - 0.5 lb. $H_2O$/lb. gel

Canister Size - 924.5 in$^3$ - 4 gal.

Canister Weight - Net, 23.1 lbs. silica gel

Capacity - 8 days/canister @ one-half standard man

Residence Time - 1 second

6. Temperature Control

Source - Animal heat generated = 235 BTU/hr.

Cooler - Commercial 5000 BTU air conditioner (modified)

Temperature range - 68-80°F (adjustable)

Cooling Coils - input plenum at top of chamber

Compressor - window mount

Thermostat location - Mounted inside chamber

7. Aerosol and Trace Contaminant Control

Halon concentration - chromatograph SFRE

Trace contaminants

Particulate filters - SFRE

Activated charcoal - not used in this study

8. Monitoring and Alarms

Bromotifluoromethane (Halon 1301) concentration - gas chromatograph

$pO_2$ - Teledyne Model 323F $O_2$ Controller

$pCO_2$ - Gas chromatograph (SFRE)

Blower failure - fall-out switching to secondary blower

Alarms

Air low stoppage - visual and audible

Oxygen level - visual and audible

Blower failure - visual

D. Subsystem Description

1. Piping, Plenum, and Valve System

All piping used in the life support system is 2 and 4 inch PVC material. It has been glued together with a cement consisting of Tetrahydrofuran (THF) (68%), Cyclohexanone (18%), PVC resin (13%), and

Carbon Black (3%). Vendor certification has been provided and a copy is enclosed in Appendix II. The piping has been outgassed by flowing air at a high rate through the system.

Valve functions have dictated the types of valves used to most efficiently run the system. Manual valves are ball valves to insure tight sealing when closed. Butterfly valves are used for blower switching as they are most easily remotely controlled. A diaphram valve is used for flow control because of its sensitivity.

Plenum added to the existing system is stainless steel to match existing chamber materials.

2. Blower System

Two Cincinnati PB-10 centrifugal blowers are used in this system. One is used as the primary blower and is controlled from the air control panel. In the event of failure of the primary blower, a pressure switch senses the cessation of flow and commands the air control panel to electrically switch on blower II. Additionally, solenoids actuate pneumatic actuators to seal off the pipe from blower I and open the pipe on blower II. This will allow for removal of blower I without disturbing the system operation. Electrical overrides on the 220 volt a.c. disconnect box permit operation of either blower manually if there is a failure in the air control panel.

3. Air Control Panel

The air control panel, a 24 volt d.c. operated system, provides the control of the entire life support system (Figure 2). Blowers are energized here, blower status, fall-out circuitry and alarms are located on this panel. If an additional relay or solenoid is needed for a specific experiment, twenty-four volts d.c. is available on the air control panel for use, (see Figure 2).

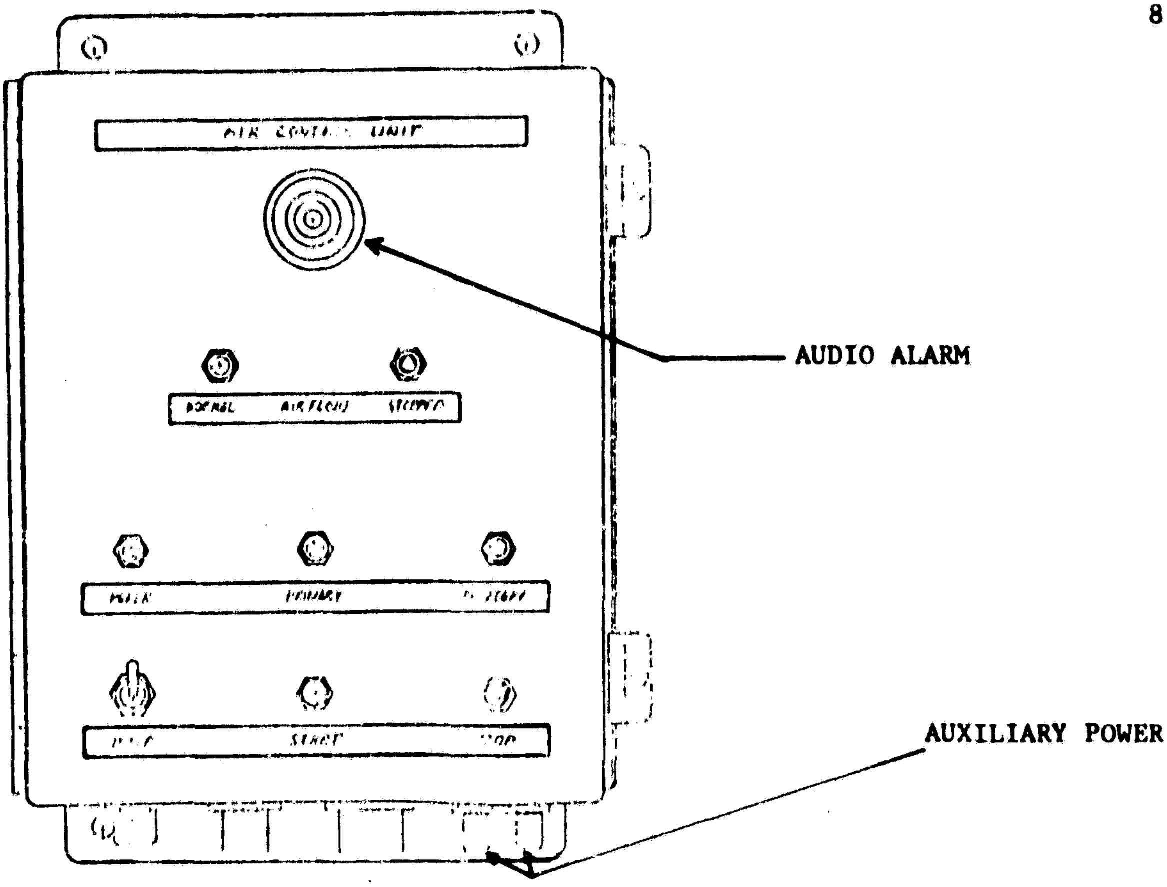



Figure 2. AIR CONTROL PANEL

4. SCRUBBER

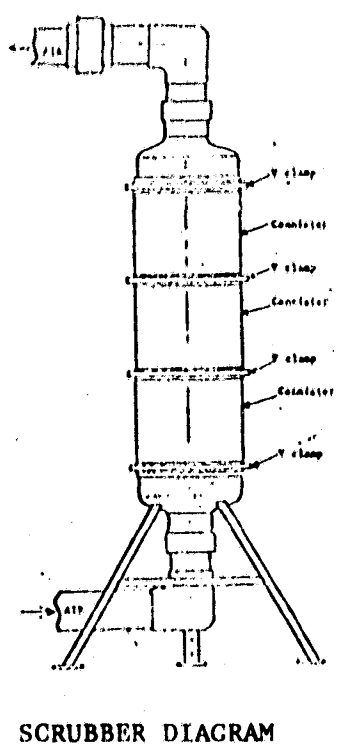


Figure 3. SCRUBBER DIAGRAM

Removal of trace contaminants, carbon dioxide, and moisture is accomplished by a vertical 3 canister stack as shown in Figure 3. Normal placement of ingredients are activated charcoal on the bottom, Baralyme in the middle, and silica gel on top. This sequence is determined by having the canister removed most, on top.

Each canister is fabricated with a permanent screen on the bottom, an eight inch open area for material bed and a removable screen at the top for containment of material.

Fabrication of the Lucite canisters was accomplished with acetone and Lucite material mixed in an empirically derived combination for minimal toxicity because of outgassing during operation.

Each canister is held together with "V" clamps for ease of assembly and disassembly. Since we are dealing with a single atmosphere system, leakage is nonexistent.

5. Oxygen Control Panel

This panel contains the valves and gauges necessary to regulate the air pressure and set the required flow rates for oxygen replenishment. When the pressure begins to fall on the supply gauge, replacement of the $O_2$ bottle is indicated. Figure 4 illustrates the oxygen control panel layout.

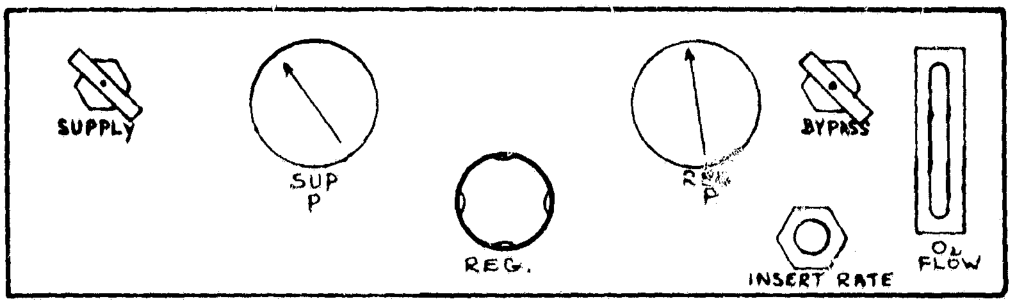



Figure 4. OXYGEN CONTROL PANEL

6. Air Conditioner

A commercial 5000 BTU air conditioner was modifed to provide chamber cooling. The cooling coils were removed and installed in the entrance plenum at the top of the chamber. The compressor is located in the window behind the chamber and the thermostat is located inside the chamber. A moisture trap at the base of the input plenum allows for water removal without insulting the integrity of the closed air system.

## II. PREPARATION FOR USE

### A. Air Control Panel

Preparation for use of this panel is minimal. Prior to use, the operator pushes the STOP button on the lower right hand side of the panel. This insures that the system is set. Insure that the valve on the air cylinder is open. Next, the START button is depressed and held for approximately 1 second. The primary blower should be running, (top blower on stand).

### B. Oxygen Control Panel

To set up the oxygen bleed system, the valve on top of the $O_2$ bottle located against the wall behind the chamber is opened. This supplies the $O_2$ to the control panel. The supply valve (upper left) is opened and the pressure is monitored on the supply gauge. The regulator knob (center) is adjusted to provide a gauge pressure of approximately 20-30 psig and is indicated on the reg. pressure gauge. The $O_2$ injection rate is controlled by the INSERTION RATE needle valve and monitored on the flow meter (extreme right). Since the chamber is large compared to the biomass, the above settings are not critical. If the flow rate is pinched down, the system will compensate by injecting longer.

### C. Oxygen Controller

The preparation of the oxygen controller has been done by SwRI in the set-up phase. These procedures are listed in the instruction manual located in Appendix II. This preparation will not have to be repeated until a new oxygen fuel cell is needed. See Section 5.2 in the instruction manual in Appendix II.

## D. Scrubber

To prepare the scrubber for use, the unit must be disassembled and the appropriate materials packed into the canisters. The procedure for this is as follows:

1. Shut off the blower on the air control panel. Close the ball valve at the base of the scrubber stack.
2. Remove the "V" clamp from the top hemi-head of the scrubber.
3. Rotate the union located at shoulder height left of the scrubber counterclockwise CCW. This assembly is now loose and it can be removed and placed on the floor.
4. Loosen the remaining "V" clamps on the scrubber stack and remove each canister as needed.
5. Remove stainless steel screens from top of each canister.
6. Pour Baralyme or silica gel into the canister in small quantities, shaking the material to insure a tight pack. Do not tamp the material. Pour in additional material, shake to settle, pour and shake until the bed is full.
7. Replace the screen over the bed material.
8. Fill as many canisters as needed for the experiment with the appropriate materials using the above procedures (5 & 6).
9. Restack canisters on scrubber base in ascending order making sure not to crimp gaskets between canisters.
10. Replace "V" clamps connecting canisters and tighten.
11. Replace top hemi-head of the scrubber on top canister and fit union together. Tighten union by rotating it clockwise CW.
12. Replace "V" clamp between top canister and scrubber head and tighten.

13. Open ball valve at the base of the scrubber stack.

14 Press START button on the air control panel to reenergize the primary blower. The system is now in operation.

The above procedure should not take more than 10 to 30 minutes. The capabilities of the system will easily allow for this system shutdown without detrimental effects to the test subjects in the chamber.

E. Air Conditioner

The preparation of the air conditioner has been done by SwRI during the installation phase and does not need attention unless a change of temperature inside the chamber is desired. If a change in temperature is to be undertaken, set up the desired chamber temperature by heating or chilling and monitor this change with the chamber thermometer. Turn the thermostat control up or down carefully to zero on the desired set point. Run the system while monitoring the chamber thermometer to verify that the air conditioner does trip at the set temperature.

## III. OPERATING PROCEDURES

A. Introduction

The operating procedures for the life support system will be constructed as if an experiment is about to be undertaken and the system is to be put into operation. Several considerations must be made prior to initiating the procedure, such as desired scrubbing materials, chamber temperature, biomass load, duration of experiment, stress loads on the test subjects, and oxygen concentration requirements.

If any of the requirements deviate from the one-half standard man biomass and 20.9% oxygen concentration, new calculations must be made so that the system can be adjusted to accommodate them. The remaining considerations listed above can be accommodated by referring to the information itemized in Section II.

Assuming, therefore, a biomass of one-half standard man and 20.9% oxygen concentration, the operating procedures are as follows.

B. Disassembly and Checkout

1. Disassemble scrubber stack (Section II.D).
2. Clean canisters with soap and water and wipe dry.
3. Open 3 inch ball valve leading to roof vent (Figure 1)
4. Depress START button on air control panel to start primary blower. This is to flush chambers and air lines of foreign particles and dust (Figure 2).
5. Open door on oxygen controller and turn power ON.
6. Monitor $O_2$ concentration on oxygen controller meter. Readings should remain at 20.9% oxygen. Allow 24 hours for stabilization. If readings appear erratic, replace the $O_2$ fuel cell as dictated in Section 5 of the instruction manual in Appendix II.
7. Open valve on top of oxygen bottle.
8. Open supply valve on oxygen control panel to check oxygen supply (Figure 4)
9. Read oxygen regulated pressure gauge to check if 20-30 psig is available. If not, adjust regulator to achieve this figure (Figure 4).

** When the above procedures have been run and deemed successful, the system is ready to be reassembled for closed loop operation.

C. Assembly and Run

1. Depress STOP button on air control panel (Figure 2).
2. Close 3 inch ball valve leading to roof vent (Figure 1).
3. Fill canisters with scrubbing agents and desiccant using procedure outlined in Section II.D. Be sure to wear rubber gloves and aspirator when handling these products.
4. Reassemble scrubber stack (Section II.D and Figure 4).
5. System is now ready for operation.
6. Insert animals in chamber, close chamber door.
7. Depress and hold for 1 second the START button on the air control panel to energize the primary blower.

* SYSTEM IS NOW OPERATING

## IV. SCRUBBER MAINTENANCE

Proper monitoring of $CO_2$ levels and maintenance of the scrubber stack will help to insure the well-being of the test subjects in the chamber.

The $CO_2$ level must be monitored at regular intervals (no longer than four hours). Observation of the scrubber canister containing Baralyme will assist in determination of $CO_2$ buildup. (Baralyme will change from a pink color to purple as it becomes depleted). With four baboons inside the chamber, the Baralyme must be changed every 48 hours. A $CO_2$ buildup occurring prior to 48 hours is an indication of channeling inside the scrubber canister. Tapping the sides of the canister will resettle the Baralyme and reduce or stop the channeling.

During disassembly, handle the canisters with care so not to chip the retaining rings at each end and protect the gaskets that fit between the canisters.

When filling the canisters with Baralyme, fill only with material that has just been opened. The color should be a bright pink. Using Baralyme that has been exposed to room air incurs the risk that it is already partially or totally depleted.

## V. TEST RESULTS

### A. Oxygen Concentration

Preliminary tests were undertaken to determine the possibility of maintaining the oxygen concentration between 19% and 21%. Using candles to burn up $O_2$ in the sealed chamber, the oxygen controller was calibrated and the system tested to achieve the above requirements without overshoot.

| | Required | Ideal | Achieved |
|---|---|---|---|
| Low Set Point | 19% | 20.9% | 20.85% |
| High Set Point | 21% | | 20.95% |

### B. $CO_2$ Buildup With no Scrubber - Four Baboons

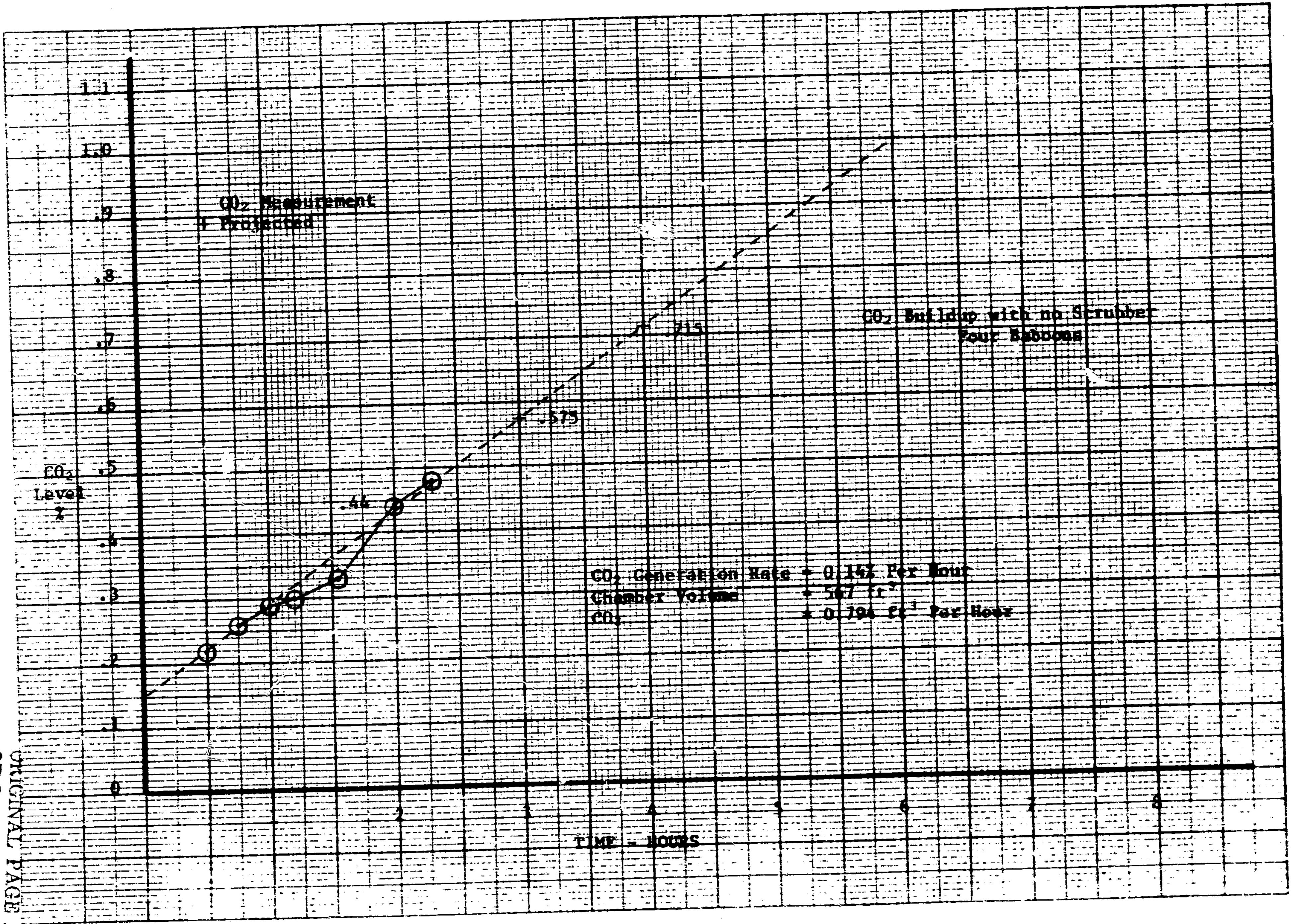
A test was run to determine the $CO_2$ buildup in the system from the metabolism of four baboons. The system was closed with air running through the scrubber but no scrubbing material (Baralyme) was used. A straight line projection to 1% was utilized. As seen from Figure 5, the $CO_2$ buildup followed the projected line closely. It can be assumed that the $CO_2$ will buildup to the 1% level in six hours in the event of scrubber channeling or depletion.

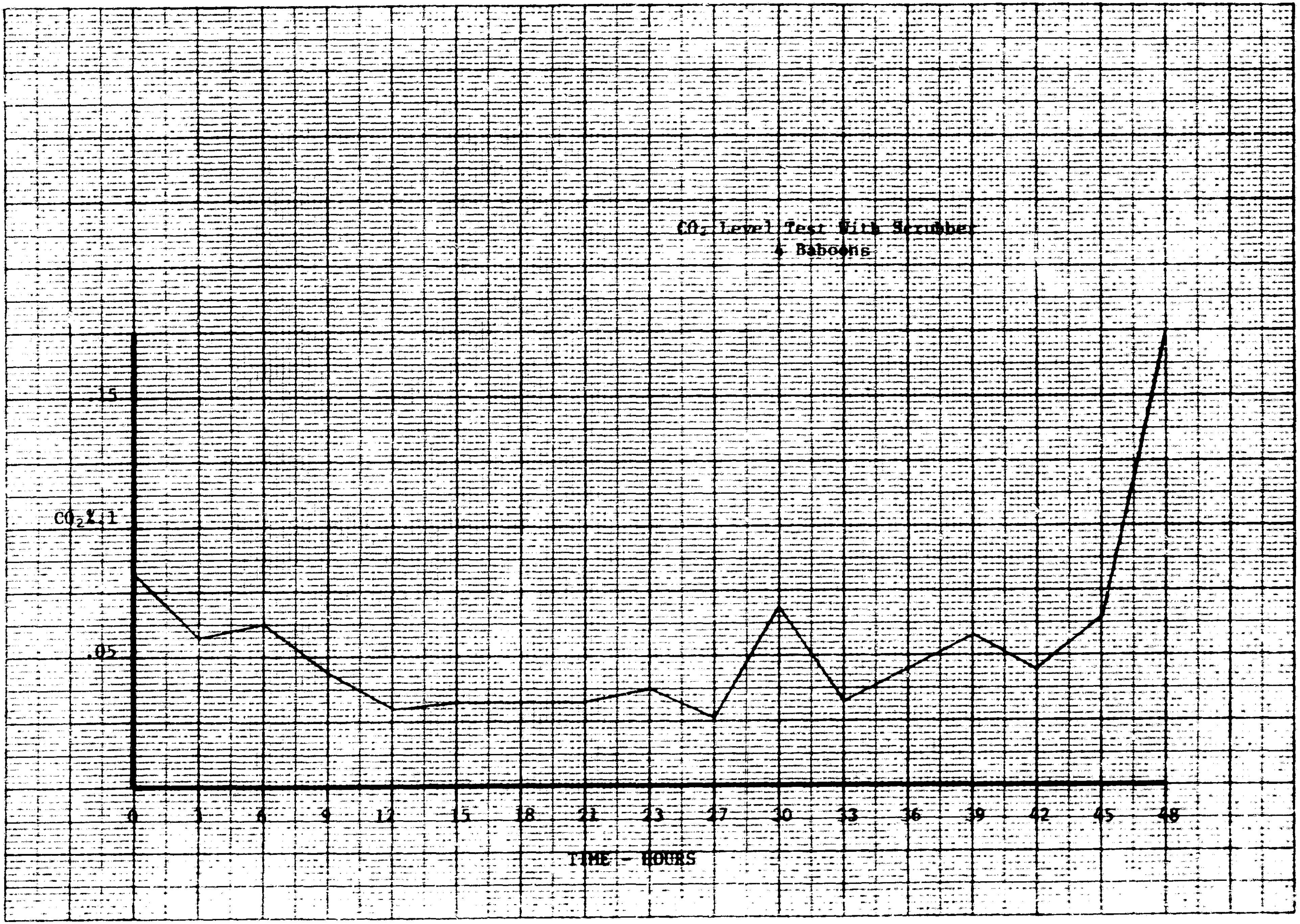
### C. $CO_2$ Level Test With Scrubber - Four Baboons

A test of scrubber capacity (1 canister) was undertaken using four baboons to determine the capacity of the scrubber. Figure 6 illustrates that the system has a 48 hour scrubber capacity. If two canisters are used at all times, a four-day scrubber can be achieved.

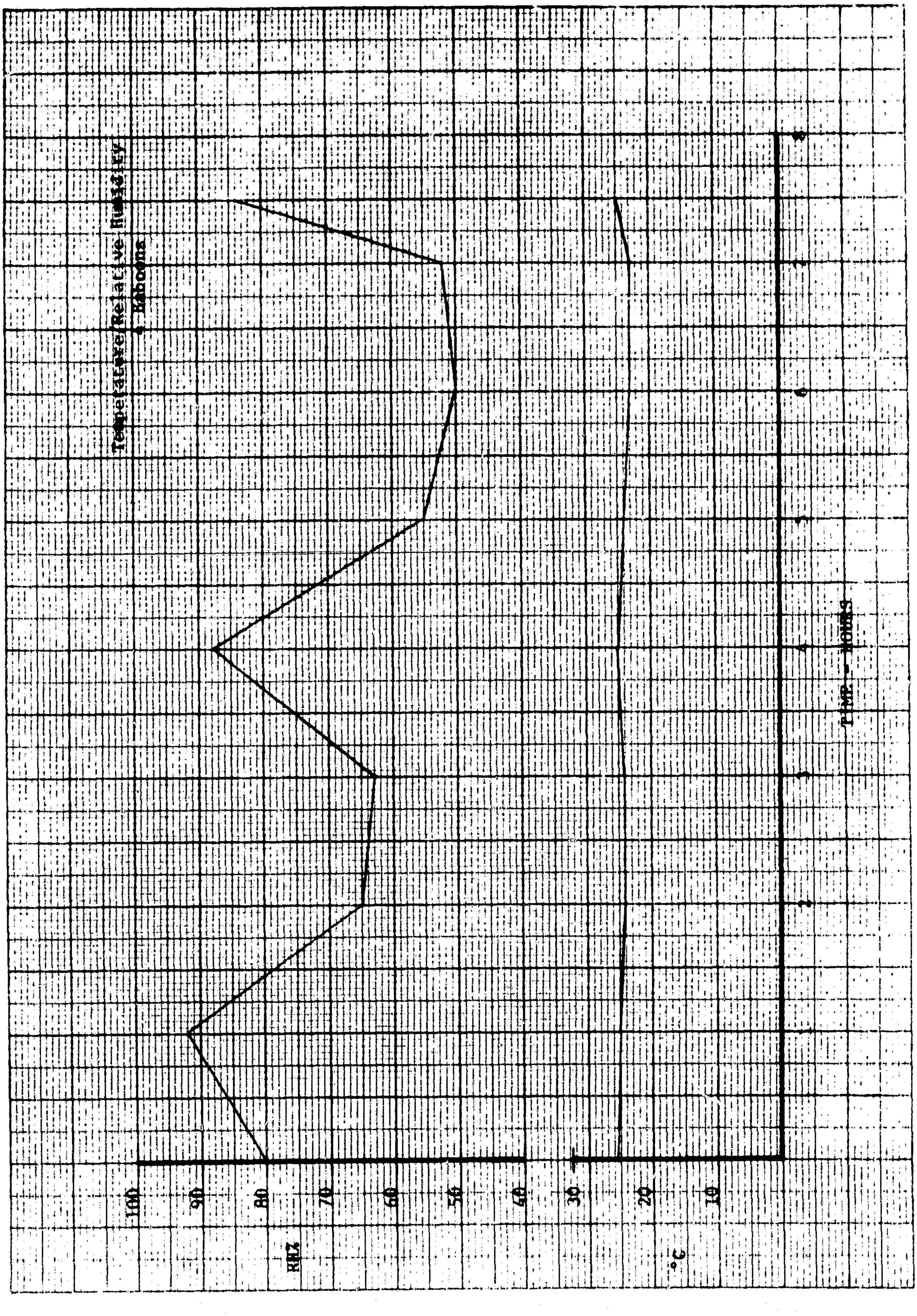
D. Temperature/Relative Humidity - Four Baboons

A test was undertaken to determine the ability of the refrigerative air conditioner to control temperature within a close tolerance and determine if this unit would also control the relative humidity. Figure 7 shows the results of this test. When the air conditioner is operating at the preset temperature set point span of ±1°F, the relative humidity is maintained at approximately 50%.


CO2 Measurement
+ Projected
CO2 Buildup with no Scrubber
Four Baboons
CO2 Level %
1.1
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
.715
.575
.44
CO2 Generation Rate = 0.14% Per Hour
Chamber Volume = 567 ft3
CO2 = 0.794 ft3 Per Hour
2
3
4
5
6
7
8
TIME - HOURS



$CO_2$ Level Test With Scrubber
4 Baboons
.15
$CO_2$ % .1
.05
0
3
6
9
12
15
18
21
23
27
30
33
36
39
42
45
48
TIME - HOURS


Temperature Relative Humidity
4 Baboons
100
90
80
70
60
50
40
30
20
10
RH%
°C
TIME - HOURS

APPENDIX I

# COMMERCIAL SOURCES FOR CONSUMABLES

I. SILICA GEL ---------------DRIERITE #7-577-1B

| | | |
|---|---|---|
| Fisher Scientific<br>P.O. Box 1307<br>Houston, Tx 77001 | Approx. Price | $1.80/lb. |

II. BARALYME--------BARIUM HYDROXIDE LIME, USP #4401-001

| | | |
|---|---|---|
| General Medical<br>1946 Shipman Drive<br>San Antonio, Tx 78219 | Approx. Price | $0.90/lb. |

III. ACTIVATED CHARCOAL--------PURAFIL CHEMISORBENT

| | | |
|---|---|---|
| Mechanical Reps. Inc.<br>618B West Rhapsody<br>San Antonio, Tx 78216 | Approx. Price | $2.55/lb. |

IV. MEDICAL GRADE OXYGEN --------SFRE source

## APPENDIX II

INSTRUCTION MANUAL

FOR

OXYGEN CONTROLLER

MODEL 323 F

SERIAL NUMBER 22561

RANGE: 0-25 %

CUSTOMER ORDER NO: 85009

SALES ORDER NO: 89408

TELEDYNE ANALYTICAL INSTRUMENTS
333 WEST MISSION DRIVE
SAN GABRIEL, CALIFORNIA 91776

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8. ACCESSORIES (WHEN APPLICABLE)

SPARE PARTS LIST

DRAWING LIST

## 1. INTRODUCTION

Teledyne Analytical Instruments' Model 323 Solid State Oxygen Controller is an instrument designed for monitoring and accurately controlling the concentration of oxygen in a confined area.

The measuring cell is a "solid state", maintenance-free structure, whose performance and usable life are guaranteed by TAI. Oxygen is consumed by the cell from the oxygen containing atmosphere surrounding the cell. An electrical current proportional to the oxygen concentration is produced by the cell; this signal is amplified and fed into a solid state comparator and switch, which in turn operates a high current capacity relay (suitable for actuating solenoid valves, etc.). The triggering level of the comparator is continuously adjustable throughout the control range of the instrument.

The cell is housed in a probe assembly that is designed to be located remotely from the unit. (There are no restrictions on probe cable length.) The balance of the instrumentation is located in a double sealed weatherproof enclosure suitable for wall or bulkhead mounting. Four military standard (MS) connectors located on the bottom of the 8" x 10" x 4" case allow access to the electronics. Cables provide interconnection of the probe and power inputs; control and recorder outputs.

## 2. DESCRIPTION

The Model 323 is an extremely versatile instrument. Several optional configurations can be supplied as original equipment or added to already existing instruments. The Model 323 is the basic instrument and has single control capability.

2.1 The (-2) option provides double control capability with each control point being continuously adjustable over the entire control range. Each relay can be wired to be activated either above or below set point (as determined by control logic).

2.2 The F option is similar to the (-2) option, except that the second control point is not adjustable. The second control point is set internally at a pre-selected low level and is used as a "fail-safe" indicator. The control lights associated with this second control point are red and green. The red light illuminates whenever a cell failure occurs or the oxygen level drops below the internally pre-selected level. The second relay, if powered externally, can be used to indicate instrument power failure (primary or secondary).

2.3 The D option includes a completely independent channel of oxygen monitoring capability, such as would be provided if a separate analyzer were incorporated to independently monitor the oxygen level being maintained by the controller. A second cell, amplifier, and signal output are incorporated. This second channel of detection can be used as a back-up for the controller and can be switched into the controller in case of component failure. Thus, the D option provides the added reliability and back-up capability of two completely independent channels of detection for those applications where improved reliability and redundancy are a prime consideration. If external monitoring is utilized, signal output 2 should be used. This will provide meaningful monitoring of control integrity outside the control "loop".

All options can be provided simultaneously, except the (-2) and F options. The model number indicates the option or options provided in a given instrument (e.g. 323D-2). Power options for all instruments include 115 VAC, 230 VAC, 12 VDC or 28 VDC.

2.4 <u>Description of Controls and Indicators</u>.

2.4.1 <u>Indicator Lights</u>. A pair of lights indicate whether the oxygen level is above or below the selected control point. Those units incorporating the F or (-2) option have an additional pair of lights for the second channel of control or alarm.

2.4.2 <u>Meter</u>. The meter is included in the Model 323 only as an indicating device. It does not interact with the switching circuitry nor does it limit the accuracy of the controller in any way. The meter indicates the oxygen level of the atmosphere immediately surrounding the sensing probe. The range covered by the meter is generally equivalent to the range of control; however, when the controller is designed to control in the range 0-10% $O_2$, the meter indicates oxygen levels through 25%. In this instance, the indicating range of the meter is extended to allow on-scale readings when the probe is sensing the oxygen in atmospheric air. In the D option, the meter is connected in the sensing circuit associated with signal output 2 (outside of the control "loop").

2.4.3 Control Point Adjustments. Either one or two of these controls are present depending on the options selected. "Control Pt. 1" is present in all options and "Control Pt. 2" is used only in the (-2) option (double control point capability). These controls are ten turn indicating dials. The desired level of control (or alarm - in those instances where the controller is being used as an alarm device) is set on the dial directly.

If the control range is 0-10%, each turn of the dial represents 1% oxygen. The number of complete turns is indicated in the small window at the top of the dial. The face of the dial is divided into 50 equal divisions allowing for the exact setting of the desired oxygen level to three significant figures. For example: to set the unit to control (or alarm) at an oxygen concentration of 2.54%, set the dial so that the figure 2 appears in the window at the top of the dial. Continue adjusting the dial until the second division mark between 50 and 60 is brought in line with the index mark immediately below the turns indicating window. Each of the 50 divisions (in the case of the 0-10% range) is equivalent to 0.02% oxygen.

In the case of controllers covering the ranges 0-100% or 0-1000 mm Hg, values indicated on the dial must be multiplied by 10 or 100, respectively. Special ranges will require more complicated conversion factors. In these instances, it is suggested that a graph or table be constructed that includes the oxygen concentrations and resultant control settings to be utilized. This can be mounted inside the front cover of the case for convenient reference.

2.4.4 Input Switch. This switch is only utilized in the D option. It is used to program one of two separate channels of sensing capability into the control circuits (see Par. 2.3).

2.4.5 Span Controls. Either one or two of these controls are present depending upon the option selected. "Span 2" is present in all options and "Span 1" is used only in the D option. The span controls are used to calibrate the instrument (see Par. 4.3.1).

2.4.6 Selector Switch. This control is a three-position rotary switch which can be adjusted to "OFF", "CAL" (used during calibration - see Par. 4.3.1), or "ON".

## 3. INSTALLATION

3.1 Location. The Model 323 is intended to be wall or bulkhead mounted (see Dwg. No. B-8504 for mounting dimensions). The case is weather tight and is coated with a special epoxy paint that will resist corrosion and abrasion. The case and electronics are designed to withstand temperatures from 0 to 140°F. The cell and probe assembly are designed to be mounted remotely from the main unit and can tolerate temperatures in the range 30-125°F.

3.2 Electrical Connections. Electrical connections are made through MS connectors. Both the probe and 115 VAC power cables are supplied completely assembled. All other cables must be made up by the customer and wired to the connector plugs as described in the Interconnection Diagram.

3.2.1 Relay Connections. The Interconnection Diagram describes how the relay (or relays) can be internally powered. In general, if the relay is to be used to power a solenoid valve or similar device, the relay contacts should be internally powered and fused externally, if a fuse is required. (See Dwg. No. A-8727).

If the relay is to be used to activate an alarm circuit, the contacts should be powered externally. In this way, the external alarm can act in the event of unit power failure. The F option ("Fail-Safe") is designed to be wired in this manner. (See Dwg. No. A-8726). However, if a simple pilot light is to be activated by the relay, and there are no fail-safe considerations, it would be reasonable to power the relay contacts internally.

Although the drawings giving recommended wiring diagrams show Relay 1 as being powered and Relay 2 as unpowered, this does not mean that under specific applications, they cannot be otherwise utilized.

If two relays are used and require interconnection externally, a single unshielded cable must be used. (The number of conductors will depend upon the manner in which the relay contacts are to be utilized.)

Unless otherwise specified, the relays come from the factory un-powered.

The control logic in a given application will ultimately determine whether a relay should be activated above or below the control point and whether or not its contacts should be powered. This is most often determined prior to receiving the customer's order. However, occasionally erroneous assumptions or misunderstandings will cause the incorrect logic to be incorporated into the controls of a given instrument. If this occurs or any questions regarding possible alternatives arise, our engineering department should be consulted.

3.3 Probe Mounting. The Model 323 probe assembly is designed to be mounted on a wall or bulkhead remotely from the main unit. The probe is not position sensitive and, therefore, can be mounted in any direction. Refer to the Probe Outline Diagram for mounting dimensions.

The measuring cell should not be installed in the probe assembly until the probe cable has been installed and the probe assembly has been mounted in place.

## 4. STARTUP

### 4.1 Preliminary

4.1.1 Check to make certain that all external connections are made to solenoid valves, recorders, alarm circuits, etc. Activate audible alarm bypass switches, if applicable, prior to connecting external alarm power.

4.1.2 If D. C. power is being used, protective diodes must be present across all coils of solenoids, alarm horns, etc. to prevent arcing.

4.1.3 Check to see that the fuse in the front panel is intact and in place. The size of the fuse is determined by the power option:

115 VAC - 1/4 amp
230 VAC - 1/8 amp
12 VDC - 2 amp
28 VDC - 1 amp

4.1.4 Place selector switch in the "OFF" position.

4.1.5 Connect primary power.

4.2 Measuring Cell Installation. The Micro-fuel Cell is supplied in a controlled atmosphere package and must be customer installed. To install the cell, use the following procedure:

1) Unscrew the probe assembly cap of the probe assembly.

2) Open the cell package and remove the shorting clip. Care should be taken not to puncture the thin membrane covering the gold sensing surface.

3) Place the cell, contact end facing inwards, into the exposed cavity of the probe assembly. Use no tools for this procedure.

4) Replace the probe assembly cap.

5) Once the cell is in place, the instrument is ready for its initial calibration and run-in period.

4.3 Initial Calibration and Warm-Up. After removal from its controlled atmosphere package, and before stable service can be assured, the Micro-fuel Cell will require a period of time to stabilize. One-half to one hour is normally sufficient. However, to insure absolute stability, the cell should be allowed 24 hours to equilibrate.

Before proceeding with calibration, it is important to make certain that the probe is in atmospheric air containing 20.9% oxygen. Paragraph 4.3.3 deals with calibration in other atmospheres. Meter readings should be ignored during all calibration procedures.

4.3.1 Calibration (for instruments without the D option). Set the selector switch to the "CAL" position. In this position, the relays are bypassed and only the "above" and "below" indicator lights above the "Control Pt. 1" dial are in the circuit. Unlock the span control. If the "below" light is on, rotate the span control clockwise (cw) until the "below" light turns off and the "above" light turns on. If the "above" light is on originally rotate the span control counterclockwise (ccw) until the "above" light turns off and the "below" light turns on. Reverse the direction of rotation of the span control slowly back and forth sufficiently to cause the lights to alternately turn on and off. A dead band, associated with the hysteresis of the comparator will be noted (that range of rotation where no switching occurs). The span control should be set in the center of this band. The span control should then be locked in this position.

4.3.2 Calibration (for instruments with the D option). These instruments have two span controls, dual sensing probes and an input switch. The input switch determines which of the two sensor circuits is driving the control or switching circuits. "Span 1" is associated with "Input 1" and "Span 2" is associated with "Input 2". The same procedure detailed in Paragraph 4.3.1 is followed; however, both inputs must be calibrated. Therefore, with the input switch in the "Input 1" position, follow the calibration procedure using "Span 1". Then, with the input switch in the "Input 2" position, repeat the calibration procedure, using "Span 2".

The input not driving the control circuits is available at the second recorder output terminals (terminals 1 and 2 of terminal strip 2). In the event of cell failure, the input switch can be thrown and the "back-up" cell will be programmed into the control circuits. This, of course, results in the malfunctioning cell appearing in the auxillary output circuit and no reliance on the readings at the second recorder output can be made. This cell, however, can be replaced without interrupting the control operation, except for the short interval of time when the replacement cell will require calibration. The replacement cell should be allowed to run-in before calibration is attmpted (see Par. 4.3).

4.3.3 Calibration in Atmospheres other than Air. Calibration can be accomplished in atmospheres other than air, providing the oxygen concentration (partial pressure) is known. Set the known oxygen concentration on the "Control Pt. 1" dial. Set the selector switch to the "ON" position. Adjust the span control(s) as in 4.3.1 or 4.3.2. The relays are not bypassed when the selector switch is in the "ON" position.

4.3.4 Frequency of Calibration. Calibration should be accomplished every two to four weeks. Longer intervals can be permitted, providing the user is convinced that the required accuracy is being achieved.

## 5. MAINTENANCE

5.1 Routine Maintenance. The Model 323 is essentially maintenance free requiring only periodic calibration checks (as indicated in Paragraph 4.3.4) and occasional cell replacement.

5.2 Cell Replacement. When the micro-fuel cell nears the end of its useful life, output readings will become erratic; shortly thereafter, the cell output will drop off sharply to zero.

To offset the possibility of not having a replacement cell available when it is needed, TAI recommends that a spare cell be ordered shortly after the analyzer is placed in service, and each time the cell is replaced thereafter. Do not attempt to stockpile spare cells.

5.3 Cell Warranty. The detection cell carries a warranty that covers its normal life expectancy. Two types of cells can be used with the Model 323, and each type carries its own warranty. They are as follows:

Class C-3. The Class C-3 cells are employed in applications where the response time is least critical (90% response time is 20 seconds). Extremely long life (approximately 18 months in air at 75°F) is provided with the Class C-3 cells. They carry a warranty of 240,000 percent-hours or one year, whichever occurs first.

Class B-1. The Class B-1 cells are used where fast rise time is desirable and shorter life can be tolerated (approximately 6 months in air at 75°F). The response time of the B-1 cell is 90% in 10 seconds. They carry a warranty of 80,000 percent-hours or one year, whichever occurs first.

Customers having warranty claims must return the cell in question to the factory for evaluation. If it is determined that failure is due to faulty workmanship or parts, the cell will be replaced at no cost to the customer. WARNING: Any evidence of tampering, or damage through mishandling, will render the cell warranty null and void.

If a cell was working satisfactorily, but ceases to function before the warranty period expires, the customer will receive credit, on a pro-rated basis, towards the purchase of a new cell.

## 6. TECHNICAL INFORMATION

6.1 Background Gas Considerations. Whenever the background gas is varied in oxygen analyses employing any class of micro-fuel cell, it is important to take the following into consideration. If the new background gas is to be one of lower density (e.g. changing from nitrogen to helium or hydrogen) and exposure is to be of long duration (greater than 1 or 2 hours), the following preconditioning should be accomplished.

The cell should be placed in pure oxygen for a period of 1 or 2 days (a longer period may be required for cells nearing the end of their expected life). This can be most easily accomplished in one of the two following ways:

1. flow oxygen from a gas cylinder through the instrument or flow-through adapter for the required interval. 100 to 200 cc/min flow rate is easily sufficient; or

2. remove the cell from the instrument or probe, replace the shorting clip and seal the cell in a plastic bag containing pure oxygen. The bag should have an internal capacity of at least 100 cc.

After conditioning the cell, as described above for the prescribed interval, return the cell to the instrument or probe (if procedure 2 has been followed). The new background gas can now be introduced.

