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AP-42 Section 9.12.1  
Reference 20  
Report Sect. 4  
Reference 29

# ENTROPY, INC.

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### STATIONARY SOURCE SAMPLING REPORT REFERENCE NO. 21691

Anheuser-Busch Brewery  
Fort Collins, Colorado

EMISSIONS TESTING FOR:  
ANHEUSER-BUSCH COMPANIES  
ONE BUSCH PLACE  
ST. LOUIS, MISSOURI  
63118-1852

FILLING ROOM VENTS

PERFORMED FOR: ROBERT LANHAM

JULY 26-28, 1994



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## 1.0 INTRODUCTION

### 1.1 Background

The Anheuser-Busch Company contracted Entropy, Inc. to conduct a testing program to quantify ethanol emissions from filling room vents at the Anheuser-Busch Brewery in Fort Collins, Colorado. The Anheuser-Busch Brewery manufactures and packages malt beverages. In the filling operation for bottles, cans, and kegs, some of the product is spilled onto the filling room floor. While most of the spilled product is removed via floor drains, some liquid evaporates and is emitted from roof vents above the filling lines.

In order to determine the amount of ethanol emitted in this manner, simultaneous testing was performed using three different analytical techniques from a number of roof vents above the filling room operation. The techniques employed included EPA Test Method 18 (direct interface gas chromatography), EPA Test Method 25A (direct interface total hydrocarbon determination), and FTIR (Fourier Transform Infrared) spectroscopy. Test Method 18 and FTIR allow the speciation of emitted organic compounds, and Test Method 25A provides a measure of the total organic content of the vent emissions. Ethanol was anticipated to be the only organic compound emitted in measurable quantities, and the use of these analytical techniques would both quantify the emission and identify the emitted compound(s). EPA Test Methods 1-4 were performed to determine the temperature, moisture content, and flow rate for several of the vents where a stack extension had been installed by Anheuser Busch. Stratification tests using Method 25A were also performed for the vents with stack extensions. Testing took place July 26<sup>th</sup> through July 28<sup>th</sup>, 1994.

The test locations were air exhaust fan vents above the filling room, including those directly above bottling and canning lines and vents removed from the filling process. For the vents above filling lines, the facility turned off all nearby exhaust fans in order to obtain a measurement of emissions due to the particular filling operation. Ambient measurements were also performed by sampling air on the roof near Vent 212; in this case, the sampling probes lay on the roof surface, approximately 10 feet from the vent. Due to the direction of prevailing winds and the size of the filling room roof, Entropy could not sample air that was upwind of roof vent emissions. Therefore, the low concentrations of ethanol detected in ambient samples are from roof vent emissions, and no correction for the ambient ethanol concentration has been made.



**1.2 Outline of Test Program**

Tables 1-1, 1-2, and 1-3 are test logs which present the sampling locations, sampling objectives, sampling methods, test dates, and run numbers for the test program.

**1.3 Test Participants**

Table 1-4 lists the personnel involved in the test program.



TABLE 1-1  
DAY 1 TEST LOG

Vent Tested	Sampling Objective	Test Method	Test Date	Run Numbers	Flue Gas Composition	Volumetric Air Flow Rate (ACFM)
Vent 227	Ethanol	Method 18	7/26/94	Vent1-Run1	Filling Room Vent	46893
				Vent1-Run2		46893
				Vent1-Run3		47637
Vent 227	Total Hydrocarbon	Method 25A	7/26/94	Vent1-Run1	Filling Room Vent	46893
				Vent1-Run2		46893
				Vent1-Run3		47637
Vent 227	Ethanol	FTIR	7/26/94	V1_R1xx	Filling Room Vent	46893
				V1_R2xx		46893
				V1_R3xx		47637
Vent 227	Flow, Temperature, Moisture	Methods 1-4	7/26/94	V1-M2-1	Filling Room Vent	46893
				V1-M2-2		46893
				V1-M2-3		47637
Vent 224	Ethanol	Method 18	7/26/94	Vent2-Run1	Filling Room Vent	47531
				Vent2-Run2		48275
				Vent2-Run3		48594
Vent 224	Total Hydrocarbon	Method 25A	7/26/94	Vent2-Run1	Filling Room Vent	47531
				Vent2-Run2		48275
				Vent2-Run3		48594
Vent 224	Ethanol	FTIR	7/26/94	V2_R1xx	Filling Room Vent	47531
				V2_R2xx		48275
				V2_R3xx		48594
Vent 224	Flow, Temperature, Moisture	Methods 1-4	7/26/94	V2-M2-1	Filling Room Vent	47531
				V2-M2-2		48275
				V2-M2-3		48594



TABLE 1-2  
DAY 2 TEST LOG

Vent Tested	Sampling Objective	Test Method	Test Date	Run Numbers	Flue Gas Composition	Volumetric Air Flow Rate (ACFM)
Vent 212	Ethanol	Method 18	7/27/94	Vent1-Run1	Filling Room Vent	41500 (spec)
Vent 212	Total Hydrocarbon	Method 25A	7/27/94	Vent1-Run1	Filling Room Vent	41500 (spec)
Vent 212	Ethanol	FTIR	7/27/94	V1_R1xx	Filling Room Vent	41500 (spec)
Vent 213	Ethanol	Method 18	7/27/94	Vent2-Run1	Filling Room Vent	41500 (spec)
Vent 213	Total Hydrocarbon	Method 25A	7/27/94	Vent2-Run1	Filling Room Vent	41500 (spec)
Vent 213	Ethanol	FTIR	7/27/94	V2_R1xx	Filling Room Vent	41500 (spec)
Vent 233	Ethanol	Method 18	7/27/94	Vent3-Run1	Filling Room Vent	43500 (spec)
Vent 233	Total Hydrocarbon	Method 25A	7/27/94	Vent3-Run1	Filling Room Vent	43500 (spec)
Vent 233	Ethanol	FTIR	7/27/94	V3_R1xx	Filling Room Vent	43500 (spec)
Vent 260	Ethanol	Method 18	7/27/94	Vent4-Run1	Filling Room Vent	43500 (spec)
Vent 260	Total Hydrocarbon	Method 25A	7/27/94	Vent4-Run1	Filling Room Vent	43500 (spec)
Vent 260	Ethanol	FTIR	7/27/94	V4_R1xx	Filling Room Vent	43500 (spec)
Vent 257	Ethanol	Method 18	7/27/94	Vent5-Run1	Filling Room Vent	26000 (spec)
Vent 257	Total Hydrocarbon	Method 25A	7/27/94	Vent5-Run1	Filling Room Vent	26000 (spec)
Vent 257	Ethanol	FTIR	7/27/94	V5_R1xx	Filling Room Vent	26000 (spec)
Ambient Air	Ethanol	Method 18	7/27/94	Ambient Air	Ambient Roof Air	NA
Ambient Air	Total Hydrocarbon	Method 25A	7/27/94	Location2-Ambient Air	Ambient Roof Air	NA
Ambient Air	Ethanol	FTIR	7/27/94	AMBIENxx	Ambient Roof Air	NA

NOTE: Flow measurements were not made on Day 2; flow rates in Table 1-2 are plant specifications reported by Anheuser-Busch.



TABLE 1-3  
DAY 3 TEST LOG

Vent Tested	Sampling Objective	Test Method	Test Date	Run Numbers	Flue Gas Composition	Volumetric Air Flow Rate (ACFM)
Vent 211	Ethanol	Method 18	7/28/94	Vent1-Run1 Vent1-Run2 Vent1-Run3	Filling Room Vent	51146 50165 47906
Vent 211	Total Hydrocarbon	Method 25A	7/28/94	Vent1-Run1 Vent1-Run2 Vent1-Run3	Filling Room Vent	51146 50165 47906
Vent 211	Ethanol	FTIR	7/28/94	V1_R1xx V1_R2xx V1_R3xx	Filling Room Vent	51146 50165 47906
Vent 211	Flow, Temperature, Moisture	Methods 1-4	7/28/94	V1-M2-1 V1-M2-2 V1-M2-3	Filling Room Vent	51146 50165 47906
Vent 214	Ethanol	Method 18	7/28/94	Vent2-Run1 Vent2-Run2 Vent2-Run3	Filling Room Vent	47637 47637 49020
Vent 214	Total Hydrocarbon	Method 25A	7/28/94	Vent2-Run1 Vent2-Run2 Vent2-Run3	Filling Room Vent	47637 47637 49020
Vent 214	Ethanol	FTIR	7/28/94	V2_R1xx V2_R2xx V2_R3xx	Filling Room Vent	47637 47637 49020
Vent 214	Flow, Temperature, Moisture	Methods 1-4	7/28/94	V2-M2-1 V2-M2-2 V2-M2-3	Filling Room Vent	47637 47637 49020



TABLE 1-4  
TEST PARTICIPANTS

<b>ANHEUSER-BUSCH COMPANIES</b>	Robert Lanham Test Coordinator
	Sandra Hicks Test Observer
	Adam Lueck Test Observer
<b>Entropy, Inc.</b>	Thomas Dunder, Ph.D. Project Director/Supervisor
	Son Bui Sampling Team Leader
	Gary Mata Sampling Team Leader
	Rick Wade Engineering Technician
	Monroe White Engineering Technician



## **2.0 SUMMARY OF RESULTS**

### **2.1 Presentation**

Table 2-1 presents the wet-basis test results for each of the three analytical methods, and Table 2-2 presents the dry-basis results. Tables 2-3 through 2-7 present run-by-run test summaries; refer to the "List of Tables and Figures" of the "Table of Contents" for a cross-reference. Detailed test results, including field and analytical data, are presented in Appendices A through D. Method 18 results, including chromatograms, are in Appendix A, while Method 25A results are found in Appendix B, FTIR data in Appendix C, and gas velocity data in Appendix D.

### **2.2 Cyclonic Flow Checks**

While conducting Method 1 velocity traverses some degree of cyclonic flow was observed in each tested vent. To compensate for the cyclonic flow, the technician manipulated the pitot to align it along the maximum flow angle at every point in the traverse.



**TABLE 2-1**  
**ETHANOL TEST RESULTS: TEST METHOD 18, TEST METHOD 25A, AND FTIR**  
**(Wet Basis Results)**

Vent	Test	Flow Rate	Method 18		Method 25A		FTIR	
			ACFM	ppm	lb/hour	ppm	lb/hour	ppm
227	RUN 1 AVERAGE	46893	4.6	1.3	1.9	0.5	4.1	1.2
	RUN 2 AVERAGE	46893	3.8	1.1	2.2	0.6	4.5	1.3
	RUN 3 AVERAGE	47637	4.9	1.4	5.7	1.6	3.8	1.1
	VENT AVERAGE	47141	4.43	1.27	3.27	0.90	4.13	1.20
224	RUN 1 AVERAGE	47531	8.1	2.3	3.6	1.0	5.5	1.5
	RUN 2 AVERAGE	48275	7.1	2.0	6.6	1.9	3.7	1.0
	RUN 3 AVERAGE	48594	5.0	1.4	6.0	1.7	3.8	1.1
	VENT AVERAGE	48133	6.73	1.90	5.40	1.53	4.33	1.20
211	RUN 1 AVERAGE	51146	7.2	2.2	8.5	2.6	6.0	1.8
	RUN 2 AVERAGE	50615	10.3	3.1	12.2	3.6	7.9	2.4
	RUN 3 AVERAGE	47956	7.5	2.1	10.3	2.9	7.8	2.2
	VENT AVERAGE	49905	8.33	2.47	10.33	3.03	7.23	2.13
214	RUN 1 AVERAGE	47637	8.3	2.4	10.0	2.9	5.9	1.7
	RUN 2 AVERAGE	47637	6.7	1.9	8.8	2.4	5.2	1.5
	RUN 3 AVERAGE	49020	8.8	2.5	10.3	2.9	6.5	1.9
	VENT AVERAGE	48098	7.93	2.27	9.70	2.73	5.87	1.70
212	VENT AVERAGE	41500	1.5	0.4	0.0	0.0	1.1	0.3
213	VENT AVERAGE	41500	1.9	0.5	0.3	0.1	0.9	0.2
233	VENT AVERAGE	43500	2.0	0.5	0.3	0.1	1.2	0.4
257	VENT AVERAGE	26000	5.3	0.8	5.2	0.8	4.6	0.7
260	VENT AVERAGE	43500	2.4	0.6	0.4	0.1	1.4	0.4
	AMBIENT	N/A	1.4	N/A	1.5	N/A	0.5	N/A

\* For vents 212, 213, 233, 257, and 260, the flow rate is the plant specification provided by Anheuser- Busch.



**TABLE 2-2**  
**ETHANOL TEST RESULTS: TEST METHOD 18, TEST METHOD 25A, AND FTIR**  
**(Dry Basis Results)**

Vent	Test	Flow Rate	Method 18		Method 25A		FTIR	
		DSCFM	ppm	lb/hour	ppm	lb/hour	ppm	lb/hour
227	RUN 1 AVERAGE	38212	4.7	1.3	2.0	0.5	4.2	1.2
	RUN 2 AVERAGE	37271	3.9	1.1	2.3	0.6	4.6	1.3
	RUN 3 AVERAGE	38371	5.1	1.4	5.9	1.6	3.9	1.1
	VENT AVERAGE	37951	4.57	1.27	3.40	0.90	4.23	1.20
224	RUN 1 AVERAGE	38670	8.2	2.3	3.7	1.0	5.5	1.5
	RUN 2 AVERAGE	38505	7.3	2.0	6.8	1.9	3.8	1.0
	RUN 3 AVERAGE	39103	5.1	1.4	6.1	1.7	3.9	1.1
	VENT AVERAGE	38759	6.87	1.90	5.53	1.53	4.40	1.20
211	RUN 1 AVERAGE	41306	7.3	2.2	8.7	2.6	6.2	1.8
	RUN 2 AVERAGE	40245	10.6	3.1	12.5	3.6	8.1	2.4
	RUN 3 AVERAGE	38147	7.7	2.1	10.6	2.9	8.0	2.2
	VENT AVERAGE	39899	8.53	2.47	10.60	3.03	7.43	2.13
214	RUN 1 AVERAGE	38472	8.5	2.4	10.2	2.9	6.0	1.7
	RUN 2 AVERAGE	37786	6.9	1.9	9.0	2.4	5.4	1.5
	RUN 3 AVERAGE	38819	9.0	2.5	10.5	2.9	6.6	1.9
	VENT AVERAGE	38359	8.13	2.27	9.90	2.73	6.00	1.70



**TABLE 2-3**  
**ETHANOL TEST RESULTS: VENT 227**

	Run 1	Run 2	Run 3	Average
Date	7/26/94	7/26/94	7/26/94	
Start Time	11:55	15:48	18:56	
End Time	12:54	16:47	19:55	
Gas Temperature (F)	74	82	80	79
% Moisture	2.5	3.4	2.6	2.8
Flow (ACFM)	46893	46893	47637	47141
Flow (DSCFM)	38212	37271	38317	37951
ppm Ethanol Method 18 (wet)	4.6	3.8	4.9	4.43
ppm Ethanol Method 25A (wet)	1.9	2.2	5.7	3.27
ppm Ethanol FTIR (wet)	4.1	4.5	3.8	4.13
ppm Ethanol Method 18 (dry)	4.7	3.9	5.1	4.57
ppm Ethanol Method 25A (dry)	2.0	2.3	5.9	3.40
ppm Ethanol FTIR (dry)	4.2	4.6	3.9	4.23
lb/hour Ethanol Method 18	1.3	1.1	1.4	1.27
lb/hour Ethanol Method 25A	0.5	0.6	1.6	0.90
lb/hour Ethanol FTIR	1.2	1.3	1.1	1.20



**TABLE 2-4**  
**ETHANOL TEST RESULTS: VENT 224**

	Run 1	Run 2	Run 3	Average
Date	7/26/94	7/26/94	7/26/94	
Start Time	13:20	17:00	20:03	
End Time	14:19	17:59	21:02	
Gas Temperature (F)	81	84	82	82
% Moisture	1.3	2.7	2.2	2.2
Flow (ACFM)	47531	48275	48594	48133
Flow (DSCFM)	38670	38505	39103	38759
ppm Ethanol Method 18 (wet)	8.1	7.1	5.0	6.73
ppm Ethanol Method 25A (wet)	3.6	6.6	6.0	5.40
ppm Ethanol FTIR (wet)	5.5	3.7	3.8	4.33
ppm Ethanol Method 18 (dry)	8.2	7.3	5.1	6.87
ppm Ethanol Method 25A (dry)	3.7	6.8	6.1	5.53
ppm Ethanol FTIR (dry)	5.5	3.8	3.9	4.40
lb/hour Ethanol Method 18	2.3	2.0	1.4	1.90
lb/hour Ethanol Method 25A	1.0	1.9	1.7	1.53
lb/hour Ethanol FTIR	1.5	1.0	1.1	1.20



**TABLE 2-5**  
**ETHANOL TEST RESULTS: VENTS 212, 213, 233, 257, 260**

	Vent 212	Vent 213	Vent 233	Vent 257	Vent 260
Date	7/27/94	7/27/94	7/27/94	7/27/94	7/27/94
Start Time	9:37	10:42	12:39	13:48	17:20
End Time	10:36	11:41	13:38	14:47	18:19
Gas	NA	NA	NA	NA	NA
Temperature (F)					
% Moisture	NA	NA	NA	NA	NA
Flow (ACFM)	41500	41500	43500	26000	43500
Flow (DSCFM)	NA	NA	NA	NA	NA
ppm Ethanol Method 18 (wet)	1.5	1.9	2.0	5.3	2.4
ppm Ethanol Method 25A (wet)	0.0	0.3	0.3	5.2	0.4
ppm Ethanol FTIR (wet)	1.1	0.9	1.2	4.6	1.4
lb/hour Ethanol Method 18	0.4	0.5	0.5	0.8	0.6
lb/hour Ethanol Method 25A	0.0	0.1	0.1	0.8	0.1
lb/hour Ethanol FTIR	0.3	0.2	0.4	0.7	0.4



**TABLE 2-6**  
**ETHANOL TEST RESULTS: VENT 211**

	Run 1	Run 2	Run 3	Average
Date	7/28/94	7/28/94	7/28/94	
Start Time	9:31	12:12	14:47	
End Time	10:30	13:11	15:46	
Gas Temperature (F)	79	86	85	83
% Moisture	2.0	2.3	2.4	2.2
Flow (ACFM)	51146	50615	47956	49905
Flow (DSCFM)	41036	40245	38147	39899
ppm Ethanol Method 18 (wet)	7.2	10.3	7.5	8.33
ppm Ethanol Method 25A (wet)	8.5	12.2	10.3	10.33
ppm Ethanol FTIR (wet)	6.0	7.9	7.8	7.23
ppm Ethanol Method 18 (dry)	7.3	10.6	7.7	8.53
ppm Ethanol Method 25A (dry)	8.7	12.5	10.6	10.60
ppm Ethanol FTIR (dry)	6.2	8.1	8.0	7.43
lb/hour Ethanol Method 18 (dry)	2.2	3.1	2.1	2.47
lb/hour Ethanol Method 25A (dry)	2.6	3.6	2.9	3.03
lb/hour Ethanol FTIR (dry)	1.8	2.4	2.2	2.13



**TABLE 2-7**  
**ETHANOL TEST RESULTS: VENT 214**

	Run 1	Run 2	Run 3	Average
Date	7/28/94	7/28/94	7/28/94	
Start Time	10:38	13:21	15:54	
End Time	11:37	14:20	16:53	
Gas Temperature (F)	79	89	88	85.3
% Moisture	2.0	2.0	2.3	2.1
Flow (ACFM)	47637	47637	49020	48098
Flow (DSCFM)	38472	37786	38819	38359
ppm Ethanol Method 18 (wet)	8.3	6.7	8.8	7.93
ppm Ethanol Method 25A (wet)	10.0	8.8	10.3	9.70
ppm Ethanol FTIR (wet)	5.9	5.2	6.5	5.87
ppm Ethanol Method 18 (dry)	8.5	6.9	9.0	8.13
ppm Ethanol Method 25A (dry)	10.2	9.0	10.5	9.90
ppm Ethanol FTIR (dry)	6.0	5.4	6.6	6.00
lb/hour Ethanol Method 18 (dry)	2.4	1.9	2.5	2.27
lb/hour Ethanol Method 25A (dry)	2.9	2.4	2.9	2.73
lb/hour Ethanol FTIR (dry)	1.7	1.5	1.9	1.70



**TABLE 2-8**  
**ETHANOL TEST RESULTS: STRATIFICATION MEASUREMENTS**  
**Test Method 25A**

Vent	Run	ppm Ethanol Position 1	ppm Ethanol Position 2	ppm Ethanol Position 3	Average
227	3	5.6	5.6	5.4	5.53
224	3	4.4	5.4	5.5	5.10
211	2	13.3	14.1	15.5	14.30
214	2	10.4	11.5	11.0	10.97

**TABLE 2-9**  
**ETHANOL TEST RESULTS: AMBIENT ROOFTOP AIR TEST**

	Run 1
Date	7/27/94
Start Time	8:50
End Time	9:20
ppm Ethanol Method 18 (wet)	1.4
ppm Ethanol Method 25A (wet)	1.5
ppm Ethanol FTIR (wet)	0.5



### 2.3: Sample Calculation

The wet basis concentration of ethanol in parts per million (ppm) was determined independently using EPA Methods 18 and 25A and FTIR. This was converted into an emission rate in pounds per hour (lb/hour) using the following formulae:

#### Wet Basis Calculation:

$$\text{Emission Rate (lb/hour)} = (\text{ppm} \times \text{ACFM} \times \text{MW} \times \text{MPH} \times \text{PC}) / (\text{ACF} \times 1,000,000)$$

where:

- ppm = ethanol concentration in ppm (wet basis)  
ACFM = Actual Cubic Feet per Minute (measured or plant specification flow rate)  
MW = molecular weight of Ethanol ( 46.057 lb/lb-mole)  
MPH = minutes per hour (60)  
ACF = Actual cubic feet per pound mole, corrected to stack temperature in degrees Rankine ( $385.3 \times (T_{\text{stack}}(R) / T_{\text{std}}(R))$ ), where  $T_{\text{std}}$  is 528 degrees Rankine  
PC = Pressure Correction ( $P_{\text{atm}} / P_{\text{std}}$ ), where  $P_{\text{std}}$  is 29.92" Hg

#### Dry Basis Calculation

Wet to Dry Conversion:

$$\text{ppm(dry)} = \text{ppm(wet)} \times (1 - (\%W / 100))$$

where:

- %W = percent moisture in stack

$$\text{Emission Rate (lb/hour)} = (\text{ppm} \times \text{SCFM} \times \text{MW} \times \text{MPH}) / (\text{CF} \times 1,000,000)$$

where:

- ppm = ethanol concentration in ppm (wet basis)  
SCFM = Standard Dry Cubic Feet per Minute (measured flow rate)  
MW = molecular weight of Ethanol ( 46.057 lb/lb-mole)  
MPH = minutes per hour (60)  
CF = Standard cubic feet per pound mole, 385.3 cubic feet/pound-mole



#### **2.4: Stratification Testing**

Stratification was tested using Method 25A on days 1 and 3, for vents 227, 224, 211, and 214. At each vent, a probe traverse was performed, and measurements were made for 15 minutes at each traverse position. As summarized in Table 2-8, minimal stratification was detected.



### **3.0 PROCESS DESCRIPTION AND OPERATION**

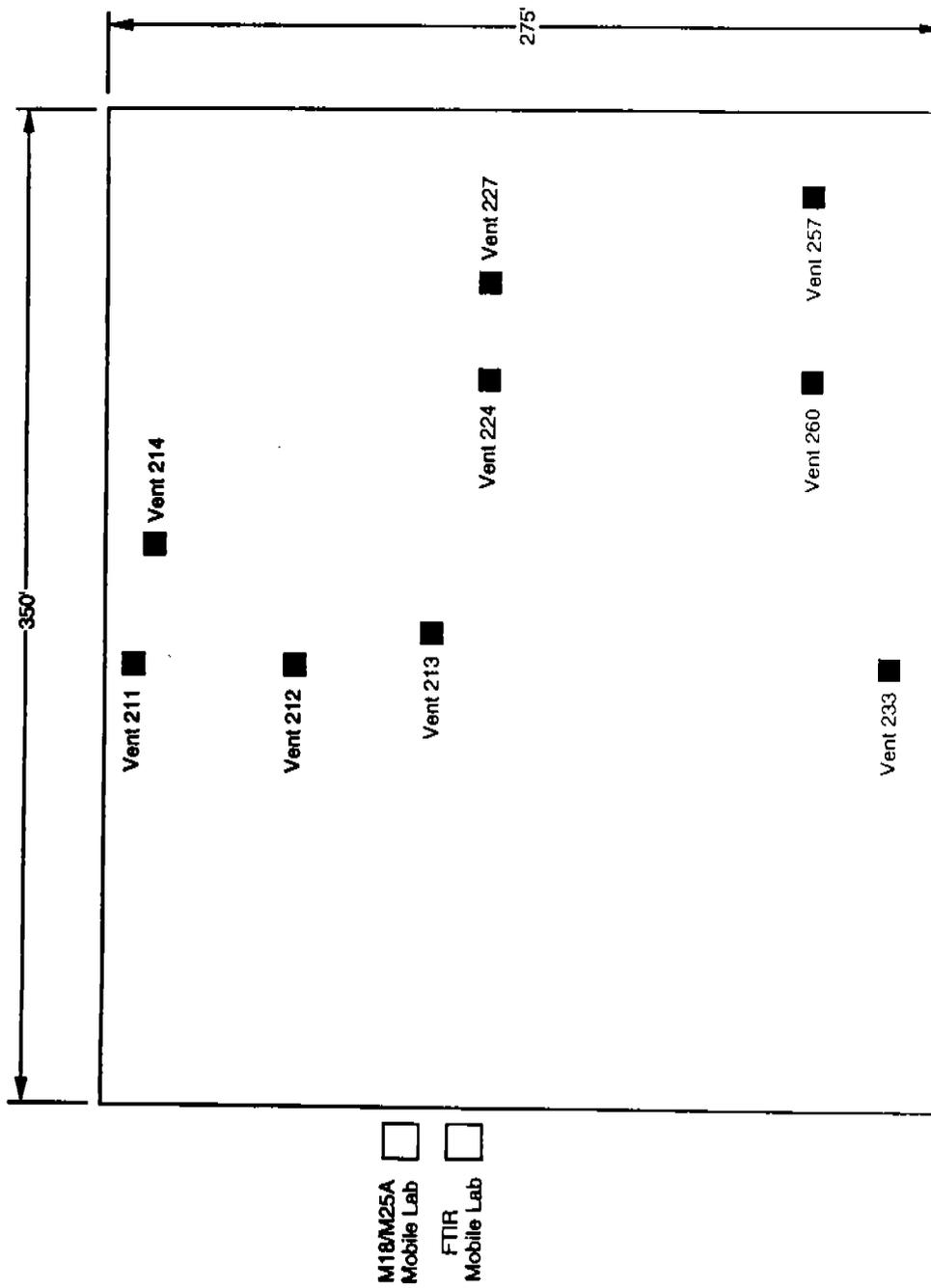
#### **3.1 General**

Anheuser-Busch operates a brewery in Fort Collins, Colorado. Spillage occurs during the production of beer, and causes VOCs to be released to the filling-room atmosphere. The filling room air exhausts through several roof vents. In particular, roof vents are positioned over the can- and bottle-filling lines. VOCs are present at 2-8 ppmvd, according to previous M25A testing. It is believed most of the VOC is ethanol. The testing covered in this report was performed at the filling room vents stacks.

#### **3.2 Source Air Flow**

Figure 3-1 is a schematic showing the location of the tested roof vents.





Note: Only tested the portion of the roof shown.

Roof vent locations: Anheuser Busch Brewery, Fort Collins, Colorado.

21691 8/94

FIGURE 3-1: LOCATION OF TESTED ROOF VENTS



## **4.0 SAMPLING AND ANALYTICAL PROCEDURES**

### **4.1 General**

All sampling and analytical procedures for Test Methods 18 and 25A were those recommended by the United States Environmental Protection Agency. The FTIR method procedures have been developed by Entropy, Inc. and used in numerous EPA-sponsored air emission field tests. This section provides brief descriptions of the sampling and analytical procedures. Detailed descriptions of the procedures are provided in Appendices A through E.

### **4.2 Sampling Points**

The number and location of the sampling points were determined according to the procedures outlined in EPA Method 1.

### **4.3 Cyclonic Flow Check**

A Type S pitot tube assembly and Magnehelic gauges were used to determine the flow angles at each of the sampling or velocity traverse points. At each point, the pitot tube was positioned at a right angle to the air flow. The angles were determined by rotating the pitot tube until a null reading was obtained on the Magnehelic gauges. When the null reading was obtained, the flow velocity was recorded.

### **4.4 Volumetric Air Flow Rates**

#### **4.4.1 Flue Gas Velocity**

The flue gas velocity and volumetric flow rate were determined according to the procedures outlined in EPA Method 2. Velocity head measurements ( $\Delta P$ ) were made using Type S pitot tubes conforming to the geometric specifications outlined in EPA Method 2. Accordingly, each has been assigned a coefficient of 0.84. Differential pressures were measured with Magnehelic gauges of appropriate range. Flue gas temperatures were measured with chromel-alumel thermocouples equipped with hand-held digital readouts.



#### **4.4.2 Flue Gas Composition**

Sample Collection. Flue gas samples were collected using an unheated, extractive sampling system consisting of a stainless steel probe, a 3-way valve, a Teflon sample line, a Teflon calibration line, and a Thomas pump. Separate, identical sampling systems were used for the Method 18/25A and the FTIR. Sampling run durations were 60 minutes.

Sample Analysis. Analysis for carbon dioxide was performed using Fyrite. Ambient oxygen concentrations were assumed. The analytical results were used to determine the flue gas composition, molecular weight, excess air, and emissions correction factor.

#### **4.4.3 Flue Gas Moisture Content**

The moisture content was determined by using a wet bulb/dry bulb apparatus.

### **4.5 Emissions Determinations**

#### **4.5.1 M18 Direct Interface**

Sample Collection. Samples were withdrawn from the source using the direct interface procedure outlined in EPA Method 18. Ethanol concentrations were determined by EPA Method 18 Direct Interface. The sampling procedure consisted of withdrawing a gas sample from the source at a constant rate and pumping the sample to an on-site gas chromatograph (GC) for analysis. All transfer lines, connections, and pumps were constructed of Type 316 stainless steel or Teflon and maintained at ambient temperature. Condensation of volatile organics or water in the sampling system was not a concern given the anticipated concentrations. Figure 4-1 is a schematic of the mobile GC system.

The gas chromatograph was calibrated before testing with three (3) concentrations of external standard gases. The GC was calibrated by introducing the external standard gases at the sampling probe and through the entire sampling system. The GC was calibrated for the 0 - 19 ppm range for ethanol.



