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DOW CHEMICAL U.S.A.

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INDUSTRIAL HYGIENE REPORT

AIR PURIFY ACID GAS CARTRIDGE MOUTHBIT RESPIRATOR FIT TESTING AND TRAINING: CHLOR-ALKALI GROUP LOUISIANA DIVISION

CRI NO. _____

FILE NO. LAD-IH-83.03

DATE 11/9/83

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DATE 11-9-83

SUMMARY

Fit testing and training of the Louisiana Division Chlor-Alkali personnel (including contractors) in the use and limitations of the air purifying acid gas cartridge mouthbit respirator has been concluded.

Quantitative fit test results of the test population (292) indicated 1.7% (5) were unable to use the mouthbit respirator for protection due to dental problems. A half-face respirator was fitted and assigned to these individuals. Thirteen and one-half percent (13.5%) (41) were unable to achieve adequate protection without the use of a nose clip and were instructed to use such. The remaining 84.8% (246) were proficient in using the mouthbit respirator without a nose clip.

The mouthbit respirator fit testing and training program is designed to deliver a high degree of assurance to both supervision and personnel that the mouthbit respirator will protect when needed.

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INTRODUCTION

The air purifying acid gas cartridge mouthbit respirator is used for various jobs and escape purposes in the Chlor-Alkali area. Due to the wide use of the mouthbit respirator, Chlor-Alkali Administration requested each individual be quantitatively fit tested and trained in the uses and limitations of the respirator. Upon this request, Louisiana Industrial Hygiene proceeded to develop and perform the testing and training program.

DISCUSSION: TRAINING AND TESTING PROCEDURES

Preparation for the testing and training program began with developing a plant-by-plant, day-by-day, individual-by-individual schedule. The schedule was structured in such a manner to efficiently test and train each individual during his or her normal daily job function.

The training program began by discussing with each individual the purpose of the exercise and a step-by-step outline of the activities to be performed. The purpose being to emphasize the importance of being able to use and maintain the mouthbit respirator proficiently.

An instruction followed on the National Institute of Occupational Safety and Health (NIOSH) approval (TC-23C-111) for the acid gas, dust, and mist cartridge (Part #R722) contained in the American Optical (A/O) mouthbit respirator. The individual's respirator was then disassembled with an explanation of each part's function (i.e. inhalation valves). The lecture proceded with mention of the limitations of the cartridge as per acid gas compound (i.e. to be used for not >10 ppm Cl_2). The personnel were instructed that the mouthbit respirator was intended to be used only for those chemicals: chlorine, sulfur dioxide, hydrochloric acid, dust and mists and not for other chemicals that might be released from other production facilities (i.e. methyl chloride from the Chlorinated Methanes Plant).

The personnel were instructed to change the cartridge according to their respective department guidelines (e.g. operations personnel at the Chlorine Plant monthly) or after each significant use. This was reiterated with a graphic description of how "breakthrough" would occur with a concentration versus time profile.

The maintenance and cleaning procedure was delivered on a part/function basis with each individual cleaning and assembling their respirators after the testing procedure.

TEST PROCEDURE

The testing procedure begins with the individual's respirator being disassembled and being fitted with a breathing air (quality: ANSI Class D) attachment in place of the cartridge and a probe attachment to the exhalation valve (designed and constructed at the Louisiana Division) as shown in Figure 1.

Each individual was then instructed on and performed the test procedure consisting of:

1. Entering the test chamber (Frontier - #FE222-2) (Figure 2) filled with approximately 500 ppm (v/v) Freon 12® (dichlorodifloromethane) (ACGIH - S.T.E.L. 1250 ppm (v/v)).

2. The test chamber atmosphere is analyzed by infrared spectrophotometry (I.R.) (Beckman Model #865-4-2-44)(see attachment). The I.R. is connected to a strip chart (Linear Model #261) with an electric pump feeding the sample to the I.R. (Thomas, Model #107CE14562TFE1) (Figure 3).