This preconditioning is required since the cell is completely sealed, and the lower density background gas diffuses through the membrane and into the cell faster than the higher density background gas can diffuse out of the cell. This results in an increase in the internal volume of the cell which in turn (if the expansion is sufficient) can cause the membrane to separate from the gold cathode. This results in a marked drop in output and response time of the cell and in most instances, the instrument will no longer be capable of being spanned.

These considerations are not relevant in instances where the cell is being operated under hyperbaric pressures due to the fact that the resulting internal volume changes become insignificant.

6.2 Transduction and Temperature Compensation. The TAI 323 Series Oxygen Controllers utilize a unique electrochemical transducer whose features include:

1) Specificity for oxygen.
2) Maintenance free operation.
3) Long calibration interval and life.
4) Disposable configuration.
5) Low cost.

The transducer functions as a fuel cell; in this instance, the fuel is oxygen. Oxygen diffusing into the cell reacts chemically to produce an electrical current that is proportional to the oxygen concentration in the gas phase immediately adjacent to the cells sensing surface.

Since the cell has a positive temperature coefficient, this variable must be eliminated. Temperature compensation using thermistor circuits has been used from 30 to 125°F. This compensation results in an accuracy specification of plus or minus 1% of full scale or ± 5% of reading, whichever is greater.

6.3 Integral Cell Protection. An N-channel field effect transistor (FET) is incorporated in the circuitry across the cell to short circuit the cell whenever the power to the instrument is off. The FET switches to a very high resistance instantly when power is supplied to the analyzer, and is essentially no longer part of the circuit.

The FET is necessary because of the characteristics of the cell and the operational amplifier. When in operation, the amplifier input circuit looks like a short to the cell (approximately one ohm). If the power were interrupted, without some means of short circuiting the cell, the amplifier would appear as an open circuit to the cell. Since the cell is a current generating device, these two circuit extremes (short circuit - open circuit) would necessitate a prolonged period of equilibration. With the incorporation of the FET in the cell circuit, the cell looks into essentially a short circuit at all times and the instrument responds immediately when power is restored to the circuit.

## 7. SPECIFICATION DATA

7.1 TAI SALES ORDER NUMBER: 89408

7.2 INSTRUMENT MODEL NUMBER: 323.F

7.3 INSTRUMENT SERIAL NUMBER: 22561

7.4 MICRO-FUEL CELL CLASS: B-1

7.5 RANGE: 0-25% ATMOSPHERES $pO_2$

7.6 ACCURACY: ± 1% OF FULL SCALE AT CONSTANT TEMPERATURE, ± 5% OF READING OR ± 1% OF FULL SCALE, WHICHEVER IS GREATER, THROUGHOUT THE OPERATING TEMPERATURE RANGE.

7.7 OPERATING TEMPERATURE RANGE: 30-125°F.

7.8 REQUIRED POWER: 115 VAC, 50-60 HZ.

7.9 HYSTERESIS: 0.1% OF FULL SCALE

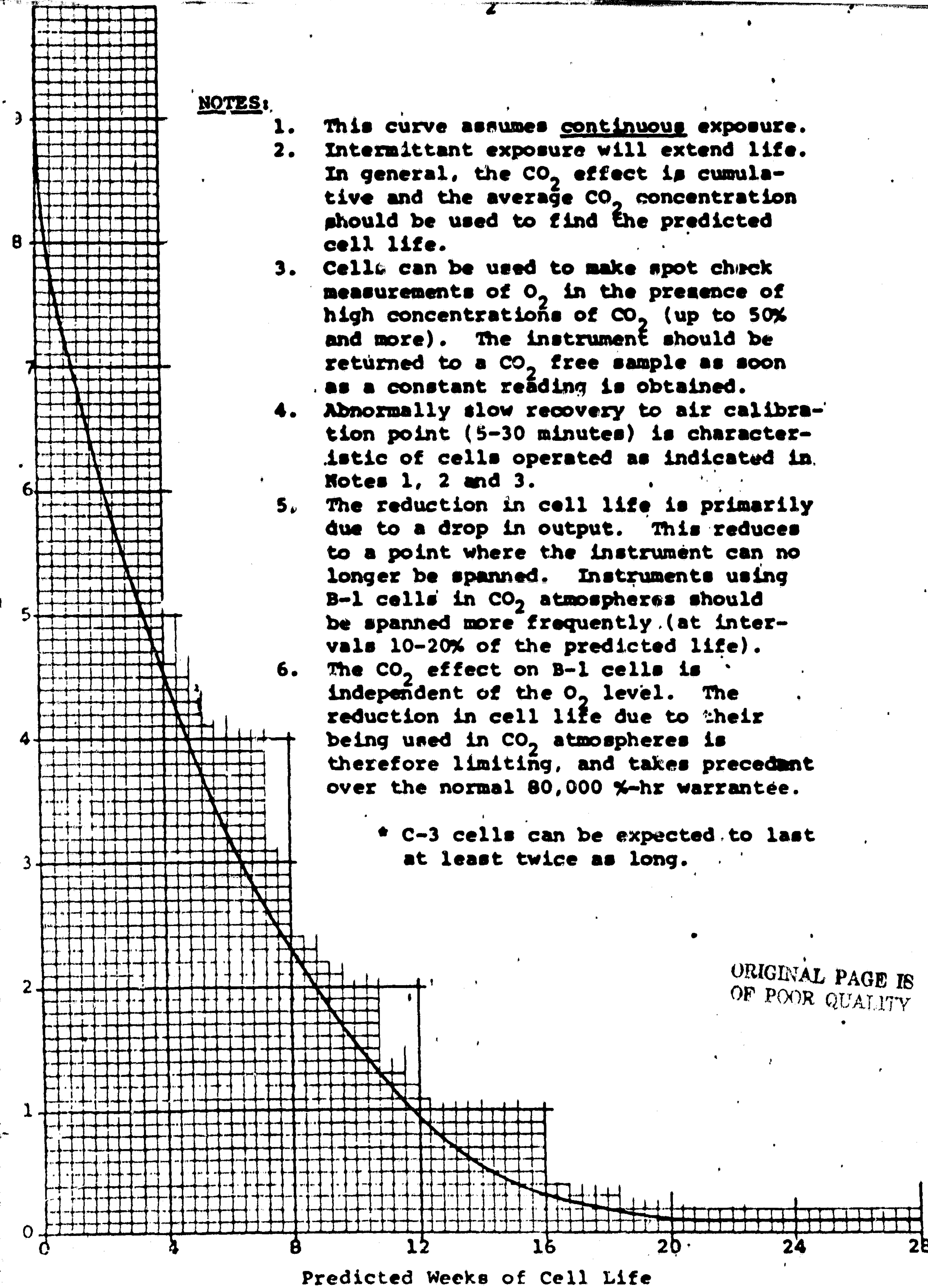
7.10 SENSITIVITY: 0.2% OF FULL SCALE

7.11 CONTROLLER OUTPUT: TWO SPDT RELAYS RATED AT 5 AMP RESISTIVE.

7.11.1 THE CONTACTS OF RELAY NO. 1 ARE INTERNALLY POWERED. THE CONTACTS OF RELAY NO. 2 ARE UNPOWERED.

NOTE: THE INTERNALLY POWERED RELAY CONTACT PLUG IS FURNISHED AS AN ACCESSORY. THE PLUG HAS BEEN SUPPLIED WIRED TO INTERNALLY POWER THE RELAY CONTACTS OF RELAY NO. 1.

7.11.2 RELAY NO. 1 IS ACTIVATED BELOW CONTROL POINT. RELAY NO. 2 IS ACTIVATED ABOVE CONTROL POINT.




**NOTES:**

1. This curve assumes continuous exposure.
2. Intermittant exposure will extend life. In general, the $CO_2$ effect is cumulative and the average $CO_2$ concentration should be used to find the predicted cell life.
3. Cells can be used to make spot check measurements of $O_2$ in the presence of high concentrations of $CO_2$ (up to 50% and more). The instrument should be returned to a $CO_2$ free sample as soon as a constant reading is obtained.
4. Abnormally slow recovery to air calibration point (5-30 minutes) is characteristic of cells operated as indicated in Notes 1, 2 and 3.
5. The reduction in cell life is primarily due to a drop in output. This reduces to a point where the instrument can no longer be spanned. Instruments using B-1 cells in $CO_2$ atmospheres should be spanned more frequently (at intervals 10-20% of the predicted life).
6. The $CO_2$ effect on B-1 cells is independent of the $O_2$ level. The reduction in cell life due to their being used in $CO_2$ atmospheres is therefore limiting, and takes precedant over the normal 80,000 %-hr warrantee.

* C-3 cells can be expected to last at least twice as long.

# TAI SERIES 323

## SPARE PARTS LIST

| QUANTITY | PART NO. | DESCRIPTION |
|---|---|---|
| 2 | L32 | Lamp, GE #327 |
| ***2 | F50 | Microfuse, 1/8 amp. |
| ***2 | F39 | Microfuse, 1/4 amp. |
| ***2 | F52 | Microfuse, 1 amp. |
| ***2 | F51 | Microfuse, 2 amp. |
| 1 | R179 | Relay, P & B KHP17D11,24V |
| *1 | C-6689 | Cell Assembly |

| Class | Color Code |
|---|---|
| C-3 | Red |
| B-1 | Tan |

* Orders for TAI cell assemblies must include the class of the cell specified in Section 7 of the instruction manual, and the serial number of the analyzer in shich the cell is to be used.

***Fuse size is determined by power option:

230 VAC-1/8 Amp.
115 VAC-1/4 Amp.
28 VDC- 1 Amp.
12 VDC- 2 Amp.

IMPORTANT: Orders for replacement parts should include the above par number, and the model and serial number of the analyzer for which the parts are intended.

Orders should be sent to: TELEDYNE ANALYTICAL INSTRUMENTS
333 West Mission Drive
San Gabriel, CA 91776

Revised: 3-1-77

## DRAWING LIST

## MDL 323F

| | |
|---|---|
| B-8504 | Controller Outline Diagram |
| B-8847 | Probe Outline Diagram |
| B-9806 | Interconnection Diagram |
| C-9805 | Schematic |
| A-9807 | Relay Interconnection Schematic |
| B-9804 | Wiring Diagram |
| B-8880 | Probe Wiring Diagram |

## APPENDIX III

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R[illegible]

# MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

## SECTION I

| | |
|---|---|
| MANUFACTURER'S NAME: R & G SLOANE | EMERGENCY TELEPHONE NO.: (213) 875-0160 |
| ADDRESS (Number, Street, City, State, and ZIP Code): P. O. Box 876, Sun Valley, California 91352 | |
| CHEMICAL NAME AND SYNONYMS: SOLVENT CEMENTS FOR POLYVINYLCHLORIDE | TRADE NAME AND SYNONYMS: FUSE ON 925 |
| CHEMICAL FAMILY: NA-MIXTURE OF PVC RESING & ORGANIC SOLVENTS | FORMULA: NA |

## SECTION II - HAZARDOUS INGREDIENTS

| PAINTS, PRESERVATIVES, & SOLVENTS | | % | TLV (Units) | ALLOYS AND METALLIC COATINGS | % | TLV (Units) |
|---|---|---|---|---|---|---|
| PIGMENTS | $TiO_2$-CARBON BLACK, INERTFILLER | 3 | | BASE METAL | | |
| CATALYST | NONE | | | ALLOYS | | |
| VEHICLE | PVC RESIN Min | 10 | | METALLIC COATINGS | | |
| SOLVENTS | SEE BELOW | | 174 | FILLER METAL PLUS COATING OR CORE FLUX | | |
| ADDITIVES | NONE | | | OTHERS | | |
| OTHERS | NONE | | | | | |

| HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES | % | TLV (Units) |
|---|---|---|
| THF - MAJOR COMPONENET TLV 200 PPM 68% prox CALCULATED FOR MIXTURE | | |
| CYCLOHEXANONE (SKIN 10 PPM 18% prox | | |

## SECTION III - PHYSICAL DATA

| | | | |
|---|---|---|---|
| BOILING POINT (°F) LOWEST BOILING COMPONENTS (THF) | 151°F | SPECIFIC GRAVITY ($H_2O$=1) TYPICAL | 0.9[illegible] |
| VAPOR PRESSURE (mm Hg.) LOWEST BOILING COMPONENTS (THF) @ 25oC | 190 | PERCENT, VOLATILE BY VOLUME (%) APPROX | 9[illegible] |
| VAPOR DENSITY (AIR=1) | 2.49 | EVAPORATION RATE (BUAC =1) (INITIALLY) | [illegible] |
| SOLUBILITY IN WATER (SOLVENT PORTION) PVC RESIN | Percipitates | | |
| APPEARANCE AND ODOR | Opaque Gray, Medium syrupy liquid, Ethereal Odor | | |

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

| | | | |
|---|---|---|---|
| FLASH POINT (Method used) | (T.O.C.) 10°F | FLAMMABLE LIMITS | Lel 1.8 [illegible] |

EXTINGUISHING MEDIA
DRY CHEMICAL, CARBONDIOXIDE, FOAM-ANSUL "PURPLE K"-NATIONAL AER-O-F[illegible]

SPECIAL FIRE FIGHTING PROCEDURES
CLOSE OR CONFINED QUARTERS REQUIRE SELF CONTAINED BREATHING APPARA[illegible]
POSITIVE PRESSURE HOSE MASKS OR AIRLINE MASKS.

UNUSUAL FIRE AND EXPLOSION HAZARDS
FIRE HAZARD BECAUSE OF LOW FLASH POINTS.
HIGH VOLATILITY AND HEAVY VAPOR.

ORIGINAL PAGE IS

## SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
185 PPM

EFFECTS OF OVEREXPOSURE SEVERE OVEREXPOSURE MAY RESULT IN NAUSEA, DIZZINESS, HEADACH CAN CAUSE ANACOSIS IRRITATION OF EYES & NASAL PASSAGES. MAY PRODUCE CUMULATIVE INJURY WHEN REPEATEDLY ABSORBED THROUGH SKIN IN SUFFICIENT QUANTITIES DEFATTING EFFECT OF SOLVENTS ON TISSUE

EMERGENCY AND FIRST AID PROCEDURES
VAPORS: REMOVE TO FRESH AIR. LIQUID: REMOVE CONTAMINATED CLOTHING & WASH SKIN WITH PLENTY OF WATER FOR 15 MINUTES FLUSH EYES WITH PLENTY OF WATER-CALL PHYSICIAN. IF SWALLOWED, INDUCE VOMITING-CALL PHYSICIAN

## SECTION VI - REACTIVITY DATA

| STABILITY | | | CONDITIONS TO AVOID |
|---|---|---|---|
| NM | UNSTABLE | | KEEP AWAY FROM HEAT, SPARKS, |
| | STABLE | X | AND OPEN FLAME |

INCOMPATABILITY *(Materials to avoid)* INORGANIC NITRATE & HALOGENATED HYDROCARBONS.

HAZARDOUS DECOMPOSITION PRODUCTS WHEN FORCED TO BURN PVC CONTRIBUTED CARBON DIOXIDE, CARBON MONOXIDE & HYDROGEN CHLORIDE AS GAS AND SMOKE

| HAZARDOUS POLYMERIZATION | | | CONDITIONS TO AVOID |
|---|---|---|---|
| | MAY OCCUR | | KEEP AWAY FROM HEAT, |
| | WILL NOT OCCUR | X | SPARKS & OPEN FLAME. |

## SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
ELIMINATE ALL IGNITION SOURCES - AVOID BREATHING OF VAPORS. KEEP LIQUID OUT OF EYES AND AVOID CONTACT WITH SKIN. FLUSH WITH LARGE VOLUME OF WATER.

WASTE DISPOSAL METHOD
INCINERATE - EXCESSIVE QUANTITIES SHOULD NOT BE PERMITTED TO ENTER DRAINS WHERE THERE IS DANGER OF VAPOR BECOMING IGNITED.

## SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)* NONE REQUIRED WITH NORMAL VENTILATION. USE RESPIRATOR FOR ORGANIC VAPORS FOR CONFINED AREAS e.g. MINE SAFETY APPLI

| VENTILATION | | |
|---|---|---|
| LOCAL EXHAUST | (Preferable)PROVIDE NORMAL VENTILA | SPECIAL RESP. CAT #85556 |
| MECHANICAL *(General)* | LOW POINT-6 AIR CHANGES PER HOUR | OTHER |

PROTECTIVE GLOVES RUBBER OR PVA GLOVES ARE SUITABLE

EYE PROTECTION CHEMICAL SAFETY GOGGLES TO PREVENT SPLASHING IN EYES.

OTHER PROTECTIVE EQUIPMENT IMPERVIOUS APRON

## SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
USE WITH ADEQUATE VENTILATION. KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME. AVOID CONTACT WITH SKIN. STORE BETWEEN 40 & 110°F.

OTHER PRECAUTIONS

# Appendix B

## Daily Concentrations of $CBrF_3$ for Experiments 1 and 2

Experiment 1

# FREON 1301 GAS CONCENTRATION

## DAILY STATISTICS

| DAY | N | AVERAGE CONC (%) | STANDARD DEVIATION | STANDARD ERROR |
|---|---|---|---|---|
| 1 | 89 | 2.82 | .31 | .03 |
| 2 | 96 | 2.89 | .30 | .03 |
| 3 | 96 | 2.89 | .23 | .02 |
| 4 | 96 | 2.81 | .33 | .03 |
| 5 | 96 | 3.01 | .26 | .03 |
| 6 | 96 | 2.81 | .25 | .03 |
| 7 | 96 | 2.85 | .19 | .02 |
| 8 | 92 | 2.86 | .29 | .03 |
| 9 | 96 | 2.84 | .28 | .03 |
| 10 | 96 | 2.84 | .25 | .03 |
| 11 | 96 | 2.75 | .21 | .02 |
| 12 | 96 | 2.75 | .24 | .02 |
| 13 | 88 | 2.77 | .26 | .03 |
| 14 | 94 | 2.86 | .22 | .02 |
| 15 | 96 | 2.84 | .23 | .02 |
| 16 | 96 | 2.70 | .22 | .02 |
| 17 | 96 | 2.87 | .30 | .03 |
| 18 | 96 | 2.74 | .28 | .03 |
| 19 | 96 | 2.91 | .24 | .02 |
| 20 | 96 | 2.78 | .32 | .03 |
| 21 | 96 | 2.95 | .19 | .02 |
| 22 | 96 | 2.88 | .27 | .03 |
| 23 | 96 | 3.03 | .28 | .03 |
| 24 | 96 | 2.75 | .42 | .04 |
| 25 | 96 | 2.81 | .28 | .03 |
| 26 | 96 | 2.85 | .27 | .03 |
| 27 | 96 | 2.87 | .26 | .03 |
| 28 | 96 | 2.69 | .19 | .02 |
| 29 | 96 | 2.75 | .34 | .03 |
| 30 | 30 | 2.73 | .25 | .04 |

READINGS WITHIN 10% OF 2.8% FREON: 72.%
READINGS WITHIN 20% OF 2.8% FREON: 97.%
READINGS OUTSIDE 20% OF 2.8% FREON: 3.%

## DAY 1

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | ---- | ---- | ---- | ---- |
| 9:00 AM | ---- | ---- | ---- | 2.23 |
| 10:00 AM | 2.58 | 3.60 | 2.84 | 2.76 |
| 11:00 AM | 2.54 | 2.78 | .93 | 3.62 |
| 12 NOON | 2.73 | 2.80 | 2.76 | 2.69 |
| 1:00 PM | 2.63 | 2.45 | 2.50 | 2.52 |
| 2:00 PM | 2.74 | 2.60 | 2.86 | 2.86 |
| 3:00 PM | 2.73 | 2.73 | 2.41 | 2.23 |
| 4:00 PM | 2.39 | 2.73 | 3.13 | 3.17 |
| 5:00 PM | 3.17 | 3.13 | 3.10 | 3.10 |
| 6:00 PM | 3.13 | 3.10 | 3.02 | 3.08 |
| 7:00 PM | 3.06 | 2.99 | 3.02 | 3.10 |
| 8:00 PM | 3.00 | 3.02 | 3.02 | 2.99 |
| 9:00 PM | 2.97 | 3.02 | 2.99 | 2.95 |
| 10:00 PM | 2.89 | 2.95 | 2.87 | 2.86 |
| 11:00 PM | 2.89 | 2.86 | 2.87 | 2.82 |
| 12 MNITE | 3.00 | 3.04 | 3.02 | 2.95 |
| 1:00 PM | 2.95 | 3.00 | 2.99 | 2.91 |
| 2:00 AM | 2.91 | 2.91 | 2.89 | 2.84 |
| 3:00 AM | 2.82 | 2.82 | 2.82 | 2.74 |
| 4:00 AM | 2.82 | 2.78 | 2.74 | 2.71 |
| 5:00 AM | 2.71 | 2.69 | 2.71 | 2.74 |
| 6:00 AM | 2.67 | 2.65 | 2.65 | 2.69 |
| 7:00 AM | 2.67 | 2.67 | 2.60 | 2.58 |

DAY 2

# FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.52 | 2.52 | 2.10 | 1.89 |
| 9:00 AM | 2.21 | 2.76 | 3.00 | 3.00 |
| 10:00 AM | 3.00 | 2.87 | 2.00 | 2.43 |
| 11:00 AM | 1.82 | 2.47 | 3.06 | 2.97 |
| 12 NOON | 2.82 | 3.00 | 2.93 | 2.87 |
| 1:00 PM | 2.95 | 2.63 | 2.73 | 2.67 |
| 2:00 PM | 3.00 | 2.71 | 2.73 | 2.74 |
| 3:00 PM | 2.74 | 2.87 | 2.45 | 2.19 |
| 4:00 PM | 2.39 | 2.43 | 2.52 | 2.95 |
| 5:00 PM | 3.13 | 3.19 | 3.15 | 3.15 |
| 6:00 PM | 3.10 | 3.12 | 3.02 | 3.04 |
| 7:00 PM | 3.06 | 3.10 | 3.06 | 3.04 |
| 8:00 PM | 3.02 | 3.02 | 3.10 | 3.06 |
| 9:00 PM | 3.02 | 3.06 | 3.02 | 2.97 |
| 10:00 PM | 2.95 | 3.02 | 2.99 | 3.00 |
| 11:00 PM | 2.95 | 2.93 | 2.86 | 3.02 |
| 12 MNITE | 3.23 | 3.25 | 3.17 | 3.21 |
| 1:00 PM | 3.26 | 3.13 | 3.25 | 3.21 |
| 2:00 AM | 3.19 | 3.13 | 3.10 | 3.10 |
| 3:00 AM | 3.15 | 3.04 | 3.04 | 3.00 |
| 4:00 AM | 3.04 | 3.02 | 2.95 | 2.99 |
| 5:00 AM | 2.93 | 2.99 | 2.97 | 2.89 |
| 6:00 AM | 2.97 | 2.86 | 2.93 | 2.84 |
| 7:00 AM | 2.87 | 2.80 | 2.84 | 2.86 |

DAY 3

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.74 | 2.82 | 2.13 | 2.06 |
| 9:00 AM | 2.80 | 3.08 | 3.02 | 2.71 |
| 10:00 AM | 2.73 | 3.04 | 3.00 | 2.91 |
| 11:00 AM | 2.69 | 2.91 | 2.80 | 2.95 |
| 12 NOON | 3.06 | 3.02 | 2.97 | 2.97 |
| 1:00 PM | 2.93 | 2.87 | 2.78 | 2.80 |
| 2:00 PM | 2.74 | 2.78 | 2.76 | 2.73 |
| 3:00 PM | 2.73 | 2.93 | 2.41 | 2.48 |
| 4:00 PM | 2.87 | 2.89 | 2.84 | 2.82 |
| 5:00 PM | 2.80 | 3.00 | 3.12 | 3.19 |
| 6:00 PM | 3.28 | 3.26 | 3.23 | 3.21 |
| 7:00 PM | 3.19 | 3.13 | 3.19 | 3.21 |
| 8:00 PM | 3.23 | 3.15 | 3.15 | 3.15 |
| 9:00 PM | 3.10 | 3.15 | 3.15 | 3.17 |
| 10:00 PM | 3.10 | 3.15 | 3.17 | 3.04 |
| 11:00 PM | 3.12 | 3.00 | 3.02 | 3.00 |
| 12 MNITE | 3.02 | 3.06 | 2.97 | 2.93 |
| 1:00 PM | 3.00 | 2.82 | 2.95 | 2.93 |
| 2:00 AM | 2.87 | 2.84 | 2.87 | 2.86 |
| 3:00 AM | 2.86 | 2.80 | 2.82 | 2.82 |
| 4:00 AM | 2.76 | 2.69 | 2.76 | 2.73 |
| 5:00 AM | 2.69 | 2.67 | 2.74 | 2.61 |
| 6:00 AM | 2.65 | 2.58 | 2.58 | 2.58 |
| 7:00 AM | 2.67 | 2.56 | 2.56 | 2.52 |

DAY 4

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.50 | 2.47 | 2.08 | 2.56 |
| 9:00 AM | 3.06 | 3.02 | 2.91 | 2.93 |
| 10:00 AM | 2.95 | 2.71 | 2.78 | 2.76 |
| 11:00 AM | 2.74 | 2.39 | 2.93 | 2.99 |
| 12 NOON | 2.97 | 2.84 | 2.84 | 2.80 |
| 1:00 PM | 2.89 | 2.60 | 2.86 | 3.12 |
| 2:00 PM | 3.08 | 3.08 | 2.87 | 2.89 |
| 3:00 PM | 2.80 | 2.84 | 1.63 | 1.85 |
| 4:00 PM | 1.93 | 2.08 | 2.52 | 3.00 |
| 5:00 PM | 3.26 | 3.34 | 3.30 | 3.26 |
| 6:00 PM | 3.26 | 3.23 | 3.17 | 3.17 |
| 7:00 PM | 3.19 | 3.23 | 3.08 | 3.19 |
| 8:00 PM | 3.17 | 3.19 | 3.21 | 3.19 |
| 9:00 PM | 3.12 | 3.10 | 3.06 | 3.08 |
| 10:00 PM | 3.08 | 3.08 | 3.00 | 3.08 |
| 11:00 PM | 2.95 | 2.93 | 2.99 | 3.00 |
| 12 MNITE | 2.84 | 2.86 | 2.86 | 2.87 |
| 1:00 PM | 2.86 | 2.82 | 2.80 | 2.80 |
| 2:00 AM | 2.73 | 2.74 | 2.76 | 2.73 |
| 3:00 AM | 2.74 | 2.71 | 2.71 | 2.65 |
| 4:00 AM | 2.61 | 2.60 | 2.60 | 2.61 |
| 5:00 AM | 2.56 | 2.61 | 2.56 | 2.56 |
| 6:00 AM | 2.48 | 2.45 | 2.41 | 2.47 |
| 7:00 AM | 2.35 | 2.37 | 2.37 | 2.35 |

DAY 5

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.35 | 2.95 | 3.43 | 2.67 |
| 9:00 AM | 3.15 | 3.19 | 3.17 | 3.15 |
| 10:00 AM | 2.91 | 2.93 | 2.86 | 2.89 |
| 11:00 AM | 2.56 | 2.95 | 2.97 | 2.97 |
| 12 NOON | 2.95 | 2.99 | 2.84 | 2.91 |
| 1:00 PM | 2.86 | 2.78 | 2.65 | 2.91 |
| 2:00 PM | 2.86 | 2.61 | 2.69 | 2.95 |
| 3:00 PM | 2.89 | 2.80 | 2.04 | 1.98 |
| 4:00 PM | 2.45 | 3.00 | 3.36 | 3.25 |
| 5:00 PM | 3.26 | 3.23 | 3.19 | 3.21 |
| 6:00 PM | 3.17 | 3.15 | 3.17 | 3.15 |
| 7:00 PM | 3.15 | 3.15 | 3.30 | 3.28 |
| 8:00 PM | 3.32 | 3.34 | 3.30 | 3.34 |
| 9:00 PM | 3.34 | 3.34 | 3.30 | 3.30 |
| 10:00 PM | 3.30 | 3.21 | 3.25 | 3.26 |
| 11:00 PM | 3.21 | 3.19 | 3.17 | 3.21 |
| 12 MNITE | 3.19 | 3.19 | 3.15 | 3.23 |
| 1:00 PM | 3.10 | 3.13 | 3.19 | 3.15 |
| 2:00 AM | 3.06 | 3.00 | 3.06 | 3.04 |
| 3:00 AM | 2.99 | 3.04 | 2.99 | 2.93 |
| 4:00 AM | 2.99 | 2.93 | 2.97 | 2.87 |
| 5:00 AM | 2.89 | 2.84 | 2.89 | 2.82 |
| 6:00 AM | 2.86 | 2.86 | 2.84 | 2.78 |
| 7:00 AM | 2.84 | 2.74 | 2.67 | 2.73 |

DAY 6

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.65 | 2.69 | 2.71 | 2.63 |
| 9:00 AM | 2.47 | 2.65 | 2.67 | 2.45 |
| 10:00 AM | 2.93 | 3.15 | 3.25 | 3.12 |
| 11:00 AM | 3.17 | 3.13 | 3.13 | 3.12 |
| 12 NOON | 3.08 | 3.00 | 2.97 | 3.00 |
| 1:00 PM | 2.99 | 3.04 | 2.91 | 2.86 |
| 2:00 PM | 2.93 | 2.91 | 2.89 | 2.84 |
| 3:00 PM | 2.76 | 2.78 | 2.74 | 2.80 |
| 4:00 PM | 2.73 | 2.76 | 2.76 | 2.67 |
| 5:00 PM | 2.67 | 2.67 | 2.63 | 2.76 |
| 6:00 PM | 2.61 | 2.56 | 2.54 | 2.56 |
| 7:00 PM | 2.58 | 2.56 | 2.60 | 2.52 |
| 8:00 PM | 2.54 | 2.54 | 2.58 | 2.52 |
| 9:00 PM | 2.54 | 2.54 | 2.54 | 2.45 |
| 10:00 PM | 2.45 | 2.43 | 2.45 | 2.45 |
| 11:00 PM | 2.45 | 2.39 | 2.35 | 2.34 |
| 12 MNITE | 2.39 | 3.04 | 3.26 | 3.19 |
| 1:00 PM | 3.26 | 3.19 | 3.19 | 3.08 |
| 2:00 AM | 3.23 | 3.12 | 3.08 | 3.06 |
| 3:00 AM | 3.15 | 3.12 | 3.04 | 3.00 |
| 4:00 AM | 3.02 | 2.97 | 3.04 | 2.95 |
| 5:00 AM | 2.91 | 2.91 | 2.91 | 2.95 |
| 6:00 AM | 2.95 | 2.84 | 2.84 | 2.87 |
| 7:00 AM | 2.80 | 2.86 | 2.80 | 2.74 |

DAY 7

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.73 | 2.71 | 2.65 | 2.69 |
| 9:00 AM | 2.61 | 2.61 | 2.61 | 1.93 |
| 10:00 AM | 2.78 | 2.95 | 2.99 | 2.89 |
| 11:00 AM | 2.86 | 2.95 | 3.10 | 3.15 |
| 12 NOON | 3.15 | 3.21 | 3.10 | 3.06 |
| 1:00 PM | 3.04 | 3.06 | 3.00 | 3.00 |
| 2:00 PM | 2.99 | 3.02 | 2.93 | 3.02 |
| 3:00 PM | 2.91 | 2.89 | 2.93 | 2.97 |
| 4:00 PM | 2.89 | 2.86 | 2.82 | 2.89 |
| 5:00 PM | 2.78 | 2.80 | 2.80 | 2.74 |
| 6:00 PM | 2.76 | 2.78 | 2.74 | 2.73 |
| 7:00 PM | 2.82 | 2.71 | 2.71 | 2.73 |
| 8:00 PM | 2.69 | 2.71 | 2.73 | 2.69 |
| 9:00 PM | 2.69 | 2.65 | 2.65 | 2.71 |
| 10:00 PM | 2.61 | 2.58 | 2.60 | 2.60 |
| 11:00 PM | 2.63 | 2.63 | 2.71 | 2.93 |
| 12 MNITE | 3.15 | 3.17 | 3.15 | 3.17 |
| 1:00 PM | 3.13 | 3.00 | 3.19 | 3.06 |
| 2:00 AM | 3.06 | 3.08 | 3.06 | 2.99 |
| 3:00 AM | 3.04 | 2.95 | 2.89 | 2.95 |
| 4:00 AM | 2.89 | 2.93 | 2.87 | 2.89 |
| 5:00 AM | 2.89 | 2.74 | 2.84 | 2.82 |
| 6:00 AM | 2.89 | 2.76 | 2.80 | 2.86 |
| 7:00 AM | 2.69 | 2.74 | 2.73 | 2.69 |

## DAY 8

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.69 | 2.73 | 2.73 | 1.84 |
| 9:00 AM | 1.95 | 2.26 | 2.73 | 3.10 |
| 10:00 AM | 2.86 | 2.76 | 2.80 | 2.76 |
| 11:00 AM | 2.73 | 2.56 | 2.82 | 2.74 |
| 12 NOON | 3.06 | 3.04 | 3.06 | 3.02 |
| 1:00 PM | 3.02 | 2.76 | 2.71 | 2.71 |
| 2:00 PM | 2.67 | 2.50 | 1.74 | 2.39 |
| 3:00 PM | 2.99 | 3.12 | 2.02 | 2.21 |
| 4:00 PM | 2.74 | 2.71 | ---- | ---- |
| 5:00 PM | ---- | ---- | 3.02 | 3.13 |
| 6:00 PM | 3.25 | 3.15 | 3.15 | 3.13 |
| 7:00 PM | 3.13 | 3.13 | 3.06 | 3.10 |
| 8:00 PM | 3.10 | 3.12 | 3.15 | 3.15 |
| 9:00 PM | 3.10 | 3.12 | 3.06 | 3.94 |
| 10:00 PM | 3.04 | 3.00 | 3.10 | 3.08 |
| 11:00 PM | 2.99 | 2.97 | 3.08 | 3.12 |
| 12 MNITE | 3.10 | 3.02 | 3.02 | 2.97 |
| 1:00 PM | 3.06 | 3.00 | 2.93 | 2.95 |
| 2:00 AM | 2.93 | 2.93 | 2.99 | 2.93 |
| 3:00 AM | 2.89 | 2.95 | 2.89 | 2.86 |
| 4:00 AM | 2.86 | 2.87 | 2.91 | 2.82 |
| 5:00 AM | 2.78 | 2.80 | 2.74 | 2.84 |
| 6:00 AM | 2.73 | 2.74 | 2.80 | 2.71 |
| 7:00 AM | 2.65 | 2.76 | 2.67 | 2.60 |

DAY 9

# FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.69 | 2.69 | 2.73 | 2.50 |
| 9:00 AM | 2.24 | 2.30 | 2.78 | 2.84 |
| 10:00 AM | 2.84 | 2.60 | 3.02 | 2.86 |
| 11:00 AM | 2.89 | 2.76 | 2.67 | 2.67 |
| 12 NOON | 2.60 | 2.73 | 2.89 | 2.86 |
| 1:00 PM | 2.91 | 2.74 | 2.69 | 3.00 |
| 2:00 PM | 2.97 | 2.69 | 2.73 | 2.67 |
| 3:00 PM | 2.76 | 2.71 | 1.78 | 1.80 |
| 4:00 PM | 1.98 | 2.54 | 2.63 | 2.80 |
| 5:00 PM | 2.76 | 2.79 | 2.89 | 3.25 |
| 6:00 PM | 3.23 | 3.21 | 3.21 | 3.28 |
| 7:00 PM | 3.25 | 3.25 | 3.26 | 3.17 |
| 8:00 PM | 3.15 | 3.23 | 3.19 | 3.15 |
| 9:00 PM | 3.13 | 3.12 | 3.17 | 3.13 |
| 10:00 PM | 3.06 | 3.10 | 3.10 | 3.06 |
| 11:00 PM | 3.12 | 3.04 | 3.12 | 2.97 |
| 12 MNITE | 3.06 | 2.99 | 3.00 | 2.95 |
| 1:00 PM | 2.91 | 2.97 | 2.93 | 2.93 |
| 2:00 AM | 2.87 | 2.91 | 2.91 | 2.87 |
| 3:00 AM | 2.82 | 2.80 | 2.82 | 2.82 |
| 4:00 AM | 2.82 | 2.78 | 2.76 | 2.74 |
| 5:00 AM | 2.69 | 2.69 | 2.67 | 2.71 |
| 6:00 AM | 2.69 | 2.69 | 2.61 | 2.63 |
| 7:00 AM | 2.61 | 2.61 | 2.61 | 2.58 |

DAY 10

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.54 | 2.56 | 2.50 | 1.87 |
| 9:00 AM | 2.45 | 3.00 | 3.12 | 3.15 |
| 10:00 AM | 2.78 | 2.76 | 2.41 | 1.97 |
| 11:00 AM | 2.58 | 2.52 | 2.82 | 3.19 |
| 12 NOON | 3.25 | 3.17 | 3.08 | 3.21 |
| 1:00 PM | 3.00 | 2.97 | 3.00 | 2.93 |
| 2:00 PM | 2.87 | 2.67 | 2.65 | 2.73 |
| 3:00 PM | 2.54 | 2.56 | 2.58 | 2.60 |
| 4:00 PM | 2.74 | 2.78 | 2.82 | 2.69 |
| 5:00 PM | 2.73 | 2.23 | 2.71 | 2.87 |
| 6:00 PM | 3.13 | 3.10 | 3.13 | 3.08 |
| 7:00 PM | 3.10 | 3.15 | 3.10 | 3.12 |
| 8:00 PM | 3.10 | 3.17 | 3.10 | 3.13 |
| 9:00 PM | 3.15 | 3.04 | 3.06 | 3.02 |
| 10:00 PM | 3.02 | 3.02 | 3.04 | 2.97 |
| 11:00 PM | 3.04 | 3.04 | 3.04 | 2.95 |
| 12 MNITE | 2.95 | 3.02 | 2.97 | 2.93 |
| 1:00 PM | 2.89 | 2.97 | 2.91 | 2.89 |
| 2:00 AM | 2.87 | 2.87 | 2.89 | 2.87 |
| 3:00 AM | 2.91 | 2.93 | 2.82 | 2.76 |
| 4:00 AM | 2.82 | 2.78 | 2.76 | 2.73 |
| 5:00 AM | 2.73 | 2.78 | 2.73 | 2.78 |
| 6:00 AM | 2.71 | 2.74 | 2.61 | 2.67 |
| 7:00 AM | 2.58 | 2.67 | 2.58 | 2.56 |

DAY 11

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.61 | 2.60 | 2.50 | 1.87 |
| 9:00 AM | 3.12 | 3.13 | 3.00 | 3.04 |
| 10:00 AM | 2.78 | 2.74 | 2.78 | 2.74 |
| 11:00 AM | 2.54 | 2.54 | 2.82 | 2.89 |
| 12 NOON | 2.82 | 2.87 | 2.89 | 2.84 |
| 1:00 PM | 2.78 | 2.69 | 2.67 | 2.65 |
| 2:00 PM | 2.67 | 2.67 | 2.63 | 2.73 |
| 3:00 PM | 2.65 | 2.60 | 2.11 | 2.41 |
| 4:00 PM | 3.06 | 2.95 | 2.91 | 2.93 |
| 5:00 PM | 2.93 | 3.13 | 3.02 | 2.99 |
| 6:00 PM | 3.06 | 2.99 | 2.91 | 2.95 |
| 7:00 PM | 2.99 | 2.97 | 2.91 | 2.95 |
| 8:00 PM | 2.97 | 2.95 | 2.91 | 2.89 |
| 9:00 PM | 2.93 | 2.91 | 2.87 | 2.93 |
| 10:00 PM | 2.86 | 2.89 | 2.84 | 2.84 |
| 11:00 PM | 2.82 | 2.86 | 2.82 | 2.78 |
| 12 MNITE | 2.82 | 2.86 | 2.74 | 2.71 |
| 1:00 PM | 2.82 | 2.71 | 2.74 | 2.69 |
| 2:00 AM | 2.78 | 2.65 | 2.65 | 2.67 |
| 3:00 AM | 2.67 | 2.65 | 2.69 | 2.58 |
| 4:00 AM | 2.52 | 2.60 | 2.60 | 2.63 |
| 5:00 AM | 2.54 | 2.52 | 2.50 | 2.50 |
| 6:00 AM | 2.48 | 2.50 | 2.47 | 2.50 |
| 7:00 AM | 2.45 | 2.41 | 2.41 | 2.54 |

DAY 12

FRE0N 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.39 | 2.41 | 2.39 | 1.72 |
| 9:00 AM | 2.73 | 2.86 | 2.86 | 2.84 |
| 10:00 AM | 2.78 | 2.67 | 2.74 | 2.67 |
| 11:00 AM | 2.50 | 3.06 | 3.02 | 3.04 |
| 12 NOON | 2.99 | 2.95 | 3.00 | 2.95 |
| 1:00 PM | 2.89 | 2.82 | 2.82 | 2.74 |
| 2:00 PM | 2.67 | 2.54 | 2.86 | 2.97 |
| 3:00 PM | 2.97 | 2.89 | 1.74 | 2.74 |
| 4:00 PM | 3.08 | 3.12 | 3.02 | 3.04 |
| 5:00 PM | 3.00 | 3.00 | 3.04 | 3.02 |
| 6:00 PM | 2.97 | 2.95 | 2.91 | 2.91 |
| 7:00 PM | 2.99 | 2.93 | 2.93 | 2.89 |
| 8:00 PM | 2.91 | 2.89 | 2.87 | 2.95 |
| 9:00 PM | 2.93 | 2.93 | 2.89 | 2.91 |
| 10:00 PM | 2.87 | 2.84 | 2.84 | 2.80 |
| 11:00 PM | 2.78 | 2.80 | 2.84 | 2.78 |
| 12 MNITE | 2.82 | 2.84 | 2.84 | 2.74 |
| 1:00 PM | 2.71 | 2.69 | 2.78 | 2.67 |
| 2:00 AM | 2.71 | 2.65 | 2.74 | 2.60 |
| 3:00 AM | 2.67 | 2.60 | 2.61 | 2.60 |
| 4:00 AM | 2.56 | 2.54 | 2.60 | 2.52 |
| 5:00 AM | 2.52 | 2.56 | 2.45 | 2.45 |
| 6:00 AM | 2.47 | 2.54 | 2.54 | 2.39 |
| 7:00 AM | 2.43 | 2.47 | 2.41 | 2.37 |

DAY 13

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.35 | 2.35 | 2.30 | 2.26 |
| 9:00 AM | 2.28 | 2.32 | 2.21 | 2.23 |
| 10:00 AM | 2.04 | 2.69 | 3.17 | 3.10 |
| 11:00 AM | 3.13 | 3.12 | 3.08 | 3.12 |
| 12 NOON | 3.04 | 3.00 | 2.97 | 2.97 |
| 1:00 PM | 2.95 | 2.95 | 2.95 | 2.89 |
| 2:00 PM | 2.93 | 2.86 | 2.89 | 2.84 |
| 3:00 PM | 2.84 | 2.80 | 2.87 | 2.80 |
| 4:00 PM | 2.80 | 2.74 | 2.82 | 2.73 |
| 5:00 PM | 2.71 | 2.73 | 2.76 | 2.67 |
| 6:00 PM | 2.73 | 2.74 | 2.65 | 2.60 |
| 7:00 PM | 2.73 | 2.63 | 2.71 | 2.71 |
| 8:00 PM | 2.65 | 2.69 | 2.71 | 2.61 |
| 9:00 PM | 2.58 | 2.60 | 2.60 | 2.63 |
| 10:00 PM | 2.58 | 2.54 | 2.52 | 2.50 |
| 11:00 PM | 2.52 | 2.52 | 2.45 | 2.43 |
| 12 MNITE | 2.47 | 2.80 | 3.02 | 2.97 |
| 1:00 PM | 3.21 | 3.19 | ---- | ---- |
| 2:00 AM | 3.19 | 3.15 | 3.19 | ---- |
| 3:00 AM | ---- | 3.12 | 3.04 | 3.02 |
| 4:00 AM | ---- | ---- | 3.02 | 2.87 |
| 5:00 AM | 2.95 | 2.89 | 2.89 | 2.82 |
| 6:00 AM | 2.87 | 2.89 | ---- | ---- |
| 7:00 AM | 2.82 | 2.82 | 2.89 | 2.80 |