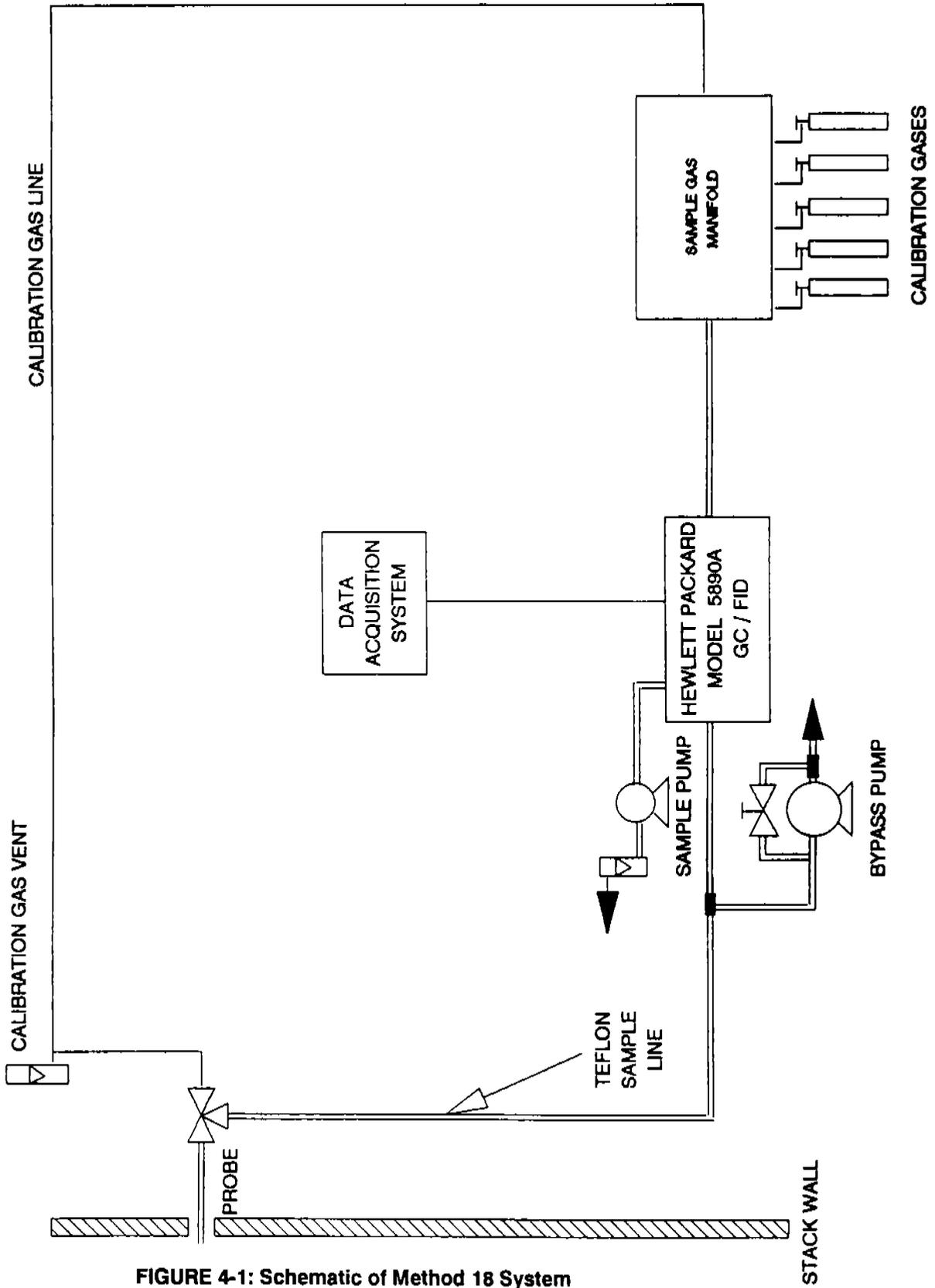


FIGURE 4-1: Schematic of Method 18 System

ENTROPY MOBILE GAS CHROMATOGRAPH SYSTEM SCHEMATIC



Performance checks were performed after every two (2) hours of sampling. A gas of a known concentration was introduced at the sampling probe and analyzed to ensure the integrity of the sampling system. If the analysis did not agree with the known concentration, the cause of the discrepancy was located and rectified.

Direct interface sampling with the GC was a semi-continuous method and provided one reading for approximately every 15 minutes of sample time.

Test Critique No sampling train leaks were observed during testing. Some contamination was detected in the sampling system during calibration and sampling. The contamination appeared on the chromatograms just prior to the ethanol peak. Though the suspect contamination was present in every chromatogram, it did not interfere with the calibration or the sampling of ethanol.

During the testing on the second day, there appeared to be a loss of sensitivity with the GC after sampling at Vent Nos. 233 and 260. The performance checks indicated a loss of sensitivity of 12.9%. At that point, extra sample line was added to the sampling system to reach the next location. Due to the loss of sensitivity, the GC was recalibrated. As indicated by the GC, the addition of the new sampling line appeared to restore the lost sensitivity. It is concluded that there may have been a flow restriction in the sampling line. The flow restriction seems to have occurred when the sample probe was removed from the stack after the completion of the test run, but prior to the performance check.

#### **4.5.2 Total Hydrocarbon - EPA Method 25A**

Sample Collection The total gaseous hydrocarbon concentration (THC) was determined in accordance with the procedures outlined in EPA Method 25A. A continuous sample of the flue gas was directed into a Rattfisch Model RS55 flame-ionization hydrocarbon analyzer.

The extractive monitor requires that the effluent gas sample be filtered to eliminate any particulate matter before being transported and injected into the analyzer. All components of the sampling system which contacted the sample were constructed of heated Type 316 stainless steel or Teflon. The output from the monitor was connected to a computerized data acquisition system (DAS).



The sample collection system consisted of an unheated probe with Teflon sample lines, a 3-way valve, and a pump. The configuration of the sampling system allows for the injection of calibration gases directly to the analyzer or through the sampling system. A Thomas Model 2107CA 18-TFE pump was used to move the effluent sample through the system. All pretest and posttest calibration procedures were performed as outlined in EPA Method 25A. The operation of the analyzer and the DAS are described below.

Rafisch Model RS-55 TGO Analyzer. This analyzer automatically and continuously monitors the TGO concentrations in a flowing gas mixture. The theory of operation is based on the principle of flame ionization detection. In the flame ionization detector, hydrogen is mixed with the sample gas and is burned in a small jet. The ionization current in the hydrogen flame is measured. In a pure hydrogen flame, very few ions are produced, but if an organic component or hydrocarbon is burned in the flame, the ion current is greatly increased. The current provides a quantitative measure of the amount of hydrocarbons in the flame. The current is converted to a voltage output. The hydrogen flame ionization detector is extremely sensitive and is capable of detecting hydrocarbon levels in the low parts per million range and is insensitive to inorganic gases such as nitrogen, carbon dioxide, and water vapor.

Data Acquisition System. The DAS uses a Compaq portable computer with a 20MB hard disk and an internal 12-bit analog-to-digital converter with a 16-channel multiplexer. In addition to providing an instantaneous display of analyzer responses, the DAS compiles the analyzer data collected once each second and averages them, calculates emission rates, and documents analyzer calibrations. The DAS integrates the real-time measurements and provides printouts of 1-minute, 15-minute, and 60-minute averaged emissions. These instruments operate on the principle of flame ionization, a phenomena in which combustion of hydrocarbons results in the generation of carbon ions. This process yields a current directly proportional to the carbon content of the molecules in the gas stream. The current is converted to a voltage output and recorded continuously on a computerized DAS.

The instrument was calibrated for 0-30 ppm  $C_1$  range using three (3) National Bureau of Standards traceable concentrations of propane ( $C_3$ ) in nitrogen ( $N_2$ ) and ultra pure zero air. The wet-basis concentration of THC was then reported in ppmv as carbon ( $C_1$ ) equivalence.



Calibration and linearity checks were performed through the entire sampling system before each test period. Zero and span drift checks were made after each run to adjust the concentration bias due to drift. All parts of the sampling train were heated to a temperature of at least 250° F.

Test Critique Results of the THC concentrations are summarized in the tables in Section 2. Leak checks of the sampling system were performed before and after each test set. No leaks were observed throughout the test period.

Calibration was performed before and after each test set with NBS traceable concentrations of propane in air and ultra zero air. Ethanol in nitrogen calibration gases were also used during calibration to determine the response factor for the FID. A study of ethanol response for the FID instrument used in the field test was performed in the Entropy laboratory in the week preceding the field test. Two ethanol gas cylinders (2.0 and 5.8 ppm) were tested, yielding concentrations of 2.1 and 7.3 ppm, respectively, from the FID instrument as  $C_1$ . This yielded true response factors of 0.5 and 0.6 for the 2.0 and 5.8 ppm cylinders, since ethanol is a two-carbon molecule. Combining these response factors and the carbon equivalent correction factor (2) gave effective response factors of 1.1 and 1.3, respectively, for the two cylinder concentrations.

During the field test, the ethanol calibration cylinders (2.0, 5.8 and 19 ppm) were used during system calibrations and calibration checks (see Appendix B). The average FID response for these cylinders was 2.24, 6.86, and 31 ppm, respectively. Thus the effective response factors were 1.1, 1.2, and 1.6 for concentrations of 2.0, 5.8 and 19 ppm. It was apparent from these results that the FID response for ethanol is not a linear function of concentration, and so no correction was made for ethanol FID response. Using the response factors given above, one can conclude that the Method 25A concentrations reported in Table 2-1 are high by a factor ranging from 0% (at 0 ppm) to about 10% at 2 ppm, about 20% at 5.8 ppm, and so forth. For the highest readings encountered during the test (12.2 ppm) the FID reading may be as much as 40% high, based on the response factor testing.

Although it appears that the system exceeded the calibration drift criteria from EPA Method 25A, it is believed this drift resulted from contamination in the sample line. This contamination appeared to be a mixture of fluorinated compounds as identified from the FTIR spectrum. The concentration of the contamination varied with changing ambient temperature as indicated from the 2.5 minute retention time peak of the GC/FID chromatograms. An attempt was made to use the contaminant concentration measured



by the Method 18 GC to correct the Method 25A results. This correction was not viable due to the variability of the contamination concentrations and the different time scales of Method 18 and Method 25A measurements.

#### 4.5.3 FTIR

Sample Collection. Samples were withdrawn from the source using the direct interface procedure outlined in the FTIR test procedure in Appendix E. Ethanol concentrations were determined by analysis of FTIR spectra. The sampling procedure consisted of withdrawing a gas sample from the source at a constant rate and pumping the sample to an on-site FTIR spectrometer for analysis. All transfer lines, connections, and pumps were constructed of Type 316 stainless steel or Teflon and maintained at ambient temperature. Condensation of volatile organics or water in the sampling system was not a concern given the anticipated concentrations.

In order to analyze the spectra measured on-site, reference spectra were measured using FTIR with three (3) concentrations of external standard gases. The reference spectra were measured by introducing the external standard gases into the FTIR gas cell. The FTIR calibration set of reference spectra covered the range of 0-19 ppm range for ethanol.

Performance checks were performed after every two (2) hours of sampling. A gas of a known concentration was introduced at the sampling probe and analyzed to ensure the integrity of the sampling system. If the analysis did not agree with the known concentration, the cause of the discrepancy was located and rectified. As shown in Appendix C, these calibration checks gave good agreement with the known concentration. No correction of the FTIR data was made using the calibration zero and span measurements.

Direct interface sampling with the FTIR was a semi-continuous method and provided one reading for approximately every 5 minutes of sample time.

Test Critique No sampling train leaks were observed during testing. Some contamination was detected in the sampling system during calibration and sampling. The contamination was identified as fluorinated hydrocarbons, hydrogen fluoride, and silicon tetrafluoride by examining the FTIR spectra. These compounds were emitted by the virgin Teflon tubing used in the sampling system, and this contamination problem was exacerbated by the long sampling lines necessary to access the sample locations. The



amount of contamination was variable during the testing, and tended to increase during the day as the temperature rose, and also decrease progressively each day of the test as the lines were conditioned. Entropy also ran ambient air through the lines overnight during the test to assist in removing the contaminants. Though the contaminants were present in every spectrum, they did not interfere with the calibration or the sampling of ethanol.

Because of the altitude of the Fort Collins location, the atmospheric pressure is considerably lower than standard conditions. This difference had to be taken into account when analyzing the FTIR spectra. The FTIR gas cell is filled to 1 atmosphere pressure, which is about 30 in. Hg at sea level, and about 25 in. Hg at Fort Collins. Due to the lower pressure, the number density of molecules in the FTIR cell was reduced. This difference was taken into account by measuring the atmospheric pressure each day and knowing the atmospheric pressure at which the FTIR reference spectra had been measured.

#### **4.6 Equipment Calibration**

Pertinent calibration data are provided in Appendices A through E.



## **5.0 QUALITY ASSURANCE/QUALITY CONTROL**

### **5.1 General**

Entropy is committed to the continued implementation of a Quality Assurance Program to assure the quality of sampling and analytical procedures of environmental measurement data. The Quality Assurance measures taken during this test project equals or exceeds the minimum QA/QC recommendations as set forth by the U.S. Environmental Protection Agency (EPA) for a particular method.

The following sections outline the QA program implemented by EI to justify the validity of test procedures. As applicable, the QA system for the various test programs addresses the following areas:

- Preventive Maintenance & Equipment Calibration
- Sample Processing
- Analytical Instrument Calibration
- Blanks and Spiked Samples
- Internal/External System Checks
- Data Reduction & Validation
- QA/QC Summary

### **5.2 Preventive Maintenance and Equipment Calibration**

An effective preventive maintenance program decreases downtime and thus increases data completeness and quality. Pretest and posttest equipment calibrations are conducted in a manner and at a frequency which meets or exceeds U.S. EPA specifications.

Each item transported to the field is inspected to detect equipment problems which may originate during periods of storage. All equipment returning from the field is cleaned, repaired, reconditioned, and recalibrated as necessary. Routine maintenance on equipment (dry gas meters, pumps, Magnehelics, manometers, Pitot tubes, and nozzles) is carried out periodically for leaks, corrosion, dents, or any other damage. Table 5-1 shows the activities for equipment calibration.



**TABLE 5-1  
IN-HOUSE EQUIPMENT CALIBRATION**

Apparatus	Calibration Method And Frequency	Specifications	Corrective Action
Type S Pitot Tubes	Standards contained in EPA Method 2	Coefficient of $0.84 \pm 0.02$	Refurbish or recalibrate
	Visual inspection prior to shipment to test site and again prior to each day of testing		
Manometers	Leak checked before and after each field use		Adjust or replace
Magnehelic Gauges	Initially calibrate over full range	0-10" water column	
	After each field use, checked against inclined manometer at average settings encountered during testing	Within $\pm 5\%$	Repair and Recalibrate
Thermometers - Impinger - Dry Gas Meter - Filter Box	After purchase and prior to each field use, using ASTM Hg-in-glass thermometer	Impinger = $\pm 2^\circ\text{F}$ DGM = $\pm 5.4^\circ\text{F}$ FB = $\pm 5.4^\circ\text{F}$	Adjust, determine correction factor, or reject
	After purchase and prior to each field use, using ASTM mercury-in-glass thermometer		
Thermocouple/ Potentiometer	After purchase. 3-point (ice bath, boiling water, and hot oil) using ASTM Hg-in-glass thermometer	$\pm 1.5\%$ of absolute temperature	Adjust, determine correction factor, or reject
	Before and after each field use, compared to ASTM Hg-in-glass thermometer at ambient conditions		
Dry Gas Meter and Orifice	Full calibration (every 6 months) over wide range of orifice settings to obtain calibration factor (isokinetic meter box)	DGM = $\pm 0.02$ from avg. coeff. for each run Ori = $\pm 0.15$ H <sub>2</sub> O over delta H range of 0.4"-4.0"	Adjust or replace
	10-minute quick calibration before sending to test site and again prior to each day of field use (isokinetic)	$\pm 3\%$ of full $\pm 5\%$ of full	Use if no backup Do not use
	Posttest (at average delta H and highest vacuum encountered) during testing) to determine if meter gamma has changed (isokinetic)	$\pm 5\%$ of full calibration Gamma (initial or recalibration) that yields the lowest sample volume for the testing is used for calculations	Recalibrate or replace
	Full calibration w/spirometer before/after each field use (nonisokinetic meter box)	$\pm 5\%$ of pretest, .02 from average coeff. from each run	Recalibrate
Dry Gas Meter Transfer Standard	Annual calibrations conducted in triplicate using EPA wet test meter. Calibrations conducted at 7 flow rates from 0.25 to 1.40 cfm.	$\pm 2\%$ of average factor for each calibration run	Adjust an recalibrate



**TABLE 5-1 (Continued)**  
**IN-HOUSE EQUIPMENT CALIBRATION**

Apparatus	Calibration Method And Frequency	Specifications	Corrective Action
Barometer	Before and after each field use against an aneroid barometer	$\pm 0.1$ " mercury	Adjust to agree
	Reference barometer adjusted for elevation differences		
Probe Nozzle	Average of 5 I.D. measurements using a micrometer. Visual inspection before and after each field use	Difference between high and low measurement $\leq 0.004$ "	Repair and recalibrate

### 5.3 Sample Processing

Entropy employs systems which ensure the integrity of an environmental sample from the time of acquisition, through analysis, and ultimately to proper disposal. These systems are necessary to allow valid conclusions to be drawn from analytical results separated in time and space from the sampling operation. In addition, these systems recognize that samples are occasionally of value even after analytical results have been reported.

Samples are collected, transported, and stored in clean containers which are constructed of materials inert to the analytical matrix. Containers are used which allow air tight seals. When necessary, containers are employed which prevent photochemical reactions. All sample containers are labeled with the following information:

- Unique source identifier
- Sample run identifier
- Analyte identifier
- Sample matrix identifier
- Sample analyst identifier

Additional information relating to the sample is recorded on the data sheet for the sampling run that afforded the subject sample. Accordingly, the sampling data sheet contains all the information listed above, plus the date and time the sample was acquired and supplemental information such as observations pertinent to the quality of the sample. For condensed samples, e.g., samples in liquid media, the sample levels are marked on the outside of the container; this mark is used to indicate sample loss, and as such, may serve as a reference in adjusting results accordingly.



Analytical data are identified in a manner identical to that of the sampling data. Accordingly, all data generated from the analysis of samples are documented with the following information:

- Source identifier
- Sample run identifier
- Analyte identifier
- Sample matrix identifier
- Analyst identifier
- Analysis date

**5.4 Instrument Calibration**

Instrument calibration is one of the most important functions in generating precise and accurate quality data. A listing of major in-house instrumentation and the corresponding Quality Assurance program is given in Table 5-2.

All of the contract laboratories involved in the analytical testing for the test program maintain rigorous QA programs for instrument calibration.

**TABLE 5-2  
 IN-HOUSE INSTRUMENT CALIBRATION**

	Calibration Method And Frequency	Specifications	Corrective Action
Analytical & Top Loading Balance	Daily and monthly checks with a series of class S weights	$\pm 1$ mg of class S weights	Adjust or repair
	Balance serviced annually by a qualified service representative and checked with a series of NBS weights		
Gas Chromatograph	3-point calibration curve at the expected range.		
	Duplicate injection of the sample until $\pm 5\%$ variation is achieved		
	Calibration repeated at the end of each test series		
HPLC/Ion Chromatograph	Calibrations conducted at the beginning, after the first injection, and after the second injection		
Fisher Accument 925 pH/Selective Ion Meter	5- point calibration prior to analyzing the samples for the specific ions		



## 5.6 Internal/External System Audit Checks

System and performance audits are routine elements of all Entropy QA/QC programs.

Internal Systems Audit: The following sampling equipment checks were conducted prior to sample collection.

- All sampling equipment was thoroughly checked to ensure clean and operable components.
- Equipment was inspected for possible damage from shipment.
- The oil manometers or Magnehelic gauges were leveled and zeroed.
- The temperature measurement systems were checked for damage and operability by measuring the ambient temperature.

Performance Audits: Performance audits of the laboratory are conducted prior to the processing of any compliance samples for analysis. Audit materials typically include samples available from the EPA prior to new source testing. Also, samples of known concentration are prepared in-house or obtained from the EPA for Internal QA checks.

External Systems Audits: Entropy is subject to a system audit each time a test is conducted for any Air Pollution Control agency. This procedure entails an EPA observer on-site to do qualitative evaluation of performance to demonstrate compliance with the applicable regulations.

## 5.7 Data Reduction and Validation

The test team leader is responsible for reviewing and validating data as they are acquired. Each team leader has extensive knowledge of sampling methodology and the characteristics of the process being measured and is capable of evaluating the accuracy, representativeness, and completeness of raw data on-site. Action to replace inadequate data can be taken immediately.

Data obtained during calibrations and test runs are recorded on standardized forms which are checked twice for completeness and accuracy by the QA Director or his designated representative. Data reduction and consistency are achieved by using the standardized forms and using Entropy's in-house computer facilities.



**5.8 QA/QC Summary**

The hydrocarbon calibration cylinders were all EPA Protocol 1 gases. The ethanol calibration gas cylinders were prepared to the highest accuracy (+/-5%) attainable by Scott Specialty Gases for this concentration range. Pretest and posttest leak checks were conducted on each sampling train.



**APPENDIX A:  
METHOD 18 FIELD DATA AND TEST  
RESULTS**



Job: Anheuser Busch  
 Address: Fort Collins, CO  
 Location: Location No. 1

DILUTION FACTOR  
 1.00  
 Mol. WT 46.07

INJECTION	TIME	AREA COUNT	ETHANOL		ACTUAL CONCEN. (PPMVD)
			CONCEN. As ANALZ (PPM)	RECOVERY FACTOR	
Vent No. 1					
Run 1 - 1	1208	18	3.47	1.084	3.77
Run 1 - 2	1223	20	3.78	1.084	4.10
Run 1 - 3	1238	24	4.39	1.084	4.76
Run 1 - 4	1253	30	5.31	1.084	5.76
Run 2 - 1	1548	22	4.09	1.110	4.54
Run 2 - 2	1603	27	4.85	1.110	5.39
Run 2 - 3	1618	11	2.40	1.110	2.67
Run 2 - 4	1633	10	2.25	1.110	2.50
Run 3 - 1	1856	23	4.24	0.965	4.09
Run 3 - 2	1911	27	4.85	0.965	4.68
Run 3 - 3	1926	28	5.01	0.965	4.83
Run 3 - 4	1941	37	6.39	0.965	6.16
Average			4.25		4.44

DILUTION FACTOR  
 1.00

Vent No. 2

Run 1 - 1	1333	44	7.46	1.084	8.08
Run 1 - 2	1348	49	8.22	1.084	8.91
Run 1 - 3	1403	44	7.46	1.084	8.08
Run 1 - 4	1418	39	6.69	1.084	7.25
Run 2 - 1	1702	12	2.56	1.110	2.84
Run 2 - 2	1717	23	4.24	1.110	4.71
Run 2 - 3	1732	32	5.62	1.110	6.24
Run 2 - 4	1747	82	13.28	1.110	14.74
Run 3 - 1	2003	24	4.39	0.965	4.24
Run 3 - 2	2018	25	4.55	0.965	4.39
Run 3 - 3	2033	35	6.08	0.965	5.87
Run 3 - 4	2048	33	5.77	0.965	5.57
Average			6.36		6.74

DILUTION FACTOR  
 1.00

Performance Checks

Run 1 - 1	1440	30	5.31	1.000	5.31
Run 1 - 2	1446	30	5.31	1.000	5.31
Run 1 - 3	1452	30	5.31	1.000	5.31
Run 2 - 1	1814	29	5.16	1.000	5.16
Run 2 - 2	1820	28	5.01	1.000	5.01
Run 2 - 3	1826	27	4.85	1.000	4.85
Run 2 - 4	1832	32	5.62	1.000	5.62
Run 3 - 1	2105	35	6.08	1.000	6.08
Run 3 - 2	2112	34	5.93	1.000	5.93
Average			5.40		5.40

SAMPLE CALCULATIONS  
EPA Method 18 for Ethanol  
Location No. 3: Vent No. 1, Run No. 1 - 1st Injection

Stack Gas Concentration (Methane):

The calibration of the Gas Chromatograph for EPA Method 18 was a linear regression when identifying methane and ethane. The following equation was used to determine stack gas concentrations:

$$y = mx + b$$

where,

y = Area Count

m = X Coefficient

x = Concentration (ppm)

b = Constant

$$\text{Area Count} = (\text{X Coefficient} \times \text{Concentration}) + \text{Constant}$$

$$\text{Concentration} = \frac{\text{Area Count} - \text{Constant}}{\text{X Coefficient}} = \frac{61 - (-14.65531)}{10.603} = 7.14 \text{ ppm}$$

Performance Check:

Percent Recovery:

$$\frac{\text{Post Test System Response}}{\text{Calibration Gas Value}} \times 100 = \frac{6.00 \text{ ppm}}{5.80 \text{ ppm}} \times 100 = 103.40\%$$

Recovery Factor:

$$\frac{\text{Calib. Gas Value} - \text{Post Test System Response}}{\text{Calib. Gas Value}} + 1 =$$

$$\frac{5.80 \text{ ppm} - 6.00 \text{ ppm}}{5.80 \text{ ppm}} + 1 = 0.966$$

The recovery factor was taken from the mean of two consecutive injections of the post test system response.

$$\frac{\text{1st injection} + \text{2nd injection}}{2} = \frac{0.966 + 0.998}{2} = 0.982$$

## ETHANOL CALIBRATION

Location: Anheuser Busch - Location No. 1

Date: 07/26/94

## LEVEL 1

	Ethanol
Concentration, ppmvd	2.00
Inj Area 1	8.6
Inj Area 2	9.1
Mean of Areas	8.9
Deviation 1, %	-3.4
Deviation 2, %	2.2

## LEVEL 2

	Ethanol
Concentration, ppmvd	5.80
Inj Area 1	32
Inj Area 2	33
Mean of Areas	32.5
Deviation 1, %	-1.5
Deviation 2, %	1.5

## LEVEL 3

	Ethanol
Concentration, ppmvd	19.0
Inj Area 1	129
Inj Area 2	110
Mean of Areas	119.5
Deviation 1, %	7.9
Deviation 2, %	-7.9

Job: Anheuser Busch  
 Address: Fort Collins, CO  
 Location: Location No. 2

DILUTION FACTOR  
 1.00  
 46.07

INJECTION	TIME	AREA COUNT	ETHANOL		ACTUAL CONCEN. (PPMVD)
			CONCEN. As ANALZ (PPM)	RECOVERY FACTOR	
Vent No. 1					
Run 1 - 1	937	3.1	1.64	0.948	1.56
Run 1 - 2	952	3.4	1.68	0.948	1.59
Run 1 - 3	1007	2.4	1.54	0.948	1.46
Run 1 - 4	1022	3.1	1.64	0.948	1.56
Average			1.63		1.54
Vent No. 2					
Run 1 - 1	1042	4.7	1.86	0.948	1.76
Run 1 - 2	1057	5.9	2.02	0.948	1.92
Run 1 - 3	1112	6.4	2.09	0.948	1.98
Run 1 - 4	1127	6.0	2.04	0.948	1.93
Average			2.00		1.90
Vent No. 3					
Run 1 - 1	1239	3.5	1.69	1.129	1.91
Run 1 - 2	1254	4.0	1.76	1.129	1.99
Run 1 - 3	1309	4.8	1.87	1.129	2.12
Run 1 - 4	1324	4.2	1.79	1.129	2.02
Average			1.78		2.01
Vent No. 4					
Run 1 - 1	1348	5.2	1.93	1.129	2.18
Run 1 - 2	1403	6.2	2.07	1.129	2.33
Run 1 - 3	1418	6.9	2.16	1.129	2.44
Run 1 - 4	1433	8.9	2.44	1.129	2.75
Average			2.15		2.42
Vent No. 5					
Run 1 - 1	1721	33	5.74	0.829	4.76
Run 1 - 2	1736	47	7.66	0.829	6.35
Run 1 - 3	1751	29	5.19	0.829	4.30
Run 1 - 4	1807	41	6.84	0.829	5.67
Average			6.36		5.27
Ambient Air					
1st Injection	850	2.2	1.52	0.948	1.44
2nd Injection	905 <	1.0 <	1.35	0.948 <	1.28
3rd Injection	920	1.3	1.39	0.948	1.32
Average			1.42		1.35

DILUTION FACTOR  
 1.00

Job: Anheuser Busch  
 Address: Fort Collins, CO  
 Location: Location No. 3

DILUTION FACTOR  
 1.00  
 MoI. WT 46.07

INJECTION	TIME	AREA COUNT	ETHANOL		ACTUAL CONCEN. (PPMVD)
			CONCEN. As ANALZ (PPM)	RECOVERY FACTOR	
Vent No. 1					
Run 1 - 1	931	61	7.14	0.982	7.01
Run 1 - 2	946	64	7.42	0.982	7.29
Run 1 - 3	1001	56	6.66	0.982	6.54
Run 1 - 4	1016	70	7.98	0.982	7.84
Run 2 - 1	1212	66	7.61	0.948	7.21
Run 2 - 2	1227	109	11.66	0.948	11.06
Run 2 - 3	1242	101	10.91	0.948	10.34
Run 2 - 4	1257	127	13.36	0.948	12.67
Run 3 - 1	1447	55	6.57	0.948	6.23
Run 3 - 2	1502	65	7.51	0.948	7.12
Run 3 - 3	1517	88	9.68	0.948	9.18
Run 3 - 4	1532	68	7.80	0.948	7.39
Average			8.69		8.32

DILUTION FACTOR  
 1.00

Vent No. 2					
Run 1 - 1	1038	79	8.83	0.982	8.67
Run 1 - 2	1053	86	9.49	0.982	9.32
Run 1 - 3	1108	75	8.46	0.982	8.30
Run 1 - 4	1123	59	6.95	0.982	6.82
Run 2 - 1	1321	44	5.53	0.948	5.24
Run 2 - 2	1336	64	7.42	0.948	7.03
Run 2 - 3	1351	65	7.51	0.948	7.12
Run 2 - 4	1506	69	7.89	0.948	7.48
Run 3 - 1	1554	65	7.51	0.948	7.12
Run 3 - 2	1609	76	8.55	0.948	8.11
Run 3 - 3	1624	101	10.91	0.948	10.34
Run 3 - 4	1639	91	9.96	0.948	9.45
Average			8.25		7.92

DILUTION FACTOR  
 1.00

Performance Checks					
Run 1 - 1	1141	49	6.00	1.00	6.00
Run 1 - 2	1147	47	5.81	1.00	5.81
Run 2 - 1	1426	50	6.10	1.00	6.10
Run 2 - 2	1432	50	6.10	1.00	6.10
Run 3 - 1	1701	50	6.10	1.00	6.10
Run 3 - 2	1707	50	6.10	1.00	6.10
Average			6.04		6.04

## ETHANOL CALIBRATION

Location: Anheuser Busch - Location No. 2

Date: 07/27/94

## LEVEL 1

-----	Ethanol
Concentration, ppmvd	2.00
Inj Area 1	8.4
Inj Area 2	8.4
Mean of Areas	8.4
Deviation 1, %	0.0
Deviation 2, %	0.0

## LEVEL 2

-----	Ethanol
Concentration, ppmvd	5.80
Inj Area 1	30
Inj Area 2	30
Mean of Areas	30.0
Deviation 1, %	0
Deviation 2, %	0

## LEVEL 3

-----	Ethanol
Concentration, ppmvd	19.0
Inj Area 1	130
Inj Area 2	131
Mean of Areas	130.5
Deviation 1, %	-0.4
Deviation 2, %	0.4