3. An impinger is placed in line before the sample inlet to remove any interference from humidity change in the I.R.

4. The I.R. is zeroed with the breathing air used in the test.

5. The I.R. is calibrated at one point (90.0 ppm v/v) on the low scale sitting (0 - 100 ppm). The certified standard gas is purchased from Gas Aalytical Services, Baton Rouge, Louisiana.

NOTE: Steps 4 and 5 are performed at the beginning of each test day with Step 4 performed after each test.

6. The test subject, upon entering the test chamber, connects the breathing air hose to the breathing air connection which has a demand regulator in line. The exhalation valve probe is connected to the I.R. via a four-way valve (Figure 3). The four-way valve is located outside the chamber and allows the tester easy adjustment to: a) standard gas; b) zero-breathing air; c) chamber air; or d) mask probe air.

7. At this time, the strip chart is recording the chamber concentration of approximately 500 ppm Freon® with the I.R. on a high scale (0 - 1000) setting and the four-way valve open to chamber concentration.

8. The I.R. is then switched to low scale (0 - 100) to facilitate direct reading of the bottom end of the test curve.

9. The four-valve is switched to draw a sample from the exhalation valve and the strip chart is observed for the individual's performance.

10. The test subject was asked to place the nose clip on as the curve approach baseline to discern nasal inhalation.

RESULTS

The results of each test were studied by the Industrial Hygienist for each individual's proficiency. The test results are comparative in nature as far as a pass/fail is concerned. A typical passing test with and without nose clip is illustrated in Figure 4. A passing test with use of a nose clip only is illustrated in Figure 5, and a failure is illustrated in Figure 6. The summation of both is located in Table I.

CONCLUSION

The mouthbit fit testing results indicate the majority (84.8%) of the Chlor-Alkali personnel are proficient in the use of the respirator with or without the use of a nose clip. A certain portion (13.5%) of the population must use a nose clip to prevent nasal inhalation. A very small part (1.7%) of the population are unable to use the mouthbit respirator for protection. It must be noted the failing population was retested on a second date with confirming results and was apparently due to dental problems (lack of teeth).

RECOMMENDATIONS

1. Each individual should be tested and trained with the mouthbit respirator upon employment.

2. Each individual should be tested and trained with the mouthbit respirator upon transfer into the Chlor-Alkali area.

3. Each individual should be tested and trained with the mouthbit respirator on a regular basis to be determined by Chlor-Alkali supervision in conjunction iwth Louisiana Division Industrial Hygiene.

4. Each individual upon incurring major dental changes should be retested with the mouthbit respirator.

ACKNOWLEDGEMENT

The Industrial Hygiene Group would like to extend a special thanks to all personnel who participated for their assistance in this effort.

TC:sb
11/9/83

TABLE 1

Category	Percent	Actual Number
Proficient with and without nose clip	84.8	246
Proficient with only the use of a nose clip	13.5	41
Not proficient with or without nose clip	1.7	5
Total	100	292