DAY 14

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | ---- | ---- | 2.87 | 2.84 |
| 9:00 AM | 2.67 | 2.76 | 2.63 | 2.13 |
| 10:00 AM | 1.87 | 2.50 | 3.00 | 2.95 |
| 11:00 AM | 3.00 | 3.26 | 3.25 | 3.23 |
| 12 NOON | 3.26 | 3.25 | 3.19 | 3.10 |
| 1:00 PM | 3.19 | 3.12 | 3.12 | 3.12 |
| 2:00 PM | 3.12 | 3.02 | 3.02 | 3.00 |
| 3:00 PM | 2.99 | 3.04 | 2.99 | 2.89 |
| 4:00 PM | 2.91 | 2.86 | 2.93 | 2.99 |
| 5:00 PM | 2.86 | 2.89 | 2.89 | 2.84 |
| 6:00 PM | 2.84 | 2.82 | 2.76 | 2.78 |
| 7:00 PM | 2.80 | 2.78 | 2.73 | 2.80 |
| 8:00 PM | 2.71 | 2.82 | 2.73 | 2.67 |
| 9:00 PM | 2.74 | 2.69 | 2.63 | 2.65 |
| 10:00 PM | 2.69 | 2.65 | 2.86 | 3.02 |
| 11:00 PM | 2.99 | 2.99 | 3.02 | 3.00 |
| 12 MNITE | 3.02 | 3.08 | 2.95 | 2.93 |
| 1:00 PM | 3.04 | 2.93 | 2.93 | 3.00 |
| 2:00 AM | 2.97 | 2.87 | 2.93 | 2.84 |
| 3:00 AM | 2.84 | 2.89 | 2.80 | 2.87 |
| 4:00 AM | 2.87 | 2.82 | 2.84 | 2.74 |
| 5:00 AM | 2.74 | 2.69 | 2.73 | 2.69 |
| 6:00 AM | 2.69 | 2.63 | 2.67 | 2.61 |
| 7:00 AM | 2.71 | 2.56 | 2.65 | 2.61 |

DAY 15

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.58 | 2.52 | 2.52 | 2.21 |
| 9:00 AM | 1.72 | 2.48 | 3.10 | 3.00 |
| 10:00 AM | 3.02 | 2.76 | 2.74 | 2.74 |
| 11:00 AM | 2.76 | 2.54 | 2.91 | 2.87 |
| 12 NOON | 2.89 | 2.89 | 2.89 | 2.91 |
| 1:00 PM | 2.86 | 2.65 | 2.73 | 2.71 |
| 2:00 PM | 2.71 | 2.45 | 2.50 | 2.80 |
| 3:00 PM | 2.76 | 2.84 | 2.17 | 2.69 |
| 4:00 PM | 3.15 | 3.17 | 3.15 | 3.12 |
| 5:00 PM | 3.10 | 3.08 | 3.08 | 3.06 |
| 6:00 PM | 3.06 | 3.04 | 3.02 | 3.06 |
| 7:00 PM | 3.04 | 3.08 | 2.97 | 3.02 |
| 8:00 PM | 2.95 | 2.97 | 2.99 | 2.97 |
| 9:00 PM | 2.97 | 2.95 | 2.95 | 3.00 |
| 10:00 PM | 2.93 | 2.93 | 2.97 | 3.08 |
| 11:00 PM | 3.00 | 3.02 | 3.02 | 3.06 |
| 12 MNITE | 3.06 | 2.99 | 3.06 | 2.97 |
| 1:00 PM | 2.97 | 2.95 | 2.87 | 2.93 |
| 2:00 AM | 2.86 | 2.87 | 2.89 | 2.84 |
| 3:00 AM | 2.80 | 2.82 | 2.86 | 2.80 |
| 4:00 AM | 2.86 | 2.73 | 2.78 | 2.69 |
| 5:00 AM | 2.82 | 2.74 | 2.74 | 2.74 |
| 6:00 AM | 2.67 | 2.69 | 2.65 | 2.67 |
| 7:00 AM | 2.60 | 2.61 | 2.58 | 2.63 |

DAY 16

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.61 | 2.63 | 2.61 | 2.17 |
| 9:00 AM | 2.69 | 2.93 | 2.99 | 2.69 |
| 10:00 AM | 2.67 | 2.74 | 2.71 | 2.48 |
| 11:00 AM | 2.35 | 2.48 | 2.86 | 2.74 |
| 12 NOON | 2.82 | 2.74 | 2.74 | 2.71 |
| 1:00 PM | 2.73 | 2.58 | 2.71 | 2.74 |
| 2:00 PM | 2.82 | 2.63 | 2.76 | 2.78 |
| 3:00 PM | 2.69 | 2.73 | 2.00 | 2.34 |
| 4:00 PM | 2.87 | 3.10 | 2.99 | 3.00 |
| 5:00 PM | 3.00 | 3.02 | 2.99 | 2.99 |
| 6:00 PM | 2.95 | 2.95 | 2.93 | 3.00 |
| 7:00 PM | 2.93 | 2.95 | 2.95 | 2.95 |
| 8:00 PM | 2.89 | 3.00 | 2.89 | 2.87 |
| 9:00 PM | 2.91 | 2.95 | 2.93 | 2.91 |
| 10:00 PM | 2.97 | 2.93 | 2.80 | 2.82 |
| 11:00 PM | 2.76 | 2.80 | 2.74 | 2.84 |
| 12 MNITE | 2.74 | 2.82 | 2.71 | 2.71 |
| 1:00 PM | 2.63 | 2.63 | 2.63 | 2.73 |
| 2:00 AM | 2.67 | 2.60 | 2.63 | 2.52 |
| 3:00 AM | 2.60 | 2.48 | 2.56 | 2.60 |
| 4:00 AM | 2.54 | 2.54 | 2.48 | 2.52 |
| 5:00 AM | 2.52 | 2.45 | 2.43 | 2.37 |
| 6:00 AM | 2.39 | 2.39 | 2.37 | 2.32 |
| 7:00 AM | 2.32 | 2.32 | 2.37 | 2.24 |

## DAY 17

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.32 | 2.28 | 1.54 | 1.97 |
| 9:00 AM | 2.56 | 2.99 | 3.00 | 2.80 |
| 10:00 AM | 2.84 | 3.23 | 4.08 | 3.04 |
| 11:00 AM | 2.89 | 2.87 | 2.93 | 2.87 |
| 12 NOON | 2.82 | 2.86 | 2.80 | 2.78 |
| 1:00 PM | 2.76 | 2.54 | 3.02 | 2.91 |
| 2:00 PM | 2.97 | 2.78 | 2.74 | 2.80 |
| 3:00 PM | 2.61 | 2.69 | 2.43 | 2.19 |
| 4:00 PM | 2.82 | 3.02 | 3.04 | 3.04 |
| 5:00 PM | 2.95 | 3.00 | 3.23 | 3.23 |
| 6:00 PM | 3.25 | 3.25 | 3.17 | 3.26 |
| 7:00 PM | 3.12 | 3.23 | 3.13 | 3.21 |
| 8:00 PM | 3.06 | 3.12 | 3.19 | 3.06 |
| 9:00 PM | 3.08 | 3.08 | 3.08 | 3.04 |
| 10:00 PM | 3.02 | 3.08 | 3.00 | 3.04 |
| 11:00 PM | 3.02 | 3.00 | 2.99 | 3.00 |
| 12 MNITE | 2.95 | 2.93 | 2.93 | 2.93 |
| 1:00 PM | 2.93 | 2.89 | 2.89 | 2.87 |
| 2:00 AM | 2.80 | 2.82 | 2.80 | 2.82 |
| 3:00 AM | 2.82 | 2.76 | 2.82 | 2.82 |
| 4:00 AM | 2.78 | 2.73 | 2.80 | 2.78 |
| 5:00 AM | 2.78 | 2.76 | 2.67 | 2.71 |
| 6:00 AM | 2.63 | 2.65 | 2.60 | 2.58 |
| 7:00 AM | 2.61 | 2.54 | 2.60 | 2.63 |

DAY 18

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.50 | 2.48 | 2.52 | 2.10 |
| 9:00 AM | 3.04 | 2.87 | 2.87 | 2.67 |
| 10:00 AM | 2.67 | 2.71 | 2.63 | 2.47 |
| 11:00 AM | 2.60 | 2.91 | 2.91 | 2.93 |
| 12 NOON | 2.89 | 2.86 | 2.86 | 2.82 |
| 1:00 PM | 2.78 | 3.02 | 3.02 | 3.06 |
| 2:00 PM | 3.02 | 2.86 | 2.78 | 2.76 |
| 3:00 PM | 2.76 | 2.76 | 1.32 | 2.24 |
| 4:00 PM | 2.65 | 3.15 | 3.19 | 3.13 |
| 5:00 PM | 3.06 | 3.12 | 3.12 | 3.12 |
| 6:00 PM | 3.04 | 3.10 | 3.02 | 2.97 |
| 7:00 PM | 3.06 | 2.99 | 3.08 | 2.99 |
| 8:00 PM | 2.97 | 2.93 | 2.97 | 2.93 |
| 9:00 PM | 2.87 | 2.93 | 2.86 | 2.93 |
| 10:00 PM | 2.89 | 2.91 | 2.82 | 2.84 |
| 11:00 PM | 2.87 | 2.76 | 2.80 | 2.73 |
| 12 MNITE | 2.73 | 2.71 | 2.80 | 2.71 |
| 1:00 PM | 2.69 | 2.67 | 2.74 | 2.63 |
| 2:00 AM | 2.58 | 2.71 | 2.58 | 2.56 |
| 3:00 AM | 2.58 | 2.61 | 2.61 | 2.60 |
| 4:00 AM | 2.60 | 2.56 | 2.47 | 2.48 |
| 5:00 AM | 2.45 | 2.37 | 2.45 | 2.37 |
| 6:00 AM | 2.37 | 2.37 | 2.41 | 2.37 |
| 7:00 AM | 2.43 | 2.32 | 2.35 | 2.30 |

DAY 19

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.28 | 2.35 | 2.26 | 2.32 |
| 9:00 AM | 2.24 | 2.21 | 1.89 | 2.65 |
| 10:00 AM | 3.26 | 3.21 | 3.21 | 3.25 |
| 11:00 AM | 3.13 | 3.15 | 3.12 | 3.13 |
| 12 NOON | 3.04 | 3.06 | 3.08 | 3.04 |
| 1:00 PM | 2.99 | 2.97 | 3.06 | 2.99 |
| 2:00 PM | 2.95 | 3.00 | 2.89 | 2.91 |
| 3:00 PM | 2.93 | 2.84 | 3.06 | 3.06 |
| 4:00 PM | 3.08 | 3.02 | 3.13 | 3.02 |
| 5:00 PM | 3.00 | 2.97 | 2.93 | 2.95 |
| 6:00 PM | 2.97 | 2.95 | 2.99 | 2.89 |
| 7:00 PM | 2.95 | 2.84 | 2.89 | 2.87 |
| 8:00 PM | 2.93 | 2.87 | 2.84 | 2.86 |
| 9:00 PM | 2.82 | 2.91 | 2.76 | 2.80 |
| 10:00 PM | 2.74 | 2.78 | 2.74 | 2.71 |
| 11:00 PM | 2.73 | 3.04 | 3.28 | 3.19 |
| 12 MNITE | 3.15 | 3.19 | 3.12 | 3.15 |
| 1:00 PM | 3.06 | 3.13 | 3.13 | 3.04 |
| 2:00 AM | 3.04 | 3.13 | 3.00 | 3.02 |
| 3:00 AM | 3.00 | 2.95 | 2.93 | 2.91 |
| 4:00 AM | 2.97 | 2.93 | 2.93 | 2.82 |
| 5:00 AM | 2.86 | 2.86 | 2.89 | 2.84 |
| 6:00 AM | 2.87 | 2.78 | 2.82 | 2.78 |
| 7:00 AM | 2.82 | 2.82 | 2.78 | 2.69 |

DAY 20

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.69 | 2.67 | 2.67 | 2.69 |
| 9:00 AM | 2.06 | 2.43 | 3.15 | 3.15 |
| 10:00 AM | 3.15 | 3.02 | 2.99 | 3.04 |
| 11:00 AM | 3.10 | 2.97 | 3.02 | 3.04 |
| 12 NOON | 2.95 | 2.89 | 2.99 | 2.95 |
| 1:00 PM | 2.91 | 2.87 | 2.84 | 2.89 |
| 2:00 PM | 2.76 | 2.82 | 2.76 | 2.84 |
| 3:00 PM | 2.76 | 2.73 | 2.71 | 2.73 |
| 4:00 PM | 2.87 | 2.69 | 2.56 | 2.56 |
| 5:00 PM | 2.54 | 2.69 | 2.56 | 2.56 |
| 6:00 PM | 2.56 | 2.52 | 2.47 | 2.47 |
| 7:00 PM | 2.47 | 2.48 | 2.47 | 2.39 |
| 8:00 PM | 2.45 | 2.39 | 2.45 | 2.39 |
| 9:00 PM | 2.39 | 2.32 | 2.39 | 2.41 |
| 10:00 PM | 2.37 | 2.35 | 2.32 | 2.34 |
| 11:00 PM | 2.32 | 2.24 | 2.30 | 2.30 |
| 12 MNITE | 2.34 | 2.24 | 2.32 | 2.86 |
| 1:00 PM | 3.32 | 3.25 | 3.34 | 3.26 |
| 2:00 AM | 3.28 | 3.19 | 3.23 | 3.21 |
| 3:00 AM | 3.30 | 3.19 | 3.17 | 3.10 |
| 4:00 AM | 3.10 | 3.15 | 3.13 | 3.12 |
| 5:00 AM | 3.12 | 3.02 | 3.10 | 2.93 |
| 6:00 AM | 3.02 | 3.06 | 3.06 | 2.95 |
| 7:00 AM | 2.99 | 2.95 | 2.95 | 2.91 |

DAY 21

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.87 | 2.82 | 2.86 | 2.84 |
| 9:00 AM | 2.80 | 2.80 | 2.76 | 2.78 |
| 10:00 AM | 2.61 | 3.17 | 3.10 | 3.04 |
| 11:00 AM | 3.02 | 3.00 | 3.39 | 3.28 |
| 12 NOON | 3.36 | 3.36 | 3.36 | 3.25 |
| 1:00 PM | 3.26 | 3.25 | 3.26 | 3.13 |
| 2:00 PM | 3.21 | 3.19 | 3.21 | 3.10 |
| 3:00 PM | 3.23 | 3.08 | 3.08 | 3.00 |
| 4:00 PM | 3.08 | 3.04 | 3.06 | 3.06 |
| 5:00 PM | 3.00 | 2.99 | 2.93 | 2.99 |
| 6:00 PM | 2.91 | 2.93 | 2.86 | 2.82 |
| 7:00 PM | 2.91 | 2.86 | 2.80 | 2.82 |
| 8:00 PM | 2.82 | 2.86 | 2.78 | 2.80 |
| 9:00 PM | 2.78 | 2.76 | 2.76 | 3.08 |
| 10:00 PM | 3.13 | 3.15 | 3.06 | 3.10 |
| 11:00 PM | 3.10 | 3.19 | 3.04 | 3.10 |
| 12 MNITE | 3.02 | 3.02 | 3.08 | 3.10 |
| 1:00 PM | 2.95 | 3.00 | 3.00 | 2.97 |
| 2:00 AM | 2.86 | 2.93 | 2.84 | 2.99 |
| 3:00 AM | 2.93 | 2.93 | 2.82 | 2.84 |
| 4:00 AM | 2.86 | 2.76 | 2.74 | 2.80 |
| 5:00 AM | 2.69 | 2.71 | 2.67 | 2.69 |
| 6:00 AM | 2.71 | 2.73 | 2.71 | 2.63 |
| 7:00 AM | 2.67 | 2.61 | 2.60 | 2.58 |

DAY 22

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.58 | 2.54 | 2.54 | 1.52 |
| 9:00 AM | 2.60 | 3.00 | 2.93 | 3.00 |
| 10:00 AM | 2.78 | 2.73 | 2.78 | 2.76 |
| 11:00 AM | 2.50 | 2.50 | 2.50 | 2.86 |
| 12 NOON | 3.00 | 2.95 | 2.99 | 2.97 |
| 1:00 PM | 2.87 | 2.87 | 2.69 | 2.86 |
| 2:00 PM | 2.91 | 2.86 | 2.63 | 2.63 |
| 3:00 PM | 2.61 | 2.65 | 2.60 | 2.24 |
| 4:00 PM | 2.82 | 3.15 | 3.17 | 3.15 |
| 5:00 PM | 3.17 | 3.12 | 3.08 | 3.32 |
| 6:00 PM | 3.32 | 3.34 | 3.17 | 3.28 |
| 7:00 PM | 3.23 | 3.23 | 3.17 | 3.25 |
| 8:00 PM | 3.26 | 3.15 | 3.17 | 3.17 |
| 9:00 PM | 3.21 | 3.13 | 3.13 | 3.15 |
| 10:00 PM | 3.12 | 3.17 | 3.13 | 3.12 |
| 11:00 PM | 3.04 | 2.99 | 2.99 | 2.99 |
| 12 MNITE | 2.97 | 3.06 | 3.02 | 2.93 |
| 1:00 PM | 2.87 | 2.95 | 2.89 | 2.95 |
| 2:00 AM | 2.97 | 2.87 | 2.80 | 2.82 |
| 3:00 AM | 2.80 | 2.76 | 2.82 | 2.78 |
| 4:00 AM | 2.82 | 2.69 | 2.74 | 2.74 |
| 5:00 AM | 2.73 | 2.71 | 2.67 | 2.73 |
| 6:00 AM | 2.74 | 2.69 | 2.60 | 2.56 |
| 7:00 AM | 2.58 | 2.58 | 2.56 | 2.61 |

DAY 23

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.56 | 2.45 | 2.58 | 2.10 |
| 9:00 AM | 2.17 | 3.12 | 3.13 | 3.12 |
| 10:00 AM | 2.97 | 2.91 | 2.87 | 2.95 |
| 11:00 AM | 2.71 | 2.67 | 2.87 | 3.12 |
| 12 NOON | 3.10 | 3.04 | 3.12 | 3.06 |
| 1:00 PM | 3.10 | 2.80 | 2.84 | 2.80 |
| 2:00 PM | 2.87 | 2.78 | 2.58 | 2.74 |
| 3:00 PM | 2.78 | 2.84 | 2.78 | 2.13 |
| 4:00 PM | 2.95 | 3.43 | 3.43 | 3.43 |
| 5:00 PM | 3.49 | 3.34 | 3.37 | 3.45 |
| 6:00 PM | 3.34 | 3.41 | 3.37 | 3.39 |
| 7:00 PM | 3.36 | 3.36 | 3.28 | 3.30 |
| 8:00 PM | 3.26 | 3.30 | 3.28 | 3.30 |
| 9:00 PM | 3.28 | 3.23 | 3.26 | 3.28 |
| 10:00 PM | 3.25 | 3.23 | 3.28 | 3.30 |
| 11:00 PM | 3.30 | 3.26 | 3.21 | 3.25 |
| 12 MNITE | 3.13 | 3.15 | 3.23 | 3.08 |
| 1:00 PM | 3.13 | 3.17 | 3.12 | 3.12 |
| 2:00 AM | 3.02 | 3.12 | 3.12 | 3.04 |
| 3:00 AM | 2.97 | 3.00 | 3.00 | 3.00 |
| 4:00 AM | 2.95 | 2.93 | 2.97 | 2.93 |
| 5:00 AM | 2.93 | 2.89 | 2.84 | 2.82 |
| 6:00 AM | 2.93 | 2.82 | 2.89 | 2.84 |
| 7:00 AM | 2.76 | 2.74 | 2.78 | 2.76 |

DAY 24

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.73 | 2.67 | 2.69 | 2.74 |
| 9:00 AM | 2.37 | 3.08 | 3.02 | 3.10 |
| 10:00 AM | 2.89 | 2.87 | 2.87 | 2.73 |
| 11:00 AM | 2.76 | 2.54 | 2.52 | 3.00 |
| 12 NOON | 2.99 | 2.97 | 2.91 | 2.87 |
| 1:00 PM | 2.65 | 2.73 | 2.71 | 2.89 |
| 2:00 PM | 2.78 | 2.76 | 2.82 | 2.73 |
| 3:00 PM | 2.02 | 2.60 | .93 | .95 |
| 4:00 PM | 3.06 | .96 | 3.28 | 3.19 |
| 5:00 PM | 3.15 | 3.26 | 3.28 | 3.25 |
| 6:00 PM | 3.21 | 3.21 | 3.19 | 3.17 |
| 7:00 PM | 3.12 | 3.21 | 3.12 | 3.15 |
| 8:00 PM | 3.10 | 3.08 | 3.12 | 3.06 |
| 9:00 PM | 3.06 | 3.00 | 3.00 | 2.95 |
| 10:00 PM | 2.95 | 2.97 | 2.97 | 2.91 |
| 11:00 PM | 2.91 | 2.91 | 2.82 | 2.86 |
| 12 MNITE | 2.84 | 2.84 | 2.82 | 2.80 |
| 1:00 PM | 2.74 | 2.78 | 2.71 | 2.69 |
| 2:00 AM | 2.71 | 2.76 | 2.69 | 2.74 |
| 3:00 AM | 2.61 | 2.60 | 2.63 | 2.58 |
| 4:00 AM | 2.52 | 2.56 | 2.50 | 2.52 |
| 5:00 AM | 2.50 | 2.58 | 2.43 | 2.47 |
| 6:00 AM | 2.52 | 2.37 | 2.48 | 2.35 |
| 7:00 AM | 2.41 | 2.37 | 2.30 | 2.30 |

DAY 25

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.41 | 2.32 | 1.59 | 2.54 |
| 9:00 AM | 3.21 | 3.21 | 3.21 | 2.86 |
| 10:00 AM | 2.78 | 2.73 | 2.76 | 2.71 |
| 11:00 AM | 2.58 | 2.52 | 2.48 | 2.99 |
| 12 NOON | 2.99 | 2.95 | 2.87 | 2.87 |
| 1:00 PM | 2.87 | 2.65 | 2.76 | 2.95 |
| 2:00 PM | 2.89 | 2.86 | 2.74 | 2.74 |
| 3:00 PM | 2.71 | 2.69 | 1.93 | 2.60 |
| 4:00 PM | 3.19 | 3.26 | 3.15 | 3.15 |
| 5:00 PM | 3.19 | 3.21 | 3.19 | 3.17 |
| 6:00 PM | 3.19 | 3.15 | 3.12 | 3.12 |
| 7:00 PM | 3.12 | 3.08 | 3.06 | 3.12 |
| 8:00 PM | 3.04 | 3.04 | 3.02 | 3.02 |
| 9:00 PM | 3.08 | 2.97 | 2.99 | 3.00 |
| 10:00 PM | 2.95 | 2.97 | 2.91 | 2.91 |
| 11:00 PM | 2.93 | 2.87 | 2.99 | 2.91 |
| 12 MNITE | 2.86 | 2.84 | 2.84 | 2.78 |
| 1:00 PM | 2.80 | 2.74 | 2.78 | 2.84 |
| 2:00 AM | 2.78 | 2.74 | 2.76 | 2.71 |
| 3:00 AM | 2.71 | 2.69 | 2.63 | 2.65 |
| 4:00 AM | 2.67 | 2.67 | 2.65 | 2.60 |
| 5:00 AM | 2.58 | 2.61 | 2.54 | 2.54 |
| 6:00 AM | 2.47 | 2.50 | 2.47 | 2.47 |
| 7:00 AM | 2.52 | 2.52 | 2.47 | 2.43 |

DAY 26

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.43 | 2.41 | 2.37 | 2.00 |
| 9:00 AM | 2.28 | 3.12 | 3.12 | 3.13 |
| 10:00 AM | 2.78 | 2.82 | 2.80 | 2.74 |
| 11:00 AM | 2.78 | 2.52 | 2.99 | 2.97 |
| 12 NOON | 2.99 | 3.06 | 3.02 | 3.00 |
| 1:00 PM | 2.97 | 2.89 | 2.76 | 2.76 |
| 2:00 PM | 2.80 | 2.76 | 2.76 | 2.65 |
| 3:00 PM | 2.76 | 2.71 | 2.65 | 2.73 |
| 4:00 PM | 2.23 | 2.28 | 3.10 | 3.34 |
| 5:00 PM | 3.25 | 3.25 | 3.17 | 3.19 |
| 6:00 PM | 3.17 | 3.17 | 3.15 | 3.23 |
| 7:00 PM | 3.17 | 3.19 | 3.21 | 3.15 |
| 8:00 PM | 3.08 | 3.15 | 3.12 | 3.12 |
| 9:00 PM | 3.12 | 3.08 | 3.13 | 3.13 |
| 10:00 PM | 3.10 | 3.04 | 3.06 | 3.02 |
| 11:00 PM | 3.06 | 2.99 | 2.99 | 3.04 |
| 12 MNITE | 2.91 | 2.89 | 2.99 | 2.86 |
| 1:00 PM | 2.89 | 2.91 | 2.84 | 2.86 |
| 2:00 AM | 2.87 | 2.82 | 2.73 | 2.80 |
| 3:00 AM | 2.71 | 2.76 | 2.69 | 2.73 |
| 4:00 AM | 2.69 | 2.67 | 2.74 | 2.73 |
| 5:00 AM | 2.69 | 2.71 | 2.60 | 2.61 |
| 6:00 AM | 2.65 | 2.54 | 2.61 | 2.52 |
| 7:00 AM | 2.54 | 2.50 | 2.43 | 2.47 |

DAY 27

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.43 | 2.43 | 2.43 | 2.39 |
| 9:00 AM | 2.43 | 2.34 | 1.76 | 2.30 |
| 10:00 AM | 3.04 | 3.21 | 3.21 | 3.21 |
| 11:00 AM | 3.21 | 3.17 | 3.15 | 3.12 |
| 12 NOON | 3.15 | 3.12 | 3.08 | 3.10 |
| 1:00 PM | 3.02 | 3.02 | 3.06 | 3.06 |
| 2:00 PM | 3.08 | 2.93 | 2.93 | 2.95 |
| 3:00 PM | 2.99 | 2.87 | 2.84 | 2.86 |
| 4:00 PM | 2.82 | 2.89 | 2.87 | 2.76 |
| 5:00 PM | 2.76 | 2.71 | 2.76 | 2.76 |
| 6:00 PM | 2.69 | 2.65 | 2.78 | 2.63 |
| 7:00 PM | 2.65 | 2.69 | 2.71 | 2.63 |
| 8:00 PM | 2.74 | 2.61 | 2.63 | 2.63 |
| 9:00 PM | 2.60 | 2.60 | 2.67 | 2.99 |
| 10:00 PM | 3.21 | 3.26 | 3.25 | 3.19 |
| 11:00 PM | 3.17 | 3.25 | 3.17 | 3.19 |
| 12 MNITE | 3.23 | 3.15 | 3.12 | 3.17 |
| 1:00 PM | 3.06 | 3.08 | 3.06 | 3.04 |
| 2:00 AM | 3.00 | 2.99 | 2.99 | 3.04 |
| 3:00 AM | 2.93 | 2.87 | 2.91 | 2.99 |
| 4:00 AM | 2.82 | 2.89 | 2.84 | 2.84 |
| 5:00 AM | 2.87 | 2.89 | 2.74 | 2.78 |
| 6:00 AM | 2.76 | 2.82 | 2.80 | 2.69 |
| 7:00 AM | 2.78 | 2.65 | 2.63 | 2.63 |

DAY 28

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.69 | 2.60 | 2.54 | 2.61 |
| 9:00 AM | 2.61 | 2.21 | 2.89 | 2.91 |
| 10:00 AM | 2.93 | 2.86 | 2.87 | 2.84 |
| 11:00 AM | 2.82 | 2.84 | 2.74 | 2.80 |
| 12 NOON | 2.82 | 2.74 | 2.76 | 2.73 |
| 1:00 PM | 3.13 | 3.12 | 3.13 | 3.17 |
| 2:00 PM | 3.15 | 3.04 | 3.04 | 3.02 |
| 3:00 PM | 3.02 | 2.99 | 2.97 | 2.95 |
| 4:00 PM | 2.99 | 2.95 | 2.99 | 2.93 |
| 5:00 PM | 2.87 | 2.82 | 2.86 | 2.84 |
| 6:00 PM | 2.84 | 2.89 | 2.84 | 2.86 |
| 7:00 PM | 2.74 | 2.73 | 2.76 | 2.76 |
| 8:00 PM | 2.74 | 2.80 | 2.82 | 2.76 |
| 9:00 PM | 2.73 | 2.67 | 2.71 | 2.67 |
| 10:00 PM | 2.63 | 2.65 | 2.65 | 2.93 |
| 11:00 PM | 3.30 | 3.25 | 3.23 | 3.23 |
| 12 MNITE | 3.25 | 3.19 | 3.26 | 3.13 |
| 1:00 PM | 3.12 | 3.21 | 3.04 | 3.08 |
| 2:00 AM | 3.10 | 3.12 | 3.02 | 3.00 |
| 3:00 AM | 3.00 | 3.06 | 3.02 | 2.95 |
| 4:00 AM | 2.93 | 2.99 | 2.87 | 2.89 |
| 5:00 AM | 2.80 | 2.91 | 2.78 | 2.87 |
| 6:00 AM | 2.80 | 2.78 | 2.74 | 2.80 |
| 7:00 AM | 2.67 | 2.76 | 2.78 | 2.65 |

## DAY 29

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.67 | 2.63 | 2.19 | 2.04 |
| 9:00 AM | 2.04 | 2.63 | 2.97 | 2.97 |
| 10:00 AM | 2.69 | 2.71 | 2.73 | 2.69 |
| 11:00 AM | 2.67 | 2.48 | 2.87 | 2.95 |
| 12 NOON | 2.89 | 2.87 | 2.84 | 2.89 |
| 1:00 PM | 2.84 | 2.69 | 2.65 | 2.80 |
| 2:00 PM | 3.37 | 3.71 | 3.49 | 3.21 |
| 3:00 PM | 3.36 | 2.84 | 2.56 | 2.60 |
| 4:00 PM | 2.19 | 1.69 | 2.54 | 1.76 |
| 5:00 PM | 3.17 | 3.17 | 3.10 | 3.15 |
| 6:00 PM | 3.10 | 3.06 | 3.06 | 3.06 |
| 7:00 PM | 3.10 | 3.06 | 3.12 | 3.06 |
| 8:00 PM | 3.04 | 3.04 | 3.08 | 2.97 |
| 9:00 PM | 2.93 | 2.93 | 2.95 | 2.91 |
| 10:00 PM | 2.91 | 2.95 | 2.84 | 2.95 |
| 11:00 PM | 1.72 | 2.80 | 2.87 | 2.91 |
| 12 MNITE | 2.82 | 2.80 | 2.87 | 2.74 |
| 1:00 PM | 2.71 | 2.74 | 2.69 | 2.78 |
| 2:00 AM | 2.61 | 2.76 | 2.67 | 2.65 |
| 3:00 AM | 2.63 | 2.63 | 2.65 | 2.61 |
| 4:00 AM | 2.58 | 2.54 | 2.50 | 2.60 |
| 5:00 AM | 2.54 | 2.50 | 2.47 | 2.48 |
| 6:00 AM | 2.58 | 2.43 | 2.41 | 2.41 |
| 7:00 AM | 2.39 | 2.43 | 2.43 | 2.43 |

## DAY 30

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.34 | 2.39 | 2.30 | 2.86 |
| 9:00 AM | 2.48 | 3.08 | 3.13 | 3.02 |
| 10:00 AM | 2.80 | 2.74 | 2.78 | 2.74 |
| 11:00 AM | 2.71 | 2.48 | 2.48 | 2.73 |
| 12 NOON | 3.10 | 2.99 | 2.97 | 3.00 |
| 1:00 PM | 2.99 | 2.87 | 2.74 | 2.86 |
| 2:00 PM | 2.86 | 2.74 | 2.60 | 2.50 |
| 3:00 PM | 2.37 | 2.35 | ---- | ---- |
| 4:00 PM | ---- | ---- | ---- | ---- |
| 5:00 PM | ---- | ---- | ---- | ---- |
| 6:00 PM | ---- | ---- | ---- | ---- |
| 7:00 PM | ---- | ---- | ---- | ---- |
| 8:00 PM | ---- | ---- | ---- | ---- |
| 9:00 PM | ---- | ---- | ---- | ---- |
| 10:00 PM | ---- | ---- | ---- | ---- |
| 11:00 PM | ---- | ---- | ---- | ---- |
| 12 MNITE | ---- | ---- | ---- | ---- |
| 1:00 PM | ---- | ---- | ---- | ---- |
| 2:00 AM | ---- | ---- | ---- | ---- |
| 3:00 AM | ---- | ---- | ---- | ---- |
| 4:00 AM | ---- | ---- | ---- | ---- |
| 5:00 AM | ---- | ---- | ---- | ---- |
| 6:00 AM | ---- | ---- | ---- | ---- |
| 7:00 AM | ---- | ---- | ---- | ---- |

Experiment 2

FREON 13B1 GAS CONCENTRATION

DAILY STATISTICS

| DAY | N | AVERAGE CONC (%) | STANDARD DEVIATION | STANDARD ERROR |
|---|---|---|---|---|
| 1 | 91 | 2.78 | .40 | .04 |
| 2 | 92 | 2.64 | .25 | .03 |
| 3 | 96 | 2.69 | .17 | .02 |
| 4 | 96 | 2.76 | .27 | .03 |
| 5 | 96 | 2.79 | .15 | .02 |
| 6 | 96 | 2.83 | .23 | .02 |
| 7 | 96 | 2.82 | .21 | .02 |
| 8 | 96 | 2.73 | .17 | .02 |
| 9 | 95 | 2.90 | .29 | .03 |
| 10 | 96 | 2.52 | .32 | .03 |
| 11 | 96 | 2.91 | .23 | .02 |
| 12 | 96 | 2.90 | .21 | .02 |
| 13 | 96 | 2.80 | .18 | .02 |
| 14 | 96 | 2.90 | .19 | .02 |
| 15 | 96 | 2.86 | .24 | .02 |
| 16 | 96 | 2.79 | .23 | .02 |
| 17 | 96 | 2.85 | .19 | .02 |
| 18 | 96 | 2.81 | .20 | .02 |
| 19 | 96 | 2.69 | .27 | .03 |
| 20 | 96 | 2.88 | .23 | .02 |
| 21 | 96 | 2.72 | .21 | .02 |
| 22 | 96 | 2.75 | .22 | .02 |
| 23 | 96 | 2.80 | .20 | .02 |
| 24 | 96 | 2.85 | .20 | .02 |
| 25 | 96 | 2.80 | .20 | .02 |
| 26 | 96 | 2.82 | .17 | .02 |
| 27 | 96 | 2.84 | .22 | .02 |
| 28 | 96 | 2.80 | .19 | .02 |
| 29 | 96 | 2.86 | .22 | .02 |
| 30 | 34 | 2.77 | .52 | .09 |

READINGS WITHIN 10% OF 2.8% FREON: 79.%
READINGS WITHIN 20% OF 2.8% FREON: 97.%
READINGS OUTSIDE 20% OF 2.8% FREON: 3.%

DAY 1

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | ---- | ---- | .14 | 1.36 |
| 9:00 AM | 1.52 | 2.45 | 2.82 | 2.85 |
| 10:00 AM | 2.72 | 2.82 | 2.80 | 2.66 |
| 11:00 AM | 2.61 | 2.77 | 2.61 | 2.45 |
| 12 NOON | 2.80 | 2.62 | 2.70 | 2.77 |
| 1:00 PM | 2.74 | 2.56 | ---- | ---- |
| 2:00 PM | ---- | 3.18 | 2.93 | 3.04 |
| 3:00 PM | 3.12 | 3.12 | 2.98 | 2.86 |
| 4:00 PM | 3.17 | 3.17 | 3.09 | 2.72 |
| 5:00 PM | 2.67 | 2.91 | 3.04 | 3.02 |
| 6:00 PM | 3.07 | 3.10 | 2.94 | 2.99 |
| 7:00 PM | 3.02 | 2.91 | 2.93 | 3.01 |
| 8:00 PM | 2.88 | 2.96 | 2.88 | 2.86 |
| 9:00 PM | 2.96 | 2.86 | 2.91 | 2.80 |
| 10:00 PM | 2.86 | 2.78 | 2.86 | 2.78 |
| 11:00 PM | 2.85 | 2.82 | 2.93 | 3.01 |
| 12 MNITE | 3.01 | 3.01 | 2.94 | 2.98 |
| 1:00 PM | 2.96 | 2.94 | 2.94 | 2.86 |
| 2:00 AM | 2.93 | 2.90 | 2.91 | 2.90 |
| 3:00 AM | 2.86 | 2.90 | 2.86 | 2.82 |
| 4:00 AM | 2.86 | 2.77 | 2.86 | 2.74 |
| 5:00 AM | 2.77 | 2.80 | 2.74 | 2.75 |
| 6:00 AM | 2.75 | 2.74 | 2.70 | 2.75 |
| 7:00 AM | 2.69 | 2.64 | 1.70 | 2.19 |

DAY 2

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.22 | 1.94 | 1.79 | 2.21 |
| 9:00 AM | 2.61 | 2.69 | 1.89 | 1.86 |
| 10:00 AM | 2.34 | 2.40 | 2.74 | 2.88 |
| 11:00 AM | 2.85 | 2.69 | 2.78 | 2.80 |
| 12 NOON | 2.82 | ---- | ---- | ---- |
| 1:00 PM | ---- | 2.53 | 2.42 | 2.56 |
| 2:00 PM | 2.67 | 2.32 | 2.56 | 2.67 |
| 3:00 PM | 2.66 | 2.45 | 2.61 | 2.75 |
| 4:00 PM | 2.77 | 2.61 | 2.38 | 2.34 |
| 5:00 PM | 2.14 | 2.16 | 2.58 | 2.91 |
| 6:00 PM | 2.94 | 2.94 | 2.94 | 2.96 |
| 7:00 PM | 2.94 | 2.98 | 2.82 | 2.90 |
| 8:00 PM | 2.90 | 2.82 | 2.85 | 2.88 |
| 9:00 PM | 2.77 | 2.82 | 2.72 | 2.77 |
| 10:00 PM | 2.77 | 2.74 | 2.77 | 2.69 |
| 11:00 PM | 2.72 | 2.83 | 2.88 | 2.80 |
| 12 MNITE | 2.88 | 2.80 | 2.83 | 2.77 |
| 1:00 PM | 2.83 | 2.75 | 2.80 | 2.78 |
| 2:00 AM | 2.74 | 2.75 | 2.72 | 2.75 |
| 3:00 AM | 2.70 | 2.77 | 2.70 | 2.69 |
| 4:00 AM | 2.72 | 2.61 | 2.62 | 2.64 |
| 5:00 AM | 2.59 | 2.64 | 2.56 | 2.56 |
| 6:00 AM | 2.54 | 2.53 | 2.54 | 2.50 |
| 7:00 AM | 2.56 | 2.53 | 2.48 | 2.50 |

DAY 3

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.45 | 2.50 | 2.40 | 2.46 |
| 9:00 AM | 2.35 | 2.45 | 2.26 | 2.10 |
| 10:00 AM | 1.98 | 2.43 | 2.78 | 2.61 |
| 11:00 AM | 2.77 | 2.75 | 2.82 | 2.80 |
| 12 NOON | 2.78 | 2.77 | 2.74 | 2.69 |
| 1:00 PM | 2.69 | 2.69 | 2.56 | 2.80 |
| 2:00 PM | 2.93 | 2.83 | 2.78 | 2.82 |
| 3:00 PM | 2.78 | 2.74 | 2.74 | 2.72 |
| 4:00 PM | 2.72 | 2.67 | 2.64 | 2.64 |
| 5:00 PM | 2.59 | 2.59 | 2.59 | 2.67 |
| 6:00 PM | 2.61 | 2.66 | 2.62 | 2.64 |
| 7:00 PM | 2.66 | 2.61 | 2.61 | 2.62 |
| 8:00 PM | 2.59 | 2.61 | 2.59 | 2.58 |
| 9:00 PM | 2.58 | 2.56 | 2.59 | 2.85 |
| 10:00 PM | 2.82 | 2.96 | 2.88 | 2.90 |
| 11:00 PM | 2.99 | 2.90 | 2.94 | 3.02 |
| 12 MNITE | 2.94 | 2.98 | 2.83 | 2.93 |
| 1:00 PM | 2.83 | 2.86 | 2.75 | 2.85 |
| 2:00 AM | 2.78 | 2.86 | 2.80 | 2.86 |
| 3:00 AM | 2.75 | 2.82 | 2.75 | 2.77 |
| 4:00 AM | 2.78 | 2.72 | 2.75 | 2.69 |
| 5:00 AM | 2.72 | 2.67 | 2.69 | 2.62 |
| 6:00 AM | 2.69 | 2.64 | 2.62 | 2.61 |
| 7:00 AM | 2.56 | 2.62 | 2.54 | 2.64 |

DAY 4

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.50 | 2.53 | 2.50 | 2.51 |
| 9:00 AM | 2.46 | 2.50 | 2.50 | 2.46 |
| 10:00 AM | 2.02 | 1.84 | 2.16 | 2.50 |
| 11:00 AM | 2.82 | 2.98 | 2.96 | 3.01 |
| 12 NOON | 3.01 | 2.99 | 3.02 | 2.98 |
| 1:00 PM | 2.98 | 2.93 | 2.90 | 2.86 |
| 2:00 PM | 2.85 | 2.82 | 2.80 | 2.78 |
| 3:00 PM | 2.75 | 2.75 | 2.69 | 2.70 |
| 4:00 PM | 2.66 | 2.62 | 2.66 | 2.62 |
| 5:00 PM | 2.64 | 2.62 | 2.64 | 2.58 |
| 6:00 PM | 2.61 | 2.58 | 2.62 | 2.61 |
| 7:00 PM | 2.64 | 2.61 | 2.61 | 2.58 |
| 8:00 PM | 2.58 | 2.53 | 2.50 | 2.53 |
| 9:00 PM | 2.53 | 2.43 | 2.48 | 2.48 |
| 10:00 PM | 2.48 | 2.43 | 2.40 | 2.42 |
| 11:00 PM | 2.34 | 2.59 | 2.90 | 3.15 |
| 12 MNITE | 3.14 | 3.23 | 3.10 | 3.12 |
| 1:00 PM | 3.25 | 3.07 | 3.14 | 3.10 |
| 2:00 AM | 3.10 | 3.18 | 3.06 | 3.09 |
| 3:00 AM | 2.99 | 3.10 | 3.06 | 3.02 |
| 4:00 AM | 3.06 | 2.96 | 3.06 | 2.96 |
| 5:00 AM | 2.99 | 2.93 | 2.93 | 3.02 |
| 6:00 AM | 2.86 | 2.96 | 2.88 | 2.88 |
| 7:00 AM | 2.91 | 2.78 | 2.82 | 2.86 |

DAY 5

FREON 1301 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.78 | 2.35 | 2.26 | 2.74 |
| 9:00 AM | 2.80 | 2.62 | 2.70 | 2.53 |
| 10:00 AM | 2.40 | 2.74 | 2.85 | 2.85 |
| 11:00 AM | 2.69 | 2.67 | 2.64 | 2.96 |
| 12 NOON | 2.85 | 2.74 | 2.70 | 2.67 |
| 1:00 PM | 2.69 | 2.56 | 2.54 | 2.82 |
| 2:00 PM | 2.83 | 2.53 | 2.66 | 2.61 |
| 3:00 PM | 2.70 | 2.51 | 2.88 | 2.85 |
| 4:00 PM | 2.98 | 2.56 | 2.51 | 2.53 |
| 5:00 PM | 2.72 | 2.83 | 2.83 | 2.83 |
| 6:00 PM | 2.86 | 2.83 | 2.88 | 2.86 |
| 7:00 PM | 2.88 | 2.85 | 2.85 | 2.83 |
| 8:00 PM | 2.88 | 2.85 | 2.88 | 2.83 |
| 9:00 PM | 2.88 | 2.90 | 2.85 | 2.82 |
| 10:00 PM | 2.83 | 2.85 | 2.80 | 2.82 |
| 11:00 PM | 2.80 | 2.94 | 3.04 | 2.99 |
| 12 MNITE | 2.96 | 2.99 | 3.02 | 3.02 |
| 1:00 PM | 2.98 | 2.96 | 2.93 | 3.02 |
| 2:00 AM | 2.96 | 2.91 | 2.91 | 2.88 |
| 3:00 AM | 2.93 | 2.93 | 2.88 | 2.88 |
| 4:00 AM | 2.90 | 2.78 | 2.83 | 2.82 |
| 5:00 AM | 2.78 | 2.80 | 2.80 | 2.77 |
| 6:00 AM | 2.78 | 2.72 | 2.72 | 2.75 |
| 7:00 AM | 2.72 | 2.69 | 2.70 | 2.67 |