## ETHANOL CALIBRATION

Location: Anheuser Busch - Location No. 3

Date: 07/28/94

## LEVEL 1

-----	Ethanol
-----	-----
Concentration, ppmvd	2.00
Inj Area 1	10.5
Inj Area 2	10.9
Mean of Areas	10.7
Deviation 1, %	-1.9
Deviation 2, %	1.9

## LEVEL 2

-----	Ethanol
-----	-----
Concentration, ppmvd	5.80
Inj Area 1	40
Inj Area 2	43
Mean of Areas	41.5
Deviation 1, %	-3.6
Deviation 2, %	3.6

## LEVEL 3

-----	Ethanol
-----	-----
Concentration, ppmvd	19.0
Inj Area 1	189
Inj Area 2	187
Mean of Areas	188.0
Deviation 1, %	0.5
Deviation 2, %	-0.5

## Ethanol

2.000	8.90
5.800	32.50
19.000	119.50

## ETHANOL

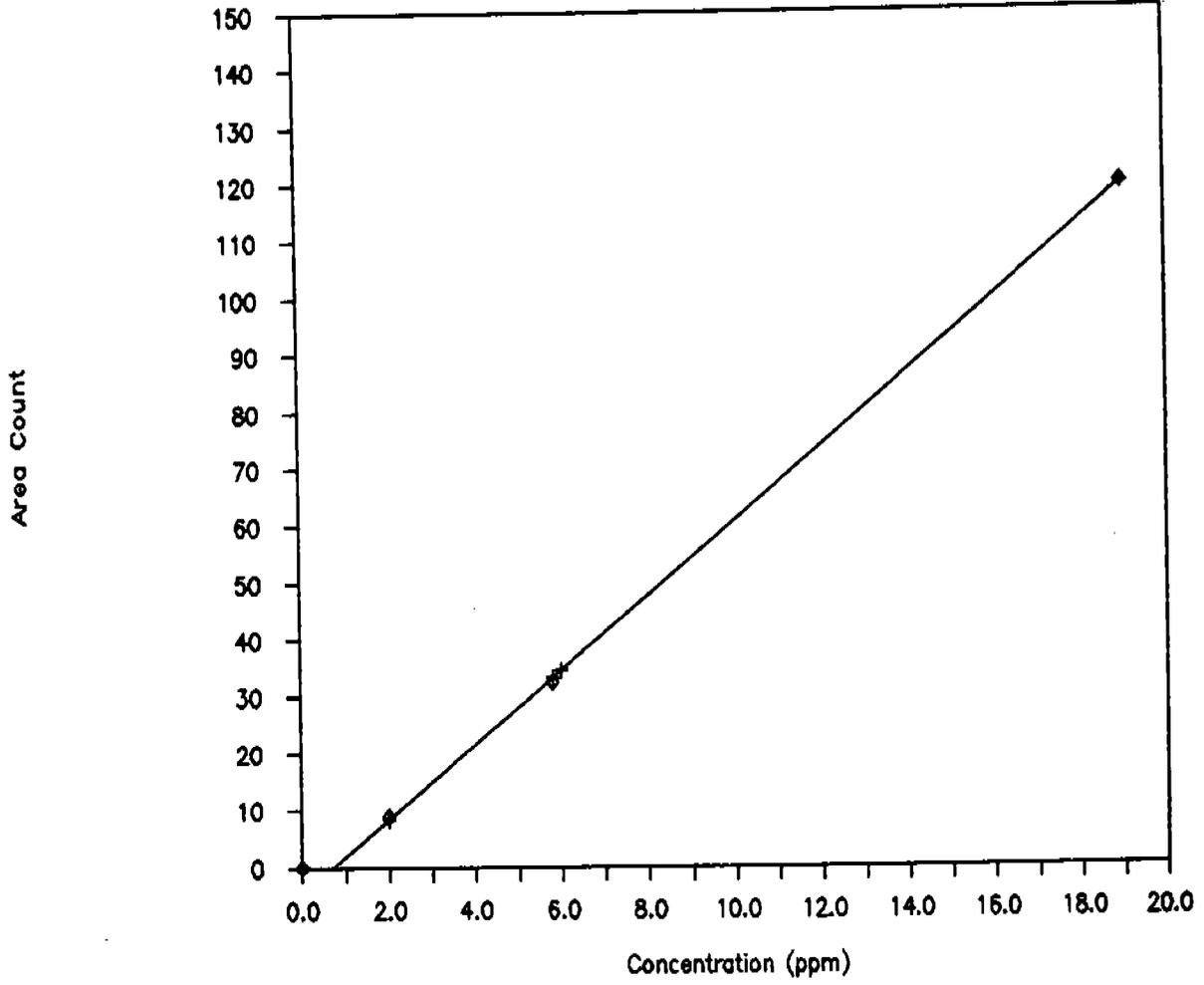
## Regression Output:

Constant	-4.683185
Std Err of Y Est	0.8729911
R Squared	0.9998876
No. of Observations	3
Degrees of Freedom	1

X Coefficient(s)	6.528
Std Err of Coef.	0.06918

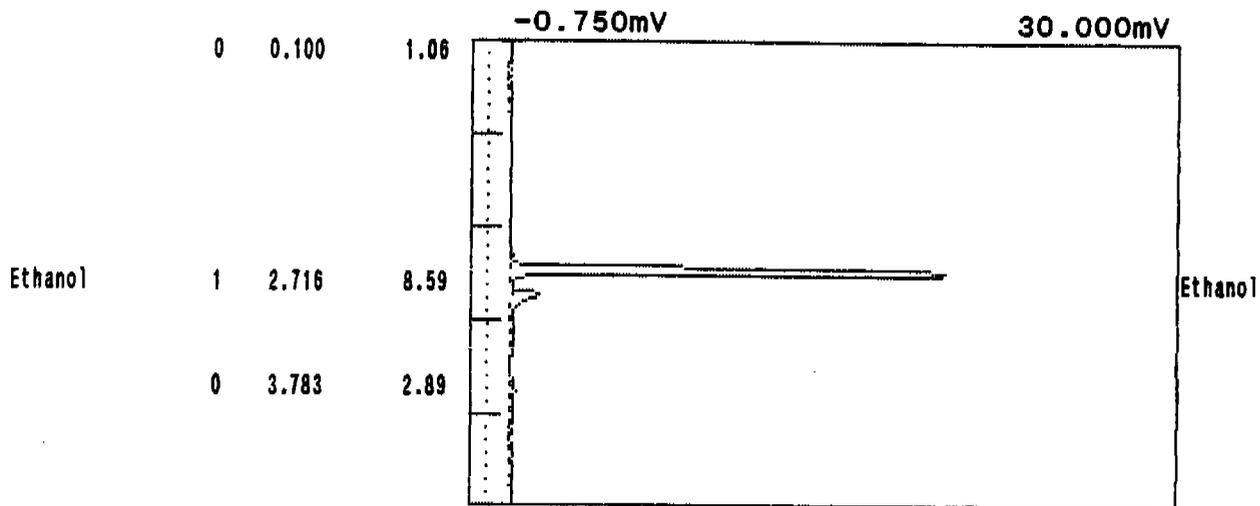
# ETHANOL

Location No.1



Operator : Gary Mata  
 Description : FID  
 Temperature :  
 Components : met18  
 Date : 07/26/1994  
 Time : 09:36:39

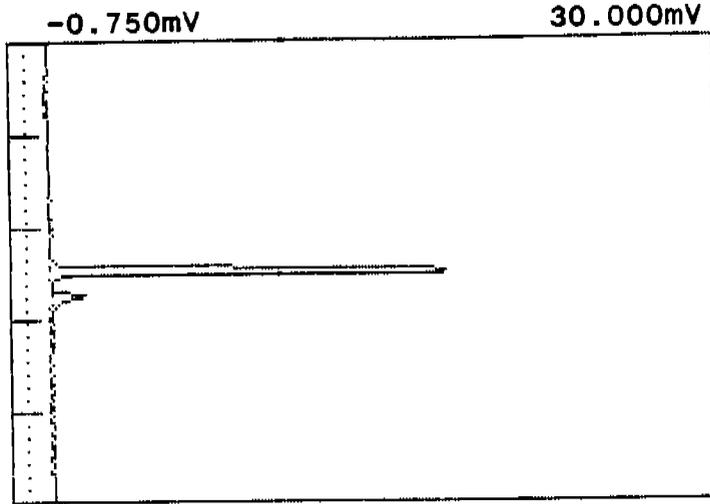
LOW CAL STD  
 2.00 ppm  
 D:\21691\LC1



Component	Number	Retention	Area
Ethanol	0	0.100	1.06
	0	2.500	88.30
	1	2.716	8.59
	0	3.783	2.89
	4		100.84

LOW CAL STD  
 2.00 PPM  
 D:\2169\ALC2

Operator : Gary Mata  
 Description : FID  
 Temperature :  
 Components : met18  
 Date : 07/26/1994  
 Time : 09:46:09



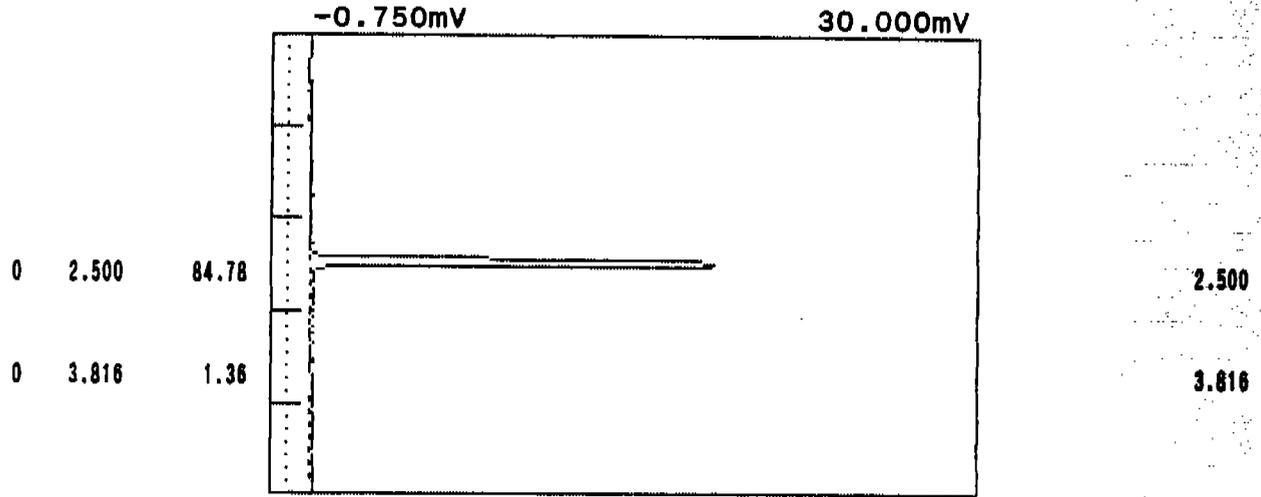
	0	1.966	1.24
Ethanol	1	2.733	9.13

	1.966
Ethanol	2.733

Component	Number	Retention	Area
	0	1.916	1.08
	0	1.966	1.24
	0	2.500	88.53
Ethanol	1	2.733	9.13
	4		99.98

Operator : Gary Mata  
 Description : FID  
 Temperature :  
 Components : met18  
 Date : 07/26/1994  
 Time : 09:54:42

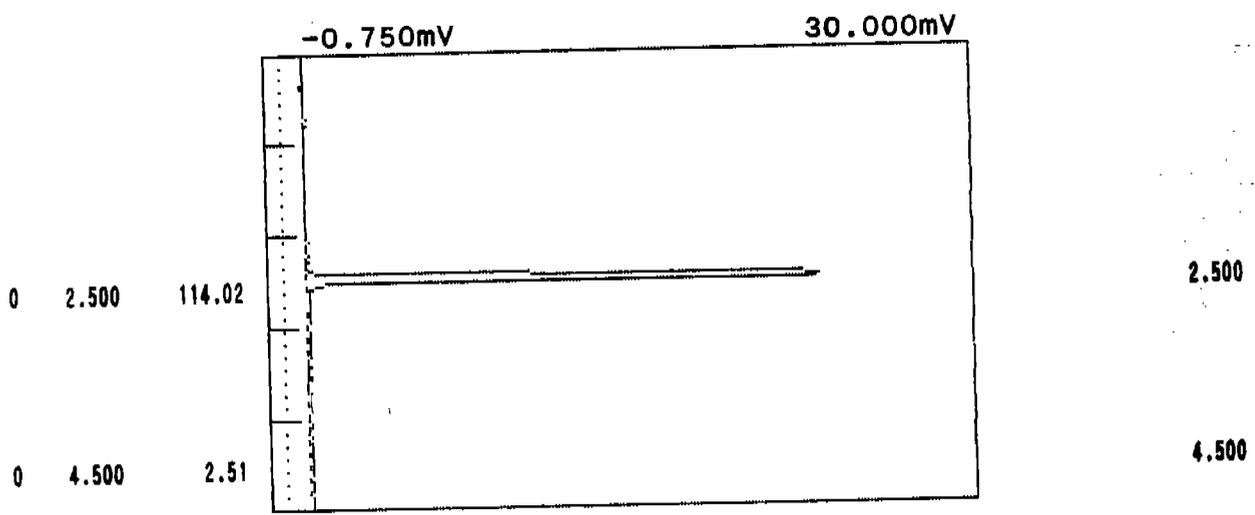
SYSTEM BLANK  
 N2  
 D:\2169\1\SBLK1



Component	Number	Retention	Area
	0	2.500	84.78
	0	3.816	1.36
2			86.14

SYSTEM BLANK  
N<sub>2</sub>  
D:\21691\5BLK2

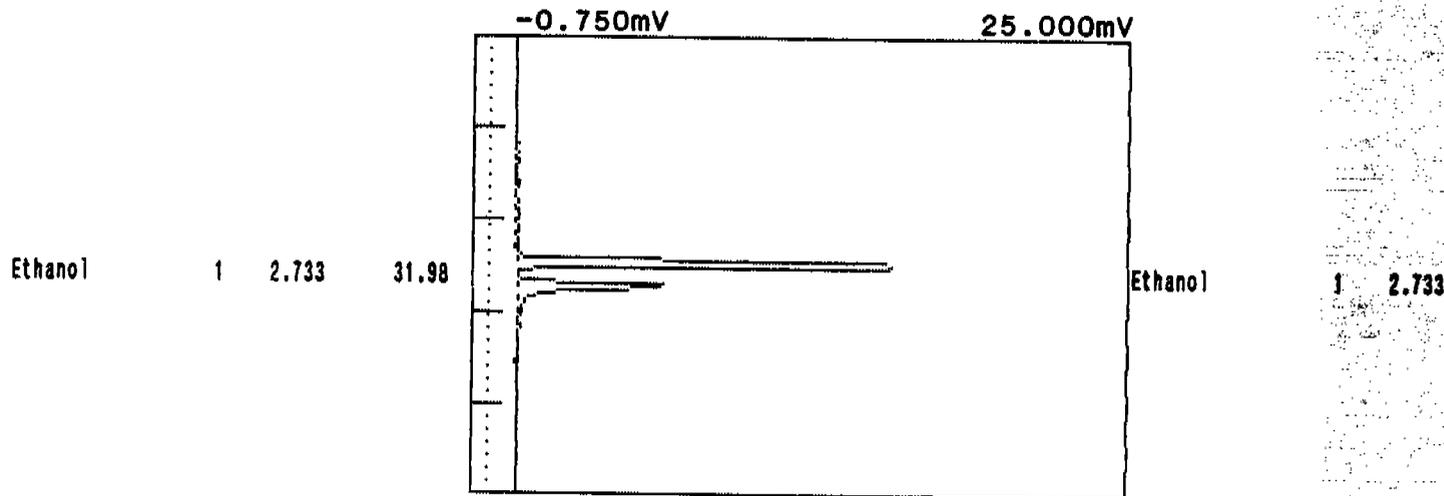
Operator : Gary Mata  
Description : FID  
Temperature :  
Components : met18  
Date : 07/26/1994  
Time : 10:01:07



Component	Number	Retention	Area
	0	2.500	114.02
	0	4.500	2.51
2			116.53

MID CAL STD  
5.80 PPM

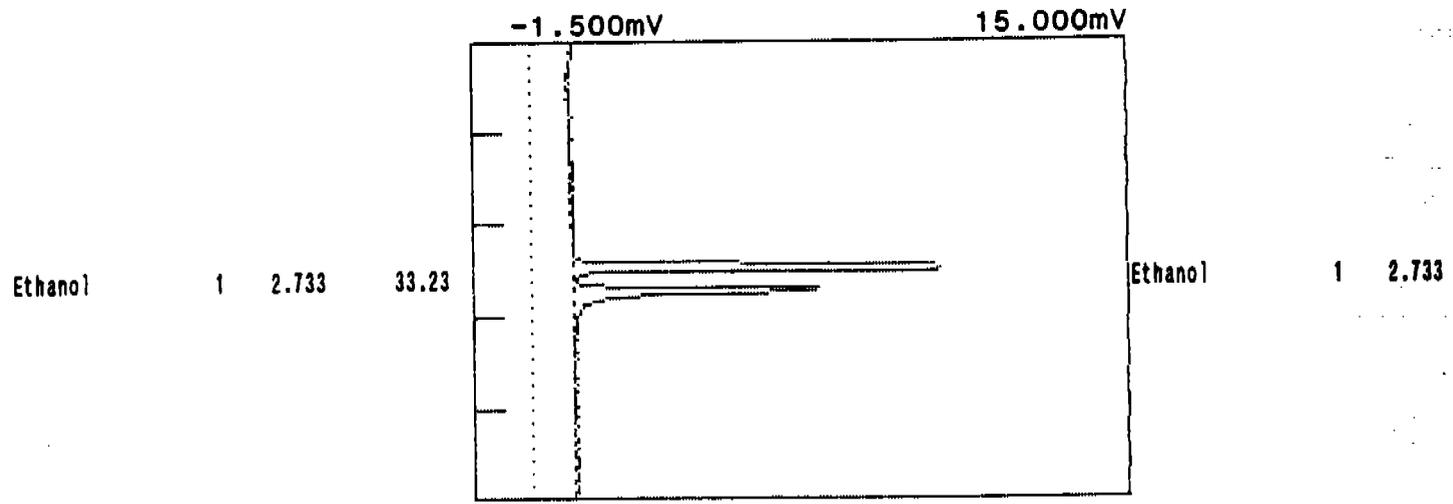
Operator : Gary Mata  
Description : FID  
File : D:\21691\MC1  
Components : met18  
Date : 07/26/1994  
Time : 10:15:41



Component	Number	Retention	Area
Ethanol	0	2.483	71.39
	1	2.733	31.98
	2		103.37

MID CAL STD  
5.80 PPM

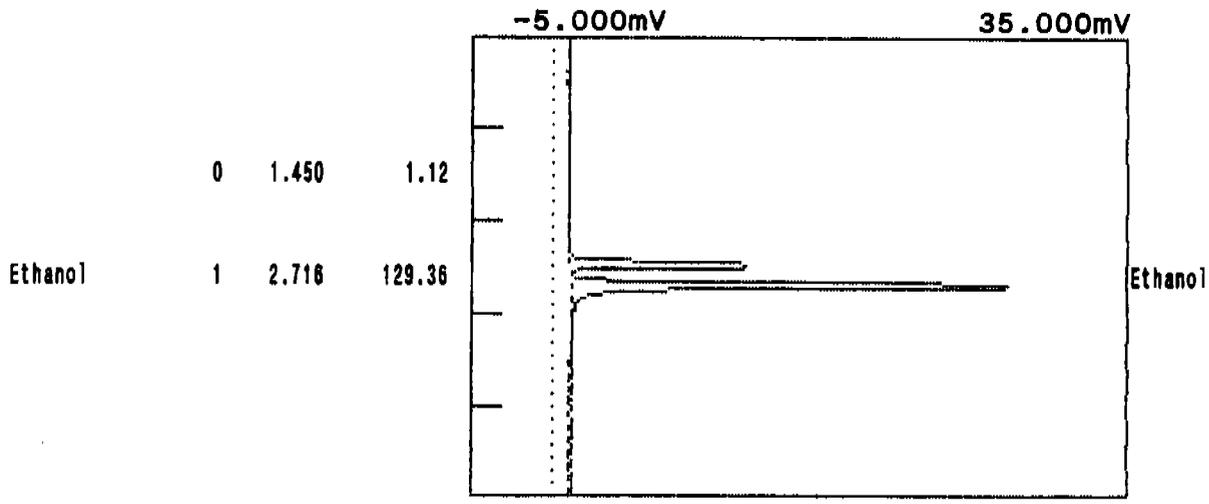
Operator : Gary Mata  
Description : FID  
File : D:\21691\MC2  
Components : met18  
Date : 07/26/1994  
Time : 10:24:08



Component	Number	Retention	Area
Ethanol	0	2.500	46.45
	1	2.733	33.23
	2		79.68

HIGH CAL STD  
19.0 PPM

Operator : Gary Mata  
Description : FID  
File : D:\21691\HC1  
Components : met18  
Date : 07/26/1994  
Time : 10:42:15

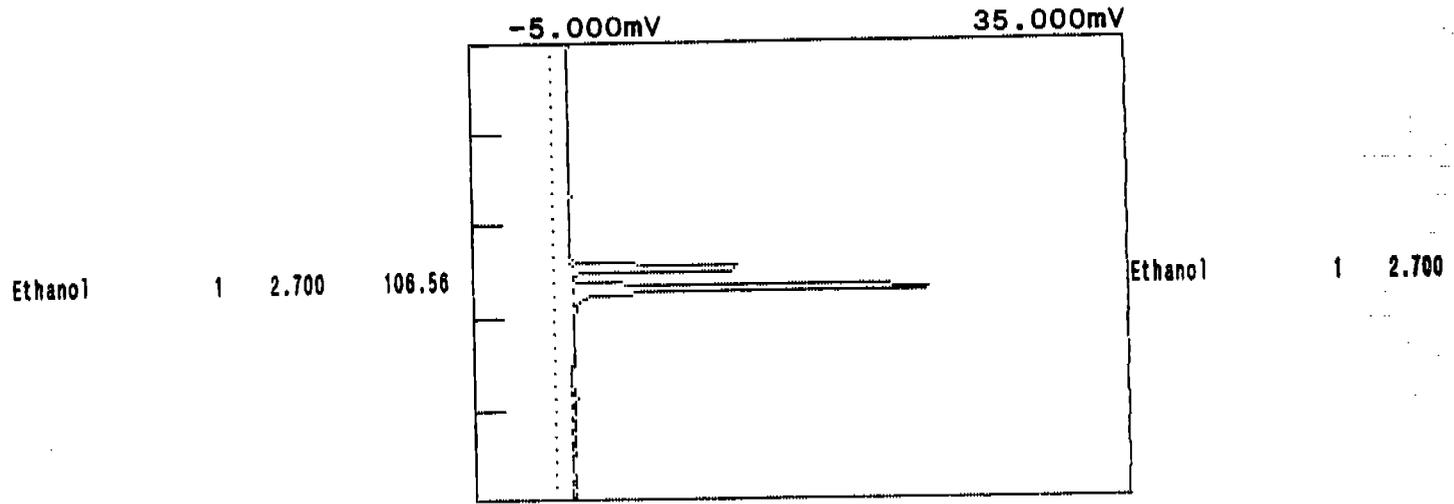


Component	Number	Retention	Area
Ethanol	0	1.450	1.12
	0	2.500	49.47
	1	2.716	129.36
	3		179.95

HIGH CAL STD  
19.0PPM

NEEDS TO BE  
REINTEGRATED!

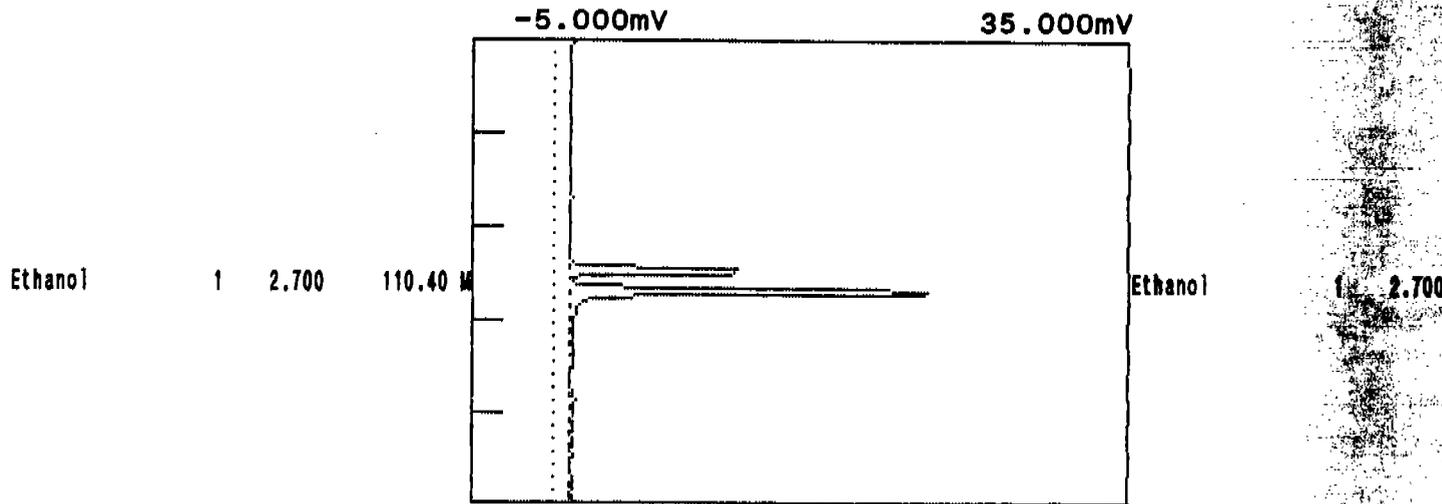
Operator : Gary Mata  
Description : FID  
File : D:\21691\HC2  
Components : met18  
Date : 07/26/1994  
Time : 10:49:16



Component	Number	Retention	Area
	0	2.483	50.24
Ethanol	1	2.700	106.56
	2		156.80

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\HC2  
 Components : met18  
 Date : 07/26/1994  
 Time : 10:49:16

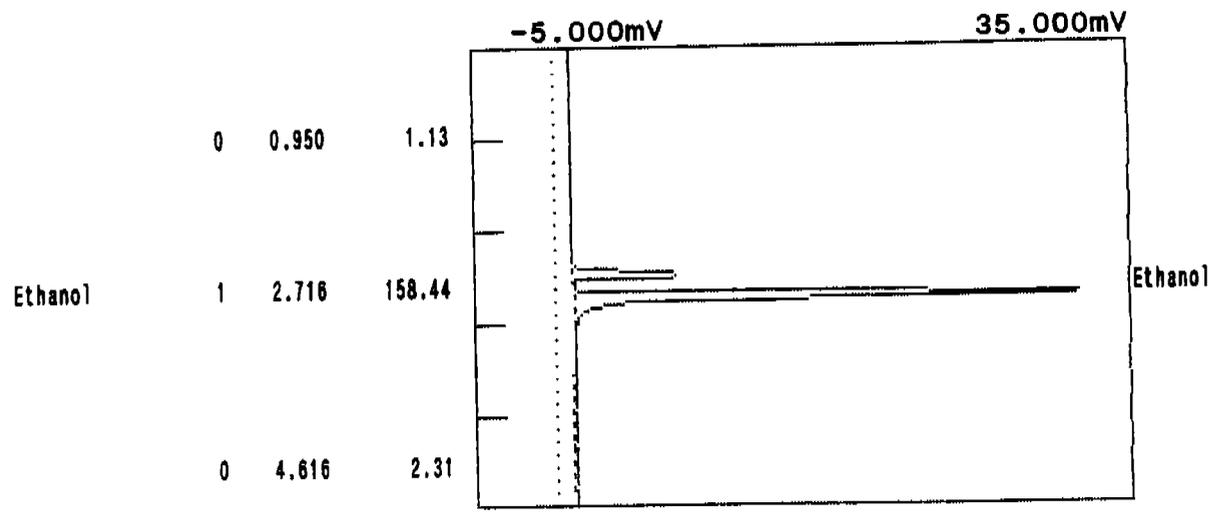
HIGH CAL STD  
 19.0 PPM



Component	Number	Retention	Area
	0	2.483	51.60 M
Ethanol	1	2.700	110.40 M
	2		162.01

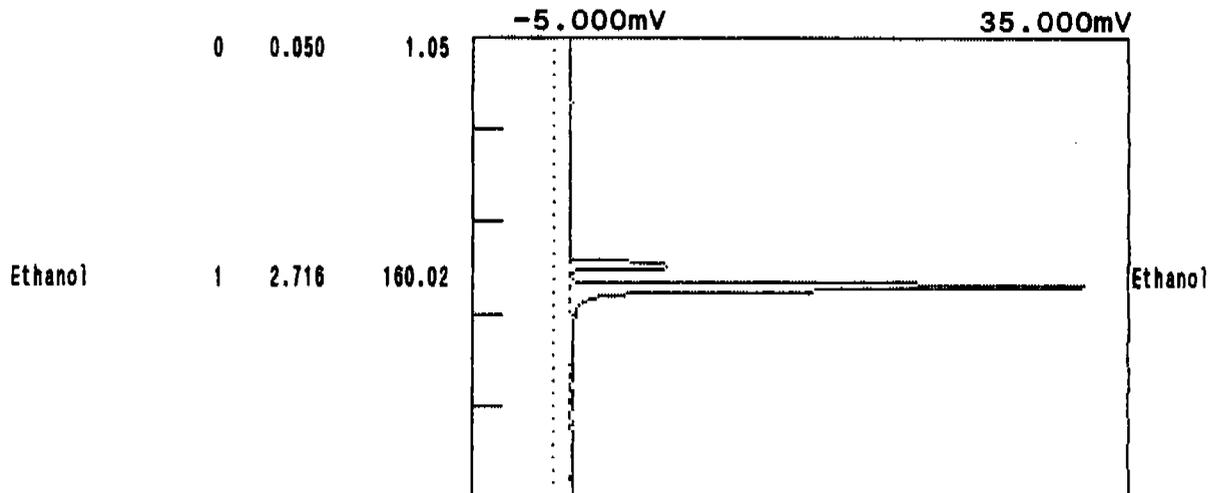
HIGH CAL STD  
19.0 PPM

Operator : Gary Mata  
Description : FID  
File : D:\21691\HC3  
Components : met18  
Date : 07/26/1994  
Time : 10:56:48



Component	Number	Retention	Area
Ethanol	0	0.950	1.13
	0	2.500	30.27
	1	2.716	158.44
	0	4.616	2.31
	4		192.16