TC:sb

FIGURE 1

A/O MOUTHBIT RESPIRATOR
WITH A. EXHALATION VALVE PROBE
AND B. BREATHING AIR ATTACHMENT

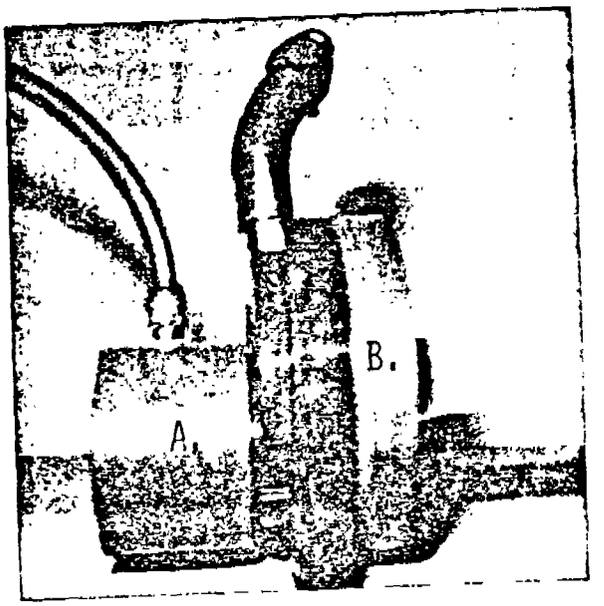


FIGURE 2

FIT TEST CHAMBER

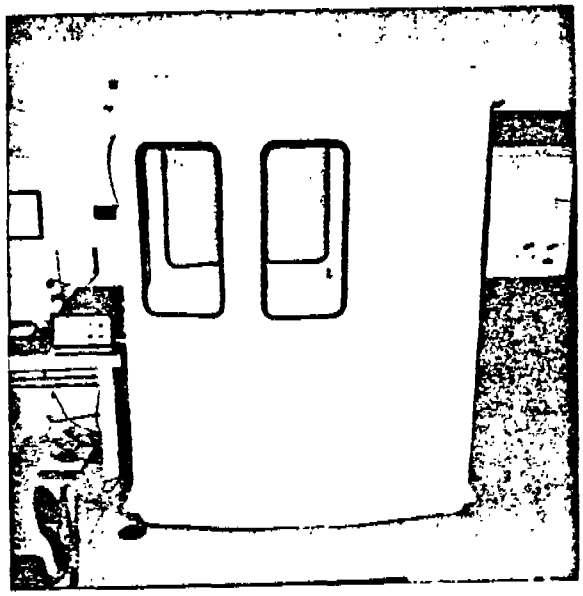
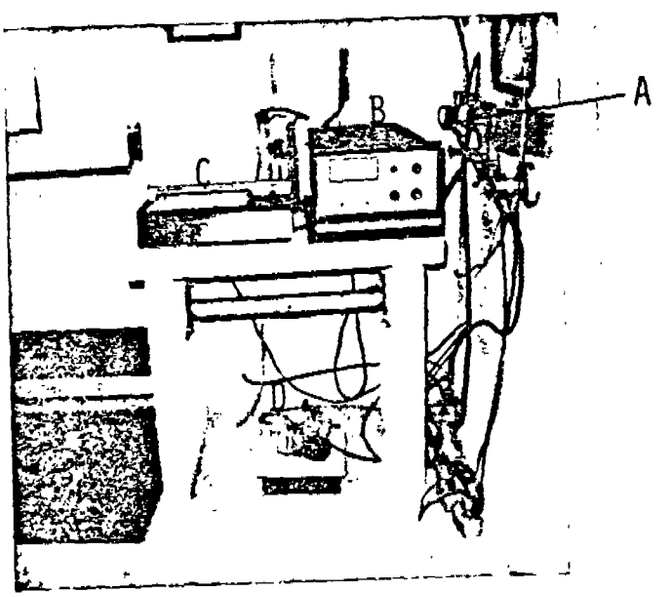