DAY 6

FREON 1381 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.59 | 2.22 | 2.22 | 2.69 |
| 9:00 AM | 2.98 | 2.94 | 2.69 | 2.54 |
| 10:00 AM | 2.62 | 2.85 | 3.09 | 2.86 |
| 11:00 AM | 2.78 | 2.72 | 2.70 | 2.74 |
| 12 NOON | 2.54 | 2.77 | 2.82 | 2.54 |
| 1:00 PM | 2.56 | 2.34 | 2.61 | 2.61 |
| 2:00 PM | 2.72 | 2.53 | 2.61 | 2.70 |
| 3:00 PM | 2.67 | 2.80 | 2.59 | 2.58 |
| 4:00 PM | 2.58 | 2.58 | 2.24 | 2.14 |
| 5:00 PM | 2.19 | 2.48 | 2.72 | 2.91 |
| 6:00 PM | 2.93 | 2.93 | 2.94 | 2.93 |
| 7:00 PM | 2.91 | 2.91 | 2.93 | 2.91 |
| 8:00 PM | 2.90 | 2.91 | 2.91 | 2.91 |
| 9:00 PM | 2.93 | 2.90 | 3.12 | 2.93 |
| 10:00 PM | 2.93 | 2.90 | 2.90 | 2.94 |
| 11:00 PM | 2.96 | 2.93 | 3.14 | 3.26 |
| 12 MNITE | 3.22 | 3.20 | 3.15 | 3.04 |
| 1:00 PM | 3.14 | 3.12 | 3.15 | 3.09 |
| 2:00 AM | 3.04 | 3.09 | 3.14 | 2.94 |
| 3:00 AM | 3.01 | 3.07 | 2.98 | 2.94 |
| 4:00 AM | 3.02 | 2.96 | 2.93 | 2.96 |
| 5:00 AM | 2.94 | 2.85 | 2.91 | 2.80 |
| 6:00 AM | 2.82 | 2.94 | 2.80 | 2.86 |
| 7:00 AM | 2.85 | 2.72 | 2.82 | 2.82 |

DAY 7

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.72 | 2.45 | 2.38 | 2.62 |
| 9:00 AM | 2.96 | 2.96 | 2.98 | 2.54 |
| 10:00 AM | 2.96 | 2.94 | 2.94 | 2.78 |
| 11:00 AM | 2.72 | 2.69 | 2.72 | 2.66 |
| 12 NOON | 2.05 | 2.53 | 2.90 | 2.98 |
| 1:00 PM | 2.94 | 2.61 | 2.83 | 2.82 |
| 2:00 PM | 2.78 | 2.51 | 2.66 | 2.74 |
| 3:00 PM | 2.66 | 2.58 | 2.42 | 2.53 |
| 4:00 PM | 2.83 | 2.90 | 2.64 | 2.45 |
| 5:00 PM | 2.72 | 2.45 | 2.78 | 2.75 |
| 6:00 PM | 2.48 | 2.45 | 2.37 | 2.40 |
| 7:00 PM | 2.74 | 2.99 | 3.02 | 3.04 |
| 8:00 PM | 3.02 | 3.04 | 3.02 | 3.02 |
| 9:00 PM | 3.04 | 3.06 | 3.04 | 3.07 |
| 10:00 PM | 3.07 | 3.06 | 3.04 | 3.01 |
| 11:00 PM | 3.02 | 3.01 | 3.01 | 2.98 |
| 12 MNITE | 2.94 | 3.09 | 3.06 | 3.09 |
| 1:00 PM | 3.07 | 3.09 | 3.07 | 3.04 |
| 2:00 AM | 3.06 | 2.91 | 2.91 | 2.94 |
| 3:00 AM | 2.94 | 2.98 | 2.96 | 2.88 |
| 4:00 AM | 2.85 | 2.88 | 2.93 | 2.93 |
| 5:00 AM | 2.93 | 2.82 | 2.77 | 2.80 |
| 6:00 AM | 2.86 | 2.85 | 2.82 | 2.72 |
| 7:00 AM | 2.72 | 2.72 | 2.72 | 2.74 |

DAY 8

FREON 1301 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.70 | 2.35 | 2.10 | 2.85 |
| 9:00 AM | 2.86 | 2.85 | 2.66 | 2.70 |
| 10:00 AM | 2.67 | 2.64 | 2.58 | 2.77 |
| 11:00 AM | 2.80 | 2.78 | 2.74 | 2.61 |
| 12 NOON | 2.64 | 3.04 | 2.99 | 2.98 |
| 1:00 PM | 2.99 | 2.80 | 3.10 | 3.06 |
| 2:00 PM | 2.98 | 2.90 | 2.70 | 2.70 |
| 3:00 PM | 2.72 | 2.69 | 2.43 | 2.69 |
| 4:00 PM | 2.94 | 2.88 | 2.64 | 2.38 |
| 5:00 PM | 2.30 | 2.46 | 2.86 | 2.86 |
| 6:00 PM | 2.85 | 2.85 | 2.80 | 2.77 |
| 7:00 PM | 2.78 | 2.75 | 2.78 | 2.75 |
| 8:00 PM | 2.77 | 2.75 | 2.78 | 2.78 |
| 9:00 PM | 2.72 | 2.77 | 2.75 | 2.74 |
| 10:00 PM | 2.72 | 2.86 | 2.85 | 2.83 |
| 11:00 PM | 2.90 | 2.91 | 2.85 | 2.83 |
| 12 MNITE | 2.88 | 2.88 | 2.85 | 2.83 |
| 1:00 PM | 2.80 | 2.83 | 2.80 | 2.83 |
| 2:00 AM | 2.80 | 2.74 | 2.77 | 2.74 |
| 3:00 AM | 2.74 | 2.72 | 2.69 | 2.70 |
| 4:00 AM | 2.69 | 2.66 | 2.69 | 2.67 |
| 5:00 AM | 2.69 | 2.62 | 2.61 | 2.59 |
| 6:00 AM | 2.62 | 2.61 | 2.61 | 2.59 |
| 7:00 AM | 2.58 | 2.58 | 2.37 | 2.21 |

DAY 9

FREON 1301 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.42 | 2.38 | 1.98 | 2.74 |
| 9:00 AM | 2.94 | 2.90 | 2.82 | 2.77 |
| 10:00 AM | 2.70 | ---- | 2.61 | 2.62 |
| 11:00 AM | 2.69 | 2.93 | 2.98 | 2.82 |
| 12 NOON | 2.82 | 2.77 | 2.77 | 2.75 |
| 1:00 PM | 2.72 | 2.42 | 2.50 | 2.94 |
| 2:00 PM | 2.91 | 2.35 | 2.86 | 2.82 |
| 3:00 PM | 2.75 | 2.62 | 2.62 | 2.61 |
| 4:00 PM | 2.64 | 2.66 | 2.40 | 2.10 |
| 5:00 PM | 2.22 | 2.30 | 2.77 | 3.09 |
| 6:00 PM | 3.20 | 3.20 | 3.22 | 3.20 |
| 7:00 PM | 3.23 | 3.25 | 3.26 | 3.23 |
| 8:00 PM | 3.23 | 3.26 | 3.30 | 3.26 |
| 9:00 PM | 3.25 | 3.28 | 3.30 | 3.28 |
| 10:00 PM | 3.28 | 3.28 | 3.10 | 3.17 |
| 11:00 PM | 3.20 | 3.22 | 3.25 | 3.06 |
| 12 MNITE | 3.12 | 3.07 | 3.18 | 3.17 |
| 1:00 PM | 3.04 | 3.06 | 3.06 | 3.14 |
| 2:00 AM | 2.99 | 3.02 | 3.07 | 3.09 |
| 3:00 AM | 2.94 | 2.98 | 3.01 | 2.99 |
| 4:00 AM | 2.88 | 2.94 | 2.98 | 2.99 |
| 5:00 AM | 2.85 | 2.85 | 2.88 | 2.82 |
| 6:00 AM | 2.80 | 2.82 | 2.86 | 2.72 |
| 7:00 AM | 2.78 | 2.80 | 2.82 | 2.70 |

DAY 10

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.72 | 2.69 | 2.51 | 2.46 |
| 9:00 AM | 2.56 | 2.48 | 2.43 | 2.56 |
| 10:00 AM | 2.70 | 2.72 | 2.67 | 3.12 |
| 11:00 AM | 3.15 | 3.14 | 3.09 | 3.04 |
| 12 NOON | 3.01 | 3.02 | 3.01 | 2.94 |
| 1:00 PM | 2.90 | 2.93 | 2.96 | 2.88 |
| 2:00 PM | 2.90 | 2.91 | 2.88 | 2.85 |
| 3:00 PM | 2.83 | 2.80 | 2.74 | 2.77 |
| 4:00 PM | 2.80 | 2.78 | 2.77 | 2.74 |
| 5:00 PM | 2.74 | 2.74 | 2.69 | 2.70 |
| 6:00 PM | 2.70 | 2.67 | 2.64 | 2.64 |
| 7:00 PM | 2.62 | 2.64 | 2.59 | 2.62 |
| 8:00 PM | 2.61 | 2.62 | 2.59 | 2.53 |
| 9:00 PM | 2.53 | 2.46 | 2.48 | 2.48 |
| 10:00 PM | 2.50 | 2.46 | 2.42 | 2.42 |
| 11:00 PM | 2.40 | 2.38 | 2.40 | 2.37 |
| 12 MNITE | 2.35 | 2.37 | 2.30 | 2.30 |
| 1:00 PM | 2.30 | 2.29 | 2.30 | 2.27 |
| 2:00 AM | 2.24 | 2.19 | 2.22 | 2.22 |
| 3:00 AM | 2.22 | 2.11 | 2.13 | 2.18 |
| 4:00 AM | 2.13 | 2.18 | 2.13 | 2.13 |
| 5:00 AM | 2.13 | 2.03 | 2.02 | 2.05 |
| 6:00 AM | 2.05 | 2.03 | 2.06 | 2.00 |
| 7:00 AM | 1.95 | 1.98 | 2.00 | 2.00 |

DAY 11

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.18 | 2.05 | 1.73 | 2.67 |
| 9:00 AM | 3.18 | 3.15 | 3.20 | 3.17 |
| 10:00 AM | 3.14 | 3.17 | 3.09 | 3.12 |
| 11:00 AM | 3.14 | 3.07 | 3.10 | 3.07 |
| 12 NOON | 3.06 | 3.01 | 2.99 | 2.98 |
| 1:00 PM | 2.94 | 2.91 | 2.91 | 2.88 |
| 2:00 PM | 2.83 | 2.85 | 2.85 | 2.80 |
| 3:00 PM | 2.78 | 2.75 | 2.75 | 2.69 |
| 4:00 PM | 2.82 | 3.09 | 3.14 | 3.14 |
| 5:00 PM | 3.09 | 3.14 | 3.12 | 3.14 |
| 6:00 PM | 3.10 | 3.09 | 3.07 | 3.09 |
| 7:00 PM | 3.06 | 3.07 | 2.06 | 2.90 |
| 8:00 PM | 3.01 | 3.02 | 3.06 | 3.02 |
| 9:00 PM | 3.04 | 3.01 | 2.98 | 2.90 |
| 10:00 PM | 2.96 | 2.93 | 2.99 | 2.91 |
| 11:00 PM | 2.86 | 3.12 | 3.09 | 2.99 |
| 12 MNITE | 3.02 | 3.06 | 2.94 | 3.02 |
| 1:00 PM | 3.06 | 2.86 | 2.98 | 2.88 |
| 2:00 AM | 2.86 | 2.94 | 2.80 | 2.86 |
| 3:00 AM | 2.83 | 2.80 | 2.80 | 2.74 |
| 4:00 AM | 2.83 | 2.77 | 2.77 | 2.74 |
| 5:00 AM | 2.82 | 2.80 | 2.70 | 2.75 |
| 6:00 AM | 2.66 | 2.77 | 2.62 | 2.70 |
| 7:00 AM | 2.62 | 2.54 | 2.62 | 2.64 |

DAY 12

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.27 | 2.24 | 2.43 | 2.78 |
| 9:00 AM | 3.04 | 2.93 | 2.86 | 2.78 |
| 10:00 AM | 2.83 | 2.72 | 2.61 | 2.66 |
| 11:00 AM | 2.74 | 2.59 | 2.75 | 2.80 |
| 12 NOON | 2.77 | 2.64 | 2.69 | 2.69 |
| 1:00 PM | 2.58 | 2.94 | 2.94 | 2.96 |
| 2:00 PM | 2.96 | 2.80 | 2.72 | 2.74 |
| 3:00 PM | 2.74 | 2.62 | 2.59 | 2.58 |
| 4:00 PM | 2.56 | 2.96 | 2.77 | 3.01 |
| 5:00 PM | 3.18 | 3.07 | 3.23 | 3.22 |
| 6:00 PM | 3.20 | 3.20 | 3.26 | 3.23 |
| 7:00 PM | 3.22 | 3.20 | 3.12 | 3.10 |
| 8:00 PM | 3.15 | 3.15 | 3.04 | 3.09 |
| 9:00 PM | 3.15 | 3.01 | 3.02 | 3.14 |
| 10:00 PM | 2.96 | 2.99 | 3.06 | 2.91 |
| 11:00 PM | 2.98 | 2.91 | 3.12 | 3.17 |
| 12 MNITE | 3.02 | 3.15 | 3.06 | 3.14 |
| 1:00 PM | 3.01 | 3.06 | 2.98 | 3.02 |
| 2:00 AM | 2.91 | 3.02 | 2.90 | 2.99 |
| 3:00 AM | 2.93 | 2.94 | 3.02 | 2.94 |
| 4:00 AM | 2.88 | 2.88 | 2.85 | 2.91 |
| 5:00 AM | 2.86 | 2.90 | 2.75 | 2.88 |
| 6:00 AM | 2.77 | 2.83 | 2.74 | 2.83 |
| 7:00 AM | 2.75 | 2.82 | 2.70 | 2.70 |

DAY 13

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.74 | 2.53 | 2.43 | 2.80 |
| 9:00 AM | 3.01 | 2.91 | 2.82 | 3.01 |
| 10:00 AM | 3.04 | 2.99 | 2.64 | 2.86 |
| 11:00 AM | 2.93 | 2.93 | 2.66 | 2.61 |
| 12 NOON | 2.98 | 2.98 | 3.01 | 2.85 |
| 1:00 PM | 2.90 | 2.80 | 2.83 | 2.66 |
| 2:00 PM | 2.69 | 2.70 | 2.72 | 2.69 |
| 3:00 PM | 2.70 | 2.54 | 2.51 | 2.83 |
| 4:00 PM | 2.80 | 2.53 | 2.45 | 2.69 |
| 5:00 PM | 3.12 | 3.20 | 3.18 | 3.15 |
| 6:00 PM | 3.02 | 3.04 | 3.06 | 3.09 |
| 7:00 PM | 3.04 | 2.93 | 2.98 | 3.04 |
| 8:00 PM | 3.06 | 2.85 | 2.91 | 2.93 |
| 9:00 PM | 2.85 | 2.88 | 2.88 | 2.93 |
| 10:00 PM | 2.88 | 2.96 | 2.93 | 2.91 |
| 11:00 PM | 2.80 | 2.91 | 2.90 | 2.75 |
| 12 MNITE | 2.83 | 2.85 | 2.78 | 2.85 |
| 1:00 PM | 2.78 | 2.82 | 2.77 | 2.82 |
| 2:00 AM | 2.74 | 2.75 | 2.75 | 2.70 |
| 3:00 AM | 2.69 | 2.69 | 2.69 | 2.64 |
| 4:00 AM | 2.64 | 2.69 | 2.59 | 2.64 |
| 5:00 AM | 2.58 | 2.62 | 2.64 | 2.53 |
| 6:00 AM | 2.54 | 2.59 | 2.50 | 2.54 |
| 7:00 AM | 2.56 | 2.50 | 2.45 | 2.69 |

DAY 14

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.69 | 2.40 | 2.88 | 2.91 |
| 9:00 AM | 2.78 | 2.74 | 2.72 | 2.98 |
| 10:00 AM | 2.91 | 2.83 | 2.66 | 3.07 |
| 11:00 AM | 3.02 | 3.07 | 3.10 | 2.86 |
| 12 NOON | 2.85 | 3.02 | 3.07 | 3.07 |
| 1:00 PM | 2.94 | 2.72 | 2.80 | 2.90 |
| 2:00 PM | 2.91 | 2.80 | 2.83 | 2.69 |
| 3:00 PM | 2.75 | 2.67 | 3.07 | 3.01 |
| 4:00 PM | 3.02 | 2.93 | 2.72 | 2.69 |
| 5:00 PM | 2.75 | 2.77 | 3.26 | 3.33 |
| 6:00 PM | 3.39 | 3.22 | 3.18 | 3.22 |
| 7:00 PM | 3.23 | 3.07 | 3.18 | 3.26 |
| 8:00 PM | 3.01 | 3.14 | 3.18 | 3.06 |
| 9:00 PM | 3.07 | 3.17 | 2.99 | 3.06 |
| 10:00 PM | 3.01 | 3.04 | 3.07 | 2.94 |
| 11:00 PM | 2.98 | 3.04 | 2.90 | 3.02 |
| 12 MNITE | 2.99 | 2.94 | 2.96 | 2.91 |
| 1:00 PM | 2.86 | 2.96 | 2.86 | 2.90 |
| 2:00 AM | 2.93 | 2.83 | 2.85 | 2.88 |
| 3:00 AM | 2.82 | 2.85 | 2.72 | 2.80 |
| 4:00 AM | 2.83 | 2.74 | 2.78 | 2.77 |
| 5:00 AM | 2.72 | 2.72 | 2.64 | 2.74 |
| 6:00 AM | 2.67 | 2.64 | 2.74 | 2.62 |
| 7:00 AM | 2.64 | 2.67 | 2.48 | 2.51 |

DAY 15

FREON 1301 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.48 | 2.50 | 2.22 | 2.74 |
| 9:00 AM | 3.01 | 3.12 | 3.06 | 2.86 |
| 10:00 AM | 2.86 | 2.90 | 2.86 | 2.66 |
| 11:00 AM | 2.93 | 2.96 | 2.96 | 2.75 |
| 12 NOON | 2.74 | 2.80 | 2.59 | 2.38 |
| 1:00 PM | 2.37 | 2.75 | 2.70 | 2.75 |
| 2:00 PM | 2.82 | 2.77 | 2.72 | 3.09 |
| 3:00 PM | 3.47 | 3.28 | 3.36 | 3.20 |
| 4:00 PM | 3.12 | 3.25 | 2.90 | 2.72 |
| 5:00 PM | 3.07 | 3.39 | 3.41 | 3.23 |
| 6:00 PM | 2.98 | 3.20 | 3.12 | 3.15 |
| 7:00 PM | 3.14 | 3.04 | 3.18 | 3.01 |
| 8:00 PM | 3.04 | 3.07 | 2.96 | 3.12 |
| 9:00 PM | 2.96 | 2.98 | 3.04 | 2.94 |
| 10:00 PM | 3.04 | 2.91 | 2.94 | 2.98 |
| 11:00 PM | 2.88 | 3.01 | 2.82 | 2.90 |
| 12 MNITE | 2.90 | 2.82 | 2.93 | 2.80 |
| 1:00 PM | 2.82 | 2.85 | 2.82 | 2.90 |
| 2:00 AM | 2.74 | 2.75 | 2.80 | 2.69 |
| 3:00 AM | 2.80 | 2.69 | 2.72 | 2.77 |
| 4:00 AM | 2.62 | 2.75 | 2.66 | 2.69 |
| 5:00 AM | 2.66 | 2.56 | 2.67 | 2.62 |
| 6:00 AM | 2.58 | 2.64 | 2.53 | 2.56 |
| 7:00 AM | 2.56 | 2.56 | 2.56 | 2.51 |

DAY 16

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.42 | 2.27 | 2.18 | 2.48 |
| 9:00 AM | 2.88 | 2.75 | 2.90 | 2.88 |
| 10:00 AM | 2.91 | 3.04 | 2.69 | 2.67 |
| 11:00 AM | 2.86 | 2.86 | 2.94 | 2.98 |
| 12 NOON | 3.14 | 3.04 | 3.12 | 3.14 |
| 1:00 PM | 3.12 | 2.77 | 2.77 | 2.77 |
| 2:00 PM | 2.78 | 2.72 | 2.82 | 2.80 |
| 3:00 PM | 2.67 | 2.74 | 2.82 | 2.64 |
| 4:00 PM | 2.69 | 2.77 | 2.32 | 2.19 |
| 5:00 PM | 2.16 | 2.48 | 2.61 | 3.23 |
| 6:00 PM | 3.10 | 3.12 | 3.22 | 3.07 |
| 7:00 PM | 3.14 | 3.15 | 3.02 | 3.07 |
| 8:00 PM | 2.94 | 3.02 | 3.09 | 2.90 |
| 9:00 PM | 3.02 | 2.94 | 3.01 | 2.99 |
| 10:00 PM | 2.88 | 2.96 | 2.83 | 2.94 |
| 11:00 PM | 2.90 | 2.86 | 2.91 | 2.80 |
| 12 MNITE | 2.88 | 2.88 | 2.80 | 2.85 |
| 1:00 PM | 2.74 | 2.78 | 2.78 | 2.75 |
| 2:00 AM | 2.83 | 2.67 | 2.75 | 2.72 |
| 3:00 AM | 2.70 | 2.74 | 2.64 | 2.75 |
| 4:00 AM | 2.61 | 2.69 | 2.69 | 2.62 |
| 5:00 AM | 2.70 | 2.59 | 2.62 | 2.59 |
| 6:00 AM | 2.59 | 2.64 | 2.54 | 2.61 |
| 7:00 AM | 2.53 | 2.56 | 2.46 | 2.53 |

DAY 37

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.53 | 2.46 | 2.37 | 2.05 |
| 9:00 AM | 2.77 | 2.88 | 2.80 | 2.85 |
| 10:00 AM | 2.94 | 3.12 | 3.02 | 3.01 |
| 11:00 AM | 2.90 | 2.99 | 2.88 | 2.98 |
| 12 NOON | 2.86 | 2.94 | 2.91 | 2.96 |
| 1:00 PM | 2.99 | 2.90 | 2.99 | 2.88 |
| 2:00 PM | 2.88 | 2.86 | 2.96 | 2.80 |
| 3:00 PM | 2.86 | 2.90 | 2.93 | 2.91 |
| 4:00 PM | 2.88 | 2.82 | 2.72 | 2.80 |
| 5:00 PM | 2.83 | 2.85 | 2.82 | 2.69 |
| 6:00 PM | 2.75 | 2.78 | 2.80 | 3.12 |
| 7:00 PM | 3.20 | 3.20 | 3.06 | 3.10 |
| 8:00 PM | 3.15 | 3.01 | 3.12 | 3.02 |
| 9:00 PM | 3.06 | 3.12 | 2.99 | 3.10 |
| 10:00 PM | 2.93 | 3.04 | 2.93 | 2.99 |
| 11:00 PM | 2.91 | 2.99 | 2.93 | 2.99 |
| 12 MNITE | 2.88 | 2.94 | 2.83 | 2.88 |
| 1:00 PM | 2.82 | 2.88 | 2.80 | 2.86 |
| 2:00 AM | 2.80 | 2.88 | 2.75 | 2.78 |
| 3:00 AM | 2.72 | 2.83 | 2.72 | 2.83 |
| 4:00 AM | 2.72 | 2.75 | 2.72 | 2.64 |
| 5:00 AM | 2.74 | 2.67 | 2.70 | 2.61 |
| 6:00 AM | 2.64 | 2.70 | 2.53 | 2.62 |
| 7:00 AM | 2.51 | 2.64 | 2.51 | 2.53 |

DAY 18

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.58 | 2.48 | 2.58 | 2.40 |
| 9:00 AM | 2.37 | 2.11 | 2.83 | 2.94 |
| 10:00 AM | 3.30 | 3.10 | 3.25 | 3.14 |
| 11:00 AM | 2.99 | 3.09 | 2.96 | 3.09 |
| 12 NOON | 2.94 | 3.04 | 2.90 | 2.94 |
| 1:00 PM | 2.86 | 2.96 | 3.01 | 2.85 |
| 2:00 PM | 2.90 | 2.93 | 2.78 | 2.83 |
| 3:00 PM | 2.85 | 2.86 | 2.74 | 2.77 |
| 4:00 PM | 2.80 | 2.82 | 2.83 | 2.72 |
| 5:00 PM | 2.66 | 2.72 | 2.75 | 2.61 |
| 6:00 PM | 2.70 | 2.72 | 2.69 | 3.07 |
| 7:00 PM | 3.17 | 3.04 | 3.09 | 3.14 |
| 8:00 PM | 3.01 | 3.09 | 2.96 | 3.04 |
| 9:00 PM | 2.96 | 3.01 | 2.98 | 2.98 |
| 10:00 PM | 2.98 | 2.96 | 2.91 | 2.93 |
| 11:00 PM | 2.88 | 2.96 | 2.80 | 2.88 |
| 12 MNITE | 2.80 | 2.91 | 2.75 | 2.85 |
| 1:00 PM | 2.78 | 2.86 | 2.69 | 2.82 |
| 2:00 AM | 2.69 | 2.78 | 2.69 | 2.77 |
| 3:00 AM | 2.66 | 2.72 | 2.64 | 2.75 |
| 4:00 AM | 2.64 | 2.72 | 2.[illegible] | 2.72 |
| 5:00 AM | 2.58 | 2.62 | 2.58 | 2.64 |
| 6:00 AM | 2.53 | 2.64 | 2.54 | 2.62 |
| 7:00 AM | 2.51 | 2.58 | 2.48 | 2.56 |

## DAY 19

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.42 | 2.19 | 2.03 | 2.30 |
| 9:00 AM | 2.94 | 3.06 | 2.72 | 2.96 |
| 10:00 AM | 2.98 | 2.88 | 2.80 | 2.80 |
| 11:00 AM | 2.80 | 2.77 | 2.35 | 2.83 |
| 12 NOON | 2.85 | 2.83 | 2.83 | 2.83 |
| 1:00 PM | 2.48 | 2.80 | 2.91 | 2.90 |
| 2:00 PM | 2.88 | 2.90 | 2.56 | 2.58 |
| 3:00 PM | 2.90 | 2.90 | 2.80 | 2.85 |
| 4:00 PM | 2.83 | 2.77 | 2.70 | 2.32 |
| 5:00 PM | 2.78 | 3.18 | 3.17 | 3.12 |
| 6:00 PM | 3.14 | 3.07 | 3.02 | 3.04 |
| 7:00 PM | 2.96 | 2.91 | 2.90 | 2.85 |
| 8:00 PM | 2.82 | 2.80 | 2.74 | 2.72 |
| 9:00 PM | 2.72 | 2.62 | 2.61 | 2.61 |
| 10:00 PM | 2.54 | 2.51 | 2.46 | 2.45 |
| 11:00 PM | 2.40 | 2.40 | 2.37 | 2.29 |
| 12 MNITE | 2.30 | 2.22 | 2.19 | 2.16 |
| 1:00 PM | 2.14 | 2.08 | 2.93 | 3.07 |
| 2:00 AM | 3.04 | 2.98 | 3.01 | 2.94 |
| 3:00 AM | 2.91 | 2.88 | 2.91 | 2.74 |
| 4:00 AM | 2.70 | 2.74 | 2.72 | 2.72 |
| 5:00 AM | 2.67 | 2.56 | 2.54 | 2.53 |
| 6:00 AM | 2.50 | 2.42 | 2.40 | 2.38 |
| 7:00 AM | 2.34 | 2.34 | 2.46 | 2.58 |

DAY 29

FREON 1301 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.54 | 2.35 | 2.19 | 2.69 |
| 9:00 AM | 2.99 | 2.96 | 2.93 | 2.75 |
| 10:00 AM | 2.75 | 2.72 | 2.67 | 2.91 |
| 11:00 AM | 2.91 | 2.86 | 2.66 | 2.82 |
| 12 NOON | 2.90 | 2.85 | 2.85 | 2.80 |
| 1:00 PM | 2.78 | 2.83 | 2.78 | 2.78 |
| 2:00 PM | 2.80 | 2.80 | 2.72 | 2.64 |
| 3:00 PM | 2.48 | 2.69 | 2.85 | 2.88 |
| 4:00 PM | 2.85 | 2.82 | 2.53 | 2.43 |
| 5:00 PM | 2.62 | 3.04 | 3.06 | 3.14 |
| 6:00 PM | 3.10 | 3.20 | 3.18 | 3.20 |
| 7:00 PM | 3.22 | 3.23 | 3.23 | 3.26 |
| 8:00 PM | 3.30 | 3.30 | 3.14 | 3.23 |
| 9:00 PM | 3.23 | 3.12 | 3.23 | 3.09 |
| 10:00 PM | 3.18 | 3.10 | 3.15 | 3.01 |
| 11:00 PM | 3.14 | 2.98 | 3.10 | 2.99 |
| 12 MNITE | 3.09 | 2.98 | 3.10 | 2.99 |
| 1:00 PM | 2.94 | 3.02 | 2.93 | 2.96 |
| 2:00 AM | 2.91 | 2.90 | 2.98 | 2.74 |
| 3:00 AM | 2.90 | 2.86 | 2.80 | 2.88 |
| 4:00 AM | 2.80 | 2.75 | 2.86 | 2.77 |
| 5:00 AM | 2.74 | 2.75 | 2.69 | 2.70 |
| 6:00 AM | 2.70 | 2.64 | 2.67 | 2.66 |
| 7:00 AM | 2.58 | 2.62 | 2.61 | 2.56 |

DAY 21

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.64 | 2.59 | 2.21 | 2.61 |
| 9:00 AM | 2.75 | 2.86 | 2.74 | 2.56 |
| 10:00 AM | 2.90 | 2.96 | 2.83 | 2.72 |
| 11:00 AM | 2.90 | 2.88 | 2.98 | 2.83 |
| 12 NOON | 2.93 | 2.88 | 2.77 | 2.86 |
| 1:00 PM | 2.72 | 2.72 | 2.77 | 3.07 |
| 2:00 PM | 2.90 | 2.88 | 2.75 | 2.75 |
| 3:00 PM | 2.83 | 2.72 | 2.56 | 2.62 |
| 4:00 PM | 3.04 | 3.01 | 2.72 | 3.10 |
| 5:00 PM | 2.74 | 3.07 | 2.94 | 2.99 |
| 6:00 PM | 3.01 | 3.01 | 2.93 | 2.99 |
| 7:00 PM | 2.91 | 2.94 | 2.83 | 2.94 |
| 8:00 PM | 2.85 | 2.96 | 2.85 | 2.88 |
| 9:00 PM | 2.85 | 2.80 | 2.93 | 2.82 |
| 10:00 PM | 2.78 | 2.83 | 2.72 | 2.80 |
| 11:00 PM | 2.75 | 2.69 | 2.78 | 2.70 |
| 12 MNITE | 2.67 | 2.77 | 2.69 | 2.69 |
| 1:00 PM | 2.70 | 2.64 | 2.66 | 2.61 |
| 2:00 AM | 2.53 | 2.59 | 2.48 | 2.61 |
| 3:00 AM | 2.53 | 2.48 | 2.54 | 2.50 |
| 4:00 AM | 2.43 | 2.50 | 2.48 | 2.43 |
| 5:00 AM | 2.42 | 2.43 | 2.37 | 2.40 |
| 6:00 AM | 2.40 | 2.35 | 2.34 | 2.40 |
| 7:00 AM | 2.35 | 2.30 | 2.50 | 2.48 |

DAY 22

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.50 | 2.50 | 2.13 | 2.46 |
| 9:00 AM | 2.83 | 2.85 | 2.78 | 3.17 |
| 10:00 AM | 3.28 | 3.12 | 2.96 | 3.07 |
| 11:00 AM | 2.98 | 2.85 | 2.91 | 2.96 |
| 12 NOON | 2.83 | 2.93 | 2.98 | 2.83 |
| 1:00 PM | 2.93 | 2.50 | 2.78 | 2.85 |
| 2:00 PM | 2.85 | 2.67 | 2.88 | 2.96 |
| 3:00 PM | 2.96 | 2.83 | 2.78 | 2.83 |
| 4:00 PM | 2.51 | 2.46 | 2.70 | 2.91 |
| 5:00 PM | 3.06 | 3.14 | 3.01 | 3.07 |
| 6:00 PM | 2.99 | 3.04 | 2.93 | 2.99 |
| 7:00 PM | 3.04 | 2.90 | 3.04 | 2.86 |
| 8:00 PM | 2.98 | 2.83 | 2.90 | 2.80 |
| 9:00 PM | 2.90 | 2.82 | 2.83 | 2.85 |
| 10:00 PM | 2.80 | 2.88 | 2.78 | 2.86 |
| 11:00 PM | 2.72 | 2.85 | 2.69 | 2.82 |
| 12 MNITE | 2.66 | 2.75 | 2.64 | 2.72 |
| 1:00 PM | 2.64 | 2.72 | 2.61 | 2.67 |
| 2:00 AM | 2.58 | 2.66 | 2.58 | 2.66 |
| 3:00 AM | 2.53 | 2.61 | 2.48 | 2.58 |
| 4:00 AM | 2.50 | 2.56 | 2.43 | 2.56 |
| 5:00 AM | 2.46 | 2.51 | 2.45 | 2.48 |
| 6:00 AM | 2.40 | 2.43 | 2.42 | 2.38 |
| 7:00 AM | 2.38 | 2.34 | 2.56 | 2.56 |

DAY 23

## FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.62 | 2.29 | 2.58 | 2.77 |
| 9:00 AM | 2.83 | 2.69 | 2.67 | 2.80 |
| 10:00 AM | 2.90 | 2.78 | 2.83 | 2.88 |
| 11:00 AM | 2.93 | 2.82 | 2.85 | 2.78 |
| 12 NOON | 2.93 | 3.02 | 2.91 | 2.83 |
| 1:00 PM | 2.82 | 2.66 | 2.90 | 2.80 |
| 2:00 PM | 2.83 | 2.69 | 2.69 | 2.62 |
| 3:00 PM | 2.98 | 2.67 | 2.78 | 2.67 |
| 4:00 PM | 2.69 | 2.62 | 2.46 | 2.80 |
| 5:00 PM | 3.09 | 3.12 | 3.10 | 3.26 |
| 6:00 PM | 3.14 | 3.20 | 3.12 | 3.22 |
| 7:00 PM | 3.06 | 3.15 | 3.02 | 3.14 |
| 8:00 PM | 2.98 | 3.12 | 2.96 | 3.06 |
| 9:00 PM | 2.91 | 3.06 | 2.91 | 2.99 |
| 10:00 PM | 2.88 | 2.98 | 2.88 | 2.96 |
| 11:00 PM | 2.88 | 2.91 | 2.86 | 2.88 |
| 12 MNITE | 2.85 | 2.80 | 2.78 | 2.80 |
| 1:00 PM | 2.82 | 2.70 | 2.80 | 2.70 |
| 2:00 AM | 2.77 | 2.69 | 2.75 | 2.67 |
| 3:00 AM | 2.69 | 2.66 | 2.67 | 2.59 |
| 4:00 AM | 2.69 | 2.59 | 2.64 | 2.58 |
| 5:00 AM | 2.59 | 2.56 | 2.59 | 2.58 |
| 6:00 AM | 2.59 | 2.53 | 2.51 | 2.54 |
| 7:00 AM | 2.50 | 2.51 | 2.48 | 2.51 |

DAY 24

FREON 1381 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.46 | 2.51 | 2.43 | 2.00 |
| 9:00 AM | 2.13 | 2.58 | 2.69 | 2.64 |
| 10:00 AM | 3.07 | 2.99 | 3.07 | 2.94 |
| 11:00 AM | 3.01 | 3.02 | 2.88 | 3.01 |
| 12 NOON | 3.02 | 2.90 | 2.94 | 2.96 |
| 1:00 PM | 2.78 | 2.85 | 2.85 | 2.88 |
| 2:00 PM | 2.83 | 2.75 | 2.82 | 2.85 |
| 3:00 PM | 2.70 | 2.69 | 2.75 | 2.75 |
| 4:00 PM | 2.66 | 2.67 | 2.66 | 2.70 |
| 5:00 PM | 2.61 | 2.62 | 2.64 | 2.67 |
| 6:00 PM | 2.56 | 2.62 | 2.69 | 3.10 |
| 7:00 PM | 3.01 | 3.15 | 3.17 | 3.10 |
| 8:00 PM | 3.01 | 3.09 | 3.04 | 2.98 |
| 9:00 PM | 3.01 | 3.04 | 2.91 | 3.01 |
| 10:00 PM | 2.94 | 2.93 | 2.98 | 2.86 |
| 11:00 PM | 2.94 | 3.01 | 2.82 | 2.91 |
| 12 MNITE | 2.85 | 3.10 | 3.12 | 2.99 |
| 1:00 PM | 3.09 | 2.94 | 3.01 | 2.99 |
| 2:00 AM | 2.98 | 3.06 | 2.94 | 2.99 |
| 3:00 AM | 2.90 | 2.98 | 2.90 | 2.91 |
| 4:00 AM | 2.93 | 2.91 | 2.91 | 2.86 |
| 5:00 AM | 2.98 | 2.86 | 2.88 | 2.78 |
| 6:00 AM | 2.90 | 2.77 | 2.86 | 2.74 |
| 7:00 AM | 2.80 | 2.69 | 2.77 | 2.69 |

DAY 25

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.72 | 2.16 | 2.30 | 2.53 |
| 9:00 AM | 2.27 | 2.86 | 3.15 | 3.06 |
| 10:00 AM | 3.06 | 3.14 | 3.12 | 2.96 |
| 11:00 AM | 3.02 | 3.06 | 2.96 | 2.91 |
| 12 NOON | 2.99 | 2.99 | 3.01 | 2.86 |
| 1:00 PM | 2.85 | 2.90 | 2.91 | 2.90 |
| 2:00 PM | 2.91 | 2.86 | 2.86 | 2.75 |
| 3:00 PM | 2.85 | 2.77 | 2.78 | 2.75 |
| 4:00 PM | 2.75 | 2.74 | 2.70 | 2.69 |
| 5:00 PM | 2.69 | 2.96 | 2.96 | 3.07 |
| 6:00 PM | 3.06 | 3.07 | 3.12 | 3.07 |
| 7:00 PM | 3.01 | 2.91 | 2.94 | 3.02 |
| 8:00 PM | 2.99 | 2.94 | 2.93 | 2.93 |
| 9:00 PM | 2.96 | 2.85 | 2.90 | 2.93 |
| 10:00 PM | 2.85 | 2.90 | 2.94 | 2.80 |
| 11:00 PM | 2.86 | 2.77 | 2.82 | 2.83 |
| 12 MNITE | 2.80 | 2.83 | 2.74 | 2.80 |
| 1:00 PM | 2.72 | 2.75 | 2.67 | 2.74 |
| 2:00 AM | 2.69 | 2.69 | 2.72 | 2.64 |
| 3:00 AM | 2.66 | 2.66 | 2.70 | 2.61 |
| 4:00 AM | 2.67 | 2.56 | 2.66 | 2.58 |
| 5:00 AM | 2.59 | 2.54 | 2.56 | 2.54 |
| 6:00 AM | 2.53 | 2.54 | 2.46 | 2.50 |
| 7:00 AM | 2.43 | 2.50 | 2.42 | 2.72 |

DAY 26

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| 8:00 AM | 2.64 | 2.72 | 2.32 | 2.85 |
| 9:00 AM | 2.98 | 3.04 | 2.85 | 2.83 |
| 10:00 AM | 2.88 | 2.54 | 2.58 | 2.99 |
| 11:00 AM | 2.85 | 2.91 | 2.80 | 2.86 |
| 12 NOON | 2.78 | 2.82 | 2.85 | 2.85 |
| 1:00 PM | 2.72 | 2.64 | 2.93 | 2.94 |
| 2:00 PM | 2.94 | 2.77 | 2.75 | 2.90 |
| 3:00 PM | 2.88 | 2.83 | 2.86 | 2.83 |
| 4:00 PM | 2.78 | 2.80 | 2.29 | 2.59 |
| 5:00 PM | 2.88 | 3.02 | 3.02 | 3.02 |
| 6:00 PM | 3.04 | 3.06 | 3.12 | 3.07 |
| 7:00 PM | 3.09 | 3.04 | 3.07 | 3.12 |
| 8:00 PM | 3.10 | 2.91 | 2.98 | 3.02 |
| 9:00 PM | 3.07 | 2.94 | 2.96 | 2.98 |
| 10:00 PM | 2.93 | 2.85 | 2.93 | 2.96 |
| 11:00 PM | 2.83 | 2.91 | 2.94 | 2.80 |
| 12 MNITE | 2.88 | 2.91 | 2.75 | 2.85 |
| 1:00 PM | 2.85 | 2.78 | 2.85 | 2.69 |
| 2:00 AM | 2.83 | 2.77 | 2.74 | 2.80 |
| 3:00 AM | 2.67 | 2.78 | 2.69 | 2.70 |
| 4:00 AM | 2.67 | 2.67 | 2.72 | 2.61 |
| 5:00 AM | 2.66 | 2.61 | 2.61 | 2.67 |
| 6:00 AM | 2.59 | 2.62 | 2.50 | 2.56 |
| 7:00 AM | 2.59 | 2.51 | 2.46 | 2.74 |

DAY 27

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.78 | 2.27 | 2.61 | 3.09 |
| 9:00 AM | 3.09 | 2.96 | 2.72 | 2.98 |
| 10:00 AM | 2.96 | 2.96 | 2.86 | 2.82 |
| 11:00 AM | 2.85 | 2.66 | 2.88 | 2.74 |
| 12 NOON | 2.77 | 2.72 | 2.72 | 2.54 |
| 1:00 PM | 2.91 | 2.88 | 2.91 | 2.91 |
| 2:00 PM | 2.27 | 2.54 | 2.80 | 2.77 |
| 3:00 PM | 2.75 | 2.66 | 2.88 | 2.85 |
| 4:00 PM | 2.88 | 2.66 | 2.48 | 2.56 |
| 5:00 PM | 2.72 | 2.72 | 2.85 | 3.26 |
| 6:00 PM | 3.30 | 3.31 | 3.23 | 3.23 |
| 7:00 PM | 3.22 | 3.18 | 3.20 | 3.17 |
| 8:00 PM | 3.20 | 3.18 | 3.20 | 3.06 |
| 9:00 PM | 3.04 | 3.07 | 3.10 | 3.07 |
| 10:00 PM | 2.96 | 2.93 | 2.98 | 2.98 |
| 11:00 PM | 3.02 | 2.86 | 2.90 | 2.94 |
| 12 MNITE | 2.96 | 2.80 | 2.85 | 2.90 |
| 1:00 PM | 2.86 | 2.75 | 2.78 | 2.82 |
| 2:00 AM | 2.82 | 2.78 | 2.72 | 2.75 |
| 3:00 AM | 2.78 | 2.69 | 2.67 | 2.72 |
| 4:00 AM | 2.72 | 2.62 | 2.62 | 2.85 |
| 5:00 AM | 2.67 | 2.54 | 2.58 | 2.62 |
| 6:00 AM | 2.61 | 2.53 | 2.56 | 2.59 |
| 7:00 AM | 2.48 | 2.51 | 2.77 | 2.72 |