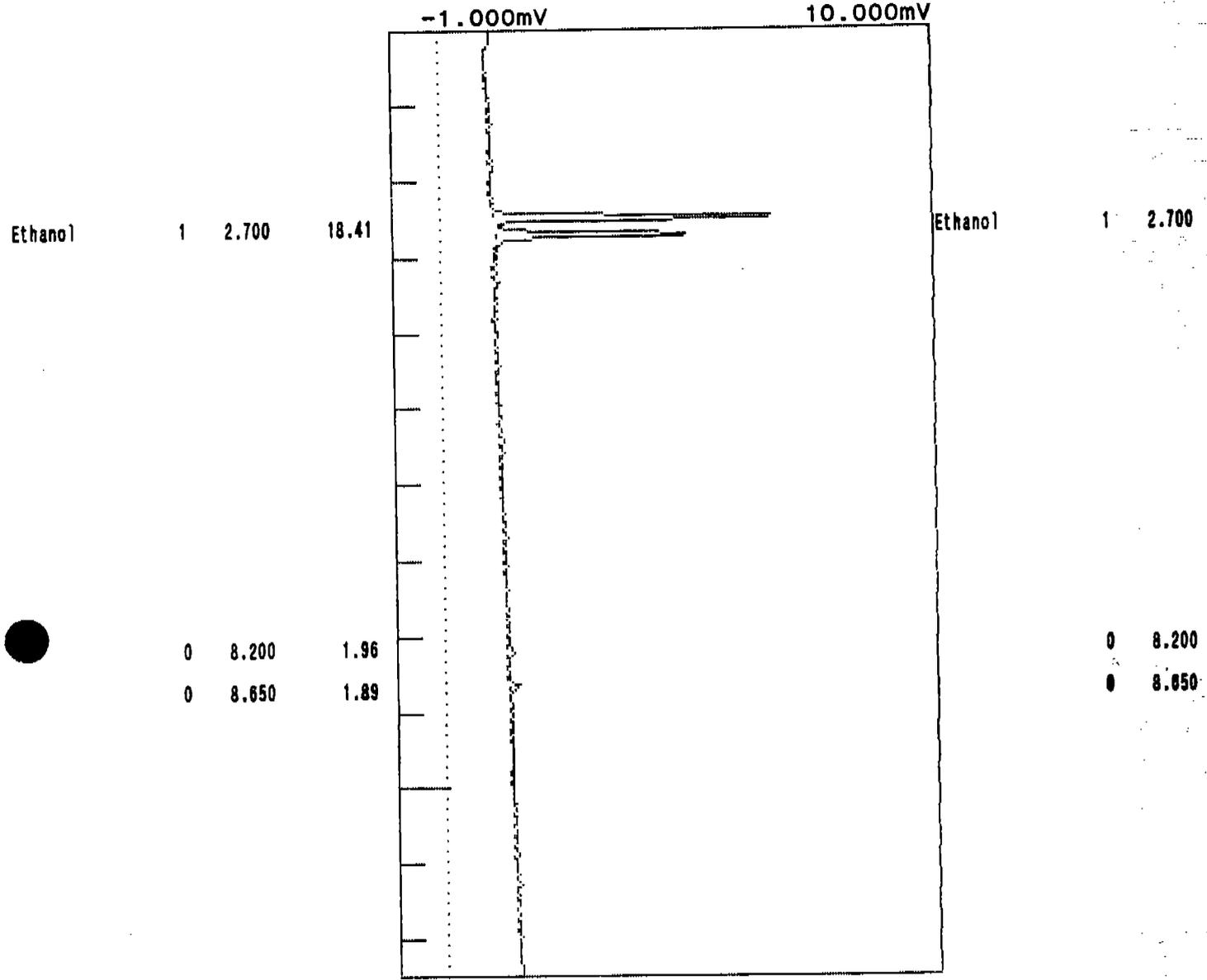
Operator : Gary Mata  
 Description : FID  
 File : D:\21691\HC4  
 Components : met18  
 Date : 07/26/1994  
 Time : 11:03:34



Component	Number	Retention	Area
	0	0.050	1.05
	0	2.500	29.81
Ethanol	1	2.716	160.02
	3		190.88

LOCATION NO. 1  
 VENT. 1 RUN #1  
 1<sup>ST</sup> INJECTION

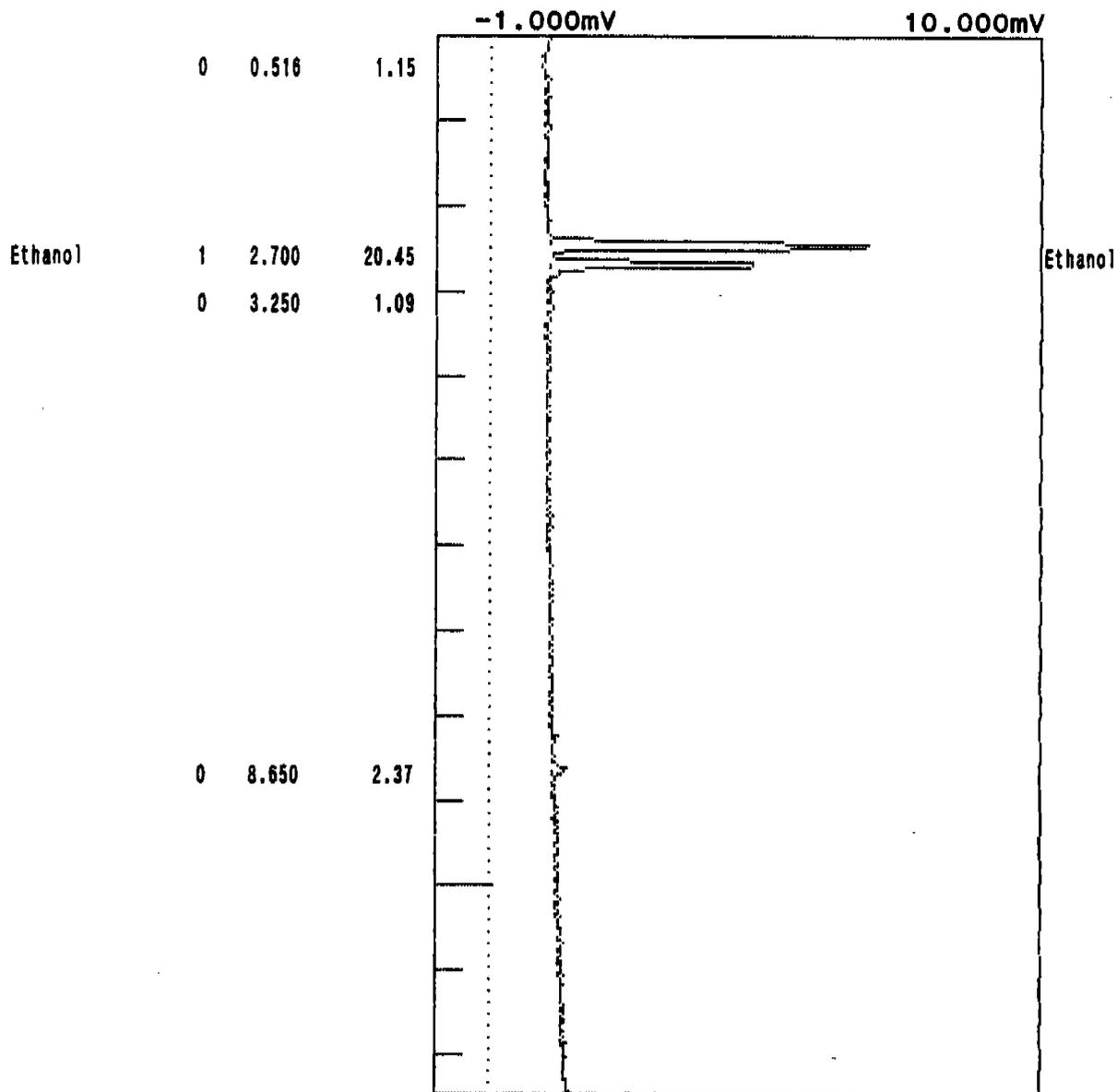
Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R11  
 Components : met18  
 Date : 07/26/1994  
 Time : 12:08:10



Component	Number	Retention	Area
Ethanol	0	2.483	25.32
	1	2.700	18.41
	0	8.200	1.96
	0	8.650	1.89
			47.57

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R12  
 Components : met18  
 Date : 07/26/1994  
 Time : 12:23:37

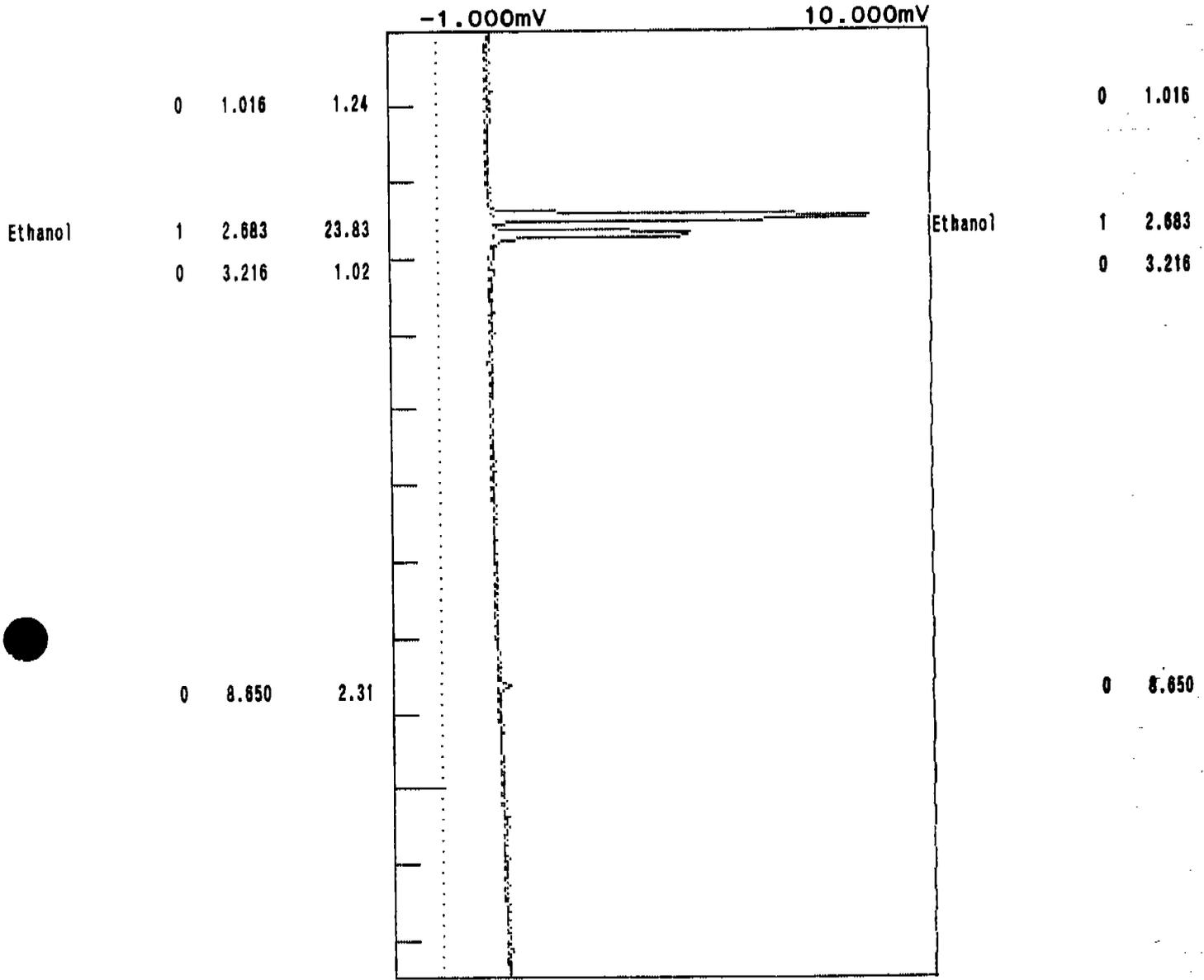
LOCATION NO. 1  
 VENT 1 RUN#1  
 2ND INJECTION



Component	Number	Retention	Area
	0	0.516	1.15
	0	2.466	32.13
Ethanol	1	2.700	20.45
	0	3.250	1.09
	0	8.650	2.37
	5		57.19

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R13  
 Components : met18  
 Date : 07/26/1994  
 Time : 12:38:29

LOCATION NO. 1  
 VENT NO. 1 RUN #1  
 3<sup>RD</sup> INJECTION



Component	Number	Retention	Area
Ethanol	0	0.800	1.78
	0	1.016	1.24
	0	2.483	42.86
	1	2.683	23.83
	0	3.216	1.02
	0	8.650	2.31

6

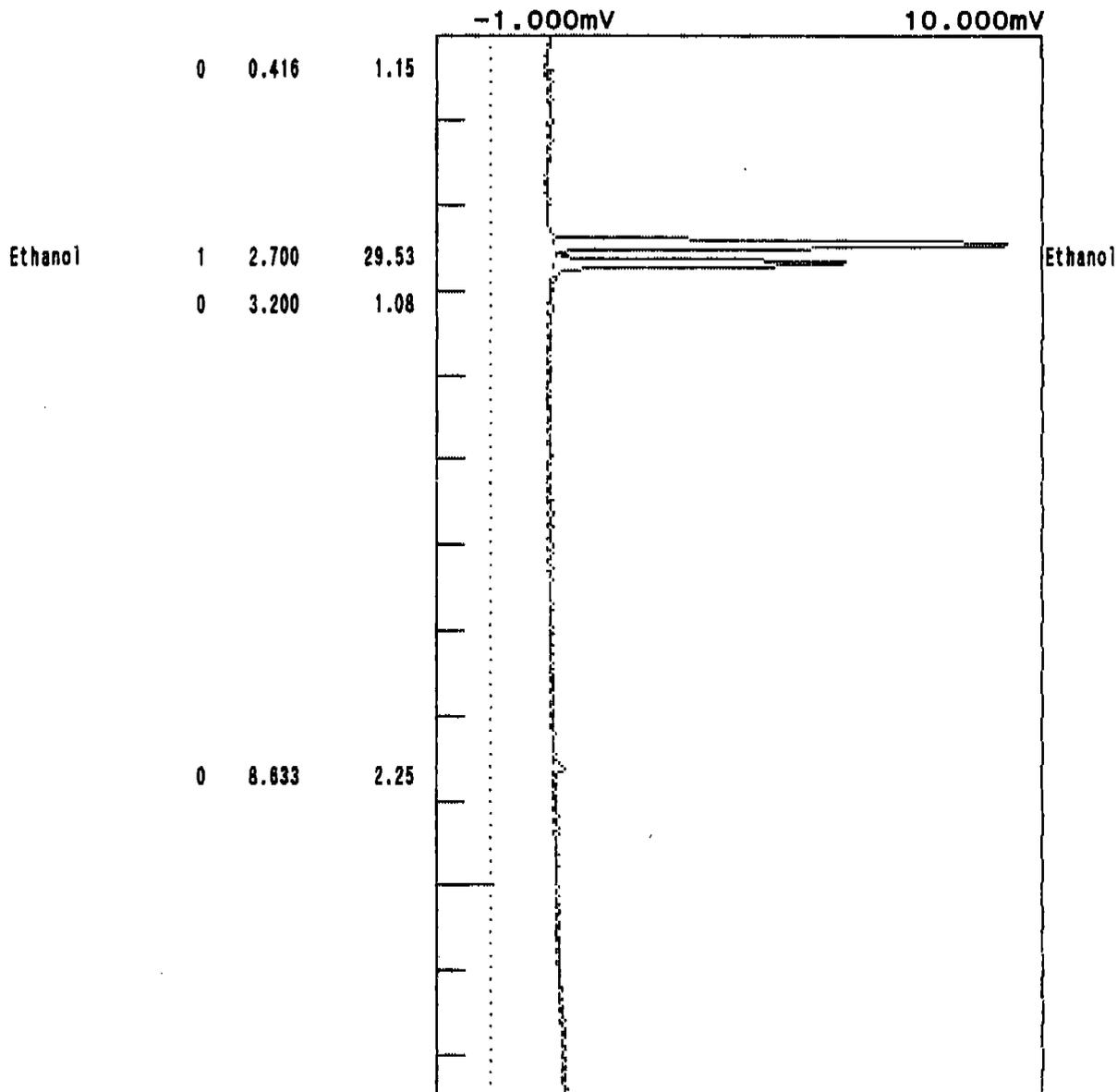
73.05

25

**ENTROPY**

LOCATION NO. 1  
 VENT NO. 1 RUN#1  
 4<sup>th</sup> INJECTION

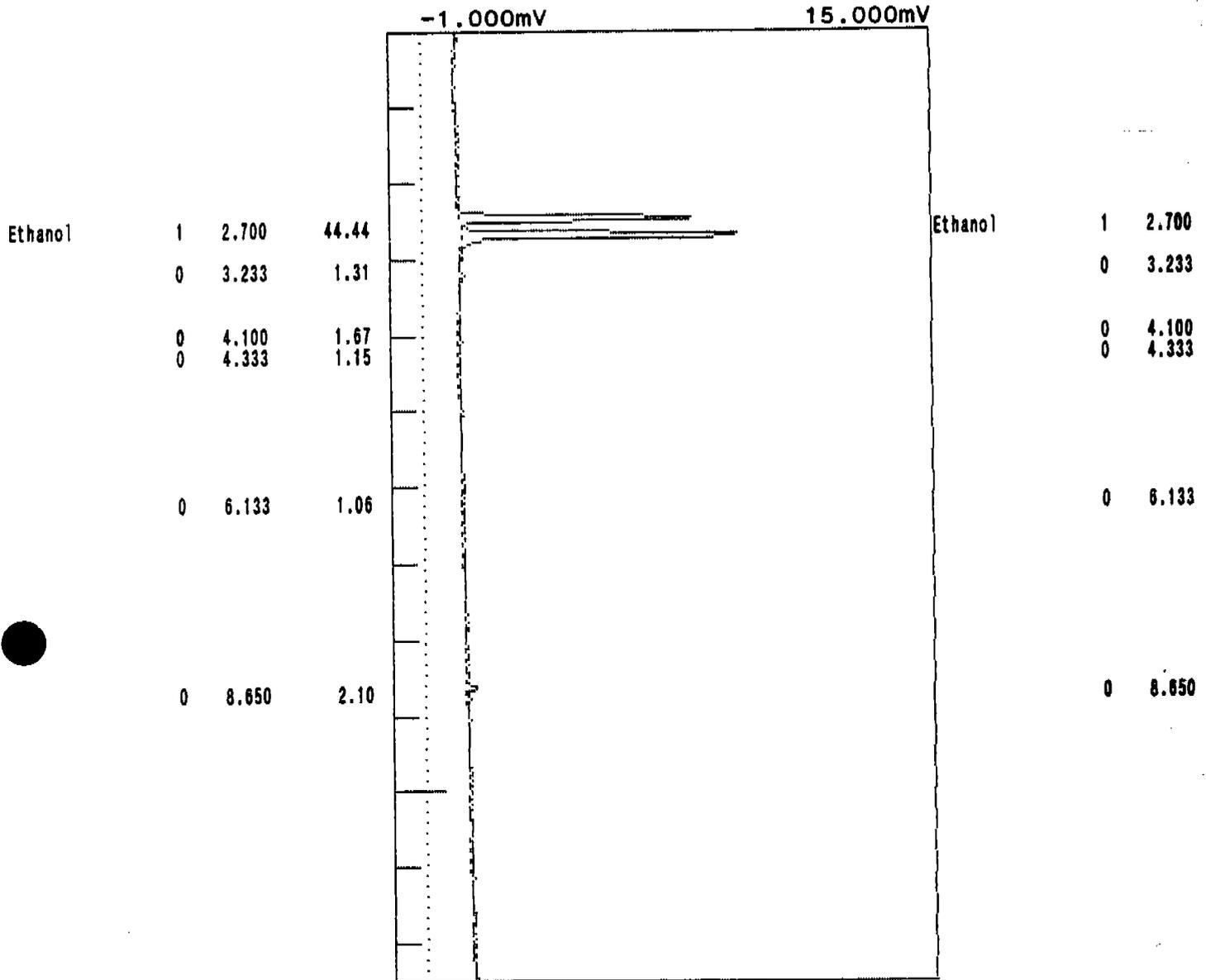
Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R14  
 Components : met18  
 Date : 07/26/1994  
 Time : 12:53:15



Component	Number	Retention	Area
Ethanol	0	0.416	1.15
	0	2.466	46.94
	1	2.700	29.53
	0	3.200	1.08
	0	8.633	2.25
	5		80.95

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R11  
 Components : met18  
 Date : 07/26/1994  
 Time : 13:33:19

LOCATION NO. 1  
 VENT NO. 2 RUN#1  
 (SAMPLING)



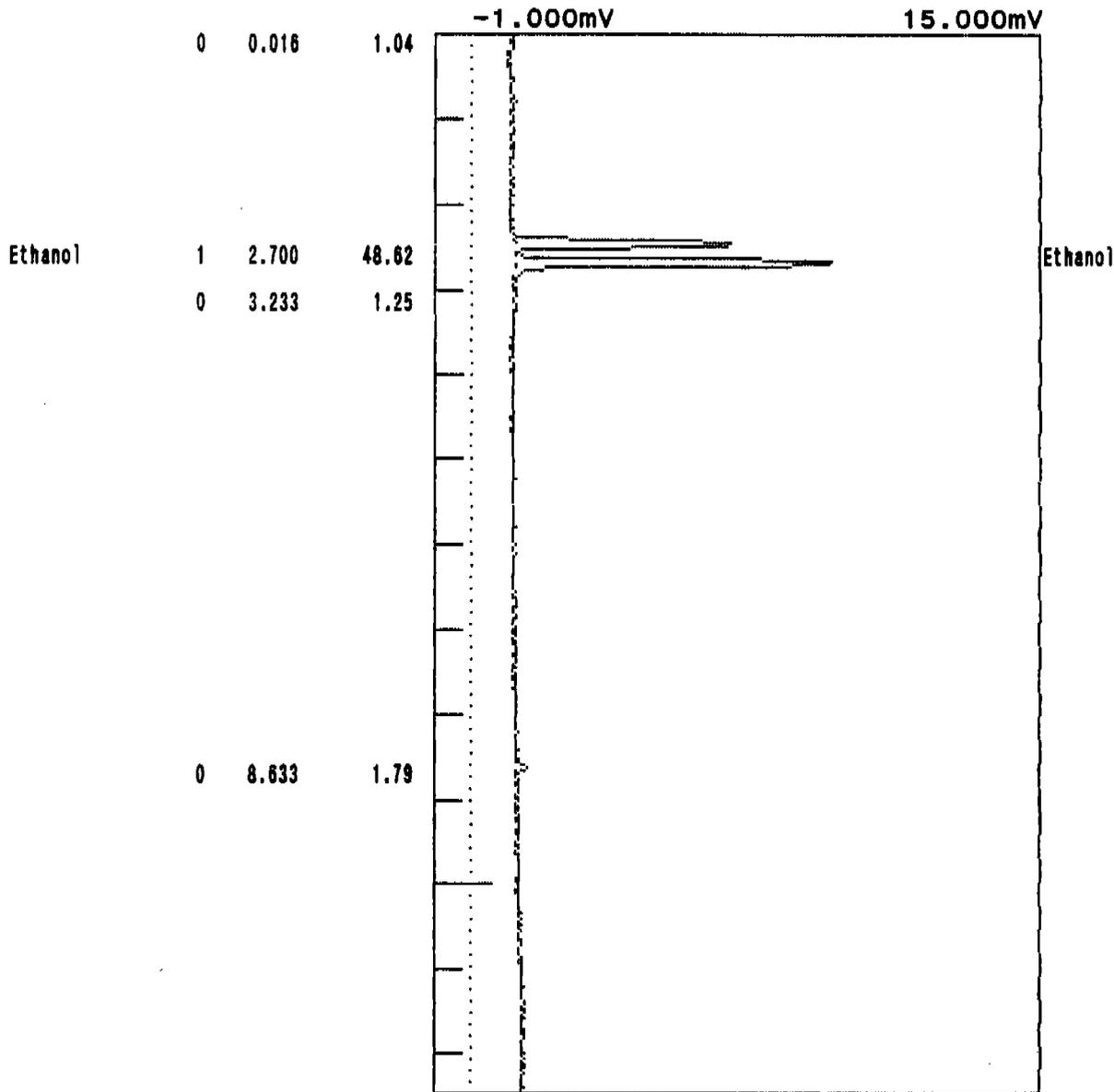
Component	Number	Retention	Area
Ethanol	0	2.483	34.71
	1	2.700	44.44
	0	3.233	1.31
	0	4.100	1.67
	0	4.333	1.15
	0	6.133	1.06
	0	8.650	2.10

7

86.44  
27

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R12  
 Components : met18  
 Date : 07/26/1994  
 Time : 13:48:13

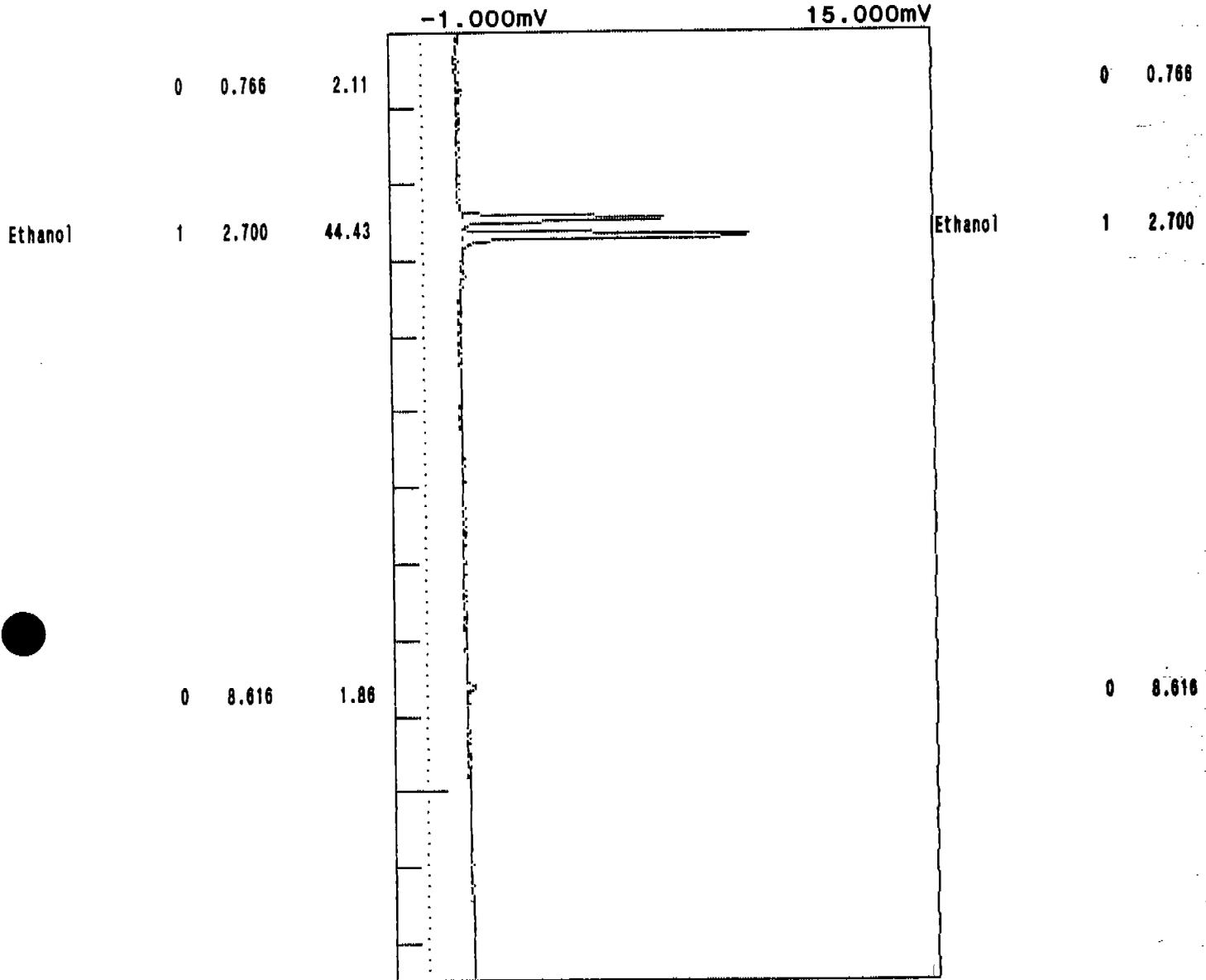
LOCATION NO. 1  
 VENT NO. 2 RUN#1  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area
Ethanol	0	0.016	1.04
	0	2.466	31.70
	1	2.700	48.62
	0	3.233	1.25
	0	8.633	1.79
	5		84.40

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R13  
 Components : met18  
 Date : 07/26/1994  
 Time : 14:03:17

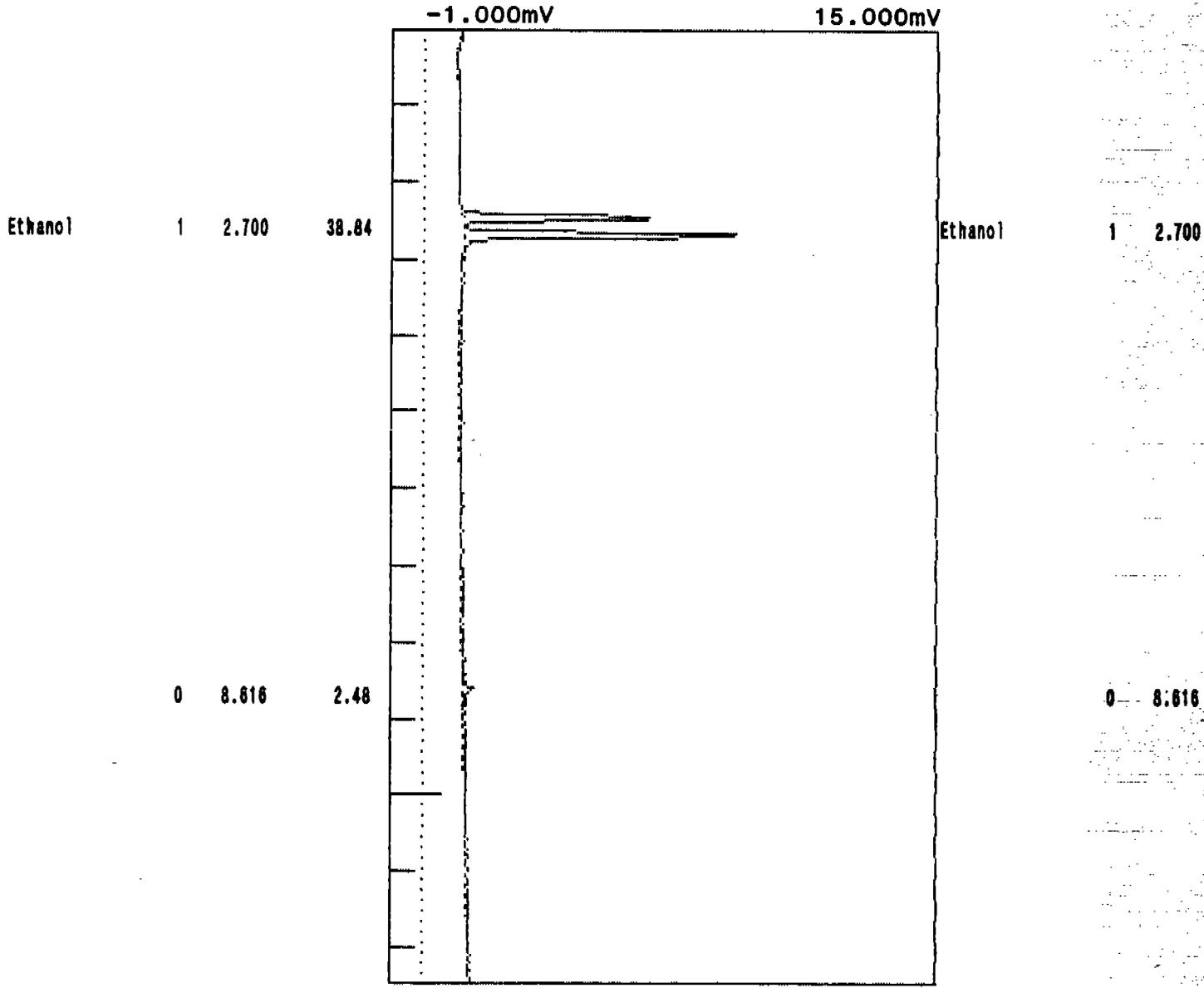
LOCATION No. 1  
 VENT NO. 2 RUN#1  
 3<sup>RD</sup> INJECTION