FIGURE 3

A. FOUR-WAY VALVE WITH
B. INFRARED SPECTROPHOTOMETER
C. STRIP CHART AND
D. PUMP



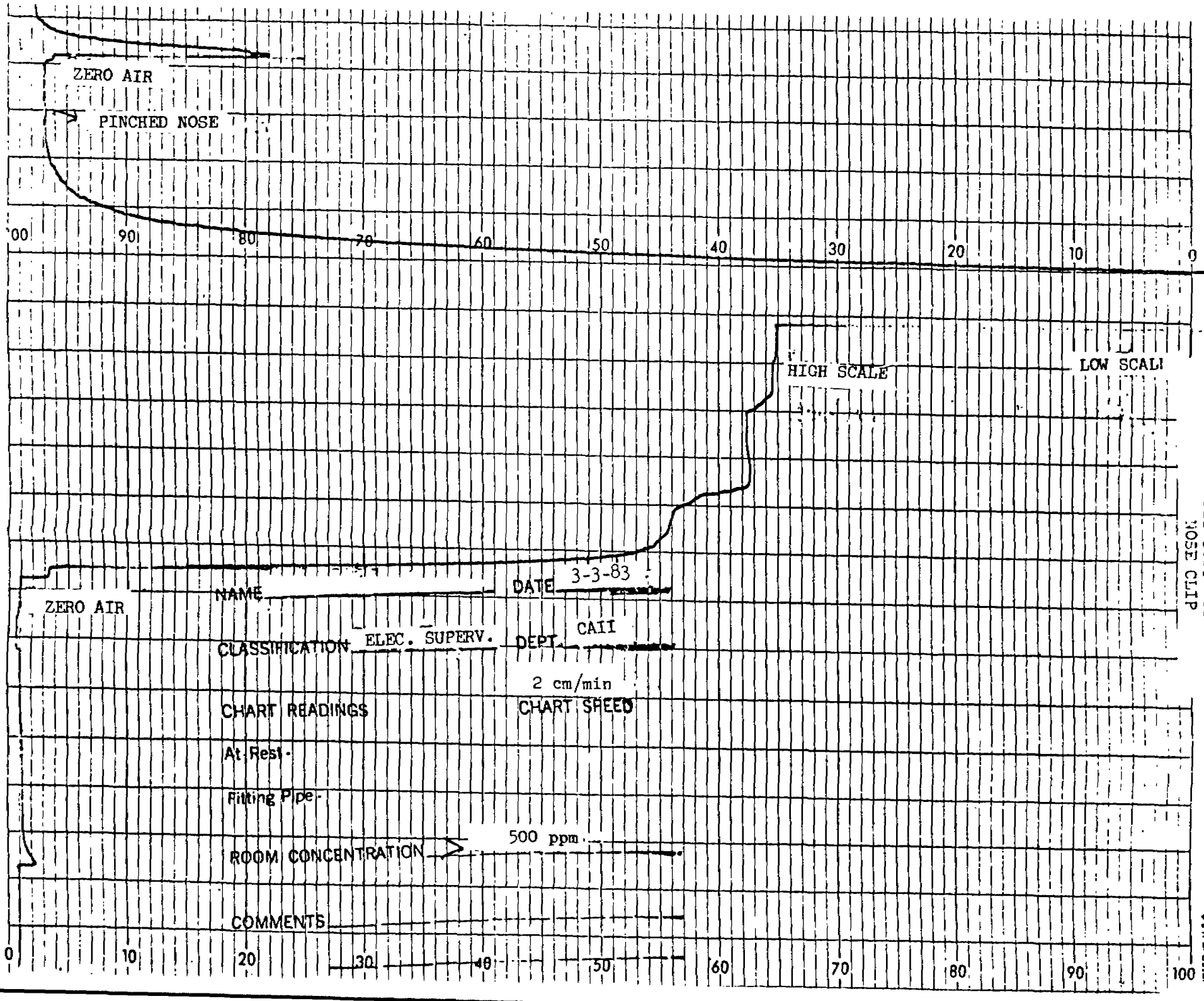