DAY 28

# FREON 13B1 CONCENTRATION IN THE CHAMBER

## AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.62 | 2.50 | 2.37 | 2.51 |
| 9:00 AM | 2.94 | 2.96 | 2.98 | 2.69 |
| 10:00 AM | 2.93 | 2.91 | 2.88 | 2.61 |
| 11:00 AM | 2.77 | 2.85 | 2.85 | 2.85 |
| 12 NOON | 2.96 | 2.90 | 2.86 | 2.86 |
| 1:00 PM | 2.85 | 2.85 | 2.88 | 2.86 |
| 2:00 PM | 2.85 | 2.66 | 2.78 | 3.04 |
| 3:00 PM | 3.02 | 2.91 | 2.88 | 2.86 |
| 4:00 PM | 2.85 | 2.64 | 2.75 | 2.75 |
| 5:00 PM | 3.12 | 3.10 | 3.09 | 3.07 |
| 6:00 PM | 3.07 | 3.04 | 3.10 | 3.04 |
| 7:00 PM | 3.07 | 3.04 | 3.06 | 2.99 |
| 8:00 PM | 2.93 | 2.86 | 2.90 | 2.91 |
| 9:00 PM | 2.91 | 3.02 | 3.07 | 2.96 |
| 10:00 PM | 3.02 | 3.01 | 2.99 | 3.01 |
| 11:00 PM | 2.93 | 2.80 | 2.85 | 2.85 |
| 12 MNITE | 2.90 | 2.75 | 2.75 | 2.77 |
| 1:00 PM | 2.83 | 2.83 | 2.70 | 2.70 |
| 2:00 AM | 2.72 | 2.72 | 2.74 | 2.62 |
| 3:00 AM | 2.64 | 2.66 | 2.69 | 2.69 |
| 4:00 AM | 2.56 | 2.58 | 2.61 | 2.59 |
| 5:00 AM | 2.62 | 2.48 | 2.50 | 2.54 |
| 6:00 AM | 2.53 | 2.46 | 2.42 | 2.45 |
| 7:00 AM | 2.45 | 2.46 | 2.45 | 2.54 |

DAY 29

## FREON 13B1 CONCENTRATION IN THE CHAMBER AT 15-MINUTE INTERVALS

| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.51 | 2.30 | 2.19 | 2.82 |
| 9:00 AM | 2.86 | 2.83 | 2.82 | 2.66 |
| 10:00 AM | 2.98 | 2.96 | 2.93 | 2.51 |
| 11:00 AM | 2.78 | 2.82 | 2.82 | 2.56 |
| 12 NOON | 2.75 | 2.80 | 2.61 | 2.37 |
| 1:00 PM | 2.80 | 3.02 | 2.99 | 2.96 |
| 2:00 PM | 2.74 | 2.78 | 2.78 | 2.78 |
| 3:00 PM | 2.77 | 2.88 | 2.88 | 2.82 |
| 4:00 PM | 2.78 | 2.85 | 2.77 | 2.88 |
| 5:00 PM | 2.88 | 3.22 | 3.22 | 3.22 |
| 6:00 PM | 3.18 | 3.22 | 3.20 | 3.22 |
| 7:00 PM | 3.22 | 3.20 | 3.20 | 3.18 |
| 8:00 PM | 3.18 | 3.20 | 3.15 | 3.04 |
| 9:00 PM | 3.12 | 3.12 | 3.18 | 3.14 |
| 10:00 PM | 2.99 | 3.02 | 3.07 | 3.07 |
| 11:00 PM | 2.91 | 3.01 | 3.06 | 3.02 |
| 12 MNITE | 2.94 | 2.96 | 2.98 | 2.86 |
| 1:00 PM | 2.90 | 2.96 | 2.85 | 2.86 |
| 2:00 AM | 2.88 | 2.77 | 2.78 | 2.85 |
| 3:00 AM | 2.75 | 2.72 | 2.78 | 2.72 |
| 4:00 AM | 2.70 | 2.77 | 2.64 | 2.70 |
| 5:00 AM | 2.75 | 2.62 | 2.62 | 2.72 |
| 6:00 AM | 2.62 | 2.66 | 2.54 | 2.58 |
| 7:00 AM | 2.64 | 2.56 | 2.70 | 2.80 |

DAY 30

FREON 13B1 CONCENTRATION IN THE CHAMBER

AT 15-MINUTE INTERVALS

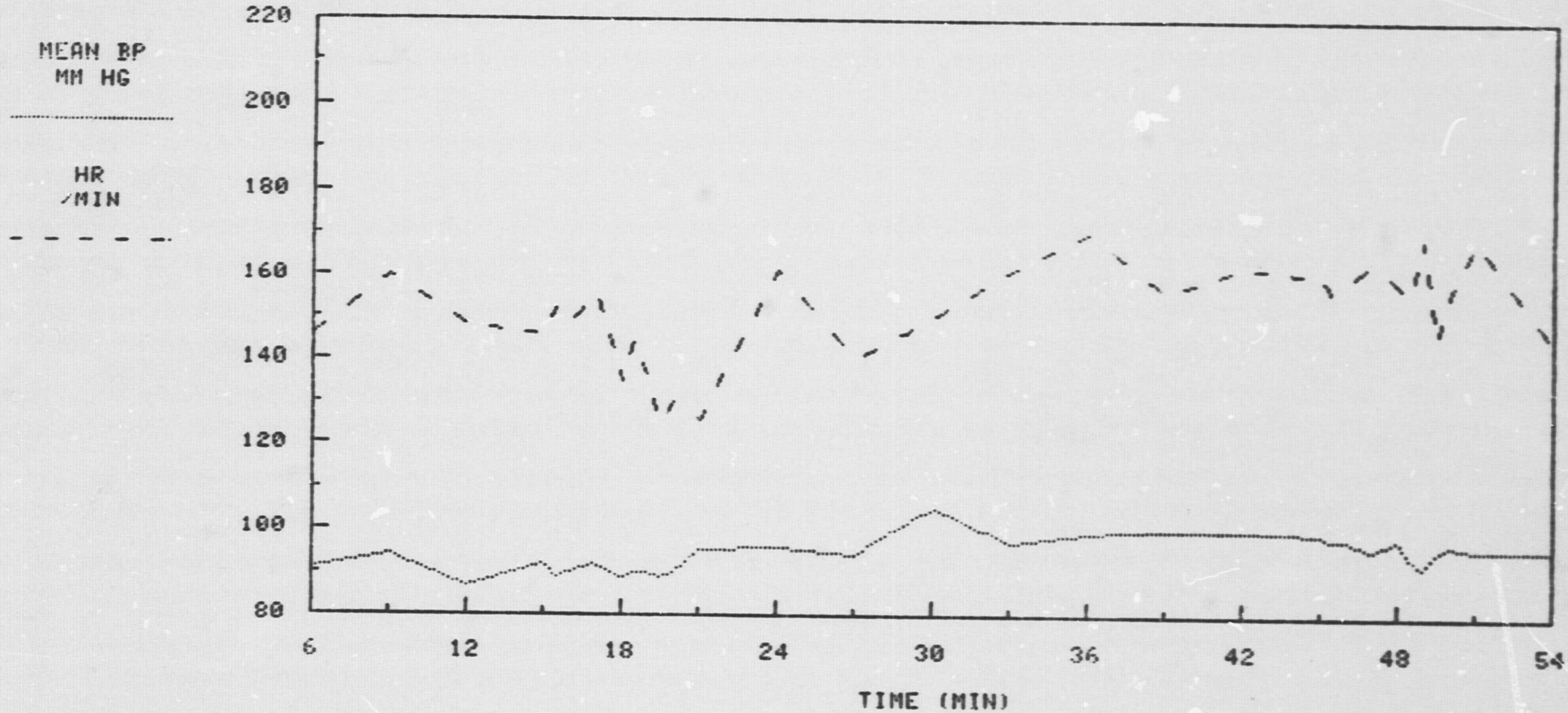
| | MINUTES PAST THE HOUR | | | |
|---|---|---|---|---|
| | 0 | 15 | 30 | 45 |
| 8:00 AM | 2.82 | 2.48 | 1.98 | 2.74 |
| 9:00 AM | 2.94 | 2.83 | 2.86 | 2.85 |
| 10:00 AM | 2.85 | 2.85 | 2.86 | 2.61 |
| 11:00 AM | 3.14 | 3.18 | 3.10 | 3.06 |
| 12 NOON | 2.85 | 2.83 | 2.80 | 2.80 |
| 1:00 PM | 2.80 | 2.72 | 2.86 | 3.10 |
| 2:00 PM | 3.10 | 3.10 | 2.98 | 2.91 |
| 3:00 PM | 2.91 | 2.86 | 2.91 | 2.74 |
| 4:00 PM | 2.78 | .05 | ---- | ---- |
| 5:00 PM | ---- | ---- | ---- | ---- |
| 6:00 PM | ---- | ---- | ---- | ---- |
| 7:00 PM | ---- | ---- | ---- | ---- |
| 8:00 PM | ---- | ---- | ---- | ---- |
| 9:00 PM | ---- | ---- | ---- | ---- |
| 10:00 PM | ---- | ---- | ---- | ---- |
| 11:00 PM | ---- | ---- | ---- | ---- |
| 12 MNITE | ---- | ---- | ---- | ---- |
| 1:00 PM | ---- | ---- | ---- | ---- |
| 2:00 AM | ---- | ---- | ---- | ---- |
| 3:00 AM | ---- | ---- | ---- | ---- |
| 4:00 AM | ---- | ---- | ---- | ---- |
| 5:00 AM | ---- | ---- | ---- | ---- |
| 6:00 AM | ---- | ---- | ---- | ---- |
| 7:00 AM | ---- | ---- | ---- | ---- |

## Appendix C

**Mean Blood Pressure and Heart Rate Taken at Varied Intervals During the Course of Exposures to $CBrF_3$**

# FREON 13B1 EXPOSURE

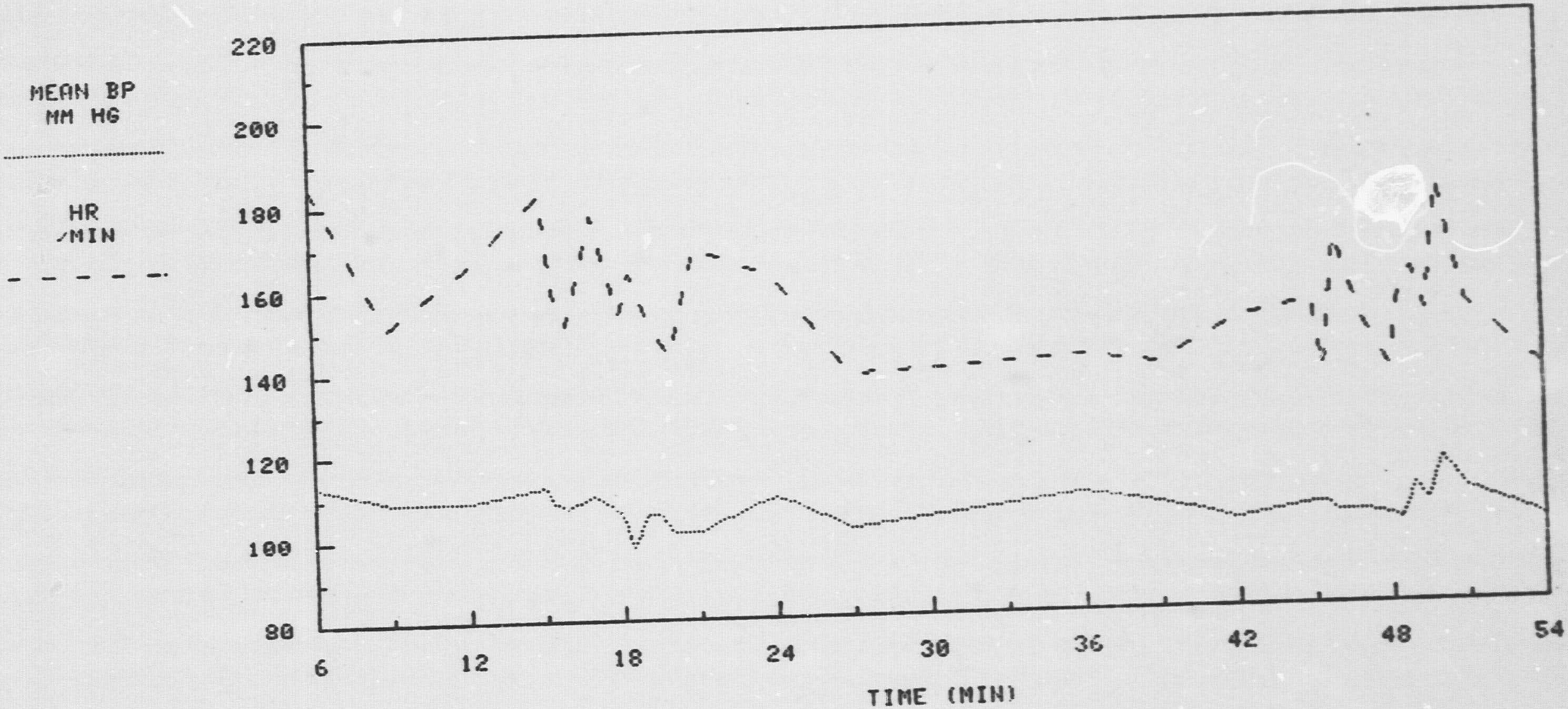
X99 PRE-GAS




151

# FREON 13B1 EXPOSURE

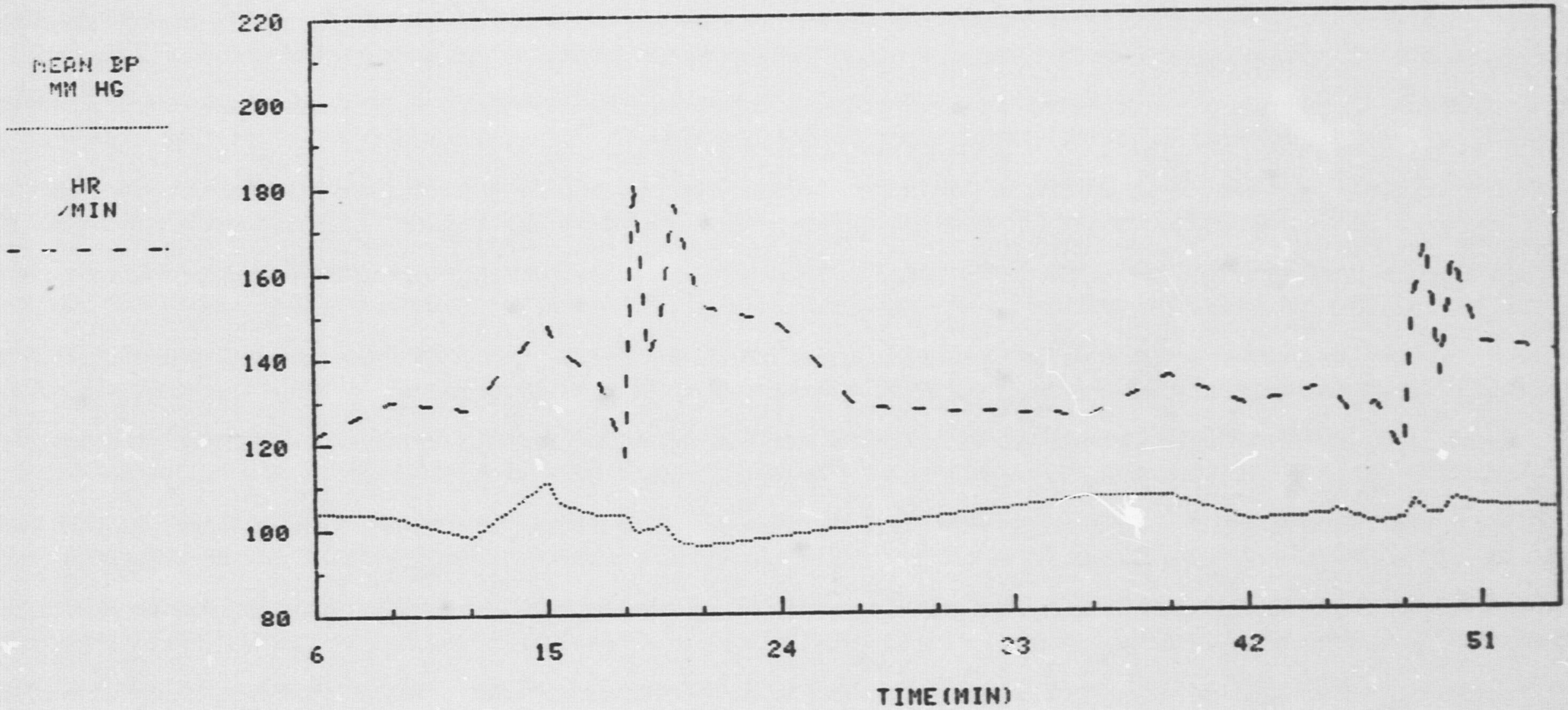
X99 DAY 2




152

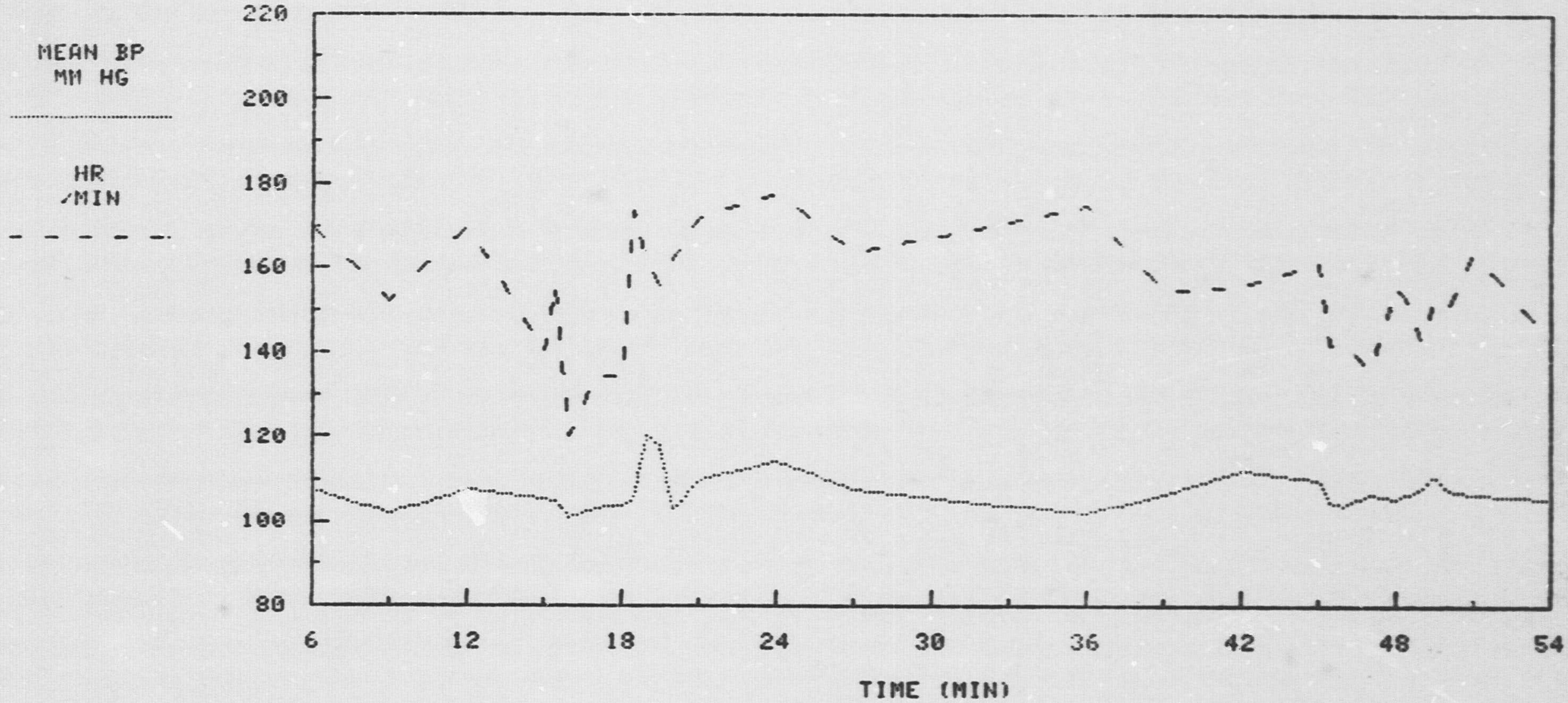
# FREON 13B1 EXPOSURE

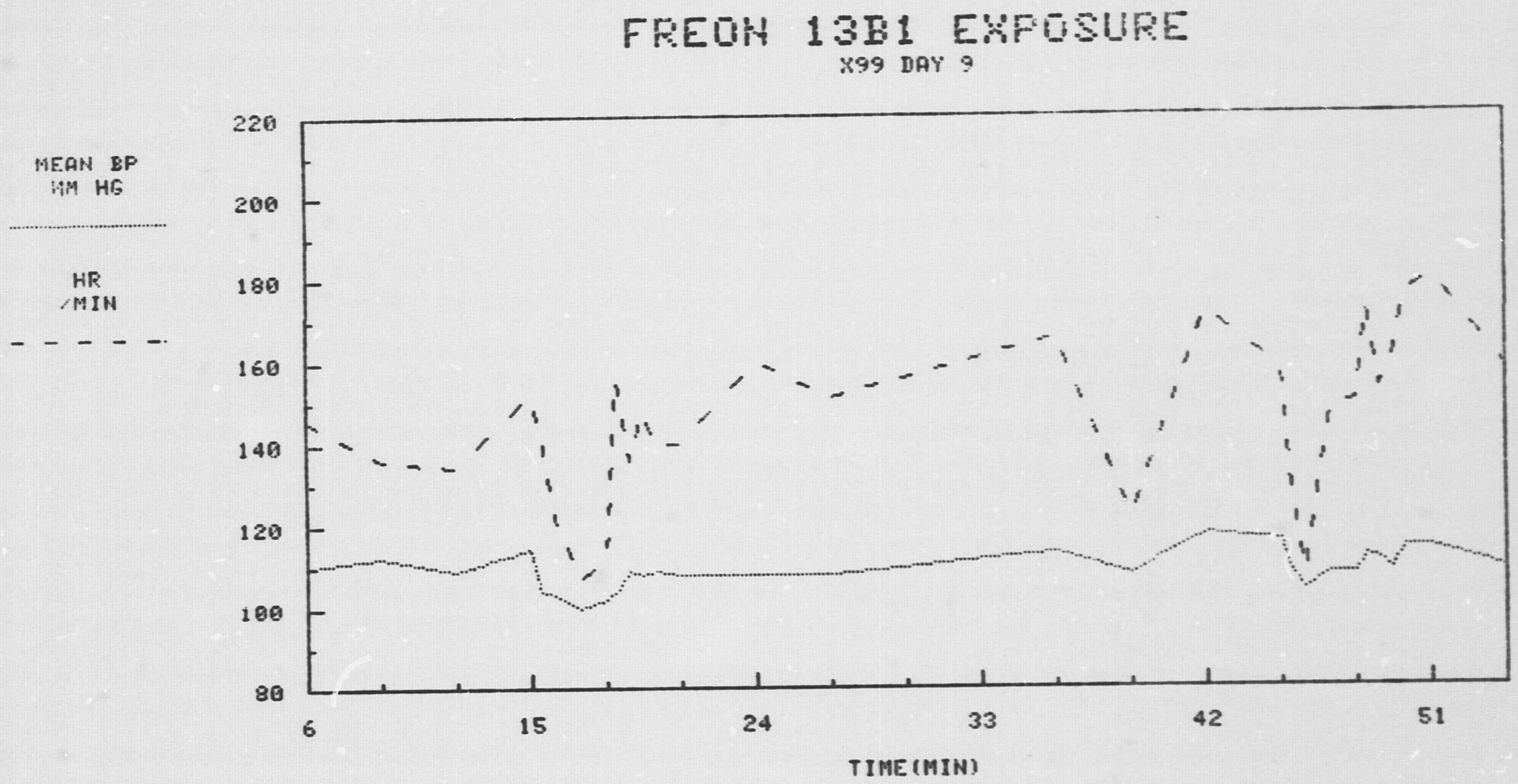
X99 DAY 5



# FREON 13B1 EXPOSURE

X99 DAY 8



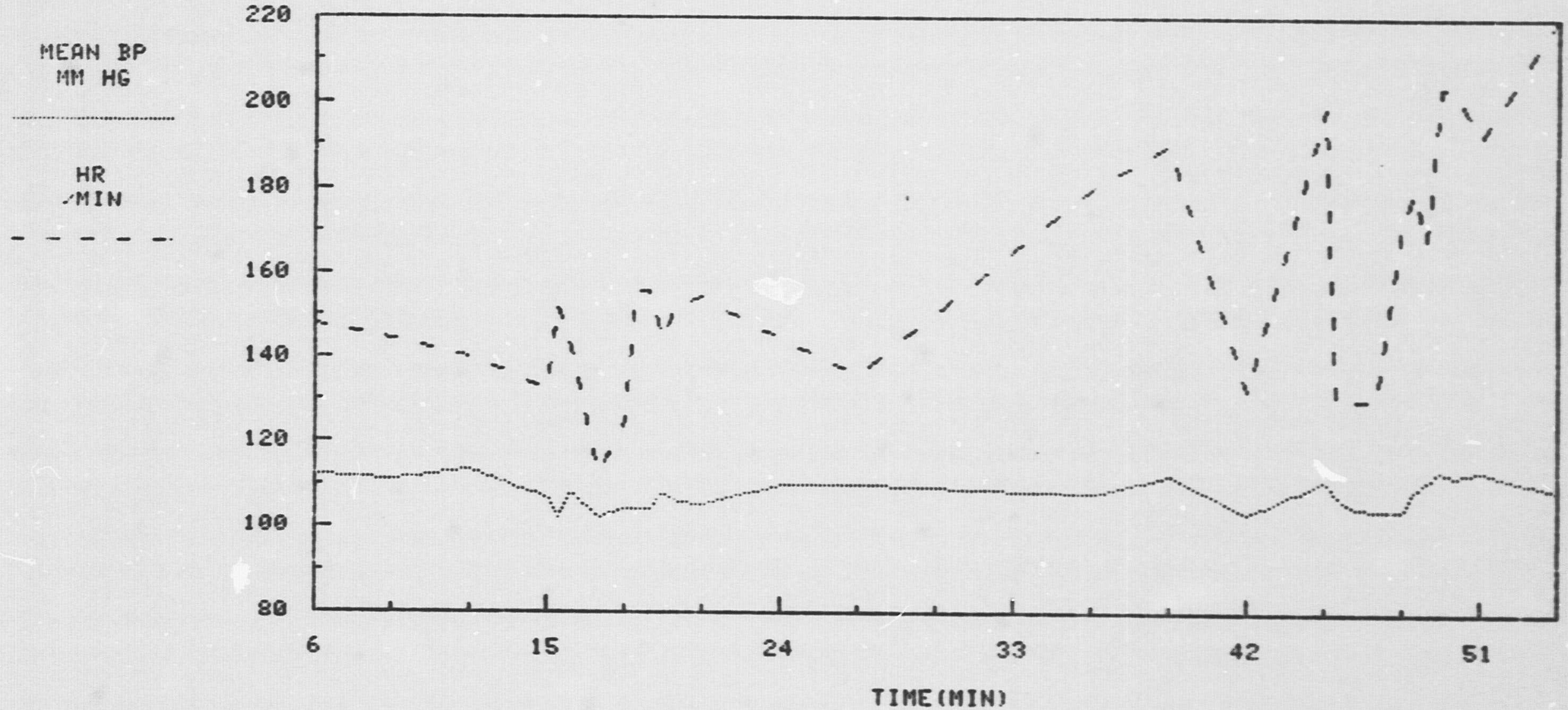


FREON 13B1 EXPOSURE
X99 DAY 9
MEAN BP
MM HG
HR
/MIN
220
200
180
160
140
120
100
80
6
15
24
33
42
51
TIME(MIN)