Component	Number	Retention	Area
	0	0.766	2.11
	0	2.466	27.69
Ethanol	1	2.700	44.43
	0	8.616	1.86
	4		76.09

LOCATION NO. 1  
 VENT NO. 2 RUN# 1  
 4th INJECTION

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R14  
 Components : met18  
 Date : 07/26/1994  
 Time : 14:18:28



Component	Number	Retention	Area
Ethanol	0	2.466	27.59
	1	2.700	38.84
	0	8.616	2.48
	3		68.91

LOCATION NO. 1

RUN #1

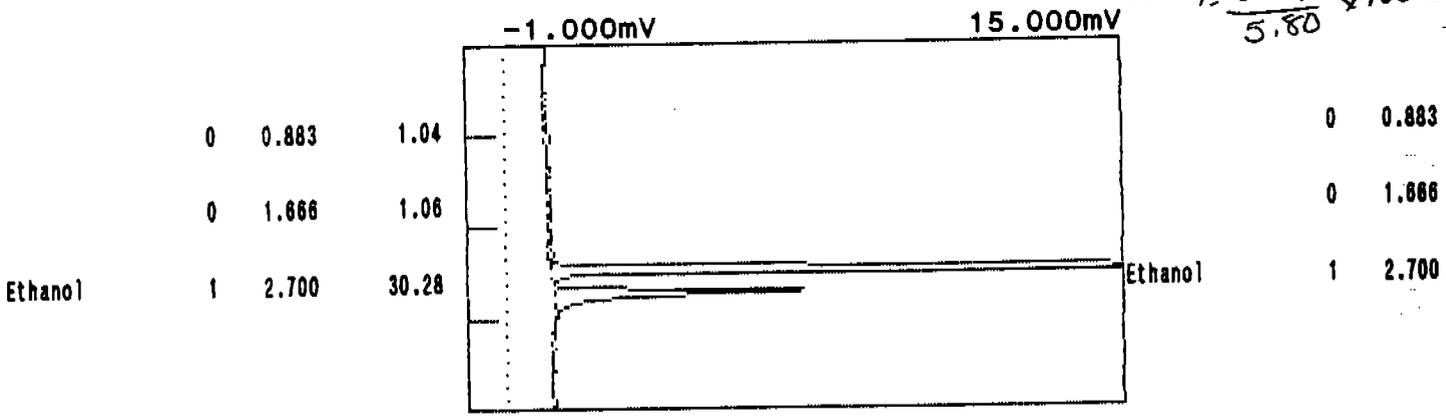
PERFORMANCE CHECK

1<sup>st</sup> INJECTION

STD = 5.80 ppm

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\R1PC1  
 Components : met18  
 Date : 07/26/1994  
 Time : 14:40:12

$$\text{RECOVERY} = \frac{5.31}{5.80} \times 100 = 91.6\%$$



Component	Number	Retention	Area
	0	0.883	1.04
	0	1.666	1.06
	0	2.500	66.08
Ethanol	1	2.700	30.28
	4		98.47

5.31 ppm

RECOVERY FACTOR

$$\frac{5.80 - 5.31}{5.80} + 1 = 1.084$$

LOCATION NO. 1

RUN # 1

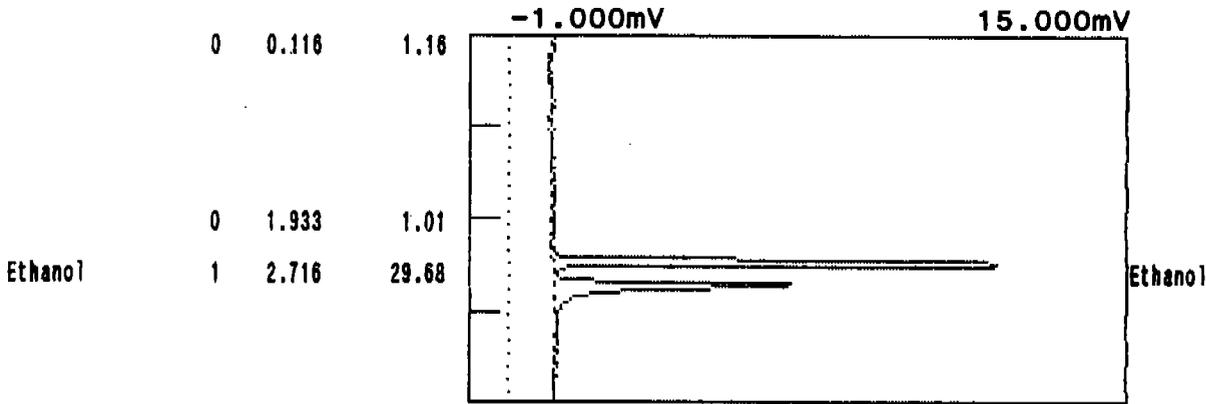
PERFORMANCE CHECK

2<sup>ND</sup> INJECTION

STD = 5.80 PPM

Operator : Gary Mata  
Description : FID  
File : D:\21691\R1PC2  
Components : met18  
Date : 07/26/1994  
Time : 14:46:40

$$\text{Recovery} = \frac{5.31}{5.80} \times 100 = 91.6$$



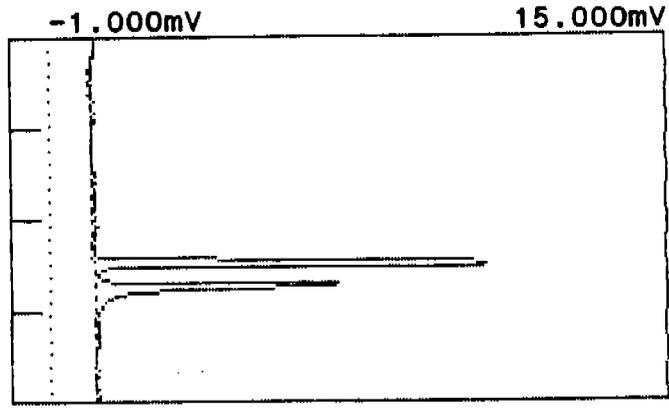
Component	Number	Retention	Area
Ethanol	0	0.116	1.16
	0	1.933	1.01
	0	2.483	51.99
	1	2.716	29.68
			5.31 ppm
	4		83.84

RECOVERY FACTOR

$$\frac{5.80 - 5.31}{5.80} + 1 = 1.084$$

RECOVERY =  $\frac{5.31}{5.80} \times 100 = 91.6\%$

Operator : Gary Mata  
Description : FID  
File : D:\21691\R1PC3  
Components : met18  
Date : 07/26/1994  
Time : 14:52:47



Ethanol 1 2.716 29.89

Ethanol 1 2.716

Component	Number	Retention	Area	
Ethanol	0	2.500	43.32	
	1	2.716	29.89	5.31 ppm
	2		73.21	

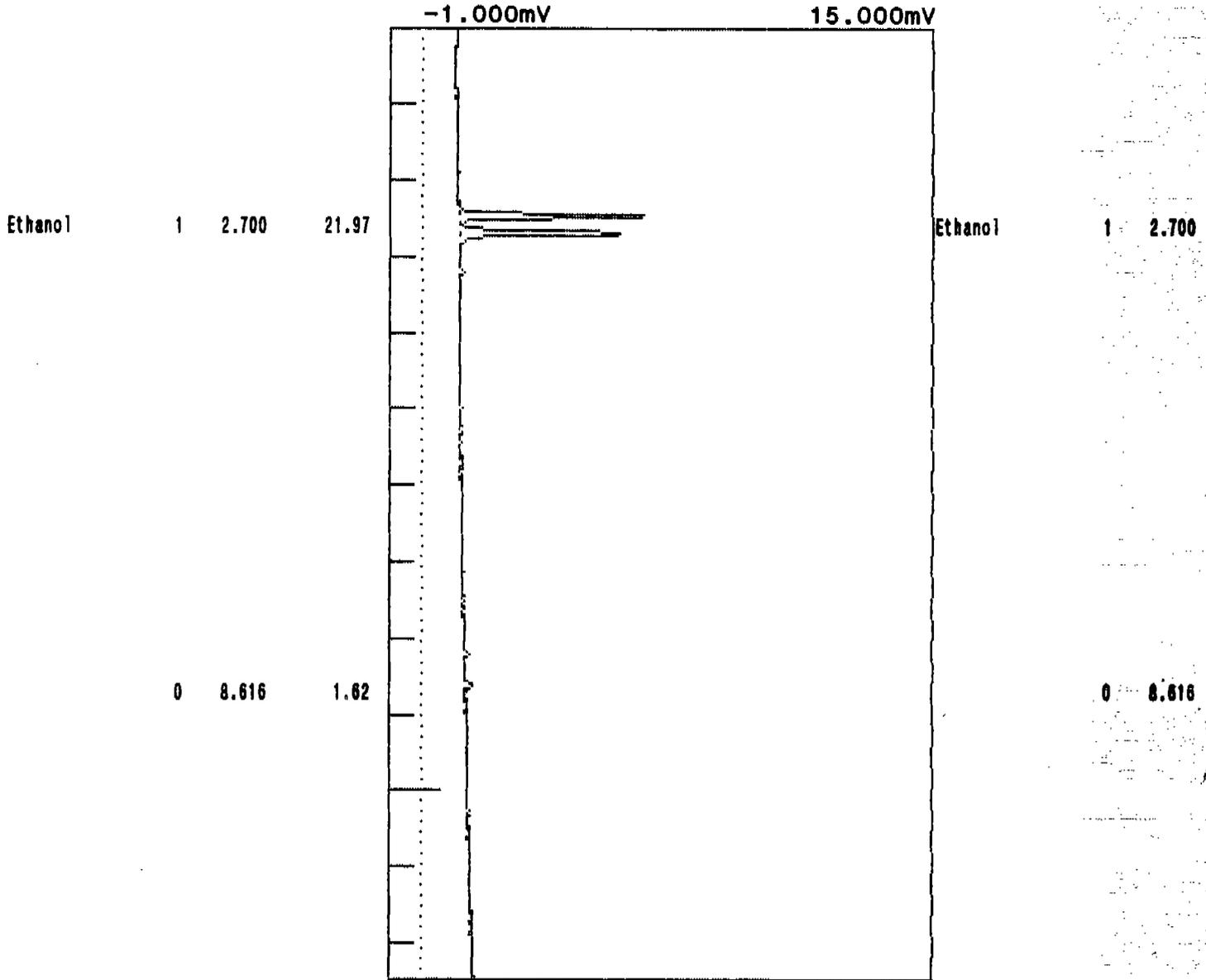
RECOVERY FACTOR

~~$\frac{5.80}{5.31} \times 100 = 1.09$~~

$\frac{5.80 - 5.31}{5.80} + 1 = 1.084$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R21  
 Components : met18  
 Date : 07/26/1994  
 Time : 15:48:21

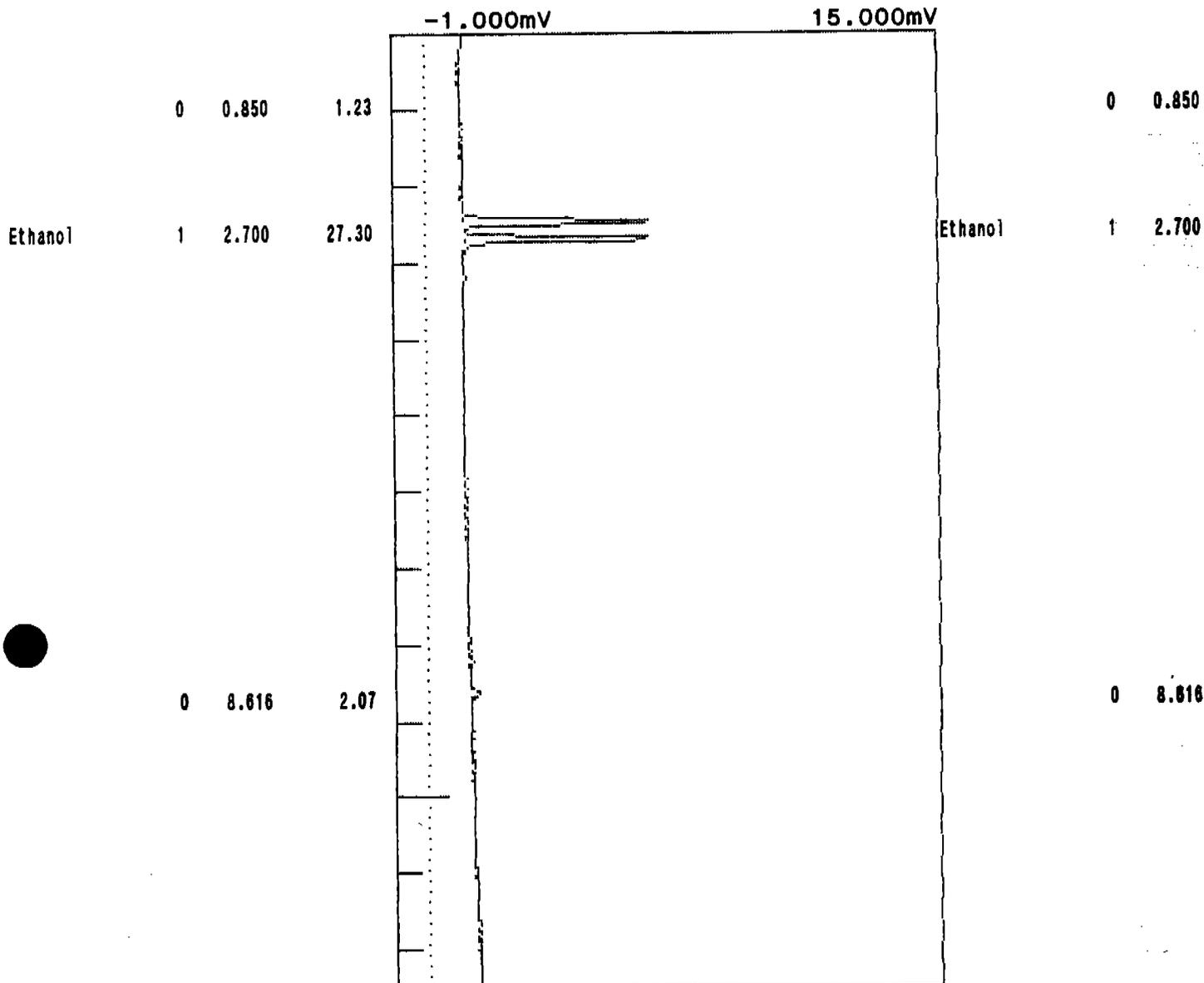
LOCATION NO. 1  
 VENT NO. 1 RUMEZ  
 1<sup>st</sup> INJECTION



Component	Number	Retention	Area
Ethanol	0	2.483	23.03
	1	2.700	21.97
	0	8.616	1.62
	3		46.62

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R22  
 Components : met18  
 Date : 07/26/1994  
 Time : 16:03:21

LOCATION NO. 1  
 VENT. NO. 1 RUN#2  
 2<sup>ND</sup> INJECTION

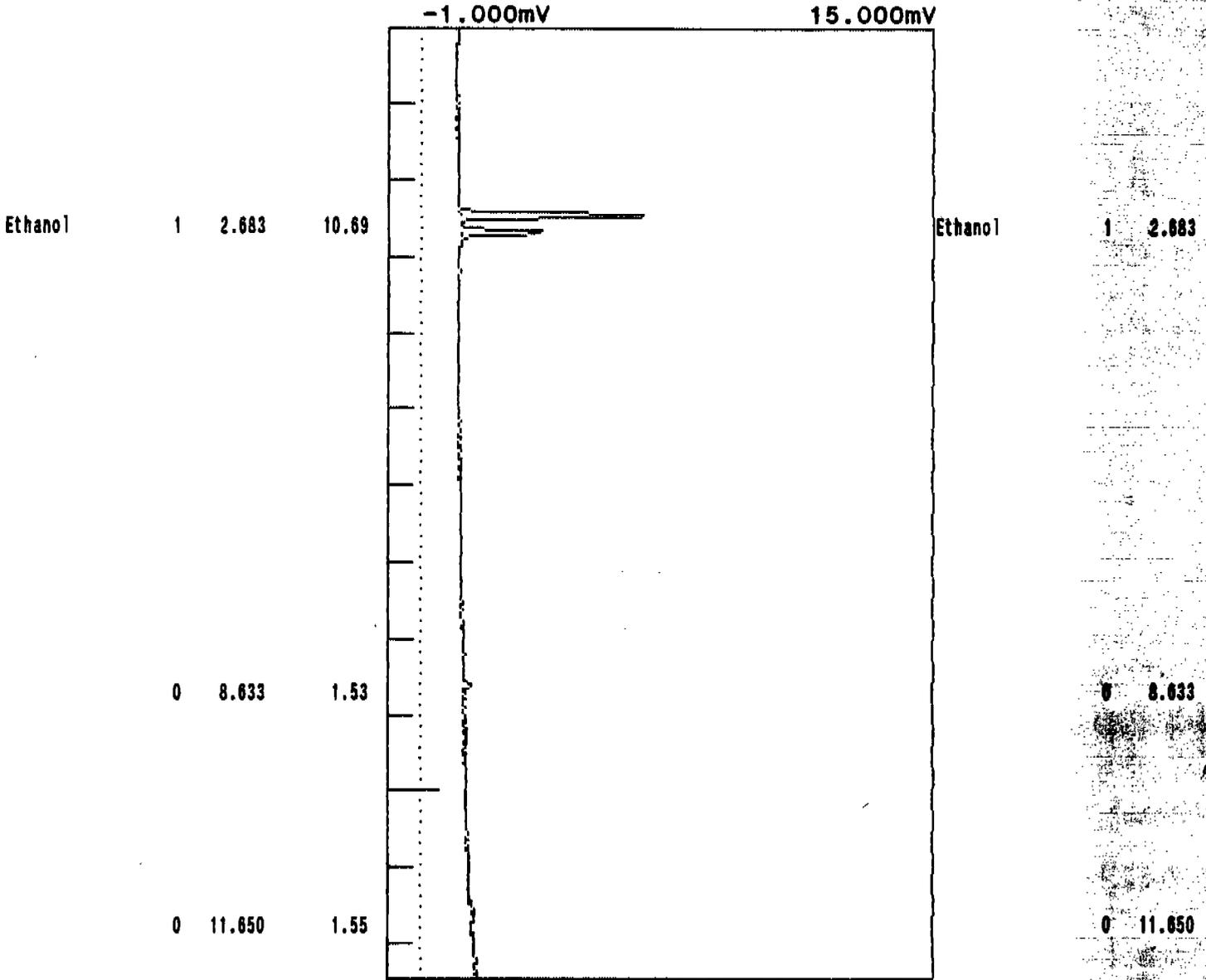


Component	Number	Retention	Area
	0	0.850	1.23
	0	2.483	25.21
Ethanol	1	2.700	27.30
	0	8.616	2.07

4 55.81

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R23  
 Components : met18  
 Date : 07/26/1994  
 Time : 16:18:53

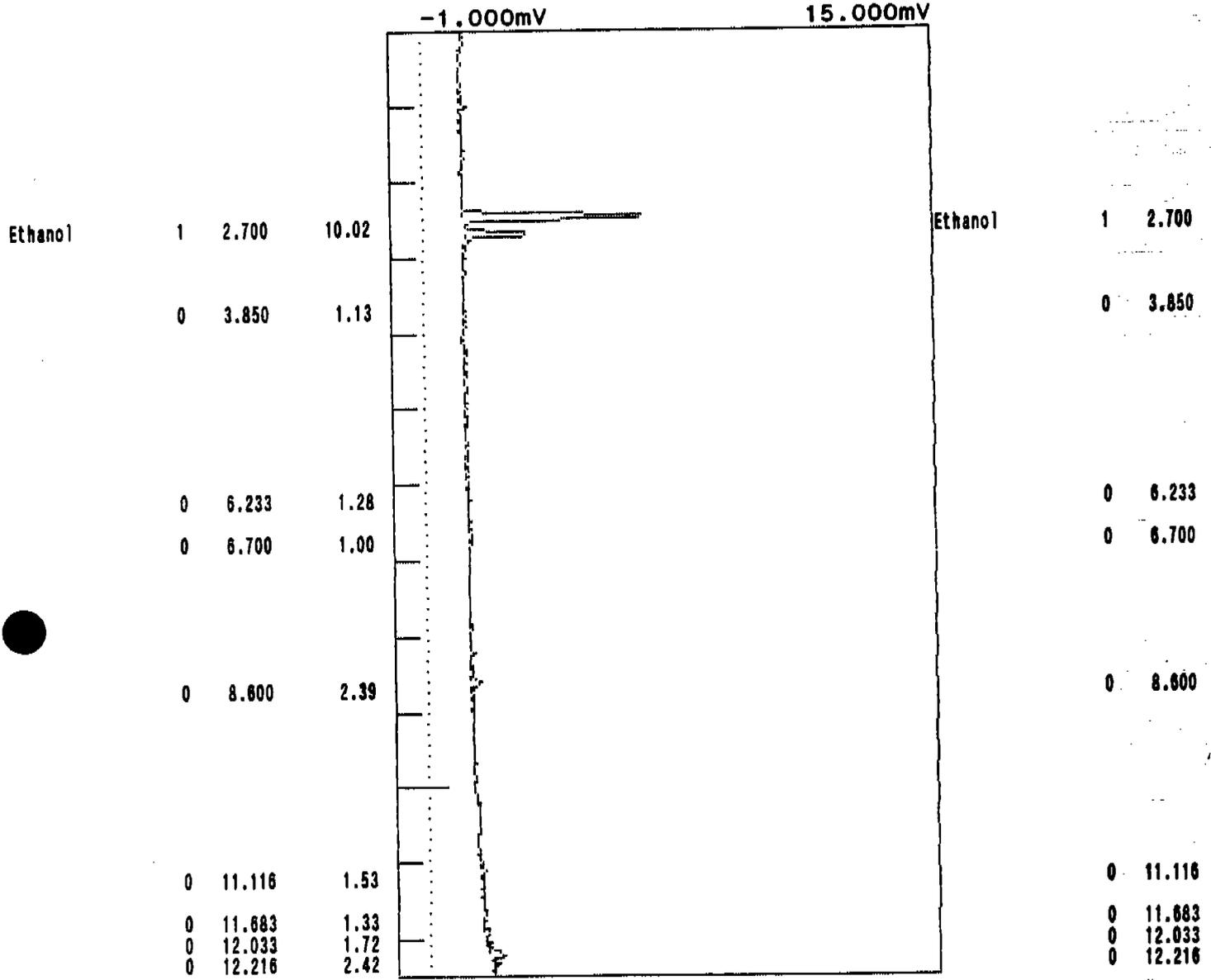
LOCATION NO. 1  
 VENT. NO. 1 RUN# 2  
 300 INJECTION



Component	Number	Retention	Area
Ethanol	0	2.483	25.95
	1	2.683	10.69
	0	8.633	1.53
	0	11.650	1.55
	4		39.72

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R24  
 Components : met18  
 Date : 07/26/1994  
 Time : 16:34:07

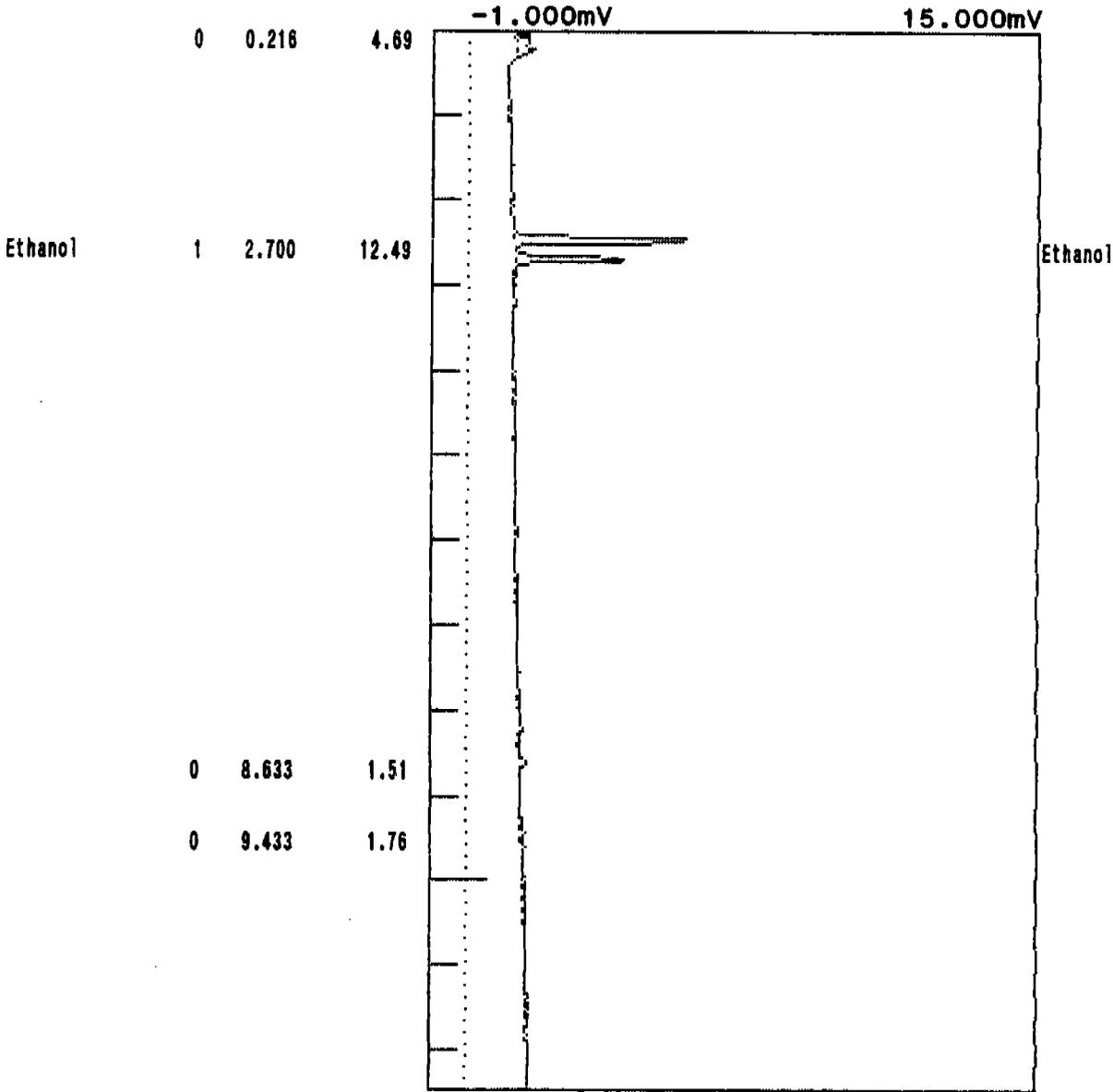
LOCATION NO. 1  
 VENT. NO. 1 RUN# 2  
 4th INJECTION



Component	Number	Retention	Area
Ethanol	0	2.483	25.94
	1	2.700	10.02
	0	3.850	1.13
	0	6.233	1.28
	0	6.700	1.00
	0	8.600	2.39
	0	11.116	1.53
	0	11.683	1.33
	0	12.033	1.72
	0	12.216	2.42

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R21  
 Components : met18  
 Date : 07/26/1994  
 Time : 17:02:28

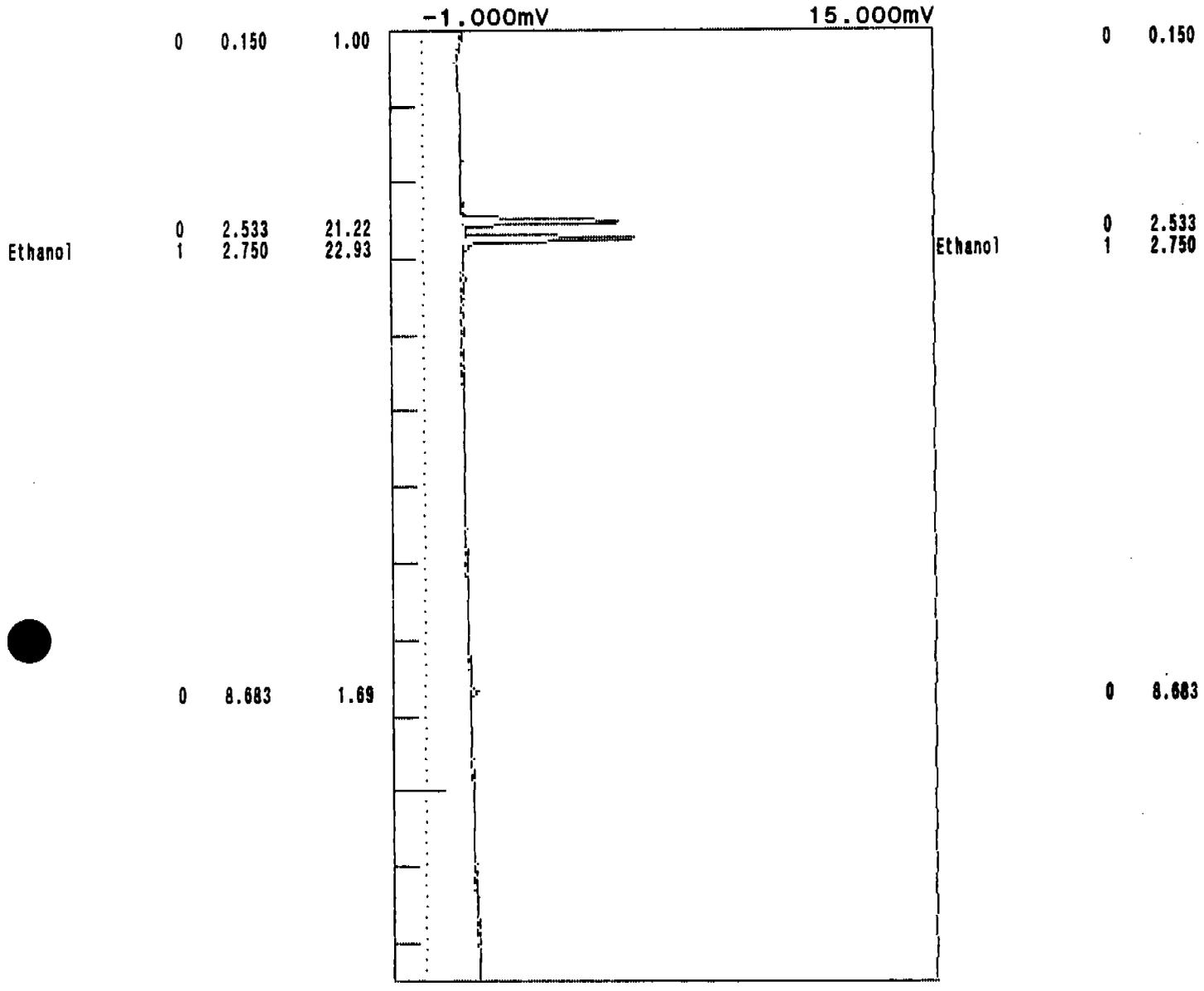
LOCATION No.1  
 VENT#2 RUN#2  
 1ST INJECTION