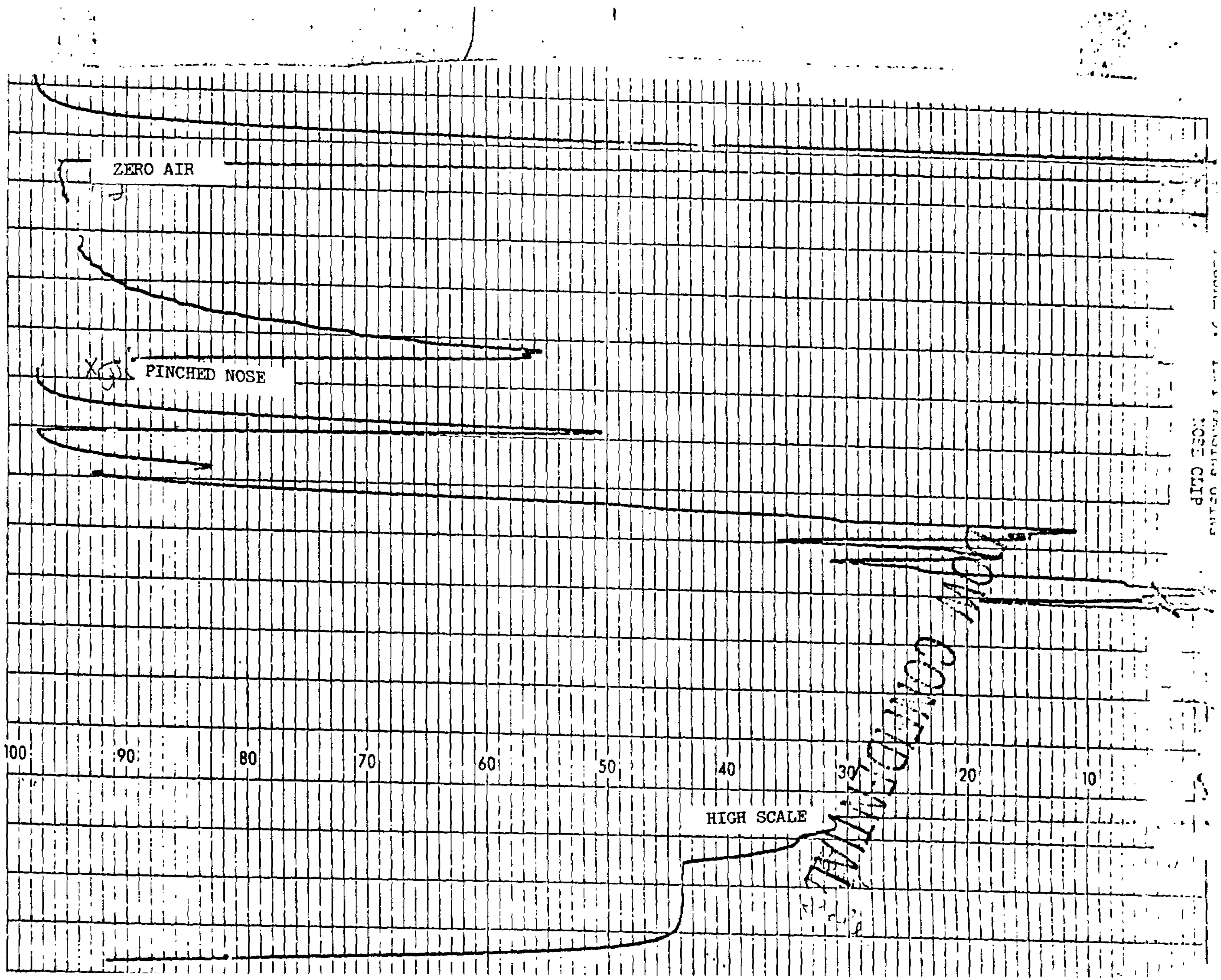
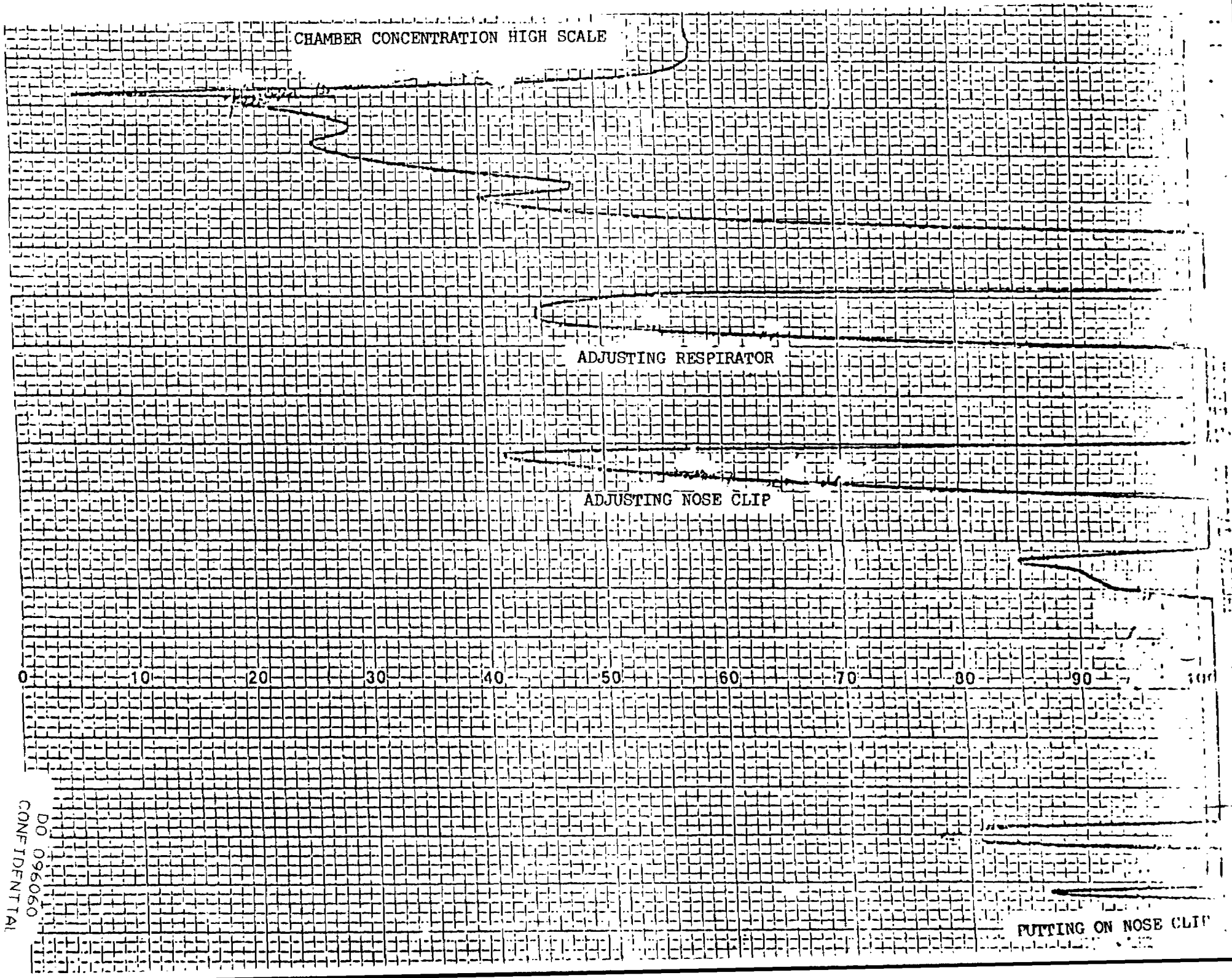