154

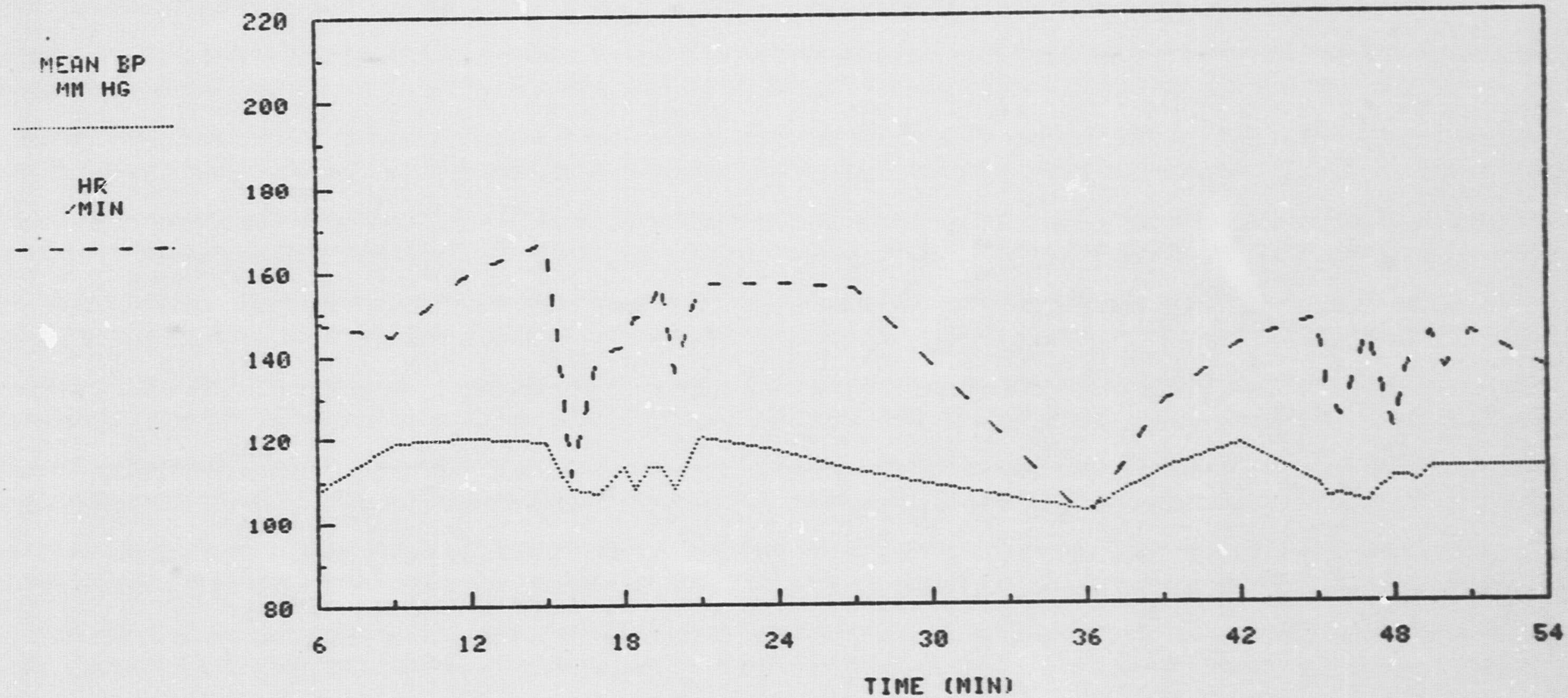
# FREON 13B1 EXPOSURE

X99 DAY 12



# FREON 13B1 EXPOSURE

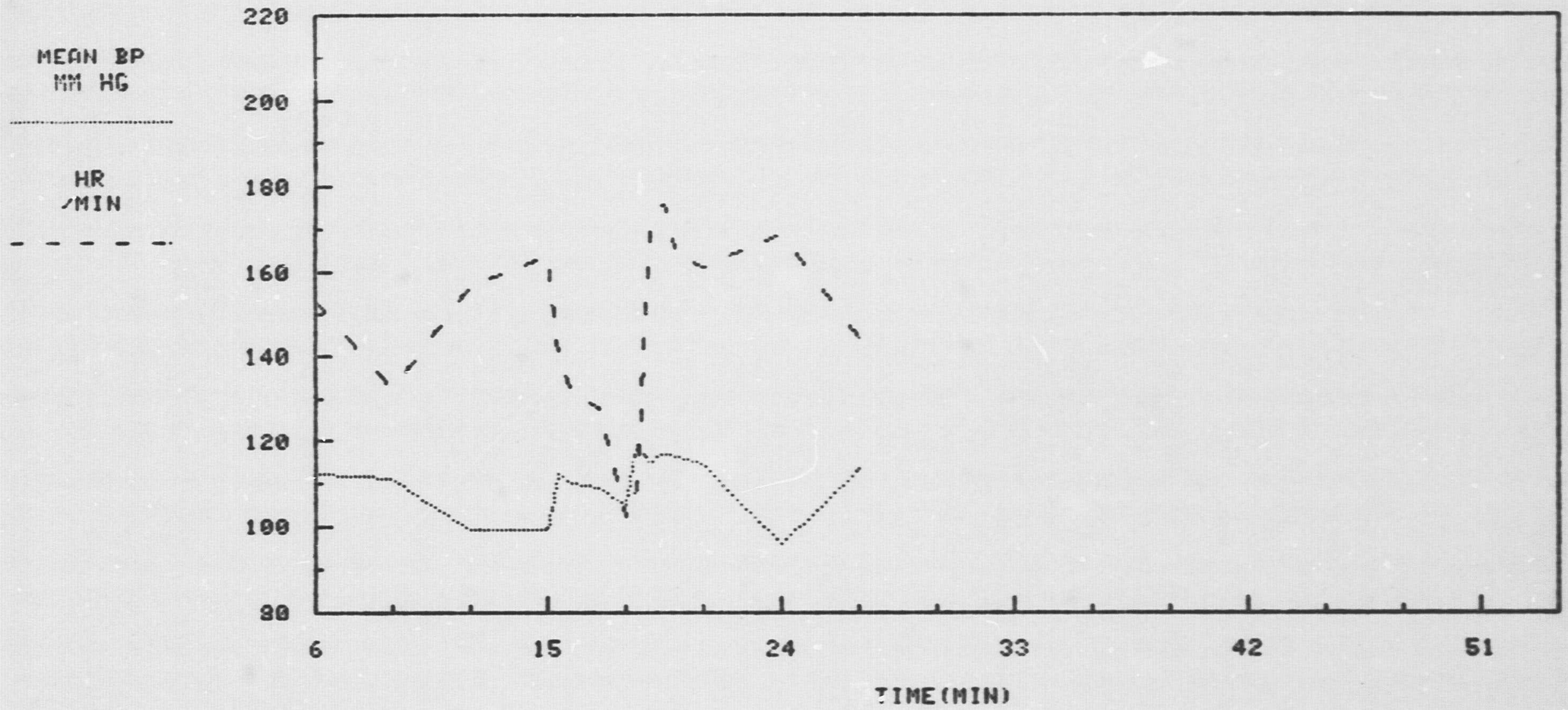
X99 DAY 14




156

# FREON 13B1 EXPOSURE

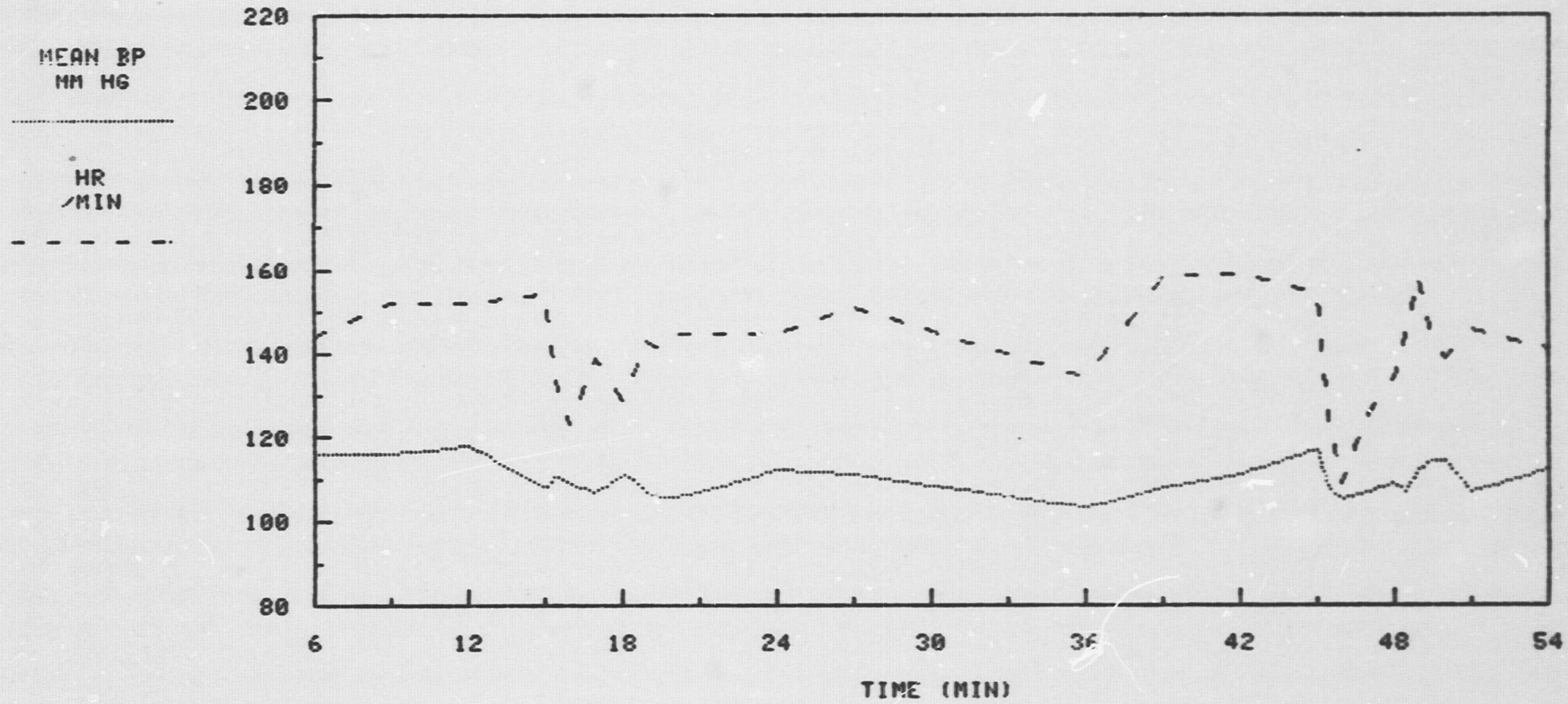
X99 DAY 19




157

# FREON 13B1 EXPOSURE

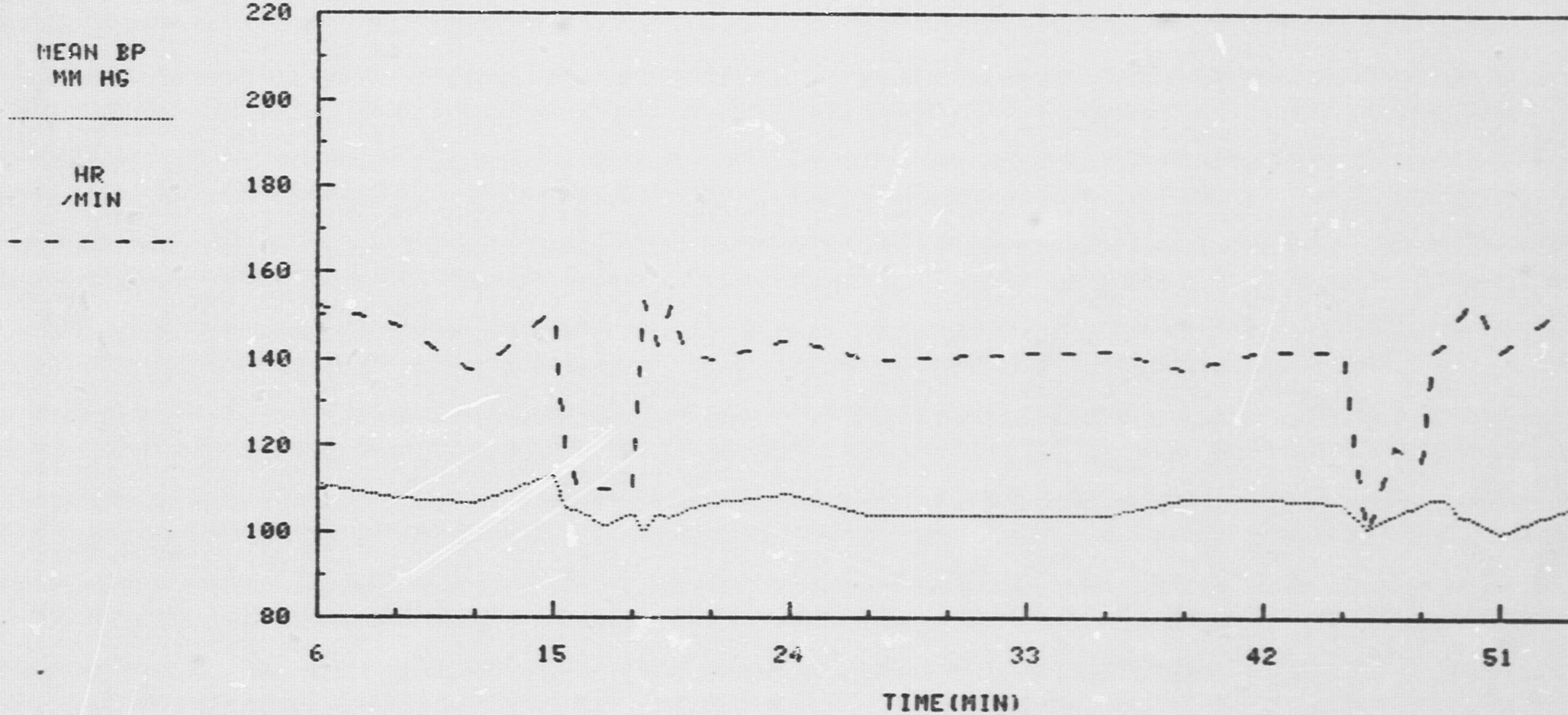
X99 DAY 21




158

# FREON 13B1 EXPOSURE

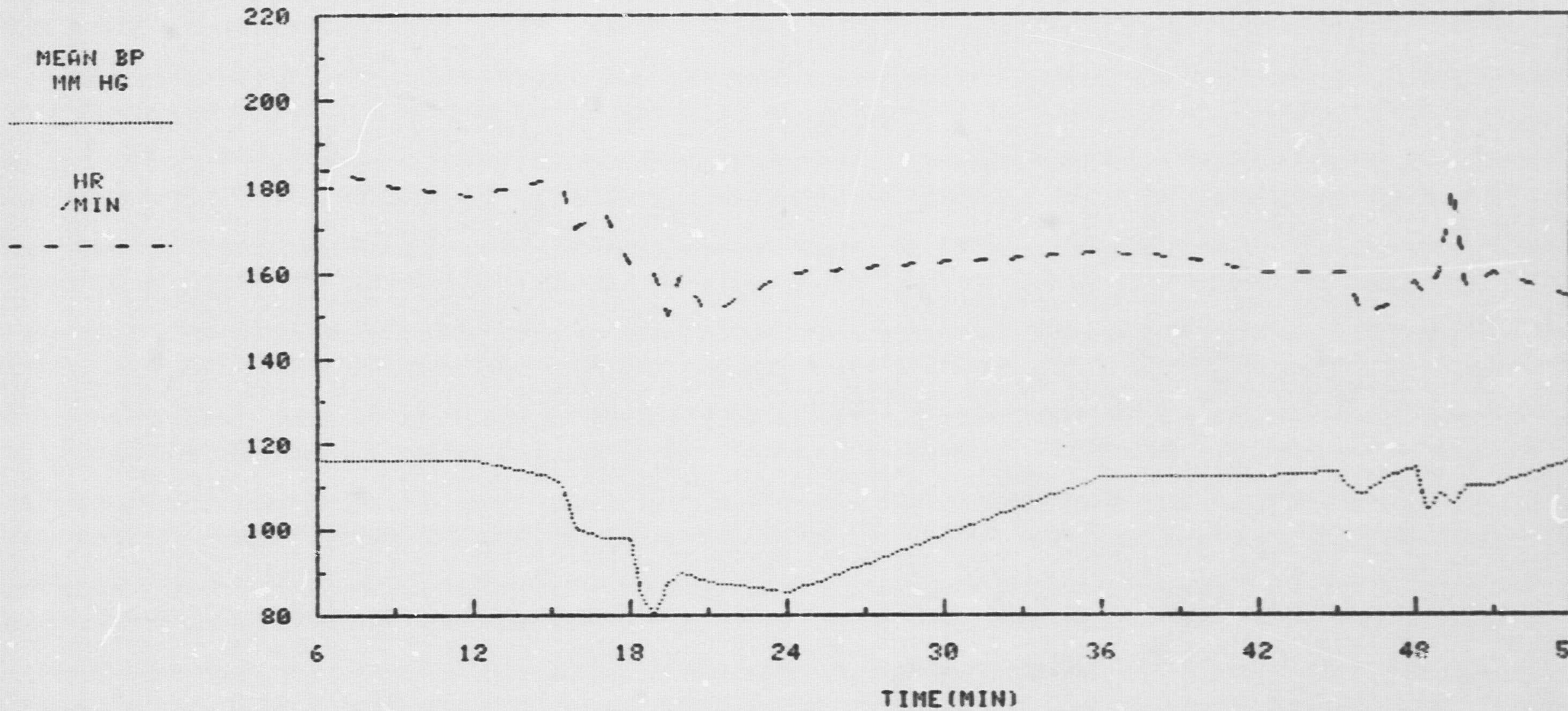
X99 DAY 22




159

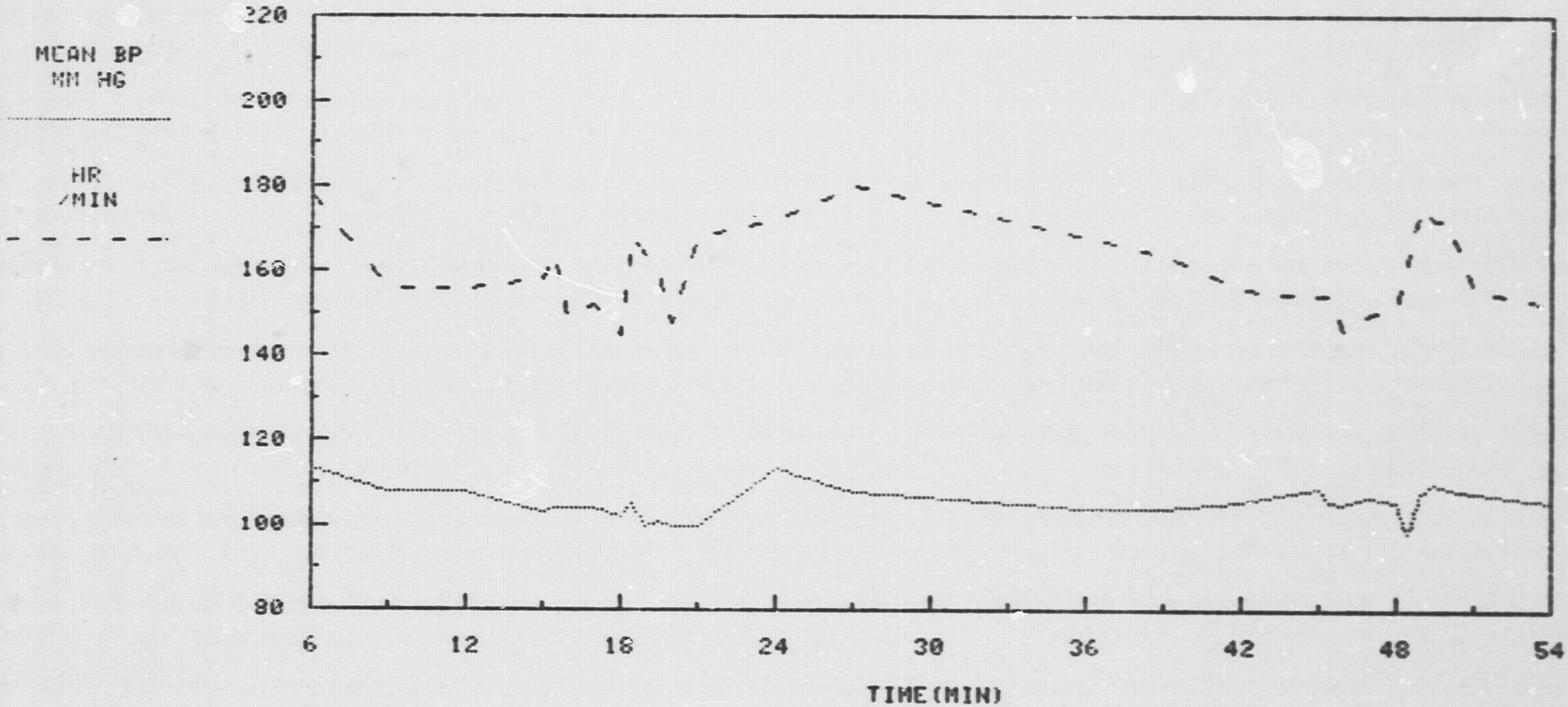
# FREON 13B1 EXPOSURE

X98 DAY 1



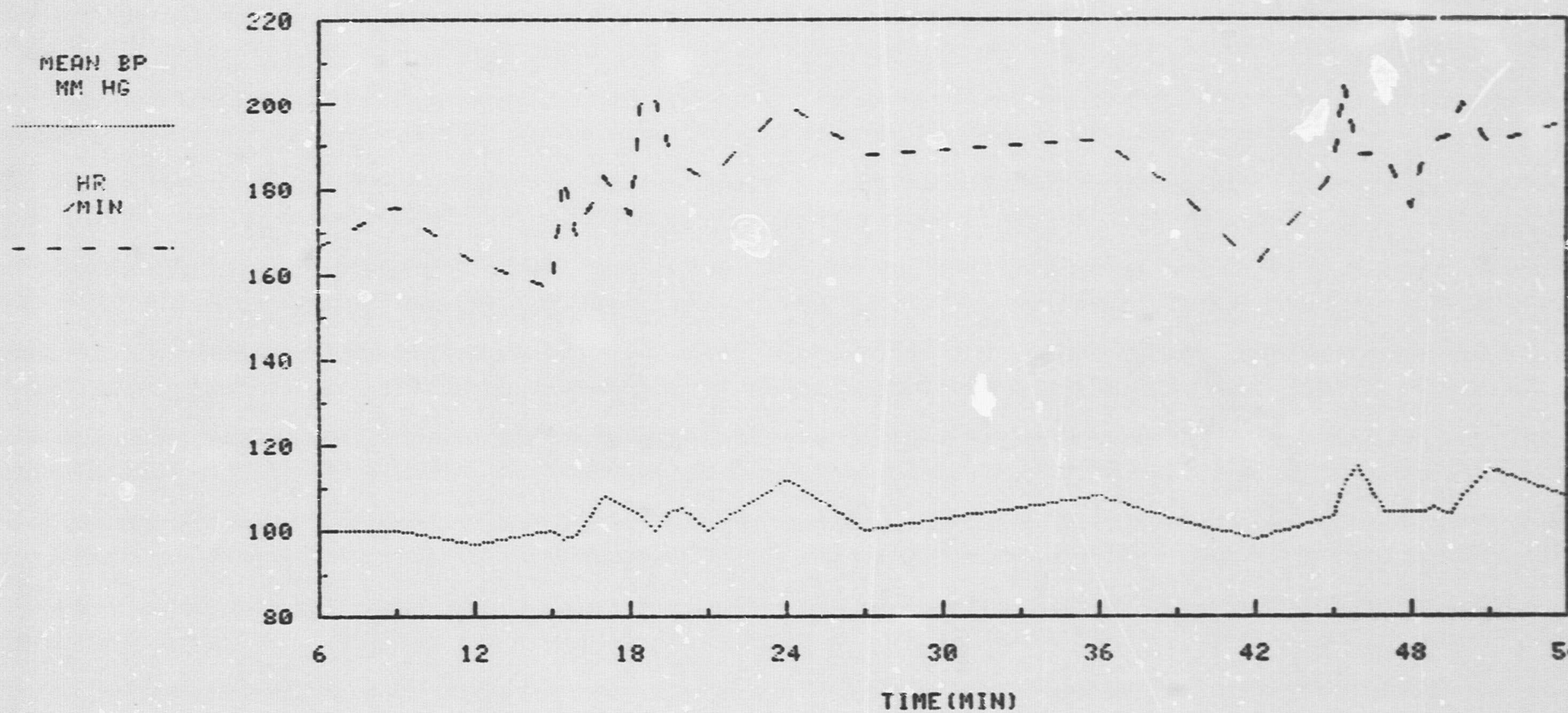
# FREON 13B1 EXPOSURE

X98 DAY 2



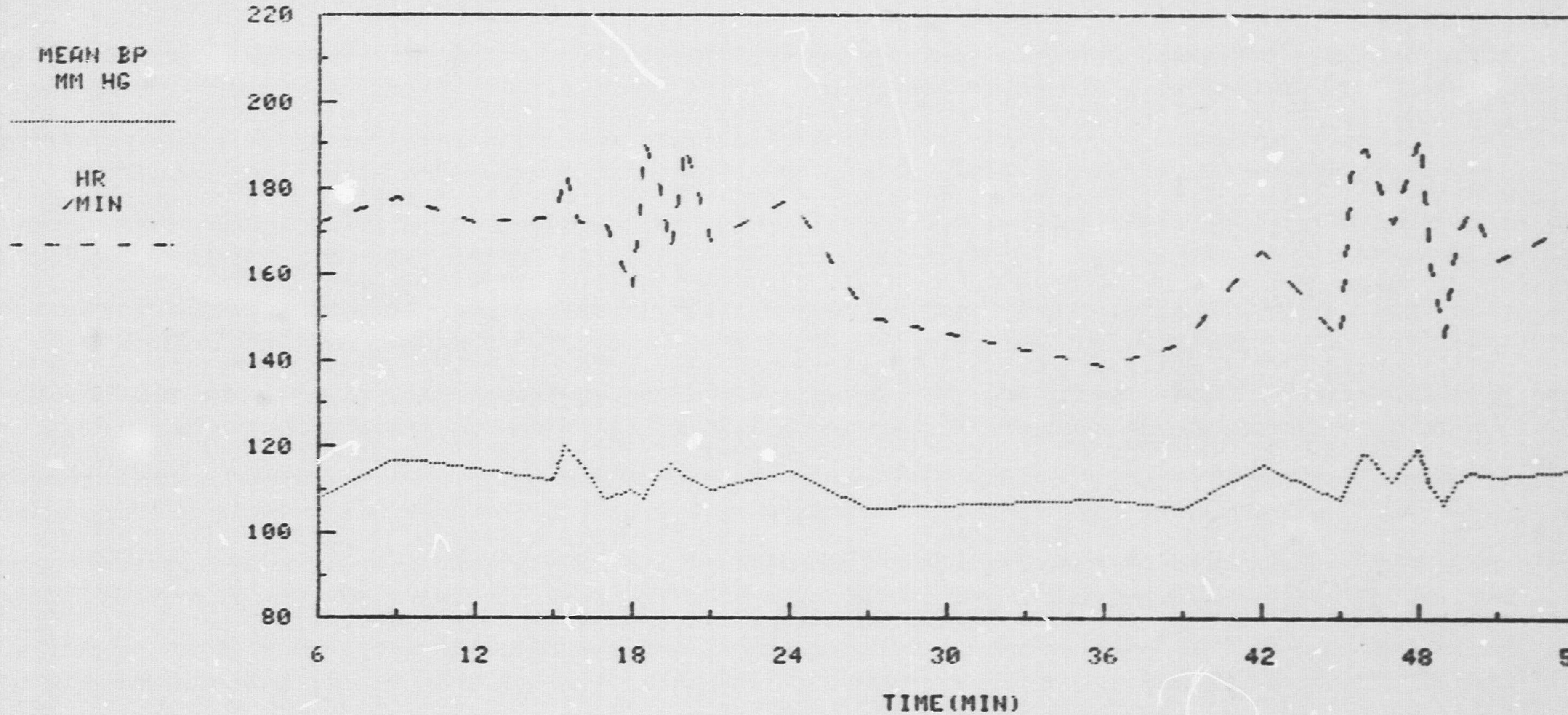
# FREON 13B1 EXPOSURE

X98 DAY 6



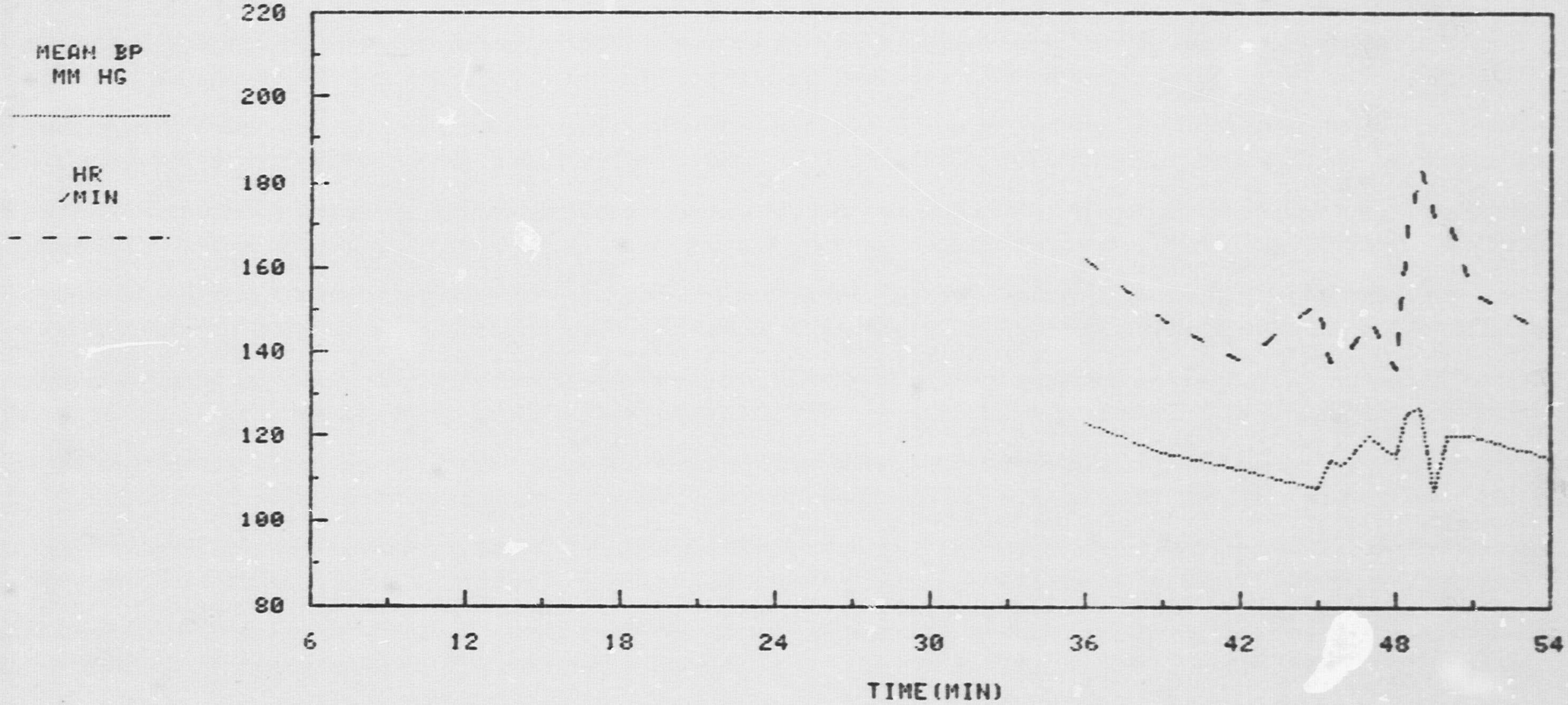
# FREON 13B1 EXPOSURE

X98 DAY 8



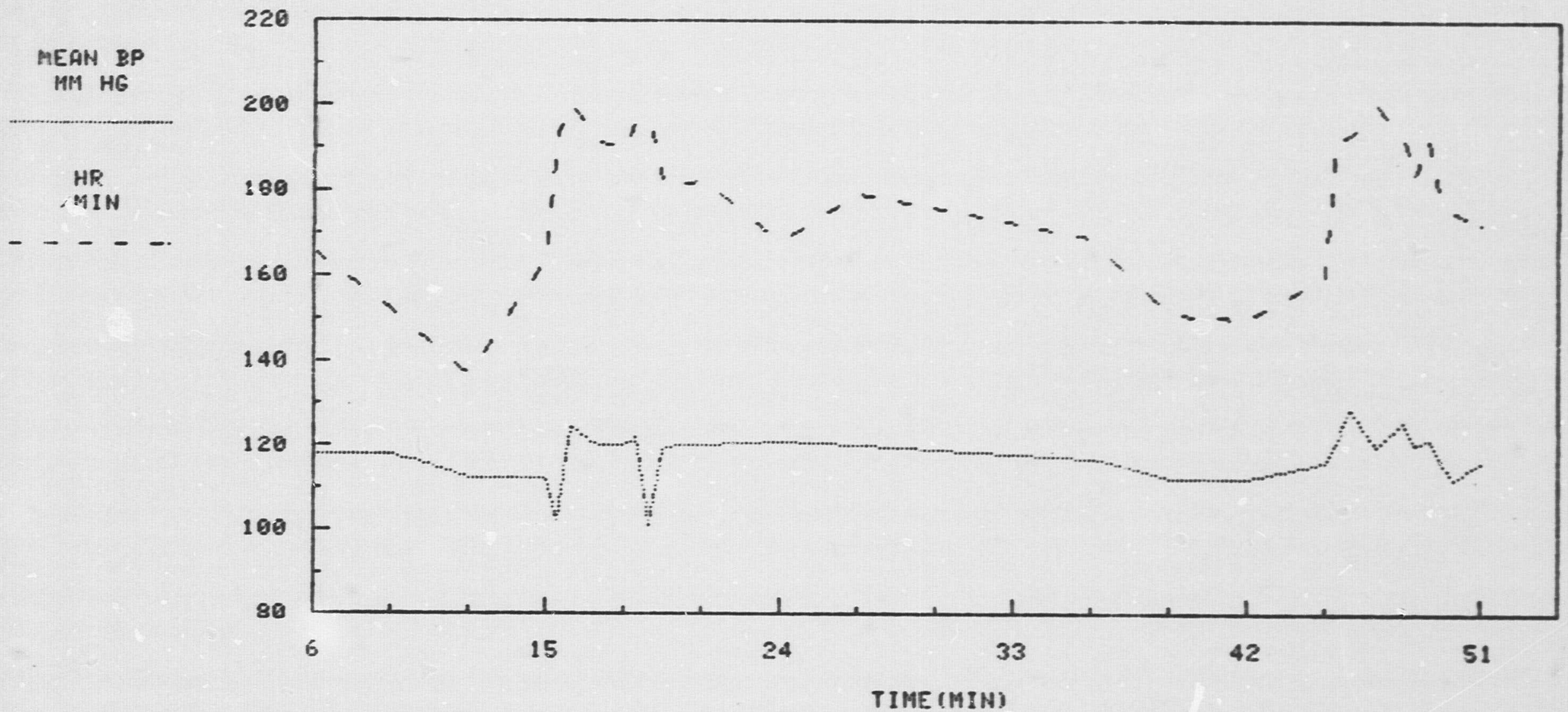
# FREON 13B1 EXPOSURE

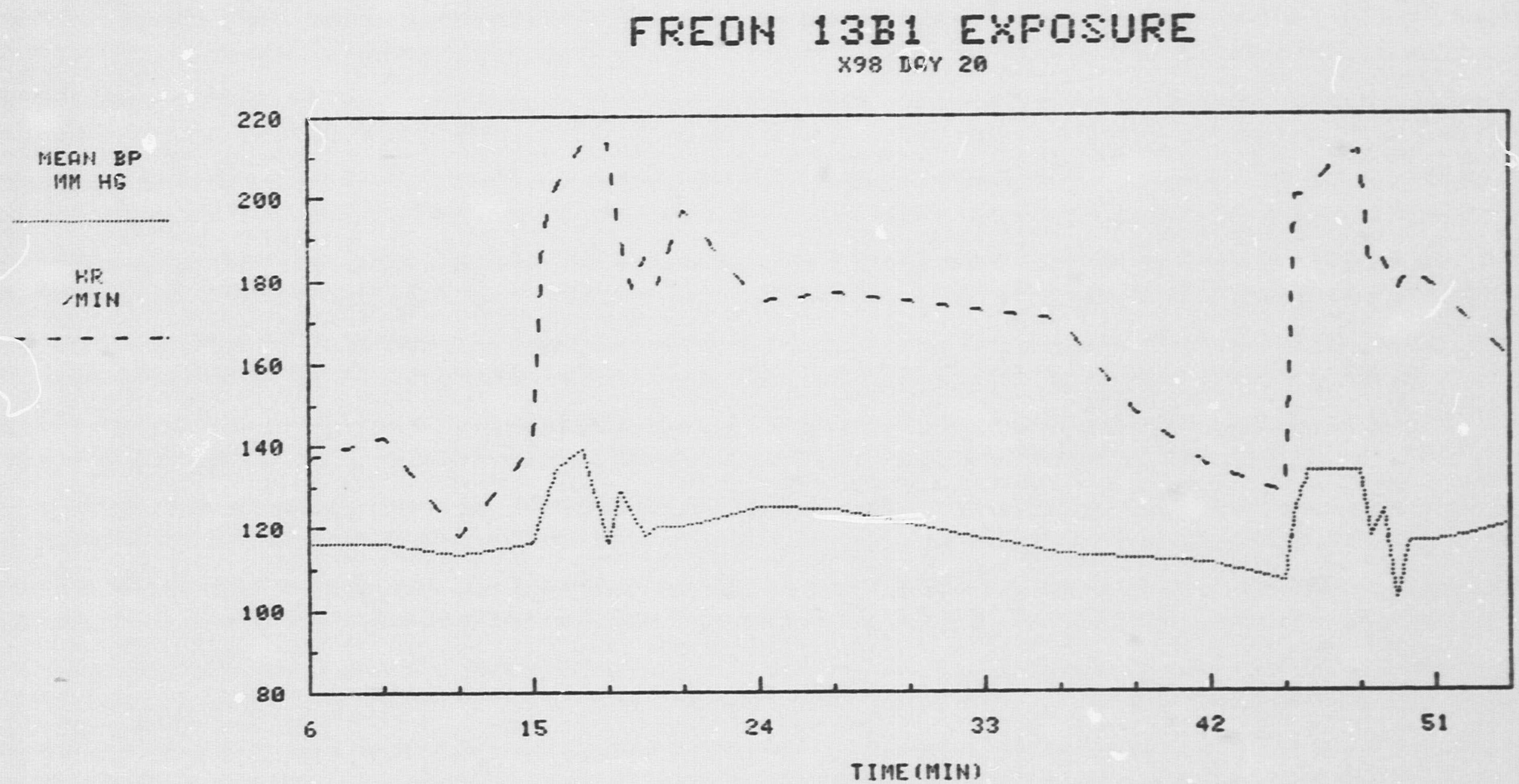
X98 DAY 9



# FREON 13B1 EXPOSURE

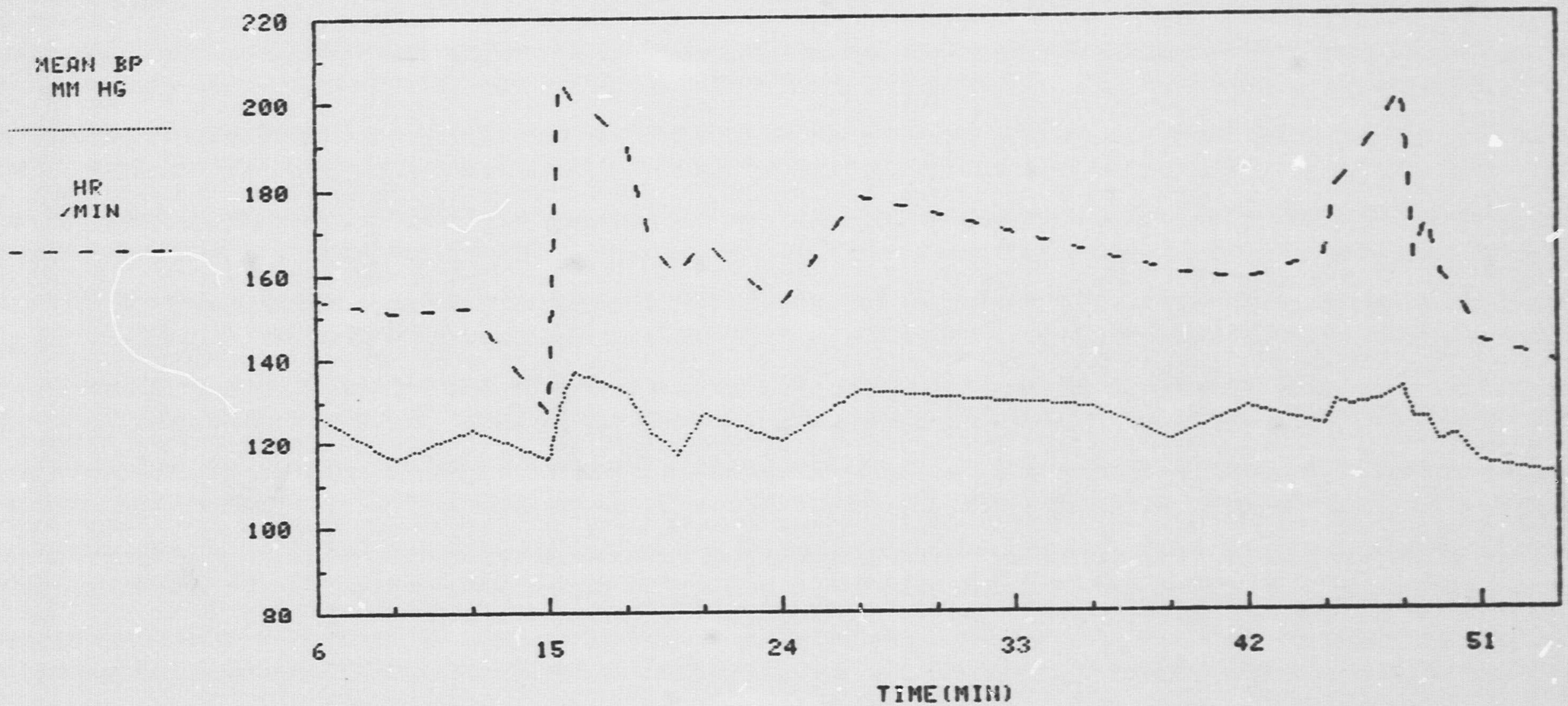
X98 DAY 13




FREON 13B1 EXPOSURE
X98 DAY 20
MEAN BP
MM HG
HR
/MIN
220
200
180
160
140
120
100
80
6
15
24
33
42
51
TIME(MIN)