Component	Number	Retention	Area
Ethanol	0	0.216	4.69
	0	2.483	20.41
	1	2.700	12.49
	0	8.633	1.51
	0	9.433	1.76
	5		40.87

LOCATION NO. 1  
 VENT NO. 2 RUN#2  
 2D INJECTION

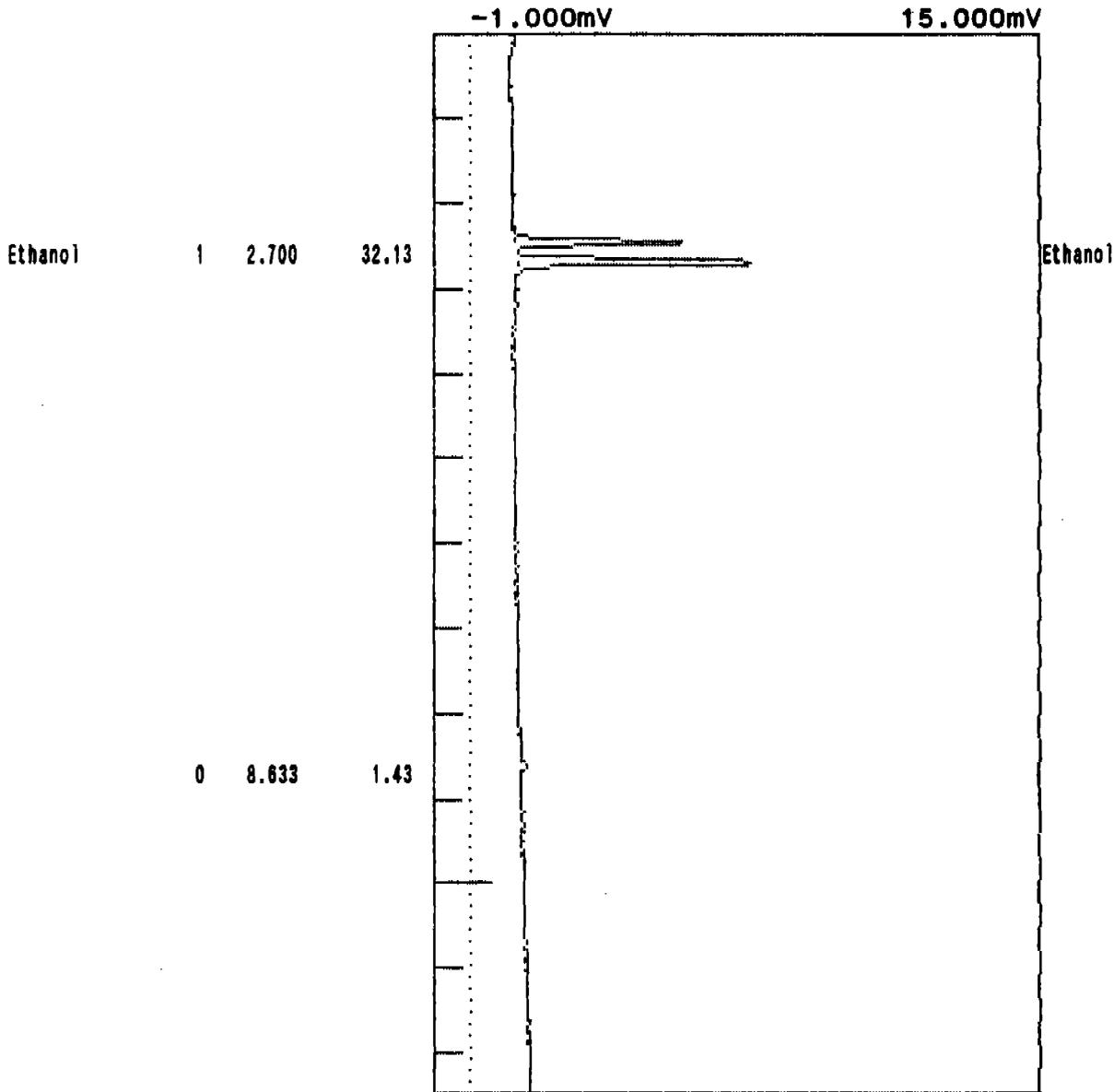
Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R22  
 Components : met18  
 Date : 07/26/1994  
 Time : 17:17:48



Component	Number	Retention	Area
	0	0.150	1.00
	0	2.533	21.22
Ethanol	1	2.750	22.93
	0	8.683	1.69
	4		46.83

LOCATION NO. 1  
 VISIT NO. 2 Run#2  
 3<sup>RD</sup> INJECTION

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R23  
 Components : met18  
 Date : 07/26/1994  
 Time : 17:32:52

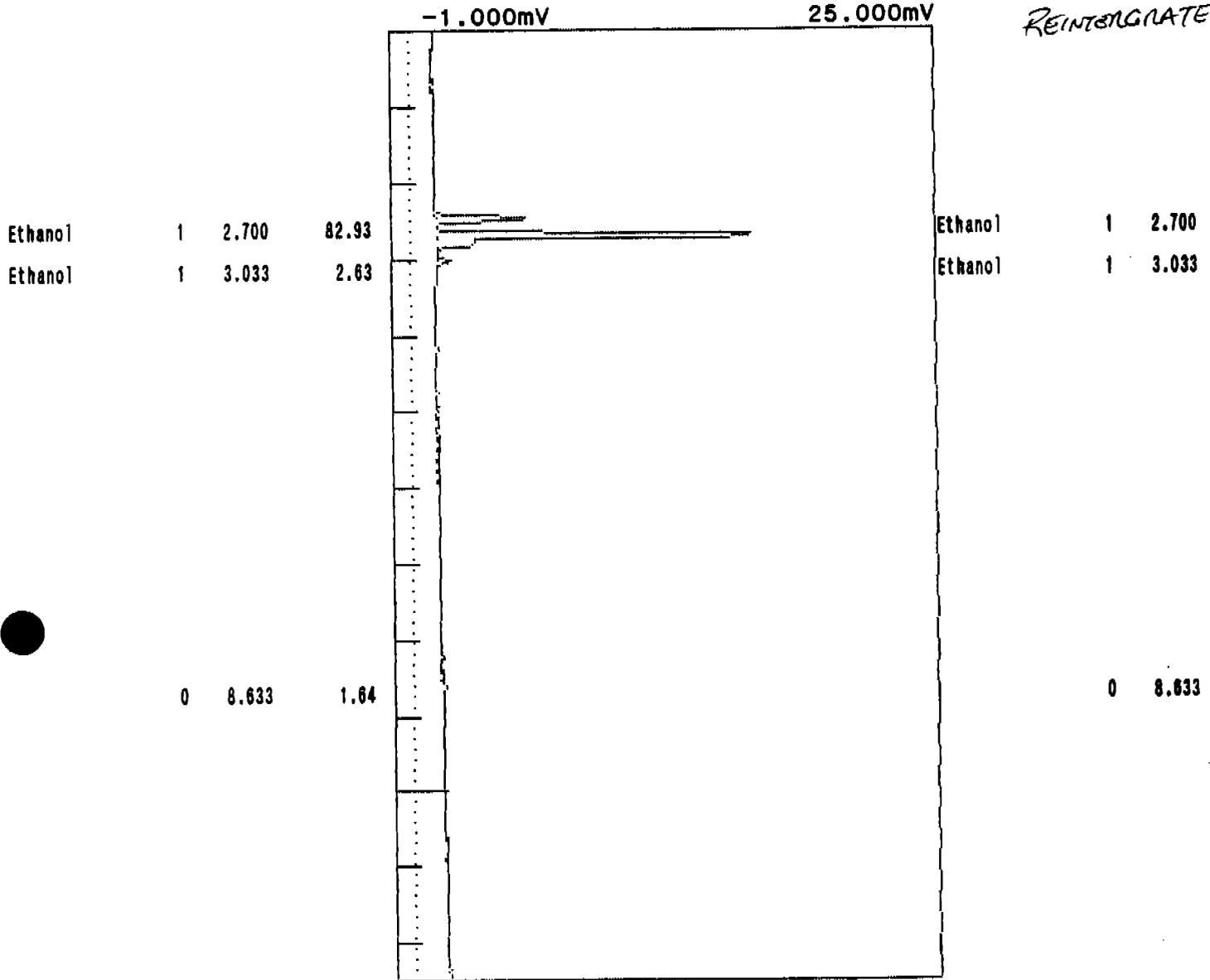


Component	Number	Retention	Area
Ethanol	0	2.483	20.39
	1	2.700	32.13
	0	8.633	1.43
	3		53.96

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R24  
 Components : met18  
 Date : 07/26/1994  
 Time : 17:48:11

LOCATION NO. 1  
 VENT NO. 2 RUN#2  
 4th INJECTION

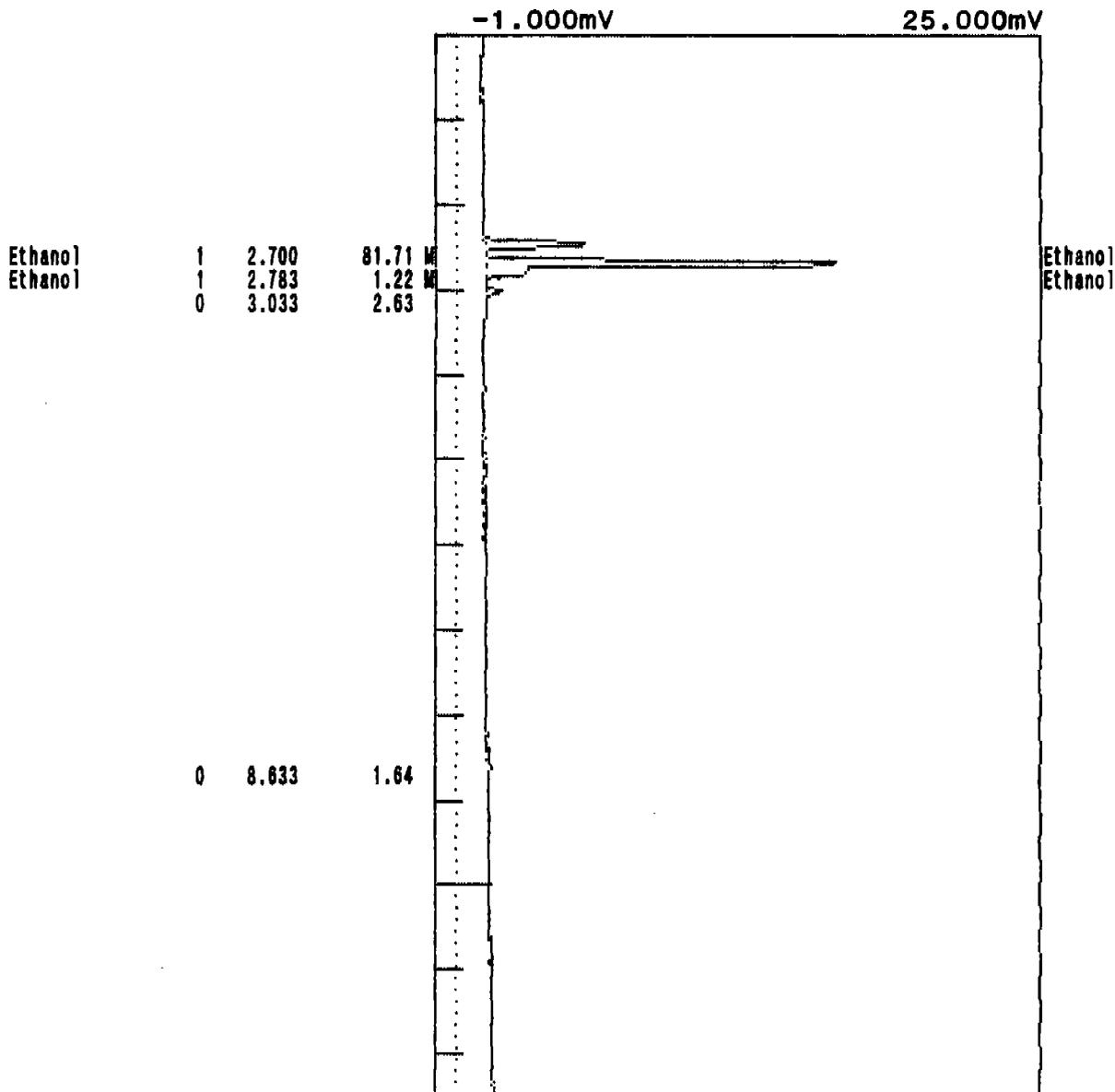
NEEDS TO BE  
 REINTEGRATED



Component	Number	Retention	Area
	0	2.483	21.21
Ethanol	1	2.700	82.93
Ethanol	1	3.033	2.63
	0	8.633	1.64
	4		108.41

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R24  
 Components : met18  
 Date : 07/26/1994  
 Time : 17:48:11

REINTEGRATION  
 LOCATION NO. 1  
 VENT NO. 2 RUN#2  
 4th INJECTION



Component	Number	Retention	Area
	0	2.483	21.21
Ethanol	1	2.700	81.71 M
Ethanol	1	2.783	1.22 M
	0	3.033	2.63
	0	8.633	1.64

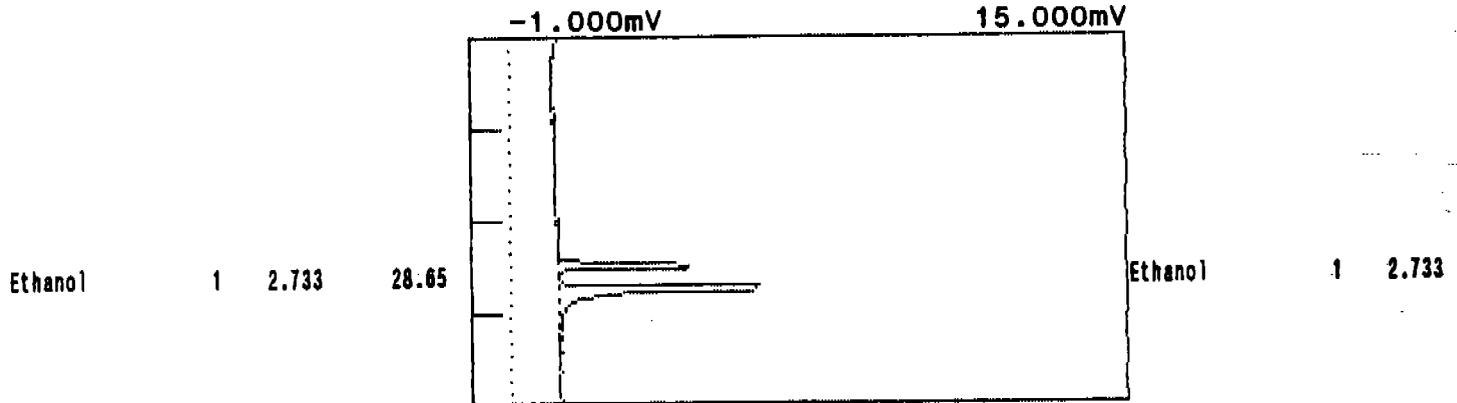
5

108.41

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\R2PC1  
 Components : met18  
 Date : 07/26/1994  
 Time : 18:14:21

PERFORMANCE CHECK  
 RUN#2  
 1st INJECTION  
 STD = 5.80 PPM

$$\text{RECOVERY} = \frac{5.16}{5.80} \times 100 = 89.0\%$$



Component	Number	Retention	Area
Ethanol	0	2.500	12.89
	1	2.733	28.65
	2		41.54

5.16 PPM

RECOVERY FACTOR

$$\frac{5.8 - 5.16}{5.8} \times 100 = 1.11$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\R2PC2  
 Components : met18  
 Date : 07/26/1994  
 Time : 18:20:15

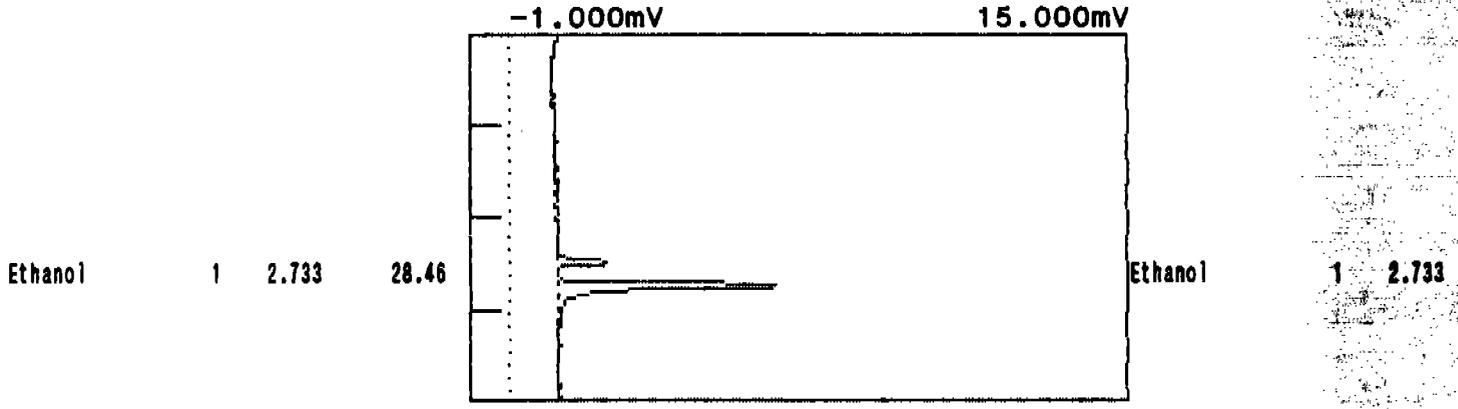
PERFORMANCE CHECK

RUN #2

2<sup>ND</sup> INJECTION

STD = 5.80 PPM

$$\text{RECOVERY} = \frac{5.01}{5.80} \times 100 = 86$$



Component	Number	Retention	Area
Ethanol	0	2.500	5.51
	1	2.733	28.46
	2		33.97

5.01 ppm

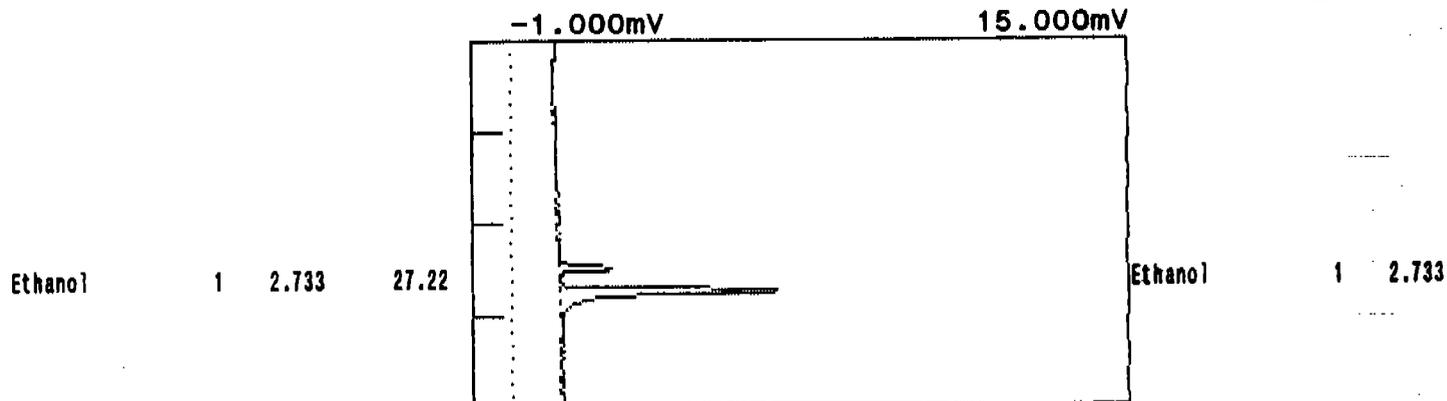
RECOVERY FACTOR

$$\frac{5.80 - 5.01}{5.80} + 1 = 1.14$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\R2PC3  
 Components : met18  
 Date : 07/26/1994  
 Time : 18:27:03

PERFORMANCE CHECK  
 RUN # 2  
 3<sup>RD</sup> INJECTION  
 STD = 5.80 PPM

$$\text{RECOVERY} = \frac{4.85}{5.80} \times 100 = 83.6\%$$



Component	Number	Retention	Area
Ethanol	0	2.500	5.70
	1	2.733	27.22
	2		32.92

4.85 ppm

RECOVERY FACTOR

$$\frac{5.80 - 4.85}{5.80} + 1 = 1.14$$

PERFORMANCE CHECK

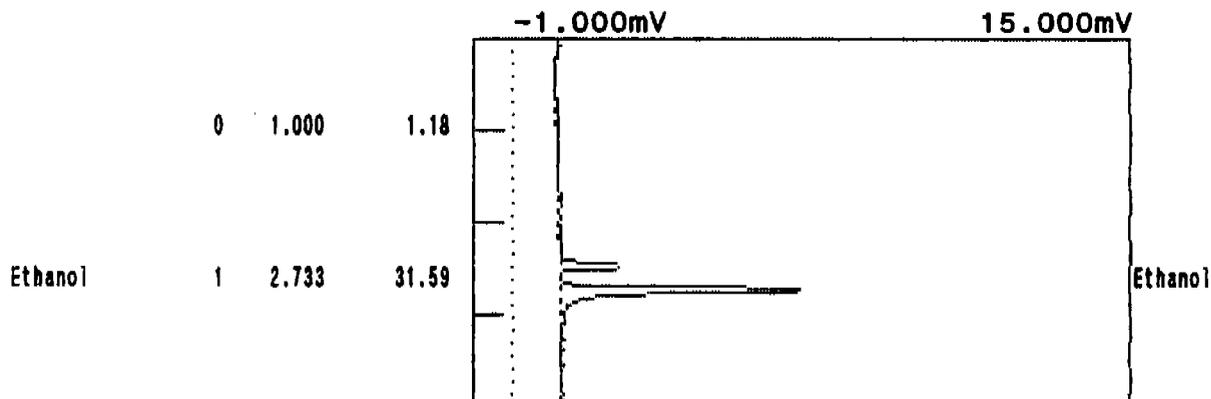
RUN #2

4th INJECTION

STD = 5.80ppm

RECOVERY =  $\frac{5.62}{5.80} \times 100 = 97\%$

Operator : Gary Mata  
Description : FID  
File : D:\21691\R2PC4  
Components : met18  
Date : 07/26/1994  
Time : 18:32:59



Component	Number	Retention	Area
	0	1.000	1.18
	0	2.483	7.04
Ethanol	1	2.733	31.59
	3		39.81

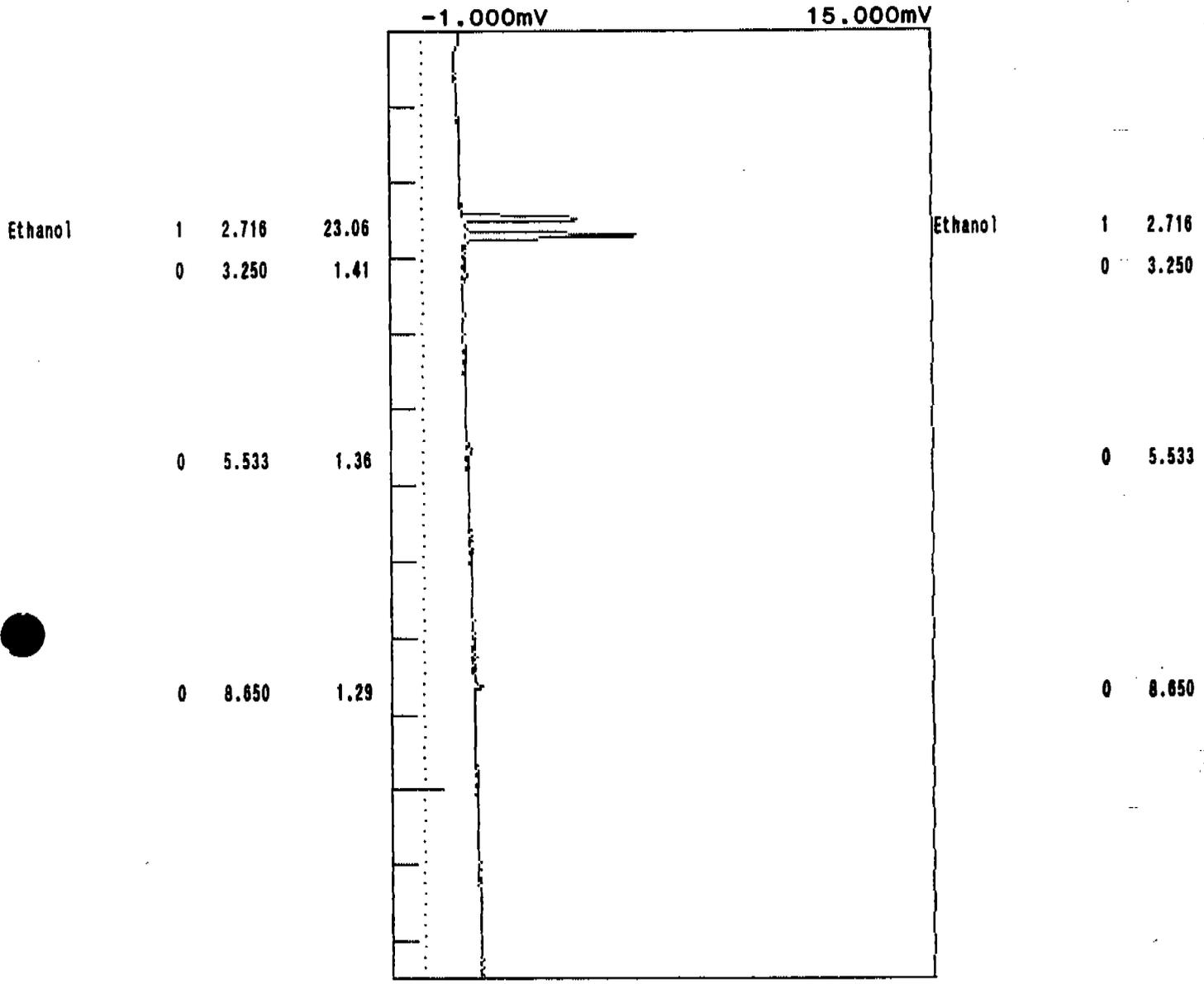
5.62 ppm

RECOVERY FACTOR

$\frac{5.8 - 5.62}{5.8} + 1 = 1.03$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R31  
 Components : met18  
 Date : 07/26/1994  
 Time : 18:56:40

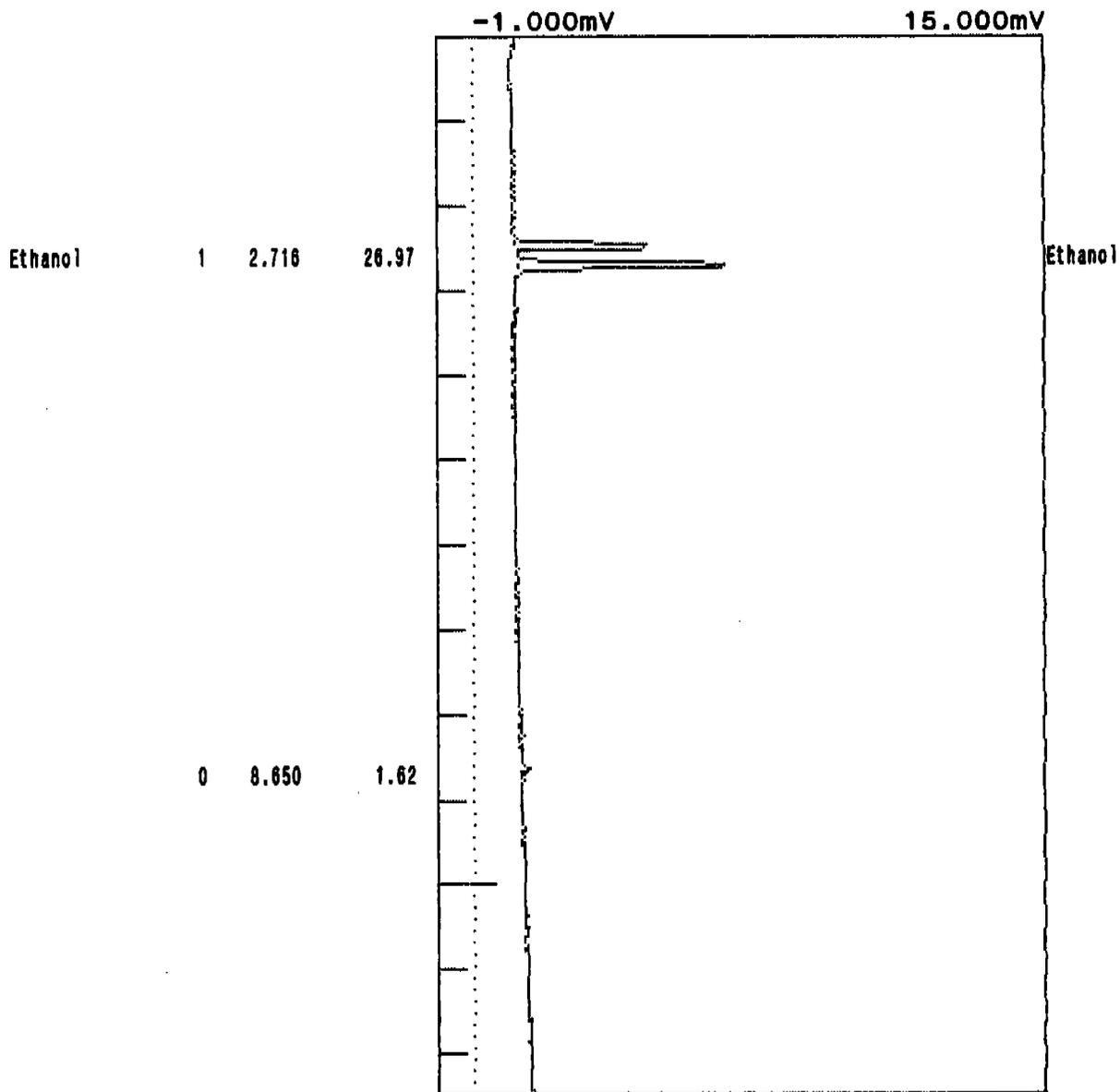
LOCATION NO.1  
 VENT NO.1 RUN#3  
 1st INJECTION



Component	Number	Retention	Area
Ethanol	0	2.483	14.33
	1	2.716	23.06
	0	3.250	1.41
	0	5.533	1.36
	0	8.650	1.29
	5		41.45