FIGURE 4. FIT TEST WITHOUT NOSE CLIP





BECKMAN

INFRARED ANALYZER CALIBRATION DATA SHEET

Customer:	Dow Chemical
Address:	Plaquemine, La.
Application:	Freon
Ranges: 1. 0-1000 ppm	2. Idle 3. 0-100 ppm
1. Uncalibrated Linearizer Range 1	[ ]
2. Calibrated Linearizer Range 1. [ ] 2. [ ] 3.	[xx]
Refer to switch chart on schematic	
3. Gas Free Calibration Assy.	[ ]
4. Calibration Curve [xx] Typical Curve	[ ]
5. Current Output Board	[ ]
6. Bench Mounting Kit	[ ]
7. Stainless Steel Tubing [xx] Teflon Tubing	[xx]
8. Air Purge Kit	[ ]
9. Explosion Proof Case	[ ]
10. Remote Range Switching	[ ]
11. AC Power 50 HZ [ ] 60 HZ	[xx]
12. Motor Source Assembly Replacement:	
633773 [ ] 638449	[xx]
638450 [ ] 638451	[ ]
13. M/A Linearizer Board	[ ]
14. Calibration Pressure: Atmospheric [xx] Other	[ ]
REMARKS:	

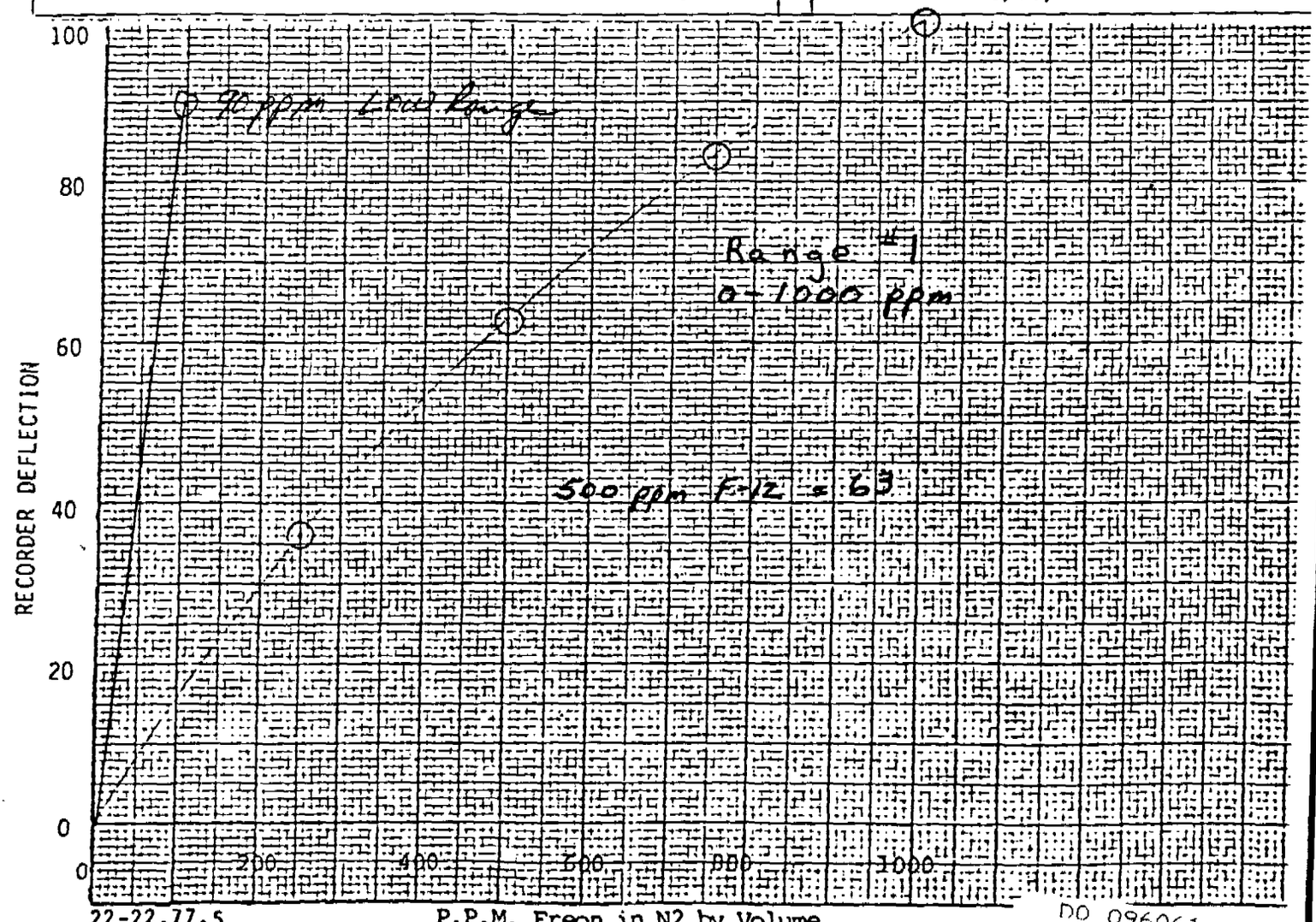
S.O. No.:	PI84169
P.O. No.:	LA58236333
Model No.:	865-X-2-4-4
Serial No.:	102812
Auto Zero/Span Serial No.	
Detector Ser. No.:	4630-G
Detector Part No.:	633947
Tag No.:	
Configuration No.:	W/S 10116

Repeatability: (In % of F.S.)			
Range 1:	± 1%	Range 3:	± 2 %
Range 2:	%	Range 4:	%

Interference Gas	Mol %	Resp. Equiv.
1. Co2	900 ppm	Neg.
2. H20	2.5%	13 ppm
3.		

Engineer: James Kearns

Date: 9/29/80



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