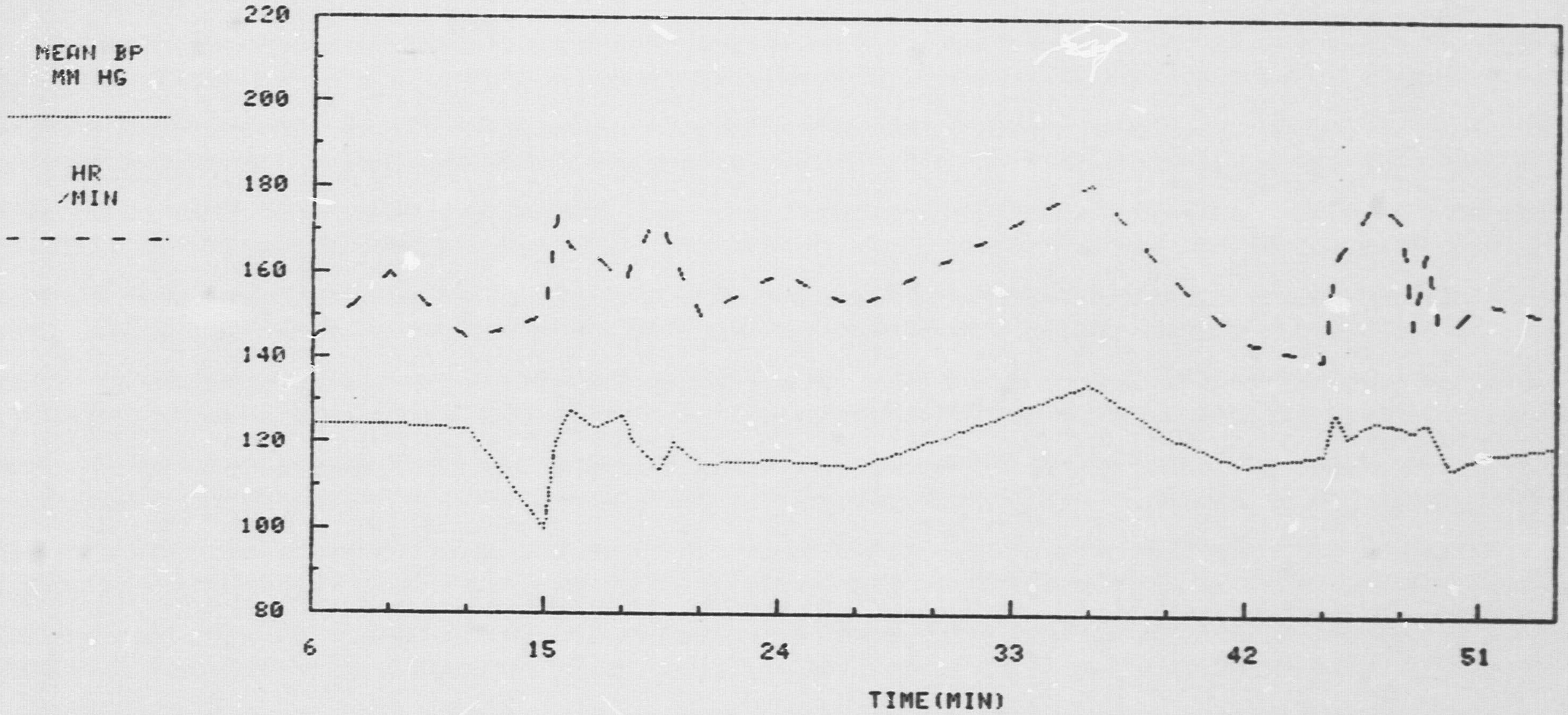
# FREON 13B1 EXPOSURE

X98 DAY 22



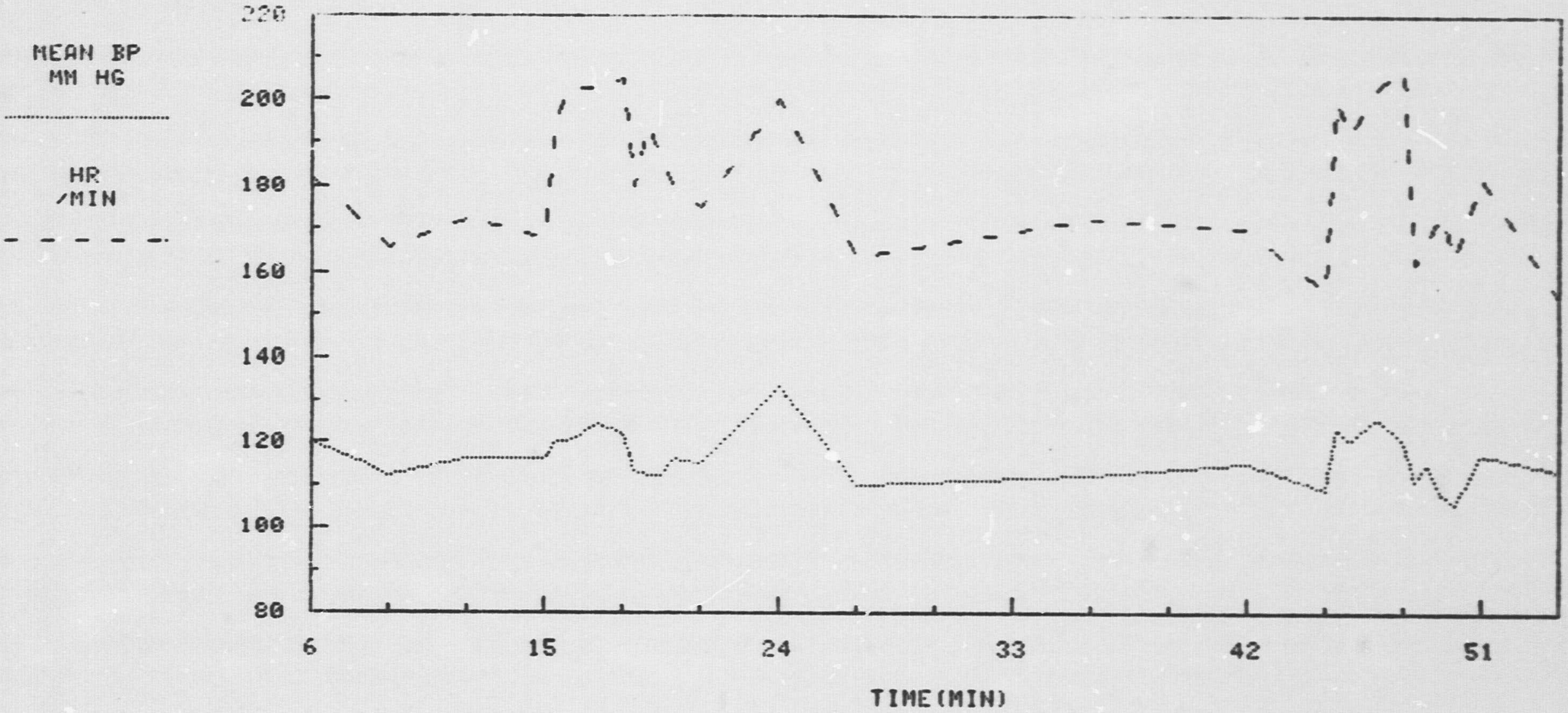
# FREON 13B1 EXPOSURE

X98 DAY 26



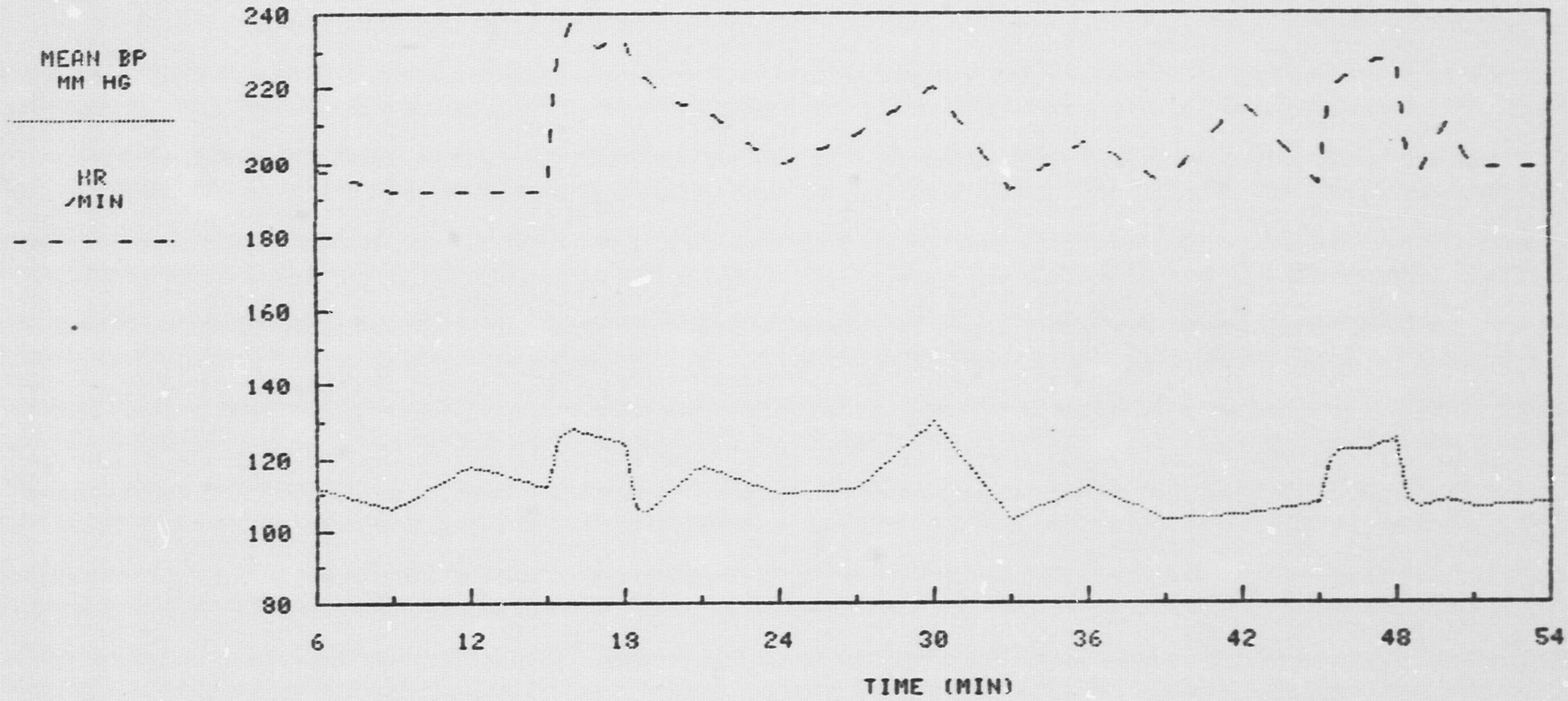
# FREON 13B1 EXPOSURE

X98 DAY 29



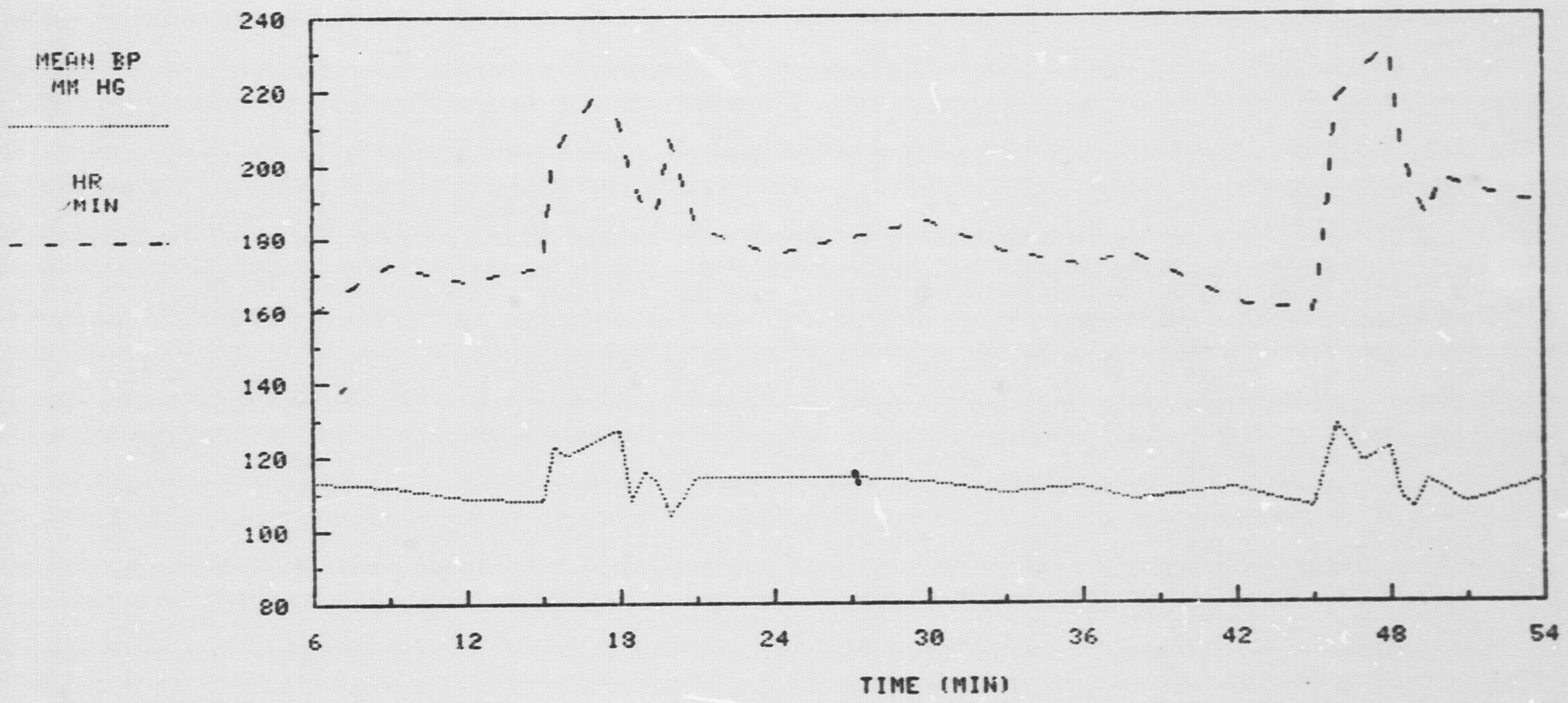
# FREON 13B1 EXPOSURE

X98 3 DAY POST GAS



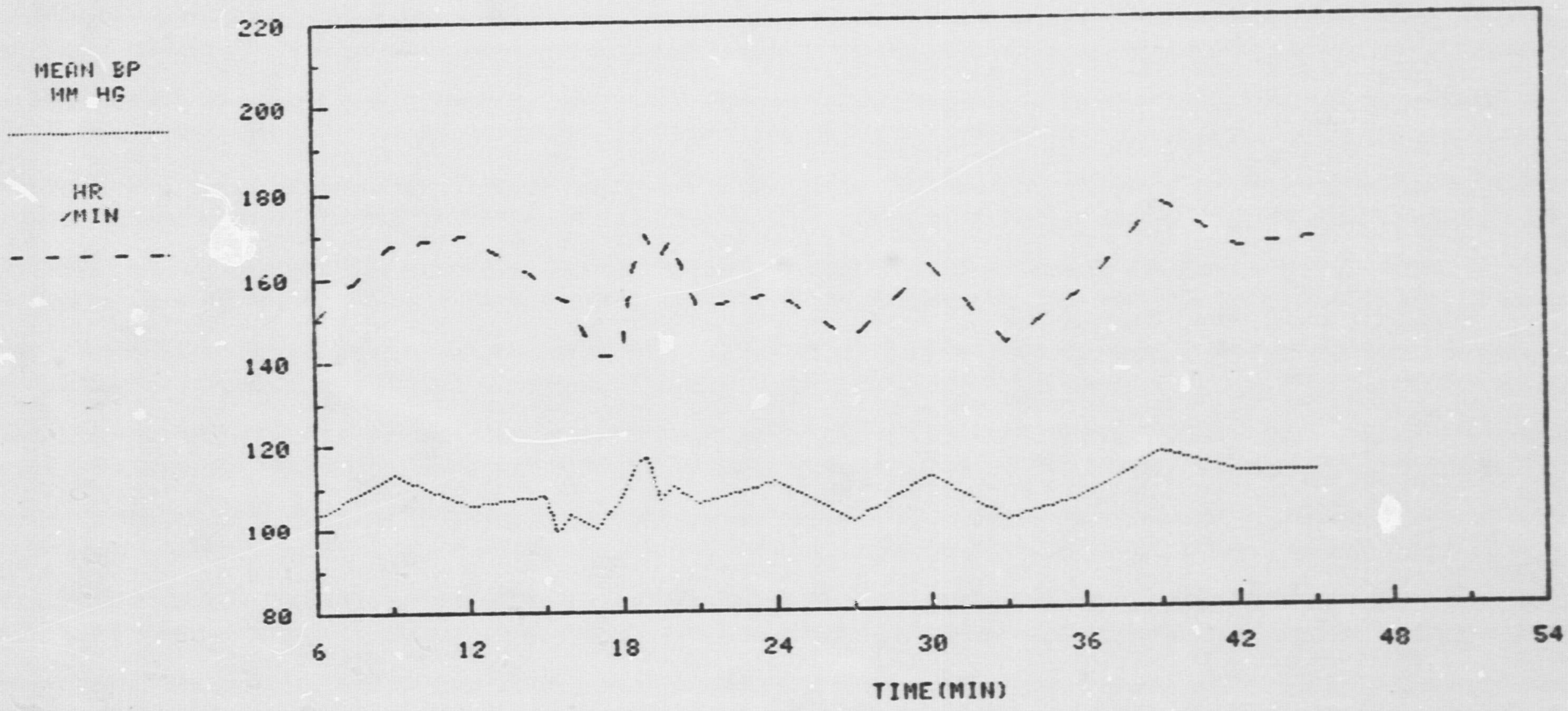
# FREON 13B1 EXPOSURE

X98 5 DAY POST GAS



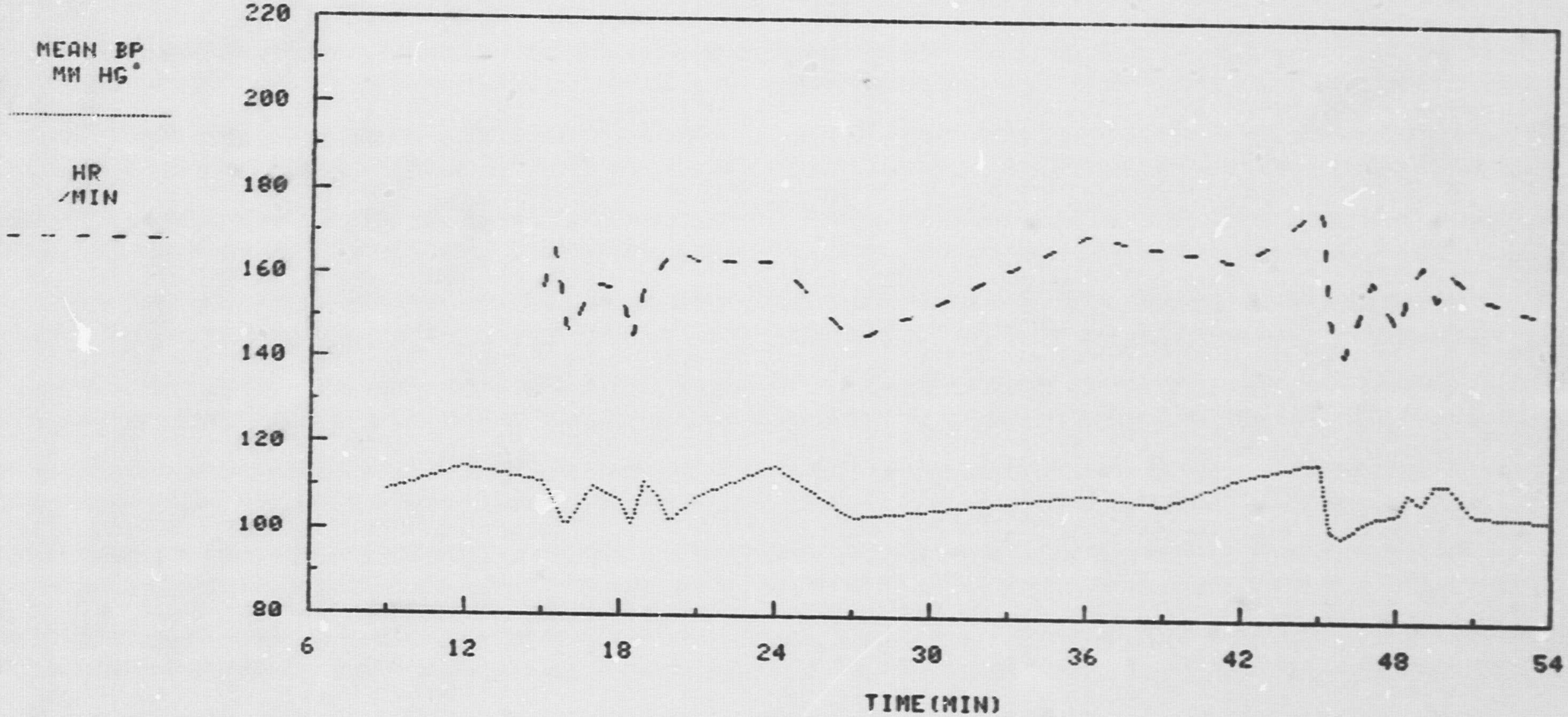
# FREON 13B1 EXPOSURE

X96 PRE-EXPOSURE



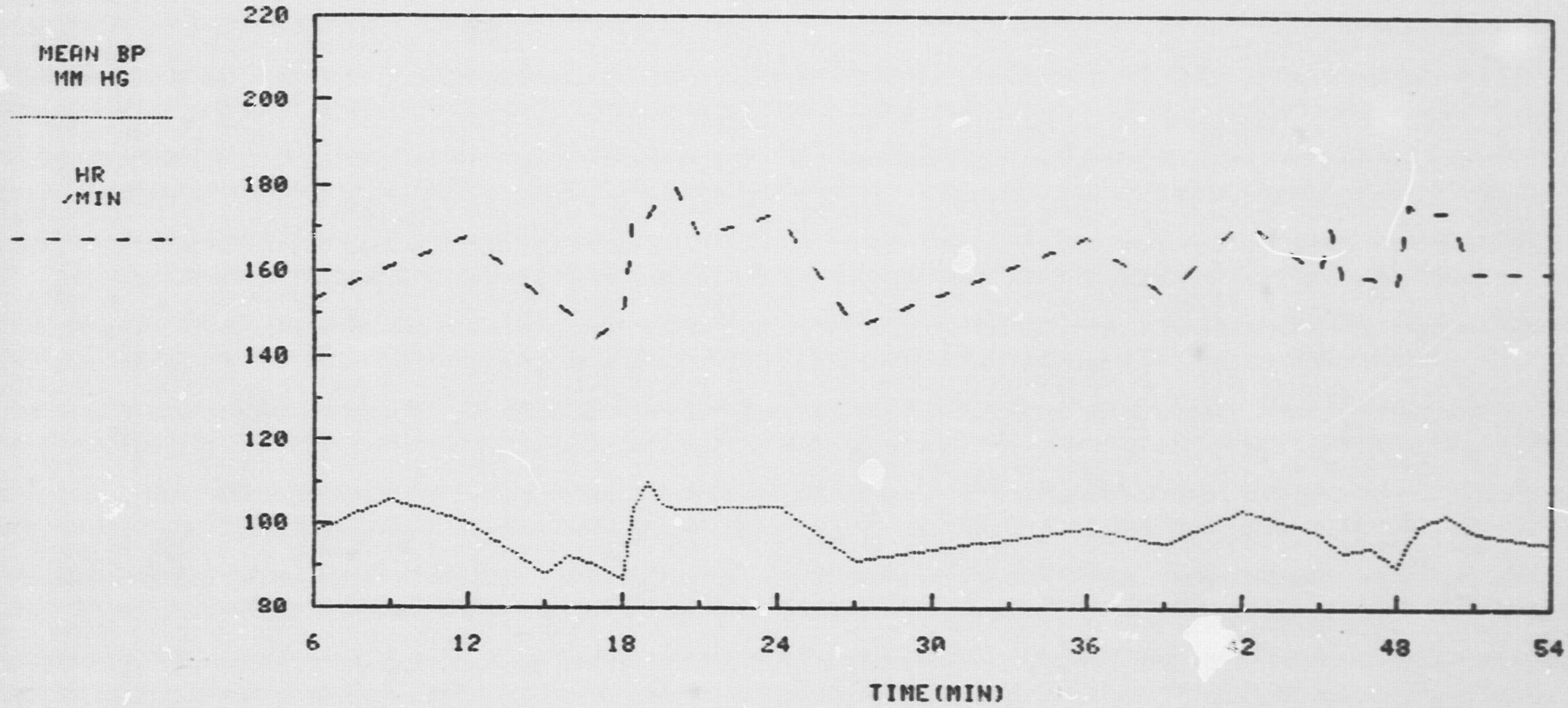
# FREON 13B1 EXPOSURE

X96 DAY 1



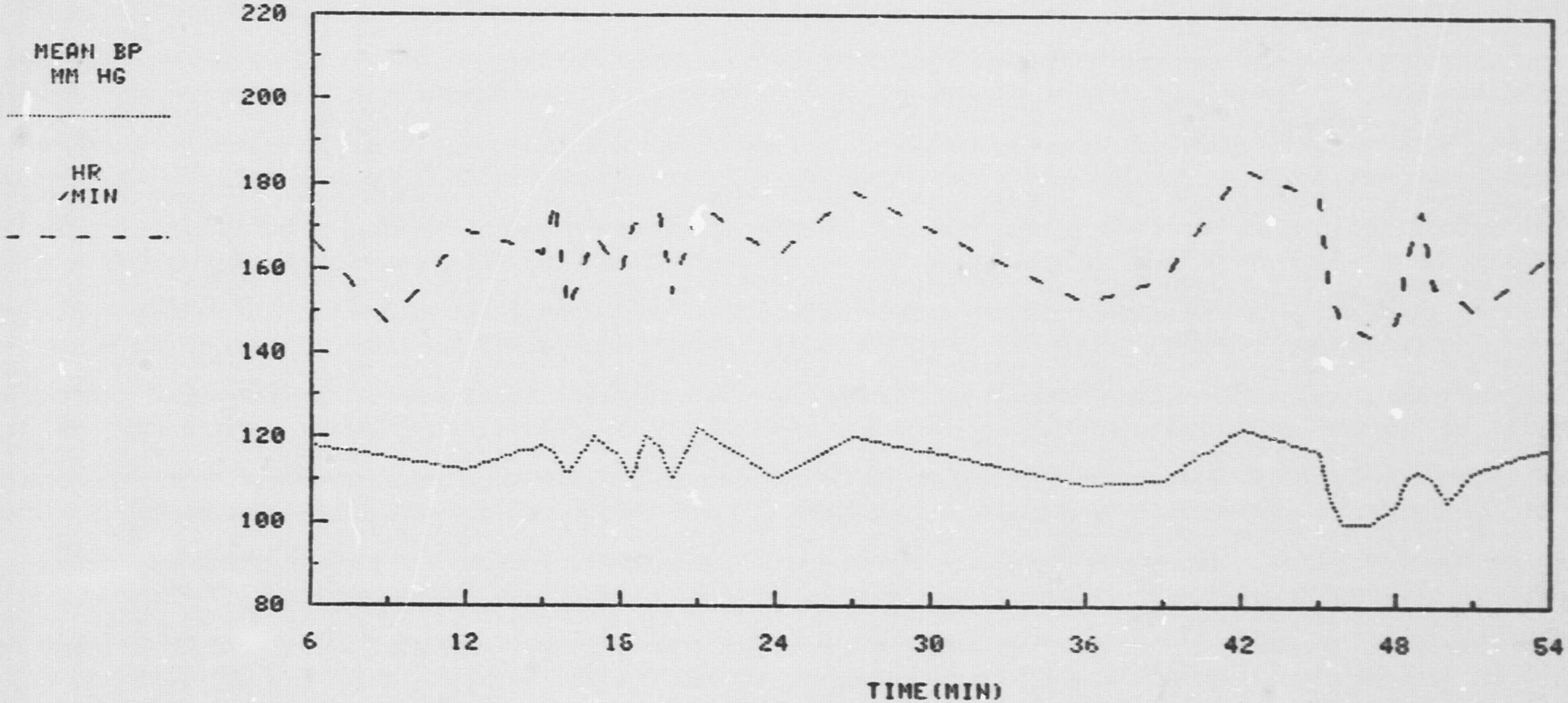
# FREON 13B1 EXPOSURE

X96 DAY 6



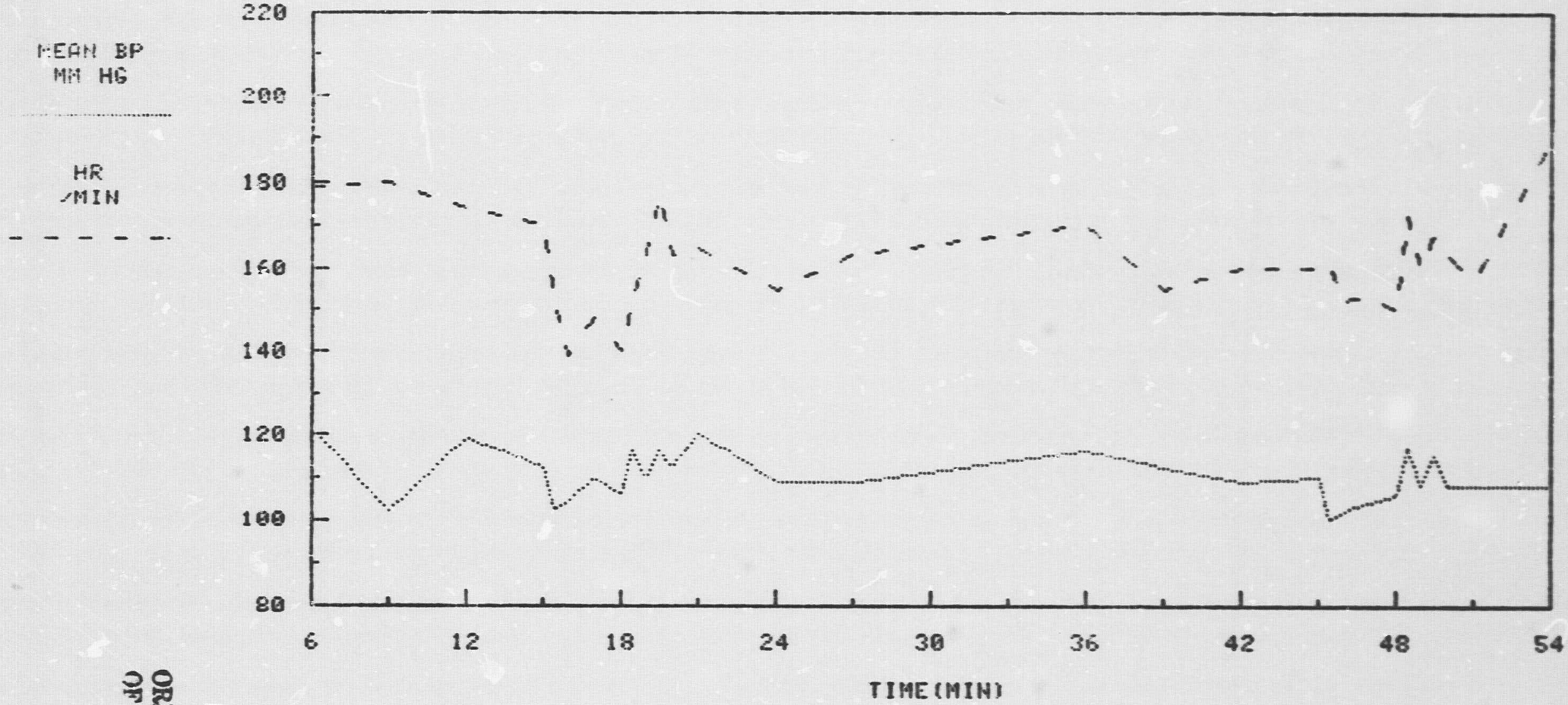
# FREON 13B1 EXPOSURE

X96 DAY 8



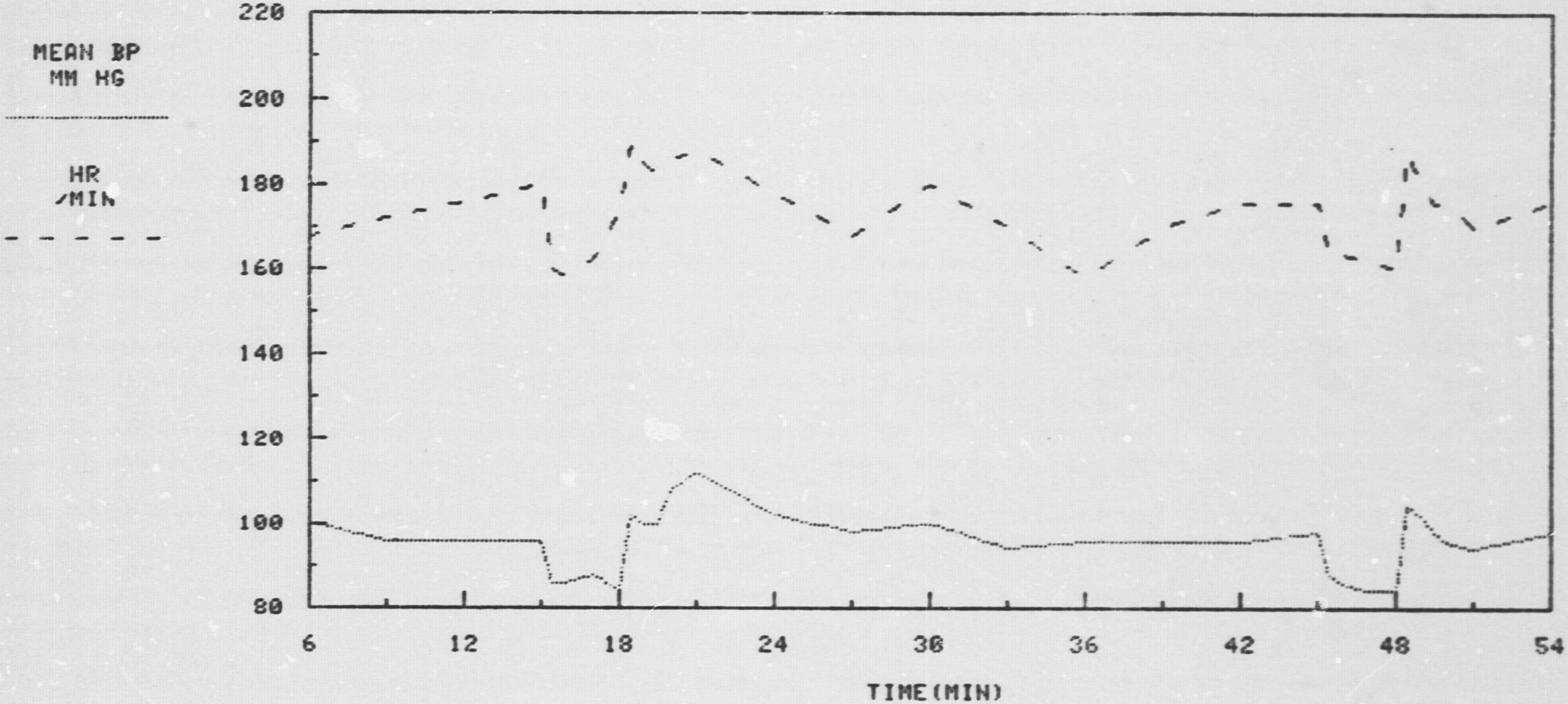
# FREON 13B1 EXPOSURE

X96 DAY 9



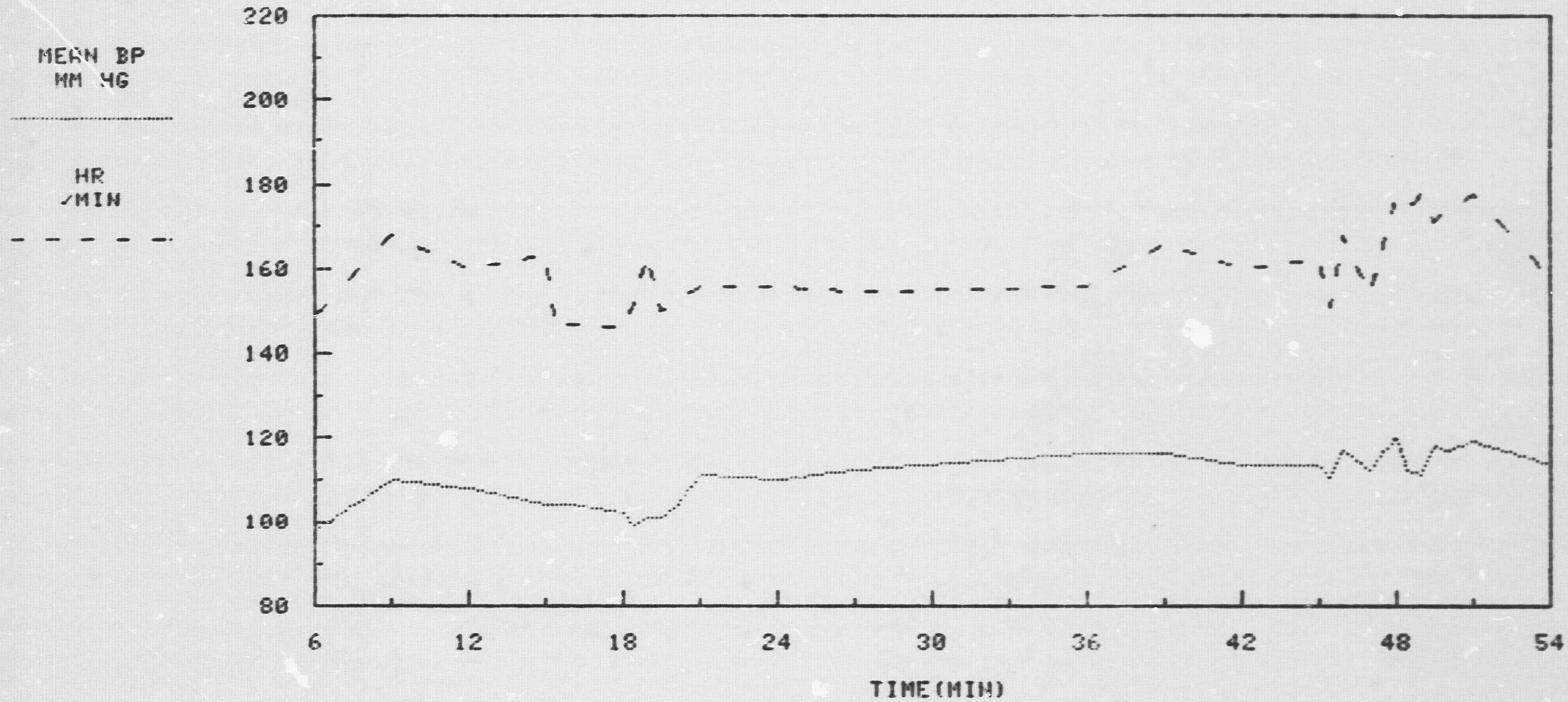
# FREON 13B1 EXPOSURE

## X92 PRE-EXPOSURE



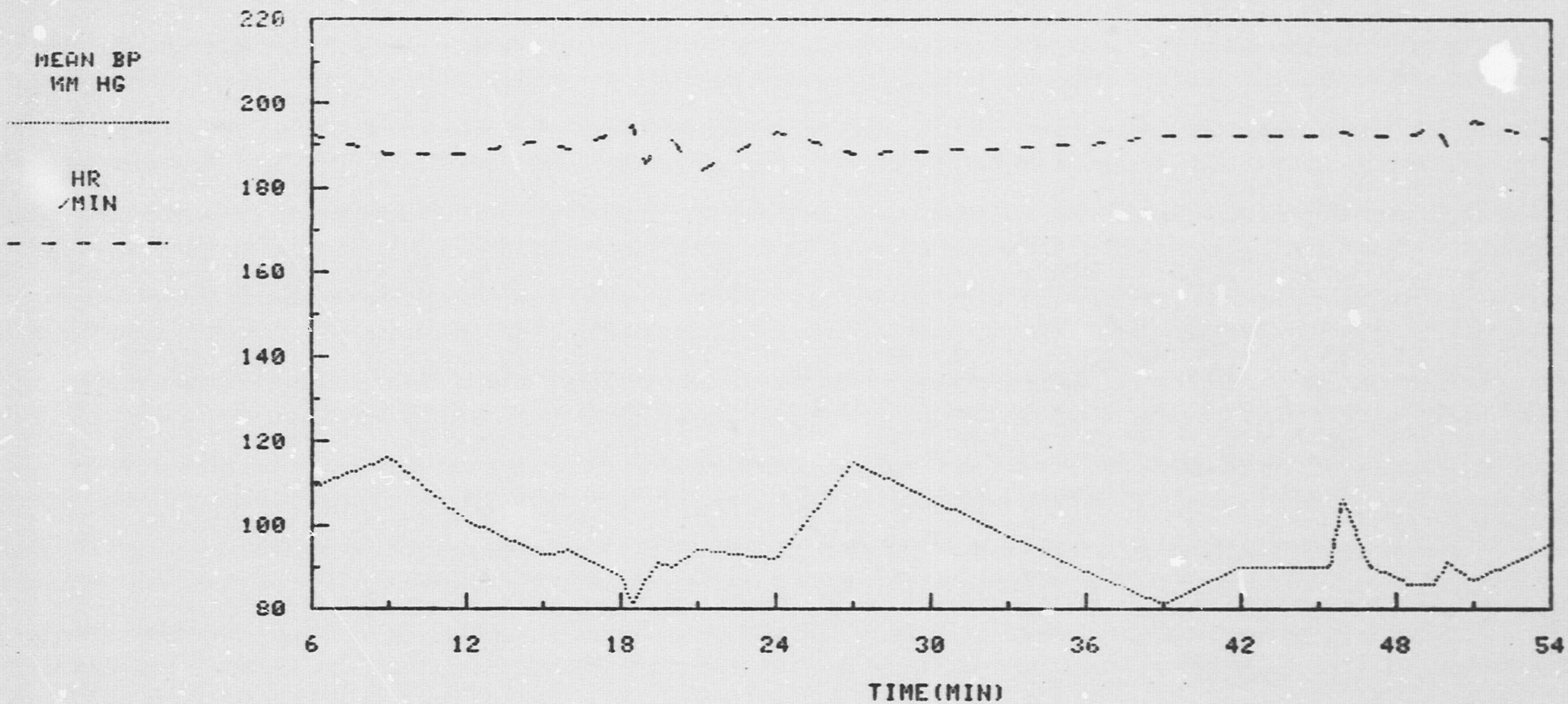
# FREON 13B1 EXPOSURE

X92 DAY 2



# FREON 13B1 EXPOSURE

X92 DAY 5



# Appendix D

## Raw Data of Plasma Epinephrine and Norepinephrine Concentrations Taken at Varied Intervals During the Course of the Exposure to $CBrF_3$

Table 1. X-92 Plasma Catecholamine Concentrations

Sample Period and Time[1]

| Date (Day) | PLASMA NA (pg/ml) Sample 1 (pre-CER) | PLASMA NA (pg/ml) Sample 2 (CER) | PLASMA NA (pg/ml) Sample 3 (post shock) | PLASMA EPI (pg/ml) Sample 1 (pre-CER) | PLASMA EPI (pg/ml) Sample 2 (CER) | PLASMA EPI (pg/ml) Sample 3 (post shock) |
|---|---|---|---|---|---|---|
| Jan. 21 (pre-exposure) | 677 (-6) | 1170 (+1) | 1310 (S+1) | 64 | 117 | 175 |
| Jan. 26 (Day 5) | 491 (-3) | 635 (+2) | 578 (S+3) | 84 | 110 | 51 |
| Feb. 17 (Day 27) | 453 (-2) | 455 (+2) | 697 (S+1) | 13 | 44 | 77 |
| Feb. 23 (post-exposure) | 727 (-3) | 388 (+1) | 440 (S+1) | 46 | 101 | 62 |
| Average | 587 ± 68 | 662 ± 18 | 642 ± 14 | 51.8 ± 15 | 93 ± 17 | 96.5 ± 23 |

[1]Time of sampling: -10 to -1 = minutes prior to onset of CER tone
= 1 to 13 = period of CER
= S + 1 to S + 3 = minutes after deliverance of shock

Table 2. X-96 Plasma Catecholamine Concentrations

| | Sample Period and Time | | | | | |
|---|---|---|---|---|---|---|
| | NA (pg/ml) | | | EPI (pg/ml) | | |
| Date (Day) | Sample 1 (pre-CER) | Sample 2 (CER) | Sample 3 (post shock) | Sample 1 | Sample 2 | Sample 3 |
| Jan. 21 (pre-exposure) | 1087 (-1) | no sample[1] | no sample[1] | n.d.[2] | no sample[1] | no sample[1] |
| Jan. 27 (Day 6) | 872 (-2) | 515 (+2) | 548 (S+2) | 21 | 116 | 17 |
| Feb. 10 (Day 20) | 1104 (-3) | 1075 (+1) | 892 (S+1) | 110 | 88 | 51 |
| Feb. 17 (Day 27) | 1980 (-5) | 3080 (+1) | 2320 (S+2) | 43 | 81 | n.d.[2] |
| Average | 1261 ± 250 | 1570 ± 780 | 1253 ± 540 | 58 ± 27 | 95 ± 11 | 34 ± 17 |

[1]CER terminated = no samples obtained

[2]n.d. = not detectable (< 10 pg/ml).

Table 3. X-98 Plasma Catecholamine Concentrations

| Date (Day) | NA (pg/ml) Sample 1 | NA (pg/ml) Sample 2 | NA (pg/ml) Sample 3 | EPI (pg/ml) Sample 1 | EPI (pg/ml) Sample 2 | EPI (pg/ml) Sample 3 |
|---|---|---|---|---|---|---|
| Jan. 27 (Day 6) | 363 (-8) | 515 (+1) | 407 (S+1) | n.d[2] | 47 | 61 |
| Feb. 3 (Day 13) | 318 (-3) | 301 (+1) | 361 (S+2) | 51 | 95 | 83 |
| Feb. 10 (Day 20) | no sample[1] | 298 (+1) | no sample[1] | no sample[1] | 72 | no sample[1] |
| Feb. 18 (Day 28) | 523 (-4) | 598 (+1) | 468 (S+1) | n.d.[2] | 41 | n.d.[2] |
| Feb. 23 (post-exposure) | 488 (-4) | 567 (+1) | 814 (S+1) | 34 | 26 | 95 |
| Average | 408 ± 40 | 461 ± 50 | 558 ± 90 | 43 ± 5 | 62 ± 12 | 64 ± 17 |

[1]Samples not obtained due to mechanical difficulties with catheter.

[2]n.d. = not detectable (< 10 pg/ml).

Table 4. X-99 Plasma Catecholamine Concentrations

| Date (Day) | NA (pg/ml) | | | EPI (pg/ml) | | |
|---|---|---|---|---|---|---|
| | Sample 1 | Sample 2 | Sample 3 | Sample 1 | Sample 2 | Sample 3 |
| Jan. 21 (pre-exposure) | 824 (-6) | 788 (+2) | 690 (S+1) | 88 | 19 | n.d.[1] |
| Jan. 26 (Day 5) | 507 (-4) | 540 (+2) | 499 (S+2) | 141 | 120 | 19 |
| Feb. 2 (Day 12) | 445 (-4) | 491 (+1) | 458 (S+1) | 173 | 42 | 15 |
| Feb. 9 (Day 19) | 573 (-5) | 643 (+1) | 658 (S+1) | 63 | 28 | 184 |
| Feb. 16 (Day 26) | 644 (-4) | 840 (+1) | 520 (S+2) | 141 | 133 | 101 |
| Feb. 23 (post-exposure) | 1200 (-3) | 1320 (+1) | 768 (S+1) | 167 | 42 | 98 |
| Average | 699 ± 110 | 772 ± 120 | 599 ± 50 | 128 ± 18 | 64 ± 20 | 83 ± 32 |

[1]n.d. = not detectable (< 10 pg/ml).

## Appendix E

## SMAC and CBC Data

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SAN ANTONIO, TEXAS 78284

# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I D | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X99 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0210936 | | | 01/21/1981 | 01/22/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 10.1 | THOUS/CMM | |
| RED CELL COUNT | 4.37 | MIL/CMM | |
| HEMOGLOBIN | 8.1 | G/DL | |
| HEMATOCRIT | 26.6 | % | |
| MCV | 61 | CU MICRONS | |
| MCH | 18.4 | PICOGRAMS | |
| MCHC | 30.4 | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 79 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 20 | % | |
| MONOCYTES | 1 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| RED CELLS ARE MICROCYTIC AND HYPOCHROMIC. | | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | 42 | MG/DL | |
| BUN | 12 | MG/DL | |
| CREATININE | 0.8 | MG/DL | |
| BUN/CREAT RATIO | 15 | | |
| URIC ACID | 0.4 | MG/DL | |
| SODIUM | 143 | MEQ/L | |
| POTASSIUM | 4.1 | MEQ/L | |
| CHLORIDE | 103 | MEQ/L | |
| CARBON DIOXIDE | 26 | MEQ/L | |
| CALCIUM | 8.9 | MG/DL | |
| ION-CA (APPROX) | 2.0 | MEQ/L | |
| PHOSPHORUS | 3.5 | MG/DL | |
| CHOLESTEROL | 122 | MG/DL | |
| TRIGLYCERIDES | 52 | MG/DL | |
| TOTAL PROTEIN | 6.6 | GM/DL | |
| ALBUMIN | 3.1 | GM/DL | |
| GLOBULINS | 3.5 | GM/DL | |
| A/G RATIO | 0.9 | | |
| TOTAL BILIRUBIN | 0.2 | MG/DL | |
| ALK PHOS | 392 | MU/ML | |
| GGT | 74 | MU/ML | |

PAGE 1: CONTINUED ON PAGE: 2

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SOUTHWEST FOUNDATION FOR
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DEPT OF LAB ANIMAL MED
P O BOX 28147
SAN ANTONIO, TEXAS 78284

# LABORATORY REPORT

Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7166

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X99 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0210936 | | | 01/21/1981 | 01/22/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| SGOT | 32 | MU/ML | |
| LDH | 950 | MU/ML | |
| IRON | 94 | MCG/DL | |

E.T. STANDLEY,MD DIRECTOR OF LABORATORIES



**FINAL REPORT**

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# LABORATORY REPORT

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Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X99 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 00277222 | | | 02/04/1981 | 02/04/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 5.8 | THOUS/CMM | |
| RED CELL COUNT | 4.52 | MIL/CMM | |
| HEMOGLOBIN | 8.5 | G/DL | |
| HEMATOCRIT | 26.5 | % | |
| MCV | 58 | CU MICRONS | |
| MCH | 18.8 | PICOGRAMS | |
| MCHC | 32.1 | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 73 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 24 | % | |
| MONOCYTES | 3 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | LO #60 | MG/DL | 70-110 |
| BUN | 17 | MG/DL | 10-26 |
| CREATININE | 0.8 | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | HI #21 | | 10-20 |
| URIC ACID | 0.3 | MG/DL | |
| SODIUM | 141 | MEQ/L | 135-147 |
| POTASSIUM | 3.7 | MEQ/L | 3.5-5.0 |
| CHLORIDE | 103 | MEQ/L | 100-110 |
| CARBON DIOXIDE | 24 | MEQ/L | 24-34 |
| CALCIUM | 9.2 | MG/DL | 8.5-10.5 |
| ION-CA (APPROX) | 2.1 | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 2.5 | MG/DL | |
| CHOLESTEROL | 199 | MG/DL | 140-270 |
| TRIGLYCERIDES | HI #493 | MG/DL | 10-200 |
| TOTAL PROTEIN | 6.6 | GM/DL | 6.0-8.0 |
| ALBUMIN | 3.6 | GM/DL | 3.5-5.0 |
| GLOBULINS | 3.0 | GM/DL | 2.3-3.5 |
| A/G RATIO | 1.2 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.1 | MG/DL | |
| ALK PHOS | 544 | MU/ML | |
| GGT | 100 | MU/ML | |
| SGOT | HI #48 | MU/ML | 0-40 |

PAGE 1: CONTINUED ON PAGE: 2

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Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X99 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 90277222 | | | 02/04/1981 | 02/04/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | HI *599 | MU/ML | 100-225 |
| IRON | 135 | MCG/DL | 60-150 |

E.T. STANDLEY,MD DIRECTOR OF LABORATORIES
**FINAL REPORT**


INTERSTATE LAB NO 42 1126
CAP LSA NO 7820001 II 45 3023

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P O BOX 28147
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|---|---|---|---|---|
| XXX | 204X99 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 0354079 | | | 02/20/1981 | 02/20/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUE |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 7.0 | THOUS/CMM | |
| RED CELL COUNT | 4.58 | MIL/CMM | |
| HEMOGLOBIN | 8.6 | G/DL | |
| HEMATOCRIT | 29.0 | % | |
| MCV | 63 | CU MICRONS | |
| MCH | 18.8 | PICOGRAMS | |
| MCHC | 30.3 L | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 70 | % | |
| NON SEGMENTED NEUTROPHILES | 9 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 20 | % | |
| MONOCYTES | 1 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | HI #306 | MG/DL | 70-110 |
| BUN | 16 | MG/DL | 10-26 |
| CREATININE | LO #0.4 | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | HI #40 | | 10-20 |
| URIC ACID | 0.1 | MG/DL | |
| SODIUM | 144 | MEQ/L | 135-147 |
| POTASSIUM | LO #3.2 | MEQ/L | 3.5-5.0 |
| CHLORIDE | 103 | MEQ/L | 100-110 |
| CARBON DIOXIDE | 26 | MEQ/L | 24-34 |
| CALCIUM | 8.9 | MG/DL | 8.5-10.5 |
| ION-CA (APPROX) | 2.2 | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 1.5 | MG/DL | |
| CHOLESTEROL | LO #60 | MG/DL | 140-270 |
| TRIGLYCERIDES | HI #290 | MG/DL | 10-200 |
| TOTAL PROTEIN | LO #5.8 | GM/DL | 6.0-8.0 |
| ALBUMIN | LO #2.8 | GM/DL | 3.5-5.0 |
| GLOBULINS | 3.0 | GM/DL | 2.3-3.5 |
| A/G RATIO | LO #0.9 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.1 | MG/DL | |
| ALK PHOS | 1050 | MU/ML | |
| GGT | 151 | MU/ML | |
| SGOT | HI #337 | MU/ML | 0-40 |

PAGE 1: CONTINUED ON PAGE: 2

C-3

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WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X99 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 50354079 | | | 02/20/1981 | 02/20/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | HI *1010 | MU/ML | 100--225 |
| IRON | 69 | MCG/DL | 60--150 |

E.T. STANDLEY, MD DIRECTOR OF LABORATORIES

**FINAL REPORT**


INTERSTATE LAB NO. 42 1126
CLIA
CAP I & A NO. 78205001

69375
SOUTHWEST FOUNDATION FOR
RESEARCH AND EDUCATION
DEPT OF LAB ANIMAL MED
P O BOX 28147
SAN ANTONIO, TEXAS 78284

# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X99 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0376046 | | | 02/25/1981 | 02/26/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 5.8 | THOUS/CMM | |
| RED CELL COUNT | 3.94 | MIL/CMM | |
| HEMOGLOBIN | 7.2 | G/DL | |
| HEMATOCRIT | 25.9 | % | |
| MCV | 66 | CU MICRONS | |
| MCH | 18.2 | PICOGRAMS | |
| MCHC | 27.8 | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 68 | % | |
| NON SEGMENTED NEUTROPHILES | 4 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 23 | % | |
| MONOCYTES | 5 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | 293 | MG/DL | |
| BUN | 30 | MG/DL | |
| CREATININE | 0.7 | MG/DL | |
| BUN/CREAT RATIO | 43 | | |
| URIC ACID | 0.7 | MG/DL | |
| SODIUM | 145 | MEQ/L | |
| POTASSIUM | 3.8 | MEQ/L | |
| CHLORIDE | 109 | MEQ/L | |
| CARBON DIOXIDE | 22 | MEQ/L | |
| CALCIUM | 8.0 | MG/DL | |
| ION-CA (APPROX) | 2.1 | MEQ/L | |
| PHOSPHORUS | 3.1 | MG/DL | |
| CHOLESTEROL | 73 | MG/DL | |
| TRIGLYCERIDES | 15 | MG/DL | |
| TOTAL PROTEIN | 4.8 | GM/DL | |
| ALBUMIN | 2.4 | GM/DL | |
| GLOBULINS | 2.4 | GM/DL | |
| A/G RATIO | 1.0 | | |
| TOTAL BILIRUBIN | 0.1 | MG/DL | |
| ALK PHOS | 940 | MU/ML | |
| GGT | 136 | MU/ML | |
| SGOT | 385 | MU/ML | |

PAGE 1: CONTINUED ON PAGE: 2

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# LABORATORY REPORT

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Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7166

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X99 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0376046 | | | 02/25/1981 | 02/26/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | 1410 | MU/ML | |
| IRON | 172 | MCG/DL | |

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**FINAL REPORT**


INTERSTATE LAB NO 42 1126
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P O BOX 28147
SAN ANTONIO, TEXAS 78284

# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X98 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 80210947 | | | 01/21/1981 | 01/22/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| * | | | |
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 9.2 | THOUS/CMM | |
| RED CELL COUNT | 6.00 | MIL/CMM | |
| HEMOGLOBIN | 11.3 | G/DL | |
| HEMATOCRIT | 33.7 | % | |
| MCV | 56 | CU MICRONS | |
| MCH | 18.8 | PICOGRAMS | |
| MCHC | 33.5 | % | |
| * | | | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 62 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 4 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 32 | % | |
| MONOCYTES | 2 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| * | | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | 42 | MG/DL | |
| BUN | 12 | MG/DL | |
| CREATININE | 0.8 | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | 15 | | 10-20 |
| URIC ACID | 0.4 | MG/DL | |
| SODIUM | 146 | MEQ/L | 135-147 |
| POTASSIUM | 4.0 | MEQ/L | 3.5-5.0 |
| CHLORIDE | 105 | MEQ/L | 100-110 |
| CARBON DIOXIDE | 27 | MEQ/L | |
| CALCIUM | 9.5 | MG/DL | |
| ION-CA (APPROX) | 2.1 | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 3.7 | MG/DL | |
| CHOLESTEROL | 123 | MG/DL | |
| TRIGLYCERIDES | 55 | MG/DL | 10-200 |
| TOTAL PROTEIN | 7.3 | GM/DL | 6.0-8.0 |
| ALBUMIN | 3.8 | GM/DL | 3.5-5.0 |
| GLOBULINS | 3.5 | GM/DL | 2.3-3.5 |
| A/G RATIO | 1.1 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.3 | MG/DL | |
| ALK PHOS | 229 | MU/ML | |
| GGT | 60 | MU/ML | |
| SGOT | 18 | MU/ML | |

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# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X98 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 80210947 | | | 01/21/1981 | 01/22/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | HI *423 | MU/ML | 100-225 |
| IRON | 163 | MCG/DL | 60-200 |

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**FINAL REPORT**



INTERSTATE LAB NO 42 1126 CAP I & A NO 78205001 IL 45 R02

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WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X98 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 30277233 | | | 02/04/1981 | 02/04/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 8.9 ok | THOUS/CMM | |
| RED CELL COUNT | 4.97 | MIL/CMM | |
| HEMOGLOBIN | 9.2 | G/DL | |
| HEMATOCRIT | 28.3 low | % | |
| MCV | 56 -- low, but what is norm? | CU MICRONS | |
| MCH | 18.5 | PICOGRAMS | |
| MCHC | 32.6 ✓ok | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 72 ok | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 26 | % | |
| MONOCYTES | 2 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | LO *58 low | MG/DL | 70-110 |
| BUN | 10 ok | MG/DL | 10-26 |
| CREATININE | 0.8 | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | 13 | | 10-20 |
| URIC ACID | 0.2 | MG/DL | |
| SODIUM | 147 ok | MEQ/L | 135-147 |
| POTASSIUM | 4.1 ok | MEQ/L | 3.5-5.0 |
| CHLORIDE | 108 | MEQ/L | 100-110 |
| CARBON DIOXIDE | 26 | MEQ/L | 24-34 |
| CALCIUM | 10.0 | MG/DL | 8.5-10.5 |
| ION-CA (APPROX) | 2.2 ok | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 4.1 | MG/DL | |
| CHOLESTEROL | 154 | MG/DL | 140-270 |
| TRIGLYCERIDES | 98 | MG/DL | 10-200 |
| TOTAL PROTEIN | 6.9 | GM/DL | 6.0-8.0 |
| ALBUMIN | 3.9 ok | GM/DL | 3.5-5.0 |
| GLOBULINS | 2.8 | GM/DL | 2.3-3.5 |
| A/G RATIO | 1.4 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.2 | MG/DL | |
| ALK PHOS | 251 ✓ | MU/ML | |
| GGT | 55 ✓✓ | MU/ML | |
| SGOT | 14 | MU/ML | 0-40 |

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# LABORATORY REPORT

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Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X93 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 60277233 | | | 02/04/1981 | 02/04/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | HI #247 | MU/ML | 100-225 |
| IRON | 143 OW | MCG/DL | 60-150 |