LOCATION NO. 1  
VENT NO. 1 RUN# 3  
JND INJECTION

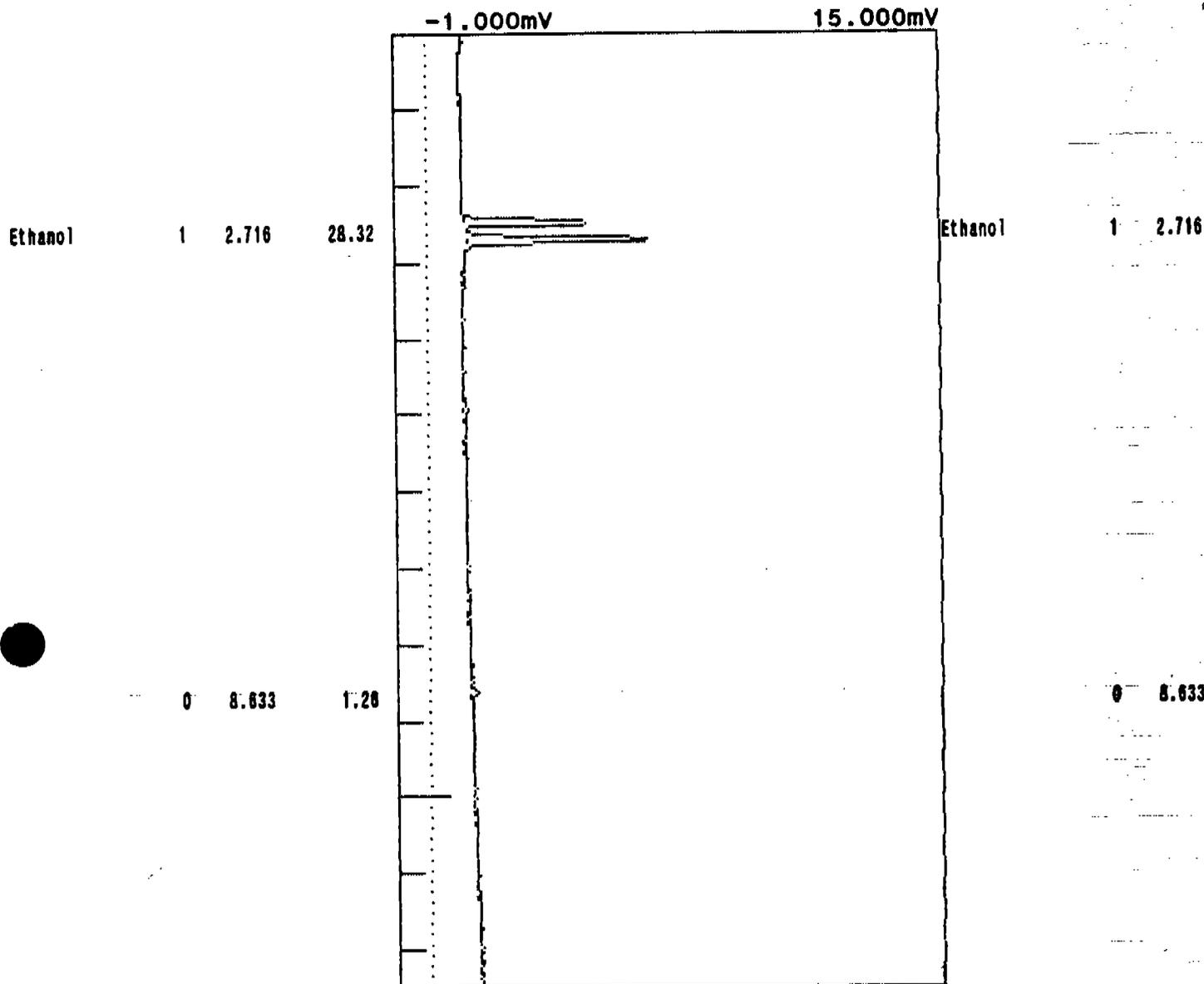
Operator : Gary Mata  
Description : FID  
File : D:\21691\V1R32  
Components : met18  
Date : 07/26/1994  
Time : 19:11:32



Component	Number	Retention	Area
Ethanol	0	2.483	17.75
	1	2.716	26.97
	0	8.650	1.62
	3		46.34

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R33  
 Components : met18  
 Date : 07/26/1994  
 Time : 19:26:30

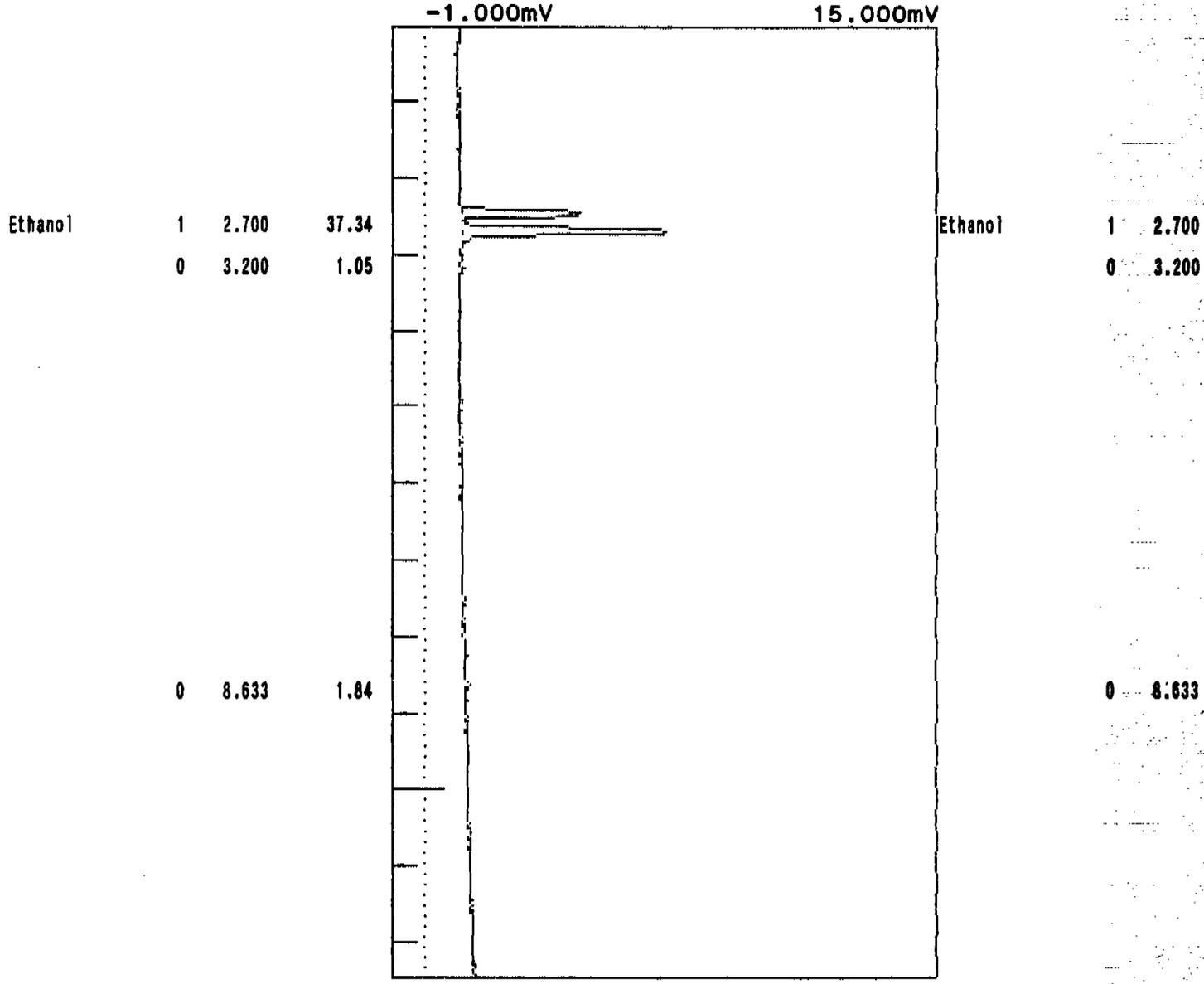
LOCATION NO. 1  
 VENT NO. 1 RUN #3  
 3<sup>RD</sup> INJECTION



Component	Number	Retention	Area
Ethanol	0	2.483	17.41
	1	2.716	28.32
	0	8.633	1.26
	3		46.99

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V1R34  
 Components : met18  
 Date : 07/26/1994  
 Time : 19:42:03

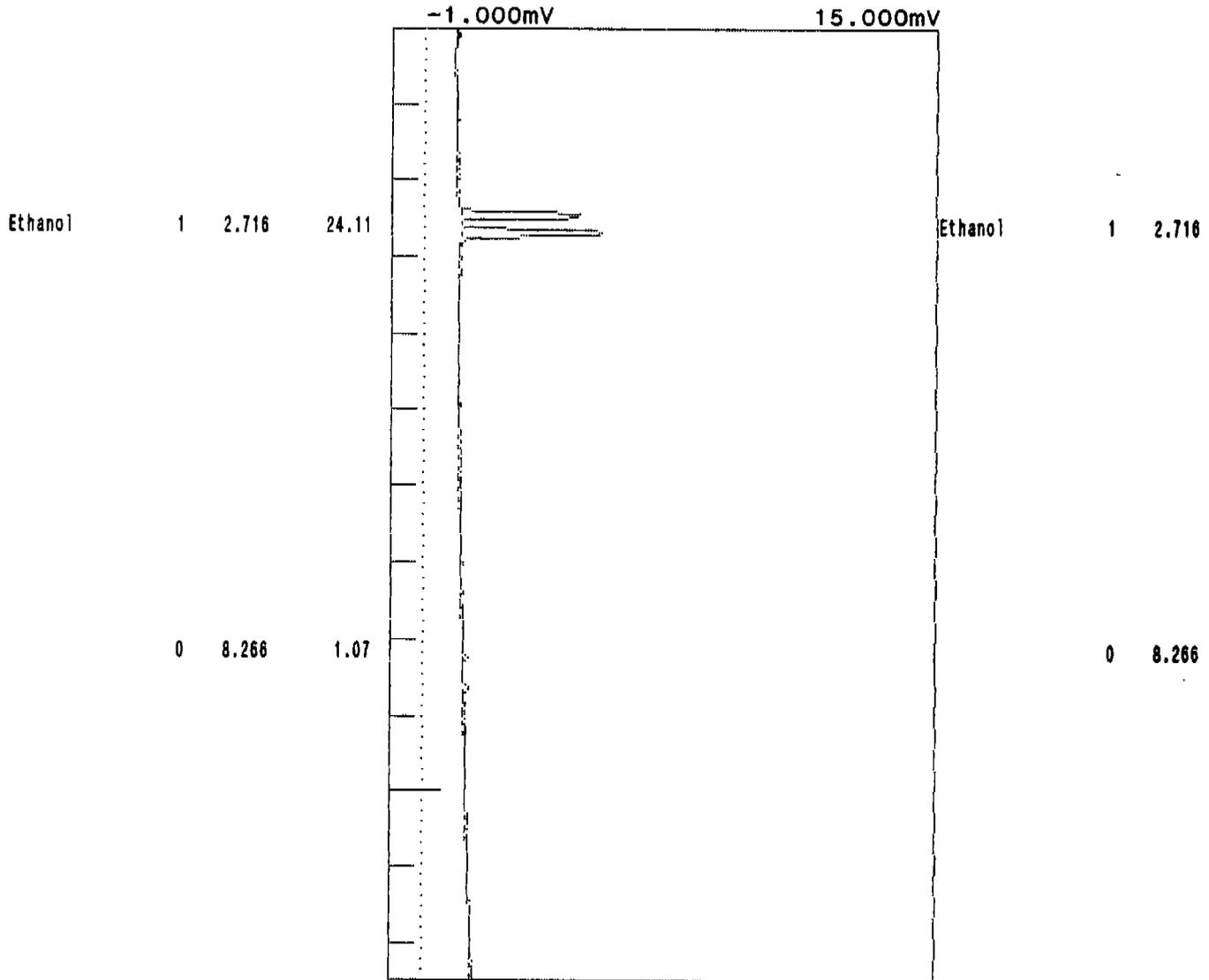
LOCATION NO. 1  
 VENT NO. 1 RUN# 3  
 4th INJECTION



Component	Number	Retention	Area
	0	2.466	19.77
Ethanol	1	2.700	37.34
	0	3.200	1.05
	0	8.633	1.84
	4		60.01

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R31  
 Components : met18  
 Date : 07/26/1994  
 Time : 20:03:26

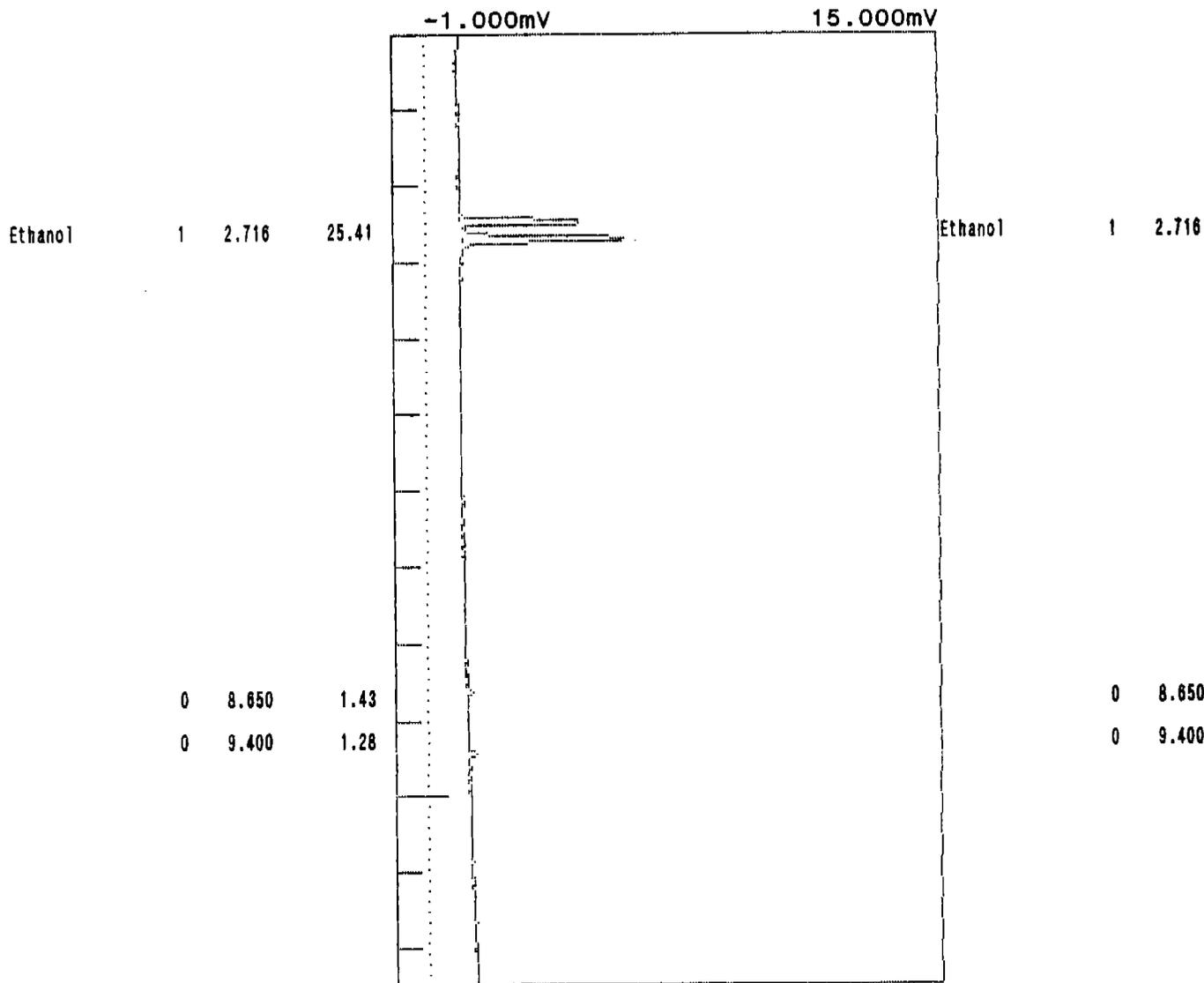
LOCATION NO.1  
 VENT NO. 2 RUN#3  
 (SI INJECTION)



Component	Number	Retention	Area
Ethanol	0	2.483	18.54
	1	2.716	24.11
	0	8.266	1.07
	3		43.73

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R32  
 Components : met18  
 Date : 07/26/1994  
 Time : 20:18:22

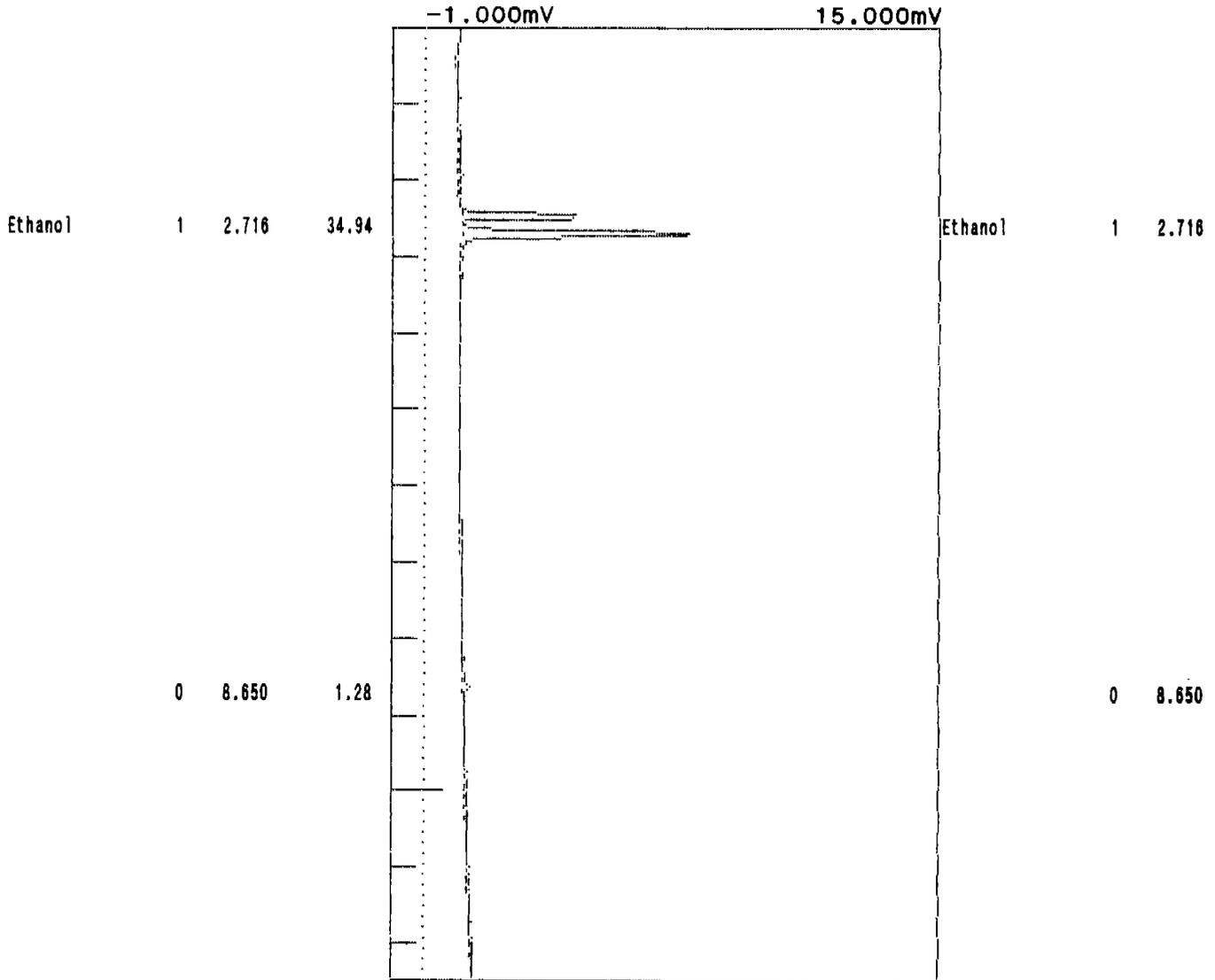
LOCATION NO. 1  
 VENT NO. 2 RUN#3  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area
	0	2.483	18.02
Ethanol	1	2.716	25.41
	0	8.650	1.43
	0	9.400	1.28
	4		46.14

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R33  
 Components : met18  
 Date : 07/26/1994  
 Time : 20:33:24

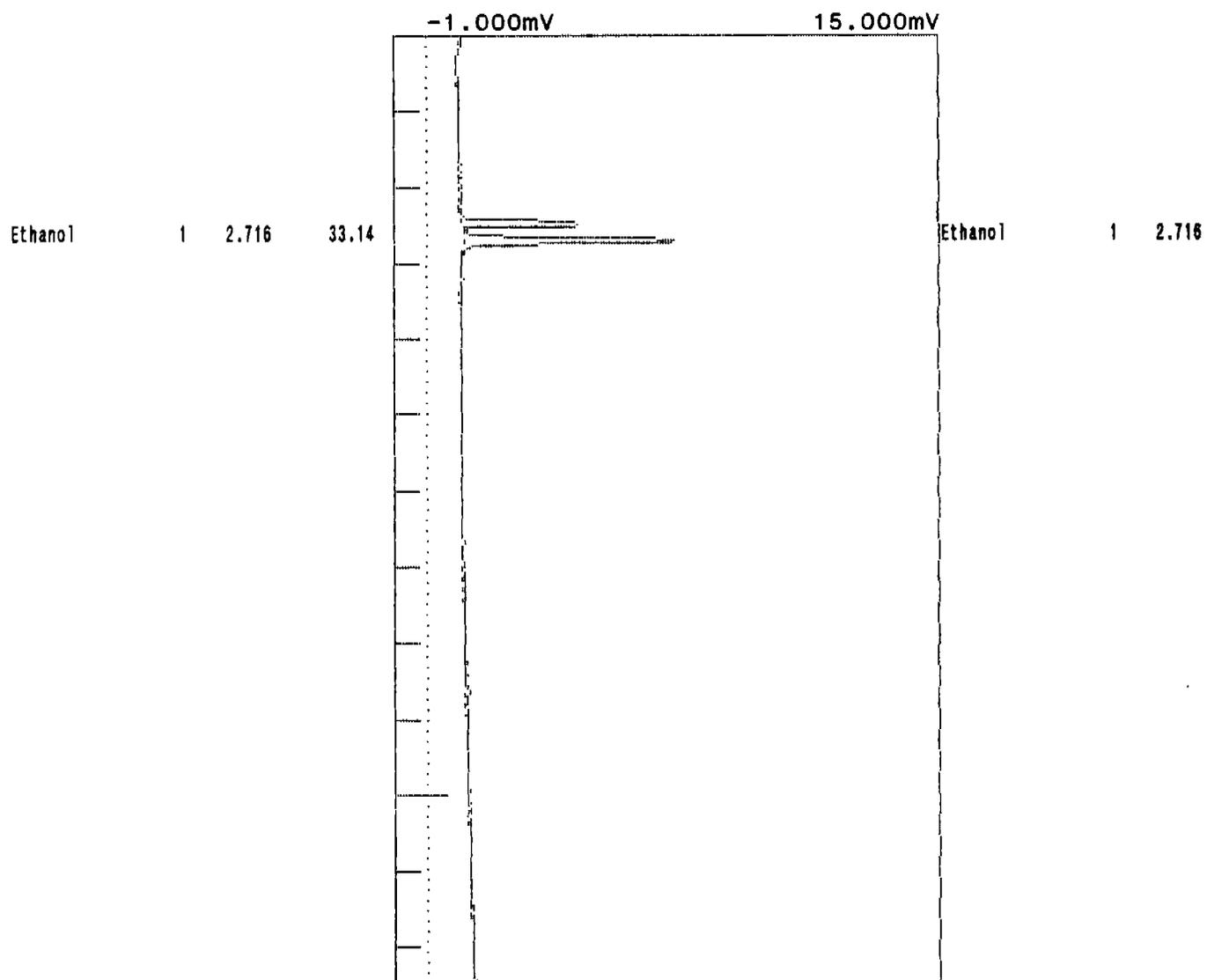
LOCATION NO. 1  
 VENT NO. 2 RUN# 3  
 3<sup>RD</sup> INJECTION



Component	Number	Retention	Area
Ethanol	0	2.483	17.04
	1	2.716	34.94
	0	8.650	1.28
	3		53.26

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\V2R34  
 Components : met18  
 Date : 07/26/1994  
 Time : 20:49:04

LOCATION NO. 1  
 VENT NO. 2 RUN #3  
 4th INJECTION

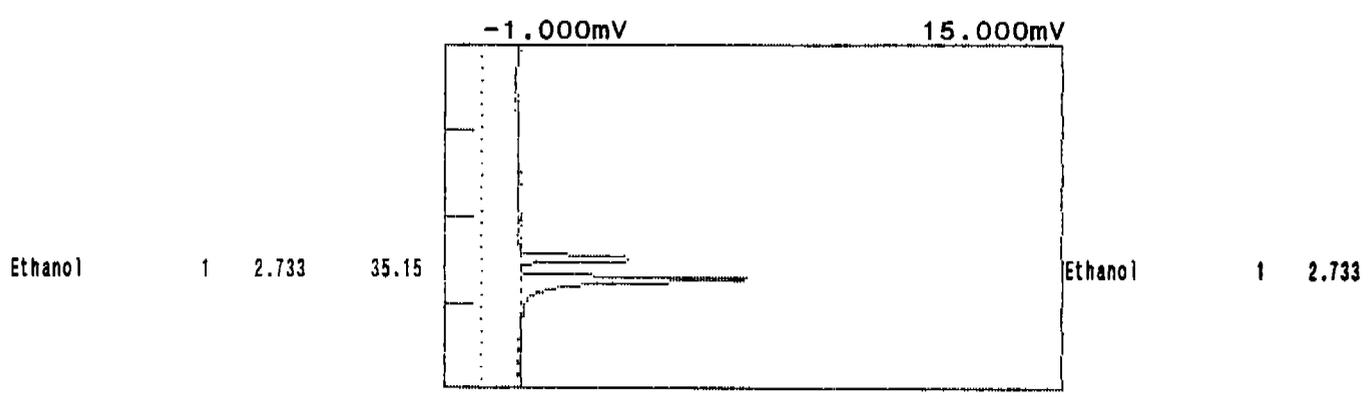


Component	Number	Retention	Area
	0	2.483	17.89
Ethanol	1	2.716	33.14
	2		51.03

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\R3PC1  
 Components : met18  
 Date : 07/26/1994  
 Time : 21:06:06

PERFORMANCE CHECK  
 RUN #3  
 1ST INJECTION  
 STD = 5.80PPM

RECOVERY =  $\frac{6.08}{5.80} \times 100 = 1.05\%$



Component	Number	Retention	Area
Ethanol	0	2.483	15.69
	1	2.733	35.15
	2		50.84

6.01ppm

RECOVERY FACTOR

$$\frac{6.01 - 5.80}{5.80} + 1 = 1.04$$

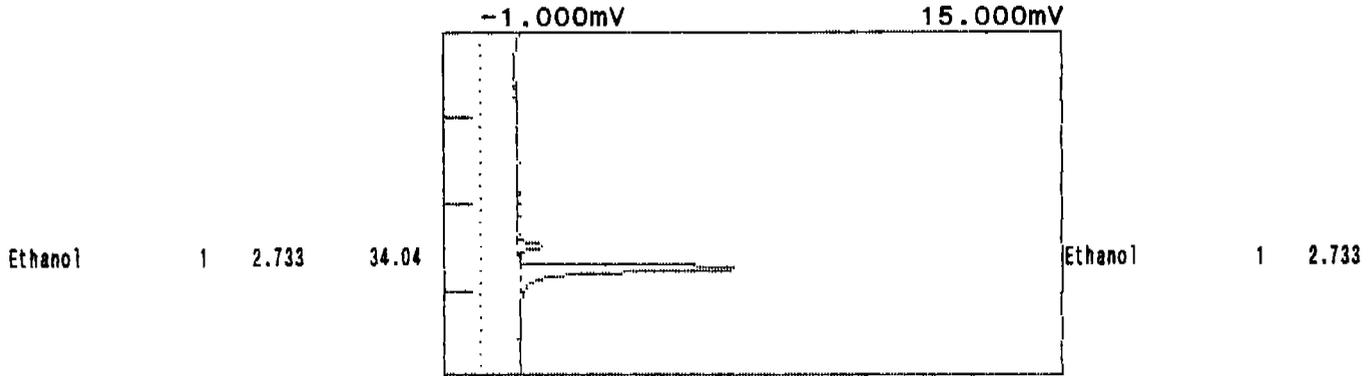
GM

$$\frac{5.80 - 6.01}{5.80} + 1 = 0.96$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\R3PC2  
 Components : met18  
 Date : 07/26/1994  
 Time : 21:12:31

PERFORMANCE CHECK  
 RUN#3  
 2ND INJECTION  
 STD = 5.80 PPM

$$\text{RECOVERY} = \frac{5.93}{5.80} \times 100 = 102.22\%$$



Component	Number	Retention	Area
<del>Ethanol</del>	1	2.516	3.43
Ethanol	1	2.733	34.04
	2		37.47

*5.93 ppm*

RECOVERY FACTOR

$$\frac{5.93 - 5.80}{5.80} + 1 = 1.02$$

$$\frac{5.80 - 5.93}{5.8} + 1 = 0.98$$

Performance Checks					DILUTION FACTOR
					1.00
Vents 1,2 - 1	1152	36	6.15	1.000	6.15
Vents 1,2 - 2	1157	35	6.01	1.000	6.01
Vents 1,2 - 3	1203	36	6.15	1.000	6.15
Vents 3,4 - 1	1509	16	3.41	1.000	3.41
Vents 3,4 - 2	1515	20	3.96	1.000	3.96
Vents 3,4 - 3	1522	19	3.82	1.000	3.82
Vents 3,4 - 4	1528	19	3.82	1.000	3.82
Vents 3,4 - 5	1540	27	4.92	1.000	4.92
Vents 3,4 - 6	1546	17	3.55	1.000	3.55
Vents 3,4 - 7	1608	29	5.19	1.000	5.19
Vents 3,4 - 8	1622	27	4.92	1.000	4.92
Vents 3,4 - 9	1628	28	5.05	1.000	5.05
Vent 5 - 1	1827	41	6.84	1.000	6.84
Vent 5 - 2	1833	41	6.84	1.000	6.84
Vent 5 - 3	1839	40	6.70	1.000	6.70
		Average	5.15		5.15

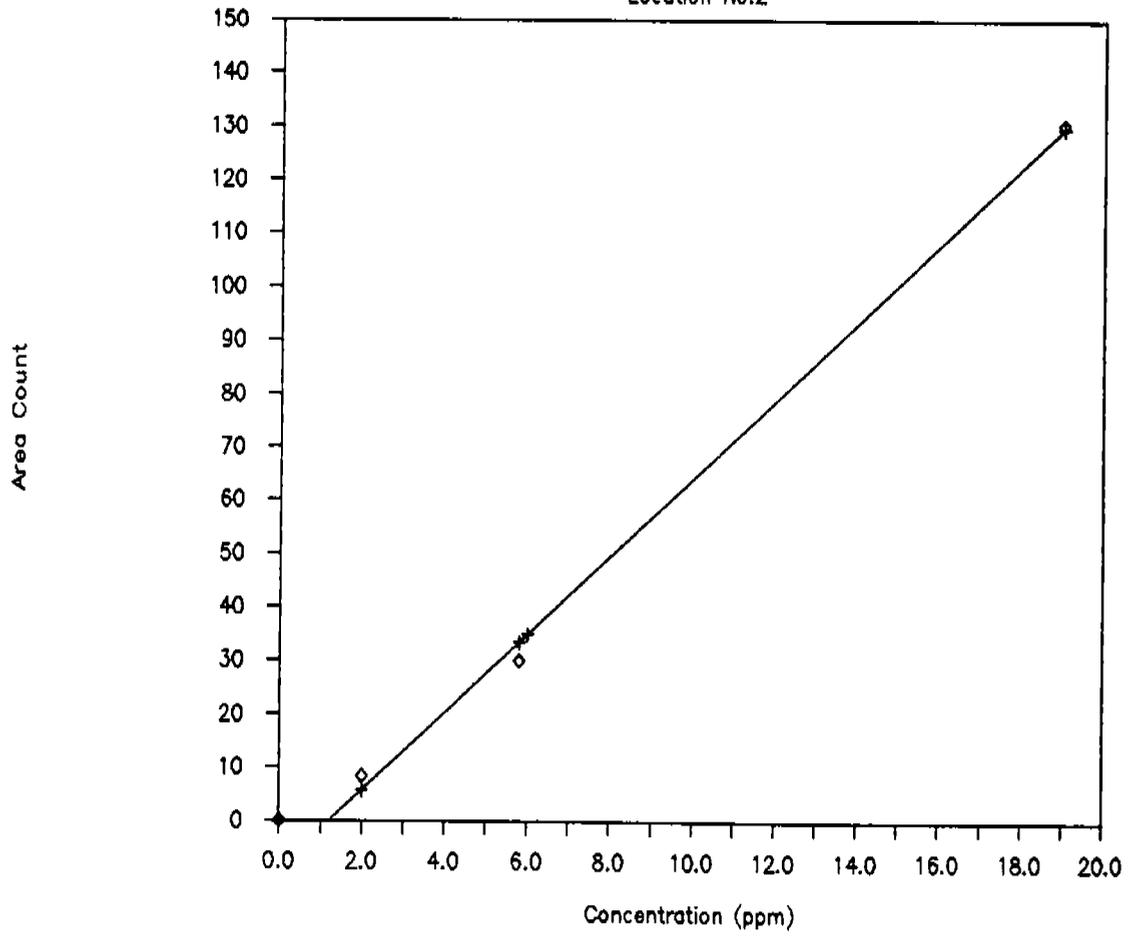
Ethanol  
-----  
2.000    8.40  
5.800    30.00  
19.000   130.50

ETHANOL  
Regression Output:  
Constant            -8.863138  
Std Err of Y Est    4.4280966  
R Squared            0.9976909  
No. of Observations    3  
Degrees of Freedom    1

X Coefficient(s)    7.294  
Std Err of Coef.    0.35092

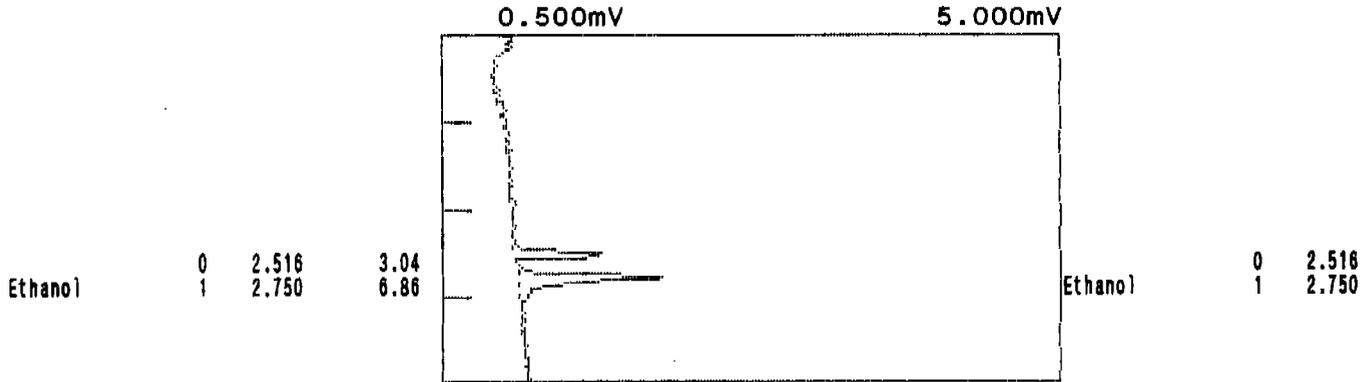
# ETHANOL

Location No.2



Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2LC1  
 Components :  
 Date : 07/27/1994  
 Time : 07:31:08

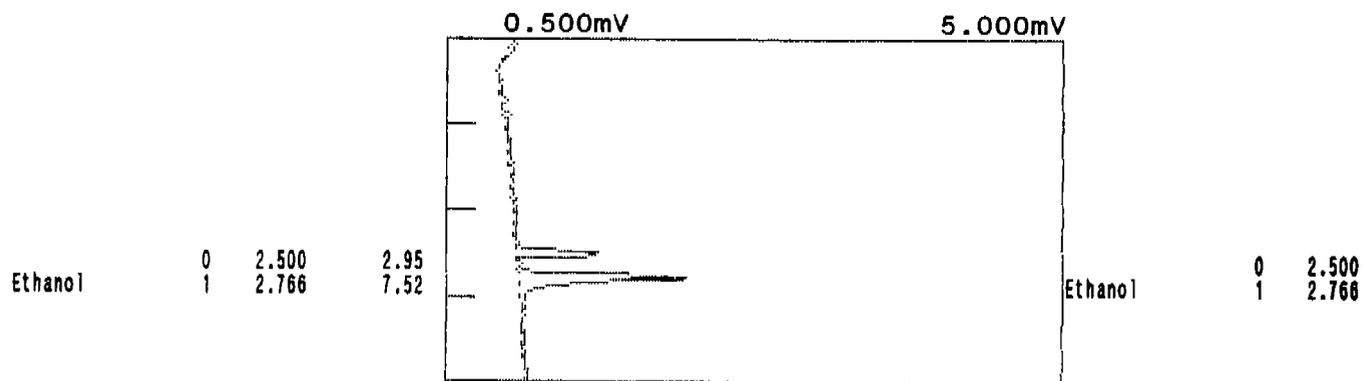
LOCATION  
 Low CAL STD.  
 2.00 PPM  
 LOCATION NO. 2



Component	Number	Retention	Area	Units
Ethanol	1	2.750	6.86	
	1		6.86	

Operator : Gary Mata  
 Description : FID  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 07:37:02

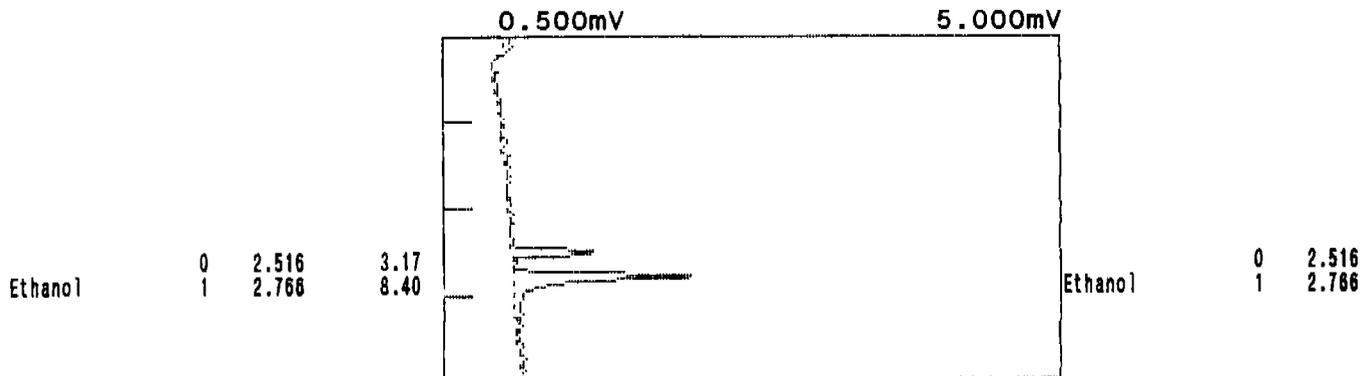
LOCATION NO. 2  
 Low CAL STD  
 2.00 ppm



Component	Number	Retention	Area	Units
Ethanol	0	2.500	2.95	
Ethanol	1	2.766	7.52	
	2		10.47	

Operator : Gary Mata  
 Description : FID  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 07:42:49

LOCATION NO. 2  
 LOW CAL STD  
 2.00PPM



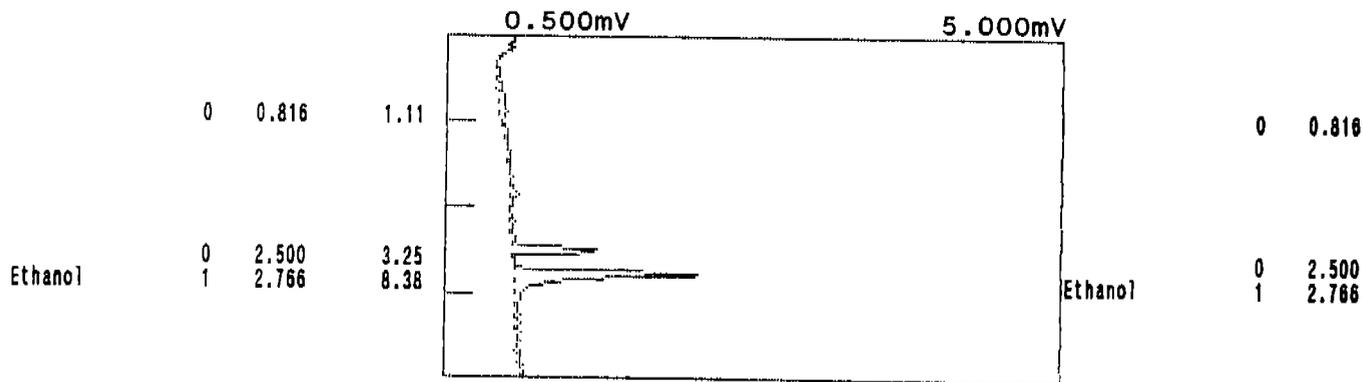
Ethanol 0 2.516 3.17  
 1 2.766 8.40

Ethanol 0 2.516  
 1 2.766

Component	Number	Retention	Area	Units
Ethanol	0	2.516	3.17	
	1	2.766	8.40	
	2		11.57	

Operator : Gary Mata  
 Description : FID  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 07:48:39

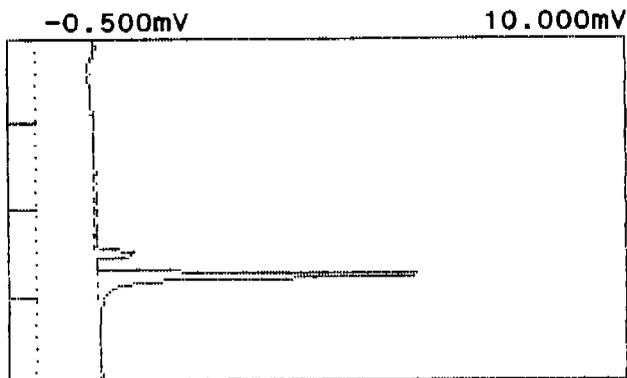
LOCATION NO. 2  
 LOW CAL STD.  
 2.00 PPM



Component	Number	Retention	Area	Units
Ethanol	0	0.816	1.11	
	0	2.500	3.25	
	1	2.766	8.38	
	3		12.75	

Operator : Gary Mata  
 Description : FID  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 07:56:02

LOCATION NO. 2  
 MID CAL STD.  
 5.80 ppm



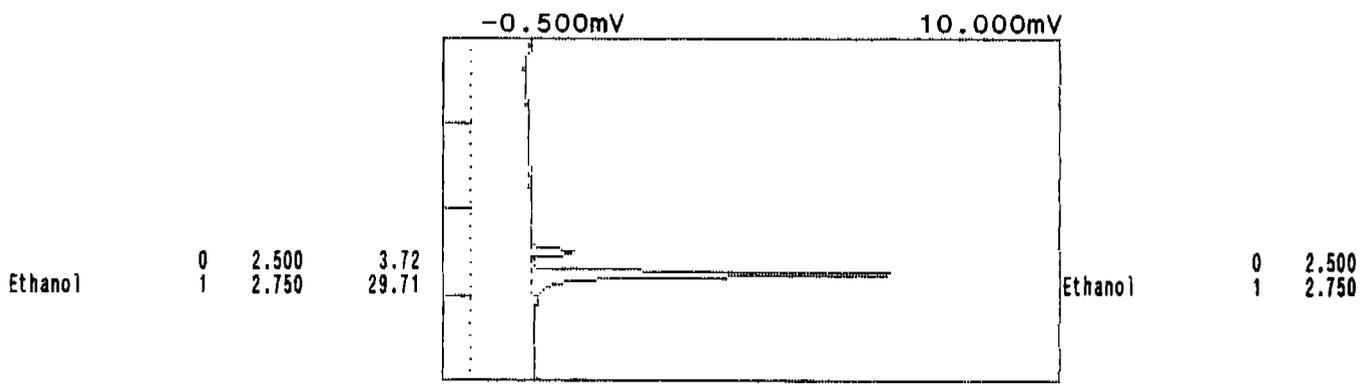
Ethanol 0 2.516 3.85  
 1 2.750 27.55

Ethanol 0 2.516  
 1 2.750

Component	Number	Retention	Area	Units
Ethanol	0	2.516	3.85	
	1	2.750	27.55	
	2		31.40	

Operator : Gary Mata  
 Description : FID  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 08:01:34

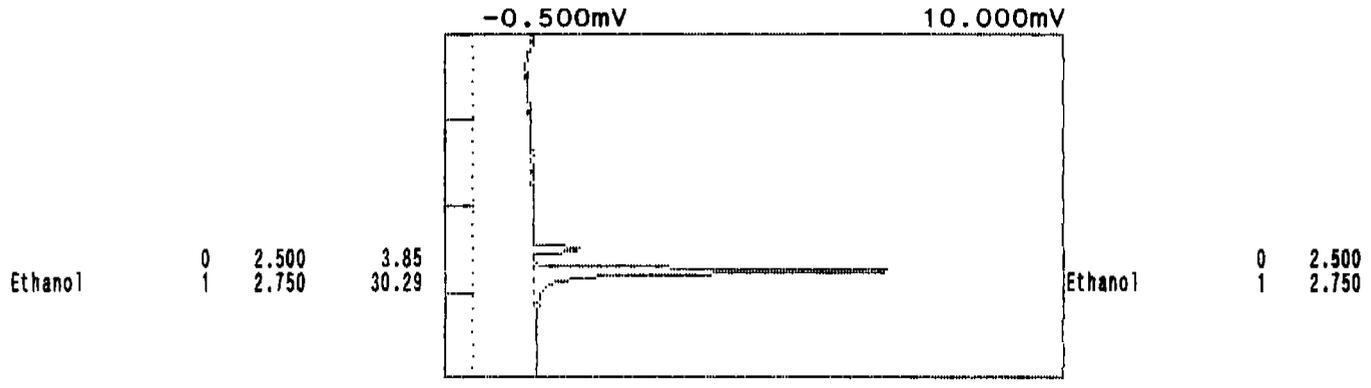
LOCATION NO. 2  
 MID CAL STD.  
 5.80 PPM



Component	Number	Retention	Area	Units
Ethanol	0	2.500	3.72	
	1	2.750	29.71	
	2		33.43	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2MC3  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 08:07:42

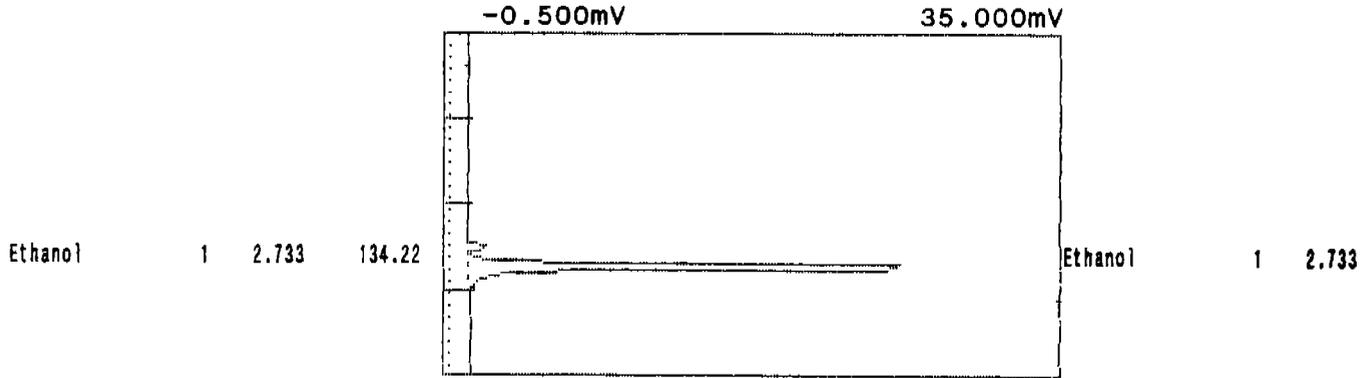
LOCATION NO. 2  
 MID CAL STD.  
 5.80 ppm



Component	Number	Retention	Area	Units
Ethanol	0	2.500	3.85	
	1	2.750	30.29	
	2		34.14	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2HC1  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 08:26:18

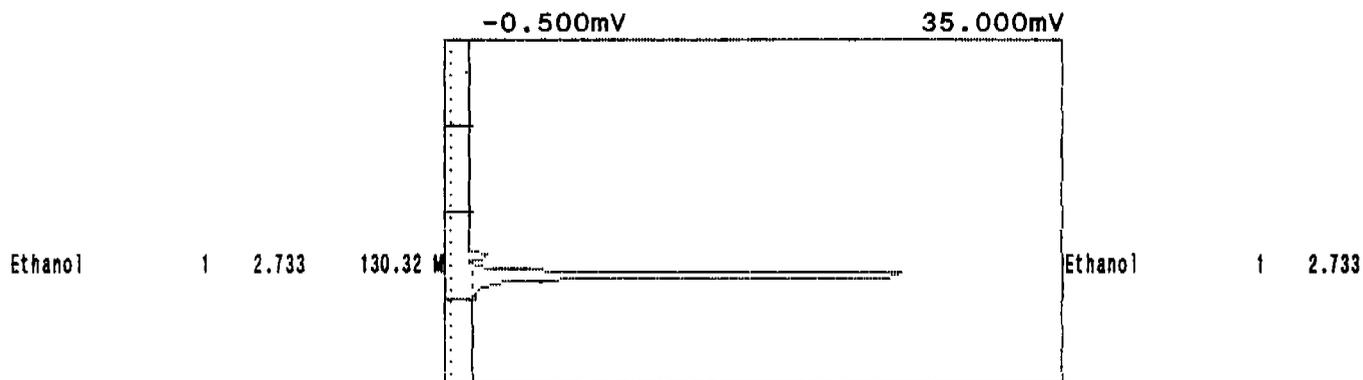
LOCATION NO. 2  
 HIGH CAL STD  
 19.00ppm  
 NEEDS TO BE  
 REINTEGRATED!



Component	Number	Retention	Area	Units
Ethanol	0	2.516	4.61	
	1	2.733	134.22	
	2		138.83	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2HC1  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 08:26:18

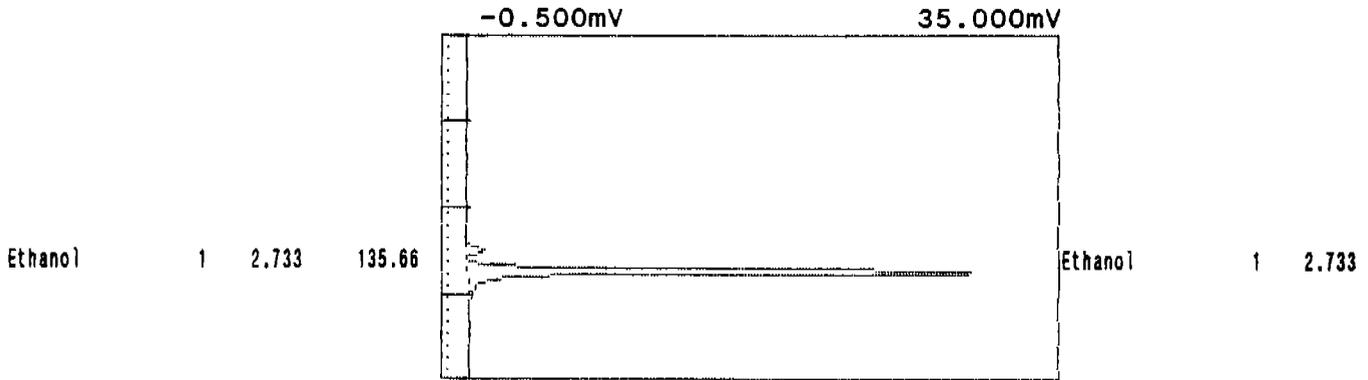
REINTEGRATION  
 HIGH CAL STD  
 19.0 PPM  
 LOCATION NO. 2



Component	Number	Retention	Area	Units
Ethanol	0	2.516	4.61	
	1	2.733	130.32	M
	2		134.94	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2HC2  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 08:31:57

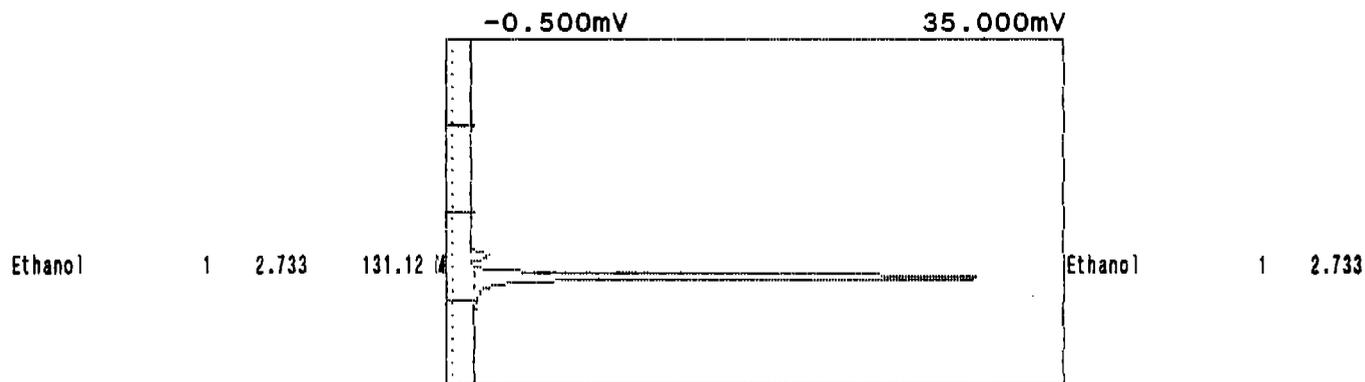
LOCATION NO. 2  
 HIGH CAL STD  
 19.0 ppm  
 NEEDS TO BE REINTEGRATED  
 2<sup>ND</sup> INTERSECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	4.90	
Ethanol	1	2.733	135.66	
	2		140.56	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2HC2  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 08:31:57

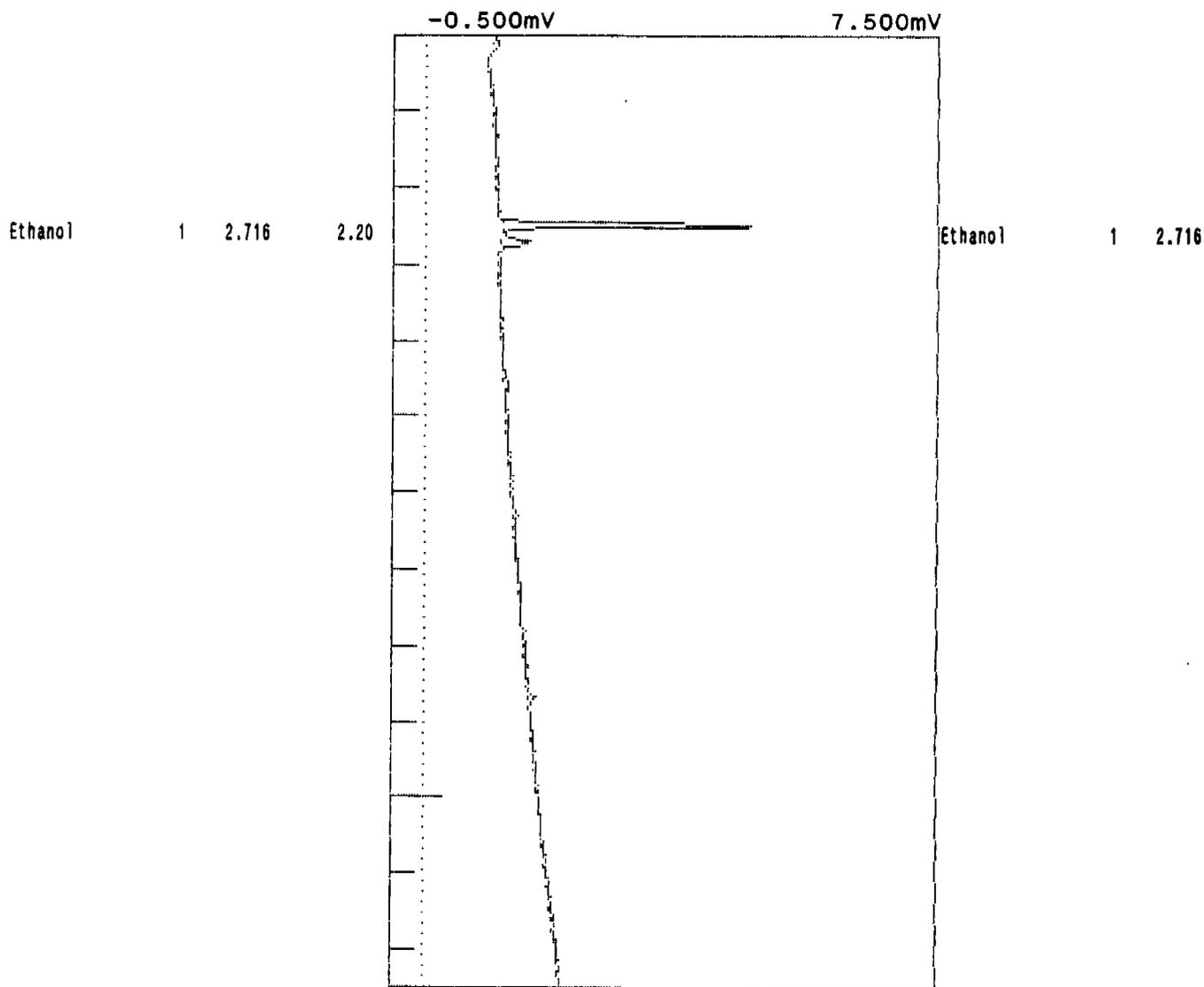
REINTEGRATED  
 LOCATION NO. 2  
 HIGH CAL 50  
 2<sup>ND</sup> INJECTION  
 19.0 ppm



Component	Number	Retention	Area	Units
Ethanol	0	2.500	4.90	
	1	2.733	131.12	M
	2		136.02	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2AA1  
 Temperature :  
 Components :  
 Date : 07/27/1994  
 Time : 08:50:44

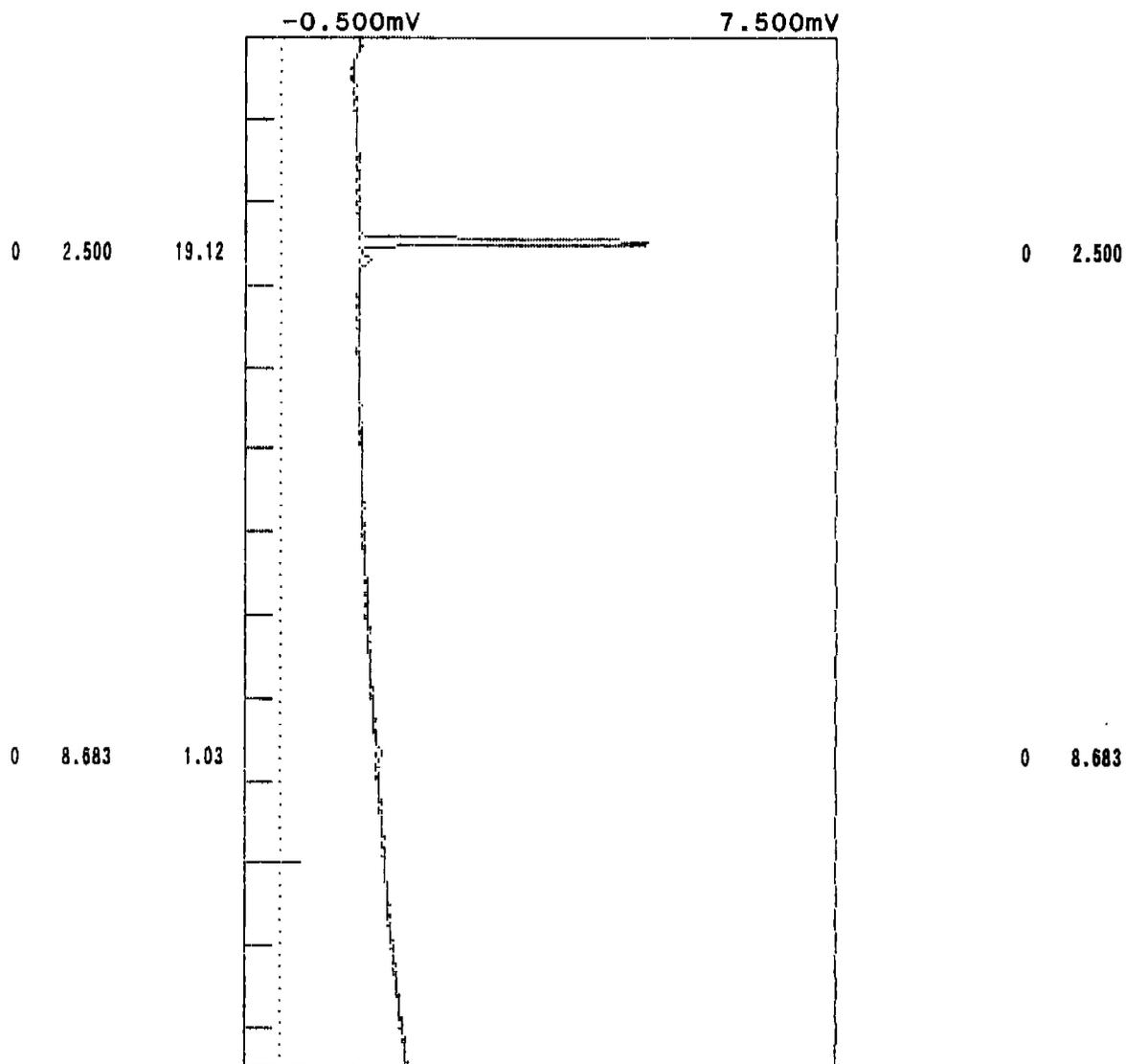
AMBIENT AIR  
 LOCATION NO. 2  
 1<sup>ST</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	14.65	
	1	2.716	2.20	
	2		16.85	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2AA2  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 09:06:19