E.T. STANDLEY, MD DIRECTOR OF LABORATORIES
**FINAL REPORT**


INTERSTATE LAB NO 42-1126
CAP I & A NO 78205001

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SAN ANTONIO, TEXAS 78284

# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7166

| PATIENT NAME | PATIENT I D | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X98 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 00353837 | | | 02/20/1981 | 02/20/1981 | 67 21 00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 7.9 | THOUS/CMM | |
| RED CELL COUNT | 5.03 | MIL/CMM | |
| HEMOGLOBIN | 9.3 | G/DL | |
| HEMATOCRIT | 28.4 | % | |
| MCV | 57 | CU MICRONS | |
| MCH | 18.4 | PICOGRAMS | |
| MCHC | 38.1 H | % | |
| IFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 56 | % | |
| NON SEGMENTED NEUTROPHILES | 1 | % | |
| EOSINOPHILES | 3 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 30 | % | |
| MONOCYTES | 10 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | LO *12 | MG/DL | 70-110 |
| BUN | 11 | MG/DL | 10-26 |
| CREATININE | LO *0.5 | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | HI *22 | | 10-20 |
| URIC ACID | 0.3 | MG/DL | |
| SODIUM | HI *148 | MEQ/L | 135-147 |
| POTASSIUM | 4.2 | MEQ/L | 3.5-5.0 |
| CHLORIDE | 107 | MEQ/L | 100-110 |
| CARBON DIOXIDE | 26 | MEQ/L | 24-34 |
| CALCIUM | 10.5 | MG/DL | 8.5-10.5 |
| ION-CA (APPROX) | 2.3 | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 2.8 | MG/DL | |
| CHOLESTEROL | LO *95 | MG/DL | 140-270 |
| TRIGLYCERIDES | 184 | MG/DL | 10-200 |
| TOTAL PROTEIN | 7.1 | GM/DL | 6.0-8.0 |
| ALBUMIN | 3.9 | GM/DL | 3.5-5.0 |
| GLOBULINS | 3.2 | GM/DL | 2.3-3.5 |
| A/G RATIO | 1.2 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.2 | MG/DL | |
| ALK PHOS | 277 | MU/ML | |
| GGT | 48 | MU/ML | |
| SGOT | 33 | MU/ML | 0-40 |

PAGE 1: CONTINUED ON PAGE: 2

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# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X98 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 30353837 | | | 02/20/1981 | 02/20/1981 | 47-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | HI #592 | MU/ML | 100-225 |
| IRON | HI #156 | MCG/DL | 60-150 |

E.T. STANDLEY, MD DIRECTOR OF LABORATORIES

**FINAL REPORT**



INTERSTATE LAB NO. 42 1176

CAP L & A NO. 7820001

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# LABORATORY REPORT

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Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7166

| PATIENT NAME | PATIENT I.D | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X98 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0376057 | | | 02/25/1981 | 02/26/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| # | | | |
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 8.6 | THOUS/CMM | |
| RED CELL COUNT | 4.75 | MIL/CMM | |
| HEMOGLOBIN | 8.7 | G/DL | |
| HEMATOCRIT | 29.8 | % | |
| MCV | 63 | CU MICRONS | |
| MCH | 18.4 | PICOGRAMS | |
| MCHC | 29.3 | % | |
| # | | | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 56 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 4 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 35 | % | |
| MONOCYTES | 5 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| # | | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | 28 | MG/DL | |
| BUN | 13 | MG/DL | |
| CREATININE | 0.7 | MG/DL | |
| BUN/CREAT RATIO | 19 | | |
| URIC ACID | 0.2 | MG/DL | |
| SODIUM | 149 | MEQ/L | |
| POTASSIUM | 4.4 | MEQ/L | |
| CHLORIDE | 107 | MEQ/L | |
| CARBON DIOXIDE | 29 | MEQ/L | |
| CALCIUM | 10.4 | MG/DL | |
| ION-CA (APPROX) | 2.3 | MEQ/L | |
| PHOSPHORUS | 5.1 | MG/DL | |
| CHOLESTEROL | 81 | MG/DL | |
| TRIGLYCERIDES | 183 | MG/DL | |
| TOTAL PROTEIN | 7.0 | GM/DL | |
| ALBUMIN | 3.9 | GM/DL | |
| GLOBULINS | 3.1 | GM/DL | |
| A/G RATIO | 1.3 | | |
| TOTAL BILIRUBIN | 0.1 | MG/DL | |
| ALK PHOS | 227 | MU/ML | |
| GGT | 43 | MU/ML | |
| SGOT | 24 | MU/ML | |

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# LABORATORY REPORT


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Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7166


| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X98 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 50376057 | | | 02/25/1981 | 02/26/1981 | 67--21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | 415 | MU/ML | |
| IRON | 96 | MCG/DL | |

E.T. STANDLEY,MD DIRECTOR OF LABORATORIES



**FINAL REPORT**

CAP I & A NO 78205001 # 45 8023

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WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X96 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 0210958 | | | 01/21/1981 | 01/22/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 9.8 | THOUS/CMM | |
| RED CELL COUNT | 5.12 | MIL/CMM | |
| HEMOGLOBIN | 10.4 | G/DL | |
| HEMATOCRIT | 31.7 | % | |
| MCV | 62 | CU MICRONS | |
| MCH | 20.2 | PICOGRAMS | |
| MCHC | 32.7 | % | |
| IFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 63 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 36 | % | |
| MONOCYTES | 1 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| TEST PROFILE | | | |
| GLUCOSE | 50 | MG/DL | |
| BUN | 12 | MG/DL | |
| CREATININE | 0.6 | MG/DL | |
| BUN/CREAT RATIO | 20 | | |
| URIC ACID | 0.4 | MG/DL | |
| SODIUM | 145 | MEQ/L | |
| POTASSIUM | 3.4 | MEQ/L | |
| CHLORIDE | 101 | MEQ/L | |
| CARBON DIOXIDE | 28 | MEQ/L | |
| CALCIUM | 9.0 | MG/DL | |
| ION-CA (APPROX) | 2.0 | MEQ/L | |
| PHOSPHORUS | 2.9 | MG/DL | |
| CHOLESTEROL | 83 | MG/DL | |
| TRIGLYCERIDES | 253 | MG/DL | |
| TOTAL PROTEIN | 6.8 | GM/DL | |
| ALBUMIN | 3.1 | GM/DL | |
| GLOBULINS | 3.7 | GM/DL | |
| A/G RATIO | 0.8 | | |
| TOTAL BILIRUBIN | 0.3 | MG/DL | |
| ALK PHOS | 673 | MU/ML | |
| GGT | 120 | MU/ML | |
| SGOT | 43 | MU/ML | |

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| PATIENT NAME | PATIENT I D | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X96 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 00210958 | | | 01/21/1981 | 01/22/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | 1330 | MU/ML | |
| IRON | 108 | MCG/DL | |

E.T. STANDLEY, MD DIRECTOR OF LABORATORIES
**FINAL REPORT**


INTERSTATE LAB NO 42-1126 CAP I & A NO 78205001 IL 45 8023

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|---|---|---|---|---|
| XXX | 204X96 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 80277244 | | | 02/04/1981 | 02/04/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 5.9 ok | THOUS/CMM | |
| RED CELL COUNT | 5.24 | MIL/CMM | |
| HEMOGLOBIN | 10.4 | G/DL | |
| HEMATOCRIT | 32.8 ok except for dehydrat. | % | |
| MCV | 62 | CU MICRONS | |
| MCH | 19.8 | PICOGRAMS | |
| MCHC | 31.7 ok | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 52 ok | % | |
| NON SEGMENTED NEUTROPHILES | 3 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 43 | % | |
| MONOCYTES | 2 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | 85 ok | MG/DL | 70-110 |
| BUN | 18 | MG/DL | 10-26 |
| CREATININE | LO #0.5 ok | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | HI #36 | | 10-20 |
| URIC ACID | 0.2 | MG/DL | |
| SODIUM | HI #150 ok | MEQ/L | 135-147 |
| POTASSIUM | 4.0 ok | MEQ/L | 3.5-5.0 |
| CHLORIDE | 104 | MEQ/L | 100-110 |
| CARBON DIOXIDE | 30 | MEQ/L | 24-34 |
| CALCIUM | 9.6 | MG/DL | 8.5-10.5 |
| ION-CA (APPROX) | 2.1 ok | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 3.4 | MG/DL | |
| CHOLESTEROL | HI #281 | MG/DL | 140-270 |
| TRIGLYCERIDES | HI #930 | MG/DL | 10-200 |
| TOTAL PROTEIN | 6.5 | GM/DL | 6.0-8.0 |
| ALBUMIN | LO #2.8 ✓ | GM/DL | 3.5-5.0 |
| GLOBULINS | HI #3.7 | GM/DL | 2.3-3.5 |
| A/G RATIO | LO #0.8 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.2 | MG/DL | |
| ALK PHOS | 1270 } high - what's norm for cyno.? | MU/ML | |
| GGT | 113 | MU/ML | |
| SGOT | HI #83 | MU/ML | 0-40 |

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69375
SOUTHWEST FOUNDATION FOR
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SAN ANTONIO, TEXAS 78284

# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X96 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 60277244 | | | 02/04/1981 | 02/04/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | HI *750 | MU/ML | 100--225 |
| IRON | HI *159 *m* | MCG/DL | 60--150 |

E.T. STANDLEY,MD ...ECTOR OF LABORATORIES
**FINAL REPORT**


INTERSTATE LAB NO 42 1126 CAP LS A NO 7829001

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P O BOX 28147
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WATS 1-800-292-7466

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|---|---|---|---|---|
| XXX | 204X96 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 0297770 | | | 02/09/1981 | 02/09/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 5.1 | THOUS/CMM | |
| RED CELL COUNT | 5.25 | MIL/CMM | |
| HEMOGLOBIN | 10.3 | G/DL | |
| HEMATOCRIT | 33.6 | % | |
| MCV | 63 | CU MICRONS | |
| MCH | 19.7 | PICOGRAMS | |
| MCHC | 30.7 | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 73 | % | |
| NON SEGMENTED NEUTROPHILES | 3 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 23 | % | |
| MONOCYTES | 1 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | ADEQUATE | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | 101 | MG/DL | 70-110 |
| BUN | 12 | MG/DL | 10-26 |
| CREATININE | LO *0.4 | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | HI *30 | | 10-20 |
| URIC ACID | 0.3 | MG/DL | |
| SODIUM | HI *148 | MEQ/L | 135-147 |
| POTASSIUM | 3.5 | MEQ/L | 3.5-5.0 |
| CHLORIDE | 100 | MEQ/L | 100-110 |
| CARBON DIOXIDE | 30 | MEQ/L | 24-34 |
| CALCIUM | 8.9 | MG/DL | 8.5-10.5 |
| ION-CA (APPROX) | 2.1 | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 2.9 | MG/DL | |
| CHOLESTEROL | 210 | MG/DL | 140-270 |
| TRIGLYCERIDES | HI *477 | MG/DL | 10-200 |
| TOTAL PROTEIN | 6.2 | GM/DL | 6.0-8.0 |
| ALBUMIN | LO *2.6 | GM/DL | 3.5-5.0 |
| GLOBULINS | HI *3.6 | GM/DL | 2.3-3.5 |
| A/G RATIO | LO *0.7 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.1 | MG/DL | |
| ALK PHOS | 2110 | MU/ML | |
| GGT | 112 | MU/ML | |
| SGOT | HI *90 | MU/ML | 0-40 |

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# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X96 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 0297770 | | | 02/09/1981 | 02/09/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | HI #468 | MU/ML | 100-225 |
| IRON | 132 | MCG/DL | 60-150 |

E.T. STANDLEY, MD DIRECTOR OF LABORATORIES
**FINAL REPORT**


INTERSTATE LAB NO 42-1126
CAP I & A NO 78205001 8 45 8023

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WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0210914 | | | 01/21/1981 | 01/22/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| # | | | |
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 9.3 | THOUS/CMM | |
| RED CELL COUNT | 5.61 | MIL/CMM | |
| HEMOGLOBIN | 10.7 | G/DL | |
| HEMATOCRIT | 33.0 | % | |
| MCV | 59 | CU MICRONS | |
| MCH | 19.1 | PICOGRAMS | |
| MCHC | 31.9 | % | |
| # | | | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 80 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 13 | % | |
| MONOCYTES | 7 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | INCREASED | | |
| # | | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | 95 | MG/DL | |
| BUN | 13 | MG/DL | |
| CREATININE | 0.8 | MG/DL | |
| BUN/CREAT RATIO | 16 | | |
| URIC ACID | 0.5 | MG/DL | |
| SODIUM | 145 | MEQ/L | |
| POTASSIUM | 4.0 | MEQ/L | |
| CHLORIDE | 104 | MEQ/L | |
| CARBON DIOXIDE | 27 | MEQ/L | |
| CALCIUM | 9.0 | MG/DL | |
| ION-CA (APPROX) | 2.0 | MEQ/L | |
| PHOSPHORUS | 3.5 | MG/DL | |
| CHOLESTEROL | 63 | MG/DL | |
| TRIGLYCERIDES | 138 | MG/DL | |
| TOTAL PROTEIN | 6.7 | GM/DL | |
| ALBUMIN | 2.6 | GM/DL | |
| GLOBULINS | 4.1 | GM/DL | |
| A/G RATIO | 0.6 | | |
| TOTAL BILIRUBIN | 0.2 | MG/DL | |
| ALK PHOS | 438 | MU/ML | |
| GGT | 59 | MU/ML | |
| SGOT | 32 | MU/ML | |

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# LABORATORY REPORT

Severance & Associates
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Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 0210914 | | | 01/21/1981 | 01/22/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | 1160 | MU/ML | |
| IRON | 142 | MCG/DL | |

E.T. STANDLEY,MD DIRECTOR OF LABORATORIES
**FINAL REPORT**



REGISTRATION LAB NO. 42 1126 CAP L & A NO. 7820600

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| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0240460 | | | 01/27/1981 | 01/27/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| * | | | |
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 11.8 | THOUS/CMM | |
| RED CELL COUNT | 5.69 | MIL/CMM | |
| HEMOGLOBIN | 11.4 | G/DL | |
| HEMATOCRIT | 34.7 | % | |
| MCV | 60 | CU MICRONS | |
| MCH | 20.0 | PICOGRAMS | |
| MCHC | 32.8 | % | |
| * | | | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 54 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 0 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 39 | % | |
| MONOCYTES | 7 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | INCREASED | | |
| * | | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | HI *126 | MG/DL | 70-110 |
| BUN | 15 | MG/DL | 10-26 |
| CREATININE | 0.8 | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | 19 | | 10-20 |
| URIC ACID | 0.2 | MG/DL | |
| SODIUM | 142 | MEQ/L | 135-147 |
| POTASSIUM | 4.5 | MEQ/L | 3.5-5.0 |
| CHLORIDE | 103 | MEQ/L | 100-110 |
| CARBON DIOXIDE | LO *23 | MEQ/L | 24-34 |
| CALCIUM | 8.8 | MG/DL | 8.5-10.5 |
| ION-CA (APPROX) | 2.0 | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 4.1 | MG/DL | |
| CHOLESTEROL | LO *77 | MG/DL | 140-270 |
| TRIGLYCERIDES | 79 | MG/DL | 10-200 |
| TOTAL PROTEIN | 6.9 | GM/DL | 6.0-8.0 |
| ALBUMIN | LO *2.8 | GM/DL | 3.5-5.0 |
| GLOBULINS | HI *4.1 | GM/DL | 2.3-3.5 |
| A/G RATIO | LO *0.7 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.1 | MG/DL | |
| ALK PHOS | 341 | MU/ML | |
| GGT | 68 | MU/ML | |
| SGOT | 33 | MU/ML | 0-40 |

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SOUTHWEST FOUNDATION FOR
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# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 00240460 | | | 01/27/1981 | 01/27/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | NOTE | MU/ML | 100-225 |
| QUANTITY IS NOT SUFFICIENT FOR QUANTITATION. LDH RESULT IS GREATER THAN 600 MU/ML . | | | |
| IRON | HI #196 | MCG/DL | 60 150 |

E.T. STANDLEY, MD DIRECTOR OF LABORATORIES



**FINAL REPORT**

69382
SOUTHWEST FOUNDATION FOR
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ATTN: DR MCGILL
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SAN ANTONIO, TEXAS 78284

# LABORATORY REPORT

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Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0263329 | | | 02/02/1981 | 02/02/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | | UNITS | REFERENCE VALUES |
|---|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | | |
| WHITE CELL COUNT | 10.5 | on | THOUS/CMM | |
| RED CELL COUNT | 4.96 | | MIL/CMM | |
| HEMOGLOBIN | 9.6 | | G/DL | |
| HEMATOCRIT | 28.7 | ~ | % | |
| MCV | 57 | | CU MICRONS | |
| MCH | 19.2 | | PICOGRAMS | |
| MCHC | 33.4 | on | % | |
| DIFFERENTIAL EXAMINATION | | | | |
| SEGMENTED NEUTROPHILES | 69 | on | % | |
| NON SEGMENTED NEUTROPHILES | 0 | | % | |
| EOSINOPHILES | 0 | | % | |
| BASOPHILES | 0 | | % | |
| LYMPHOCYTES | 31 | | % | |
| MONOCYTES | 0 | | % | |
| IMMATURE CELLS | 0 | | % | |
| PLATELET ESTIMATION | INCREASED | | | |
| 24 TEST PROFILE | | | | |
| GLUCOSE | 37 | low | MG/DL | |
| BUN | 14 | on | MG/DL | |
| CREATININE | 0.7 | | MG/DL | |
| BUN/CREAT RATIO | 20 | | | |
| URIC ACID | 0.3 | | MG/DL | |
| SODIUM | 147 | on | MEQ/L | |
| POTASSIUM | 3.9 | on | MEQ/L | |
| CHLORIDE | 107 | | MEQ/L | |
| CARBON DIOXIDE | 25 | | MEQ/L | |
| CALCIUM | 8.9 | | MG/DL | |
| ION-CA (APPROX) | 2.0 | on | MEQ/L | |
| PHOSPHORUS | 3.9 | | MG/DL | |
| CHOLESTEROL | 69 | | MG/DL | |
| TRIGLYCERIDES | 112 | on | MG/DL | |
| TOTAL PROTEIN | 6.6 | | GM/DL | |
| ALBUMIN | 2.9 | low | GM/DL | |
| GLOBULINS | 3.7 | | GM/DL | |
| A/G RATIO | 0.8 | | | |
| TOTAL BILIRUBIN | 0.2 | | MG/DL | |
| ALK PHOS | 483 | | MU/ML | |
| GGT | 69 | | MU/ML | |
| SGOT | 27 | | MU/ML | |

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SOUTHWEST FOUNDATION FOR
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# LABORATORY REPORT

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 80263329 | | | 02/02/1981 | 02/02/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | 506 | MU/ML | |
| IRON | 149 | MCG/DL | |

E.T. STANDLEY, MD DIRECTOR OF LABORATORIES
**FINAL REPORT**


INTERSTATE LAB NO 42-1126
CAP I & A NO 7020001

SOUTHWEST FOUNDATION FOR
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DEPT OF LAB ANIMAL MED
P O BOX 28147
SAN ANTONIO, TEXAS 78284

# LABCRATORY REPORT

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San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 30353826 | | | 02/20/1981 | 02/20/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 5.1 | THOUS/CMM | |
| RED CELL COUNT | 5.00 | MIL/CMM | |
| HEMOGLOBIN | 9.7 | G/DL | |
| HEMATOCRIT | 29.6 | % | |
| MCV | 59 | CU MICRONS | |
| MCH | 19.3 | PICOGRAMS | |
| MCHC | 32.8 | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 49 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 1 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 47 | % | |
| MONOCYTES | 3 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | INCREASED | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | LO *48 | MG/DL | 70-110 |
| BUN | LO *6 | MG/DL | 10-26 |
| CREATININE | 0.9 | MG/DL | 0.6-1.5 |
| BUN/CREAT RATIO | LO *7 | | 10-20 |
| URIC ACID | 0.2 | MG/DL | |
| SODIUM | 146 | MEQ/L | 135-147 |
| POTASSIUM | 3.9 | MEQ/L | 3.5-5.0 |
| CHLORIDE | 105 | MEQ/L | 100-110 |
| CARBON DIOXIDE | 24 | MEQ/L | 24-34 |
| CALCIUM | 9.7 | MG/DL | 8.5-10.5 |
| ION-CA (APPROX) | 2.2 | MEQ/L | 1.9-2.3 |
| PHOSPHORUS | 5.1 | MG/DL | |
| CHOLESTEROL | LO *76 | MG/DL | 140-270 |
| TRIGLYCERIDES | 31 | MG/DL | 10-200 |
| TOTAL PROTEIN | 6.7 | GM/DL | 6.0-8.0 |
| ALBUMIN | LO *3.2 | GM/DL | 3.5-5.0 |
| GLOBULINS | 3.5 | GM/DL | 2.3-3.5 |
| A/G RATIO | LO *0.9 | | 1.0-2.2 |
| TOTAL BILIRUBIN | 0.2 | MG/DL | |
| ALK PHOS | 470 | MU/ML | |
| SGOT | 70 | MU/ML | |
| SGOT | 33 | MU/ML | 0-40 |

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**LABORATORY REPORT**

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Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I D | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 00353826 | | | 02/20/1981 | 02/20/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | HI *860 | MU/ML | 100--225 |
| IRON | 120 | MCG/DL | 60--150 |

E.T. STANDLEY,MD DIRECTOR OF LABORATORIES
**FINAL REPORT**

69375
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# LABORATORY REPORT

The Laboratory of Pathology
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Phone 512-225-5101
WATS 1-800-292-7166

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| 80376068 | | | 02/25/1981 | 02/26/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| AUTOMATED BLOOD COUNT | | | |
| WHITE CELL COUNT | 6.8 | THOUS/CMM | |
| RED CELL COUNT | 4.94 | MIL/CMM | |
| HEMOGLOBIN | 9.3 | G/DL | |
| HEMATOCRIT | 30.2 | % | |
| MCV | 61 | CU MICRONS | |
| MCH | 18.8 | PICOGRAMS | |
| MCHC | 31.2 | % | |
| DIFFERENTIAL EXAMINATION | | | |
| SEGMENTED NEUTROPHILES | 39 | % | |
| NON SEGMENTED NEUTROPHILES | 0 | % | |
| EOSINOPHILES | 5 | % | |
| BASOPHILES | 0 | % | |
| LYMPHOCYTES | 50 | % | |
| MONOCYTES | 6 | % | |
| IMMATURE CELLS | 0 | % | |
| PLATELET ESTIMATION | INCREASED | | |
| 24 TEST PROFILE | | | |
| GLUCOSE | 31 | MG/DL | |
| BUN | 9 | MG/DL | |
| CREATININE | 1.1 | MG/DL | |
| BUN/CREAT RATIO | 8 | | |
| URIC ACID | 0.2 | MG/DL | |
| SODIUM | 147 | MEQ/L | |
| POTASSIUM | 4.6 | MEQ/L | |
| CHLORIDE | 107 | MEQ/L | |
| CARBON DIOXIDE | 27 | MEQ/L | |
| CALCIUM | 9.8 | MG/DL | |
| ION-CA (APPROX) | 2.2 | MEQ/L | |
| PHOSPHORUS | 4.7 | MG/DL | |
| CHOLESTEROL | 82 | MG/DL | |
| TRIGLYCERIDES | 30 | MG/DL | |
| TOTAL PROTEIN | 6.6 | GM/DL | |
| ALBUMIN | 3.4 | GM/DL | |
| GLOBULINS | 3.2 | GM/DL | |
| A/G RATIO | 1.1 | | |
| TOTAL BILIRUBIN | 0.1 | MG/DL | |
| ALK PHOS | 310 | MU/ML | |
| GGT | 86 | MU/ML | |
| SGOT | 35 | MU/ML | |

PAGE 1: CONTINUED ON PAGE: 2

INTERSTATE LAB NO 42-1126
CAP I & A NO 78205001 II 46 8072

69375
SOUTHWEST FOUNDATION FOR
RESEARCH AND EDUCATION
DEPT OF LAB ANIMAL MED
P O BOX 28147
SAN ANTONIO, TEXAS 78284

**LABORATORY REPORT**

The Laboratory of Pathology
Severance & Associates
San Antonio, Texas 78212
Phone 512-225-5101
WATS 1-800-292-7466

| PATIENT NAME | PATIENT I.D. | AGE | SEX | REQUESTING PHYSICIAN |
|---|---|---|---|---|
| XXX | 204X92 | | | |

| ACCESSION # | DATE COLLECTED | TIME COLLECTED | RECEIVED | REPORTED | CLIENT ROUTING |
|---|---|---|---|---|---|
| S0376068 | | | 02/25/1981 | 02/26/1981 | 67-21-00 |

| TEST PROCEDURE | RESULT | UNITS | REFERENCE VALUES |
|---|---|---|---|
| LDH | 830 | MU/ML | |
| IRON | 100 | MCG/DL | |

E.T. STANDLEY, MD DIRECTOR OF LABORATORIES
**FINAL REPORT**

# Appendix F

# Pathologist's Reports

SFRE NECROPSY PROTOCOL FORM

Accession Number 3233

TO BE COMPLETED BY SUBMITTING VETERINARIAN: Today's Date: Jan.17,1981

Animal Number: 204X95 Species: Cynomolgus Sex: Male Age: ______ Weight: 5 kg.

Investigator: Dr.Geller, Dr.Samuels Dept.: DBES Account to be charged: ______

Date of Death: Jan.17,'81 Cadaver Unfixed ______ hrs @ ______ °F, plus ______ hrs in re

Type of Death (Euthanasia, Research-Related, Spontaneous, Etc.):

History, Symptoms, Treatment and Laboratory Data: Chair trained-Catheters surgically implanted into Jugular V. & Carotid Art. on Jan.8. Animal also had EKG Electrodes implanted same day - Tolerated procedure well - Animal pulled catheters on Jan.13 and bled some from arterial cath. - Cath.became plugged and clot was injected back into animal to free catheter. Animal became depressed in PM after this - Animal ate Jan.13,14,15th but PM of Jan 15 would not eat & became more depressed - Treated with IV Fluids - Whole blood, Antibiotics & steroids After treatment at 1630 on Jan 16 animal stopped breathing. Could not revive. Kept alive on Bird respirator but pupils fixed and dilated. Cardiovascular system did well as long as animal was on respirator. Mass about 1-2 cm in diameter palpated in left side of abdomen.

Clinical Diagnosis:
Diag - Vascular Thrombus ov embolus? Affecting resp. center - Iatrogenic.

Signature of Submitting Veterinarian: ______
Richard J. Haines, Jr., D.V.M.

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TO BE COMPLETED BY PATHOLOGIST:

External (Skin, Eyes, Ears): Dried blood over much of body surface. No discharges from body openings. Several catheters emerging from right side of neck on back side just below head.

Primary Incision: Good layer of subcutaneous fat.

Body Cavities: Much peritoneal fat: Excessive fluid in thoracic cavity.

Respiratory (Nasal Passages, Sinus, Larynx, Trachea, Bronchi, Lungs, Pleura): Complete atelactasis of 1 pulmonary lobe, partial atelactasis of several lobes.

Circulatory (Heart, Arteries, Veins, Lymph Vessels, Blood): No lesions in heart; catheters in neck vessels.

Lymphatic (Lymph Nodes, Tonsil, Thymus): No gross lesions.

Hemopoietic (Spleen, Bone Marrow): No gross lesions.

Urinary (Urethra, Bladder, Ureters, Kidneys): No gross lesions.

Genital (Gonads, Uterus, Cervix, Acc. Organs, External Genitalia, Mammary Gland):

No gross lesions.

Digestive (Mouth, Pharynx, Salivary Glands, Esophagus, Stomach, Intestines, Rectum, Pancreas): Hard discrete mass in lumen of lower colon - fecolith.

Liver and Gall Bladder: Liver is full of blood - severe congestion.

Endocrine (Thyroid, Adrenals, Hyphophysis, Parathyroid): No gross lesions.

Locomotor (Skeletal Muscles and Bones): No gross lesions.

Nervous (Brain, Spinal Cord, Meninges, Nerves): No gross lesions.

Post-Mortem Diagnoses (Gross Path.):

1. Hydrothorax.
2. Atelactasis, pulmonary, severe.
3. Fecolith, lower colon.
4. Congestion, liver, severe.

C. A. Gleiser

Prosector: C. A. Gleiser, V.M.D.
Pathologist

Date of Necropsy: Jan. 17, 1981

January 27, 1981

Cynomolgus #204X95 Pathology #3233

Investigator: Dr. Geller✓

## Histopathologic Examination

Brain: No lesions.

Lung (Multiple Sections): Most alveoli are filled with pink acellular material (edema). Many bronchioles and some bronchi contain masses of neutrophils (bronchopneumonia).

Spleen: No lesions.

Heart: No lesions.

Kidney: No lesions

Liver: Most hepatocytes contain fat vacuoles.

Pancreas and Small Intestine: Only post mortem change.

Mesenteric Lymph Node: No lesions.

Skeletal Muscle: No lesions.

Large Intestine: No lesions.

## Histopathologic Diagnoses

1. Bronchopneumonia.
2. Edema, pulmonary, severe.
3. Fatty change, liver, diffuse, moderate.

C. A. Gleiser, V.M.D.
Pathologist

February 27, [illegible]

Pathology #3268 ✓ [illegible]

Cynomolgus #204X96

Investigator: Dr. Geller

Histopathologic Examination

Brain (Midbrain & Brainstem): No lesions.

Lung: Many alveoli are filled with neutrophils in one section. Another section shows patchy consolidation with some fibrosis. There are clumps of an exogenous pigmented material in this section.

Liver: Clumps of hemosiderin scattered throughout section. Mild fibrosis of some hepatic trinities.

Spleen: Lots of hemosiderin in section.

[illegible]: No lesions.

[illegible]

Heart: [illegible] of pericardium near base with fibrosis.

Major Artery: No lesions.

Kidney: Dilatation of some cortical tubules.

Intestine: No lesions.

Lymph Node: Reticular cell hyperplasia, hemosiderosis and erythrophagocytosis.

Histopathologic Diagnoses

1. Pneumonia, purulent, patchy.
2. Pneumonia, chronic, fibrosing, patchy.
3. Cirrhosis, portal, mild.
4. Hemosiderosis, liver, spleen.
5. Pericarditis, chronic, focal.
6. Hyperplasia, reticular cell, erythrophagocytosis, and hemosiderosis, lymph node.

C. A. Gleiser, V.M.D.
Pathologist

SFRE NECROPSY PROTOCOL FORM

Accession Number 3268 [illegible]

TO BE COMPLETED BY SUBMITTING VETERINARIAN: Today's Date: Feb. 18, 1981

Animal Number: 204X96 Species: Cynomolgus Sex: Male Age: ______ Weight: __________

Investigator: Dr. Geller Dept.: Behav. Sci. Account to be charged: 1254.1

Date of Death: __________ Cadaver Unfixed ________ hrs @ _____ °F, plus ____ hrs in ref

Type of Death (Euthanasia, Research-Related, Spontaneous, Etc.):

History, Symptoms, Treatment and Laboratory Data:

Clinical Diagnosis:

Signature of Submitting Veterinarian: ______________________________

TO BE COMPLETED BY PATHOLOGIST:

External (Skin, Eyes, Ears): Deep ulcers, submaxillary, bilateral. Catheters exiting thru skin behind right ear. Some loss of flesh.

Primary Incision: Subcutaneous leads removed. Some subcutaneous fat present.

Body Cavities: Some peritoneal fat present. Adhesion of upper colon to right kidney. Multiple pleural adhesions.

Respiratory (Nasal Passages, Sinus, Larynx, Trachea, Bronchi, Lungs, Pleura):

Some pleural adhesions.

Circulatory (Heart, Arteries, Veins, Lymph Vessels, Blood): No gross lesions.

Lymphatic (Lymph Nodes, Tonsil, Thymus): Submaxillary and inguinal lymph nodes are enlarged.

Hemopoietic (Spleen, Bone Marrow): No gross lesions.

Urinary (Urethra, Bladder, Ureters, Kidneys): No gross lesions.

Genital (Gonads, Uterus, Cervix, Acc. Organs, External Genitalia, Mammary Gland):

No gross lesions.

Digestive (Mouth, Pharynx, Salivary Glands, Esophagus, Stomach, Intestines, Rectum, Pancreas):

Colon filled with liquid fecal matter.

Liver and Gall Bladder: No gross lesions.

Endocrine (Thyroid, Adrenals, Hyphophysis, Parathyroid): No gross lesions.

[illegible] (Skeletal Muscles and Bones): Some loss of skeletal musculature, especially around head.

Nervous (Brain, Spinal Cord, Meninges, Nerves): No gross lesions.

Post-Mortem Diagnoses (Gross Path.):

1. Ulcers, submaxillary, bilateral.
2. Emaciation, mild.
3. Lymphadenopathy, submaxillary and inguinal.
4. Adhesions, pleural.

March 7, [illegible]

Cynomolgus #204X99 Pathology #3270 ✓ copy 2

Investigator: Dr. Geller

## Histopathologic Examination

Lung: There is widespread rupture and thinning of interalveolar septae. There are also many areas in which the alveoli are filled with a proteinaceous acellular material. These are diffuse lesions of marked intensity.

Pancreas: No lesions.

Kidney: No lesions.

Liver: Some Kupffer cells laden with hemosiderin. Fine granular pigment (hemosiderin) in many hepatocytes.

Thyroid: No lesions.

Brain: No lesions.

Spleen: Severe loss of lymphocytes - lymphoid follicles are scarce. Sinusoids are dilated, relatively bloodless and lined by hypertrophied endothelial cells.

Adrenal: No lesions.

Heart: Wide seperation of myofibers by empty spaces - edema (?). Some fragmentation of individual myofibers.

Salivary Gland & Lymph Node: Small nodes adjacent to salivary gland (submaxillary); nodes are embedded in a mass of dense fibrous connective tissue (scarring).

The nodes show marked reticular cell hyperplasia, many clusters of neutrophils and some scarring.

Intestine: No lesions.

## Histopathologic Diagnoses

ORIGINAL PAGE IS OF POOR QUALITY

1. Edema, pulmonary, severe.
2. Emphysema, pulmonary, severe.
3. Edema, myocardium.
4. Degeneration, myofiber, mild.
5. Fibrosis, submaxillary area.
6. Atrophy, lymphoid, spleen.
7. Hemosiderosis, liver.
8. Hyperplasia, reticulo-endothelial, submaxillary lymph node.

SFRE NECROPSY PROTOCOL FORM

Accession Number 3270 / [illegible]

TO BE COMPLETED BY SUBMITTING VETERINARIAN: Today's Date: Feb.24, 1981

Animal Number: 204X99 Species: Cynomolgus Sex: Male Age: 5 years Weight: 4 kg

Investigator: Dr. Geller Dept.: DBES Account to be charged: 1254.1

Date of Death: Feb.24,1981 Cadaver Unfixed 0 hrs @ - °F, plus - hrs in re[frig.]

Type of Death (Euthanasia, Research-Related, Spontaneous, Etc.):

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History, Symptoms, Treatment and Laboratory Data: Animal trained to chair - 3 EKG electrode wires placed S. C. and Int. Jugular V and Carotid Art. cannulas inserted and brought out SC in back of head - Placed in chair and then in chamber and exposed to gas for 30 days - Did fairly well until Feb. 20 and started looking depressed and weak. Did not eat over weekend - Received fluids IV - Antibiotic given 23 & 24 Feb. with corticosteriods - Fed with stomach tube Feb.23 & 24. During period in chamb[er] animal had blood clots pushed in during catheter clearing procedures.

Clinical Diagnosis:

Shock due to stress of procedure.

Signature of Submitting Veterinarian: Richard J. Haines, Jr., D.V.M.

---

TO BE COMPLETED BY PATHOLOGIST:

External (Skin, Eyes, Ears): Catheters exiting thru skin behind right ear. Some loss of flesh and condition of neck and throat are yellow (medication). Bilateral skin abrasions in submaxillary area.

Primary Incision: Some subcutaneous fat. Some leads found just beneath the skin.

Body Cavities: Little peritoneal fat. Multiple pleural adhesions.

Respiratory (Nasal Passages, Sinus, Larynx, Trachea, Bronchi, Lungs, Pleura):

Lungs are markedly expanded, pleural edges are rounded; lungs are very crepitous. Trachea, bronchi and bronchioles filled with frothy fluid. Fluid runs freely from cut surfaces of lungs.

Lymphatic (Lymph Nodes, Tonsil, Thymus): No lesions.

Hemopoietic (Spleen, Bone Marrow): No gross lesions.

Urinary (Urethra, Bladder, Ureters, Kidneys): No gross lesions.

Genital (Gonads, Uterus, Cervix, Acc. Organs, External Genitalia, Mammary Gland): No gross lesions.

Digestive (Mouth, Pharynx, Salivary Glands, Esophagus, Stomach, Intestines, Rectum, Pancreas): Stomach is full of curdled fluid. Large intestine is distended with gas.

Liver and Gall Bladder: No gross lesions.

Endocrine (Thyroid, Adrenals, Hyphophysis, Parathyroid): No gross lesions.

Locomotor (Skeletal Muscles and Bones): No gross lesions.

Nervous (Brain, Spinal Cord, Meninges, Nerves): No gross lesions.

Post-Mortem Diagnoses (Gross Path.):

1. Emphysema, pulmonary, severe.
2. Edema, pulmonary, severe.
3. Flabby heart (?).
4. Pleural adhesions, diffuse.

April 21, 1981

Cynomolgus #204X92 — Pathology #3328

Investigator: Dr. Geller

## Histopathologic Examination

Brain (Multiple Sections): There are many scattered discrete holes in the white matter of the cerebellum. These are not accompanied by any inflammatory or degenerative lesions.

In the basillar portion of the medulla there are many more such holes and in addition there are observed degenerated or necrotic nerve fibers in some of these holes. Some very large glial cells are seen in this area also.

Some small discrete holes are also seen in the white matter of the cerebral cortex. They are not as numerous here, and there does not appear to be any inflammatory or degenerative change here.

Lung: Lung mite pigment, peribronchiolar lymphoid hyperplasia and medial hyperplasia of the walls of small arteries are seen. This is just a thickening of the medial without any inflammatory or degenerative changes.

Testis: No lesions.

Heart: Many nuclei of the myocardial fibers are enlarged or elongated. Some are very long. There is excessive widening of spaces between some fibers and some fibers are vacuolated. There are no inflammatory cells present.

Liver: There is periductal fibrosis around some of the bile ducts.

Pancreas: Some fatty infiltration into exocrine pancreas.

Thyroid & Parathyroid: No lesions.

Adrenal: No lesions.

Lymph Node: No lesions.

Kidney: No lesions.

Spleen: Many of the lymphoid follicles are enlarged with large germinal centers.

Intestine (Multiple Sections): No lesions.

Skeletal Muscle: No lesions.

Cynomolgus #204X92 — Pathology #3328

Histopathologic Diagnoses

1. Edema and demyelination, medulla o. and cerebellum.
2. Cardiomyopathy, mild.
3. Fibrosis periductal, liver.
4. Fatty change, pancreas, mild.
5. Hyperplasia, lymphoid, spleen.
6. Hyperplasia, medial, small artery, lung.

C. A. Gleiser, V.M.D.
Pathologist

April 21, 1981

Cynomolgus 204X98 | Pathology #3324

Investigator: Dr. Geller ✓

Histopathologic Examination

Brain (Multiple Sections): No lesions.

Lung: Focal thickening of pleura, multiple.

Heart: No lesions.

Testis and Epididymus: No lesions.

Pancreas: No lesions.

Mesentery: Section includes a lymph node, some fat, connective tissue and a granuloma that contains many eosinophils, some giant cells and connective tissue. There is another small granuloma adjacent to it. These are probably parasitic granulomas.

Liver: Multiple mineralized granulomas throughout section. Centers of granulomas are mineralized. Periphery is a connective tissue capsule. Clumps of hemosiderin also seen adjacent to triads.

Adrenal: Modular cortical hyperplasia.

Spleen: Some of the lymphoid follicles are enlarged.

Thyroid: No lesions.

Kidney: No significant lesions.

Intestine (Multiple Sections): Hemosiderin scattered throughout mucosa, mild.

Histopathologic Diagnoses

1. Granulomas, mineralized, multiple, liver (probably parasitic).

2. Granulomas, mesentery, probably parasitic.

3. Hyperplasia, nodular, cortical, adrenal.

4. Hemosiderosis, liver, intestine, mild.

C. A. Gleiser, V.M.D.

## SFRE NECROPSY PROTOCOL FORM

Accession Number 3328

TO BE COMPLETED BY SUBMITTING VETERINARIAN: Today's Date: April 15, 1981

Animal Number: 204X92 Species: Cynomolgus Sex: Male Age: Adult Weight: ______

Investigator: Dr. Geller Dept.: Env.Sci. Account to be charged: 1254.1

Date of Death: 4/15/81 Cadaver Unfixed 0 hrs @ ____ °F, plus ____ hrs in ref.

Type of Death (Euthanasia, Research-Related, Spontaneous, Etc.):

History, Symptoms, Treatment and Laboratory Data:

Clinical Diagnosis:

Signature of Submitting Veterinarian: Richard J. Haines, Jr., D.V.M.

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TO BE COMPLETED BY PATHOLOGIST:

External (Skin, Eyes, Ears): Good flesh and condition; no discharges from body openings

Primary Incision: Good layer of subcutaneous fat.

Body Cavities: Abundance of peritoneal and omental fat.

Respiratory (Nasal Passages, Sinus, Larynx, Trachea, Bronchi, Lungs, Pleura):

No gross lesions.

Circulatory (Heart, Arteries, Veins, Lymph Vessels, Blood): No gross lesions.

Lymphatic (Lymph Nodes, Tonsil, Thymus): No gross lesions.

Hemopoietic (Spleen, Bone Marrow): No gross lesions.

Urinary (Urethra, Bladder, Ureters, Kidneys): No gross lesions.

Genital (Gonads, Uterus, Cervix, Acc. Organs, External Genitalia, Mammary Gland): No gross lesions.

Digestive (Mouth, Pharynx, Salivary Glands, Esophagus, Stomach, Intestines, Rectum, Pancreas): No gross lesions.

Liver and Gall Bladder: No gross lesions.

Endocrine (Thyroid, Adrenals, Hyphophysis, Parathyroid): No gross lesions.

Locomotor (Skeletal Muscles and Bones): No gross lesions.

Nervous (Brain, Spinal Cord, Meninges, Nerves): No gross lesions.

Post-Mortem Diagnoses (Gross Path.): None; no gross lesions observed.

C A Gleiser

Prosector: C. A. Gleiser, V.M.D.
Pathologist
Date of Necropsy: April 14, 1981

## SFRE NECROPSY PROTOCOL FORM

Accession Number 3324

TO BE COMPLETED BY SUBMITTING VETERINARIAN: Today's Date: April 14, 1981

Animal Number: 204X98 Species: Cynomolgus Sex: Male Age: Adult Weight: ______

Investigator: Dr. Geller Dept.: Env. Sciences Account to be charged: 1254.1

Date of Death: 4/14/81 Cadaver Unfixed ______ hrs @ ______ °F, plus ______ hrs in ref.

Type of Death (Euthanasia, Research-Related, Spontaneous, Etc.):

---

History, Symptoms, Treatment and Laboratory Data:

Clinical Diagnosis:

Signature of Submitting Veterinarian: ______________________

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TO BE COMPLETED BY PATHOLOGIST:

External (Skin, Eyes, Ears): Good flesh and condition. No discharges from body openings.

Primary Incision: Good layer of subcutaneous fat.

Body Cavities: Abundance of peritoneal and omental fat. Several filarid worms in peritoneal cavity.

Respiratory (Nasal Passages, Sinus, Larynx, Trachea, Bronchi, Lungs, Pleura):

Multiple focal pleural adhesions on both sides.

Circulatory (Heart, Arteries, Veins, Lymph Vessels, Blood): Abundance of pericardial fat.

Lymphatic (Lymph Nodes, Tonsil, Thymus): No gross lesions.

Hemopoietic (Spleen, Bone Marrow): No gross lesions.

Urinary (Urethra, Bladder, Ureters, Kidneys): No gross lesions.

Genital (Gonads, Uterus, Cervix, Acc. Organs, External Genitalia, Mammary Gland): Only one testis present.

Digestive (Mouth, Pharynx, Salivary Glands, Esophagus, Stomach, Intestines, Rectum, Pancreas): No gross lesions.

Liver and Gall Bladder: Capsular surface of liver is pitted. Numerous tiny discrete creamy spots on capsular and cut surfaces. They feel hard - probably mineralized.

Endocrine (Thyroid, Adrenals, Hyphophysis, Parathyroid): No gross lesions.

Locomotor (Skeletal Muscles and Bones): No gross lesions.

Nervous (Brain, Spinal Cord, Meninges, Nerves): No gross lesions.

Post-Mortem Diagnoses (Gross Path.):

1. Filariasis, peritoneal.
2. Fibrosis, multifocal, liver (parasitic lesions?)
3. Aplasia, testis, unilateral.

C A Gleiser

Prosector: C. A. Gleiser, V.M.D.
Pathologist
Date of Necropsy: April 14, 1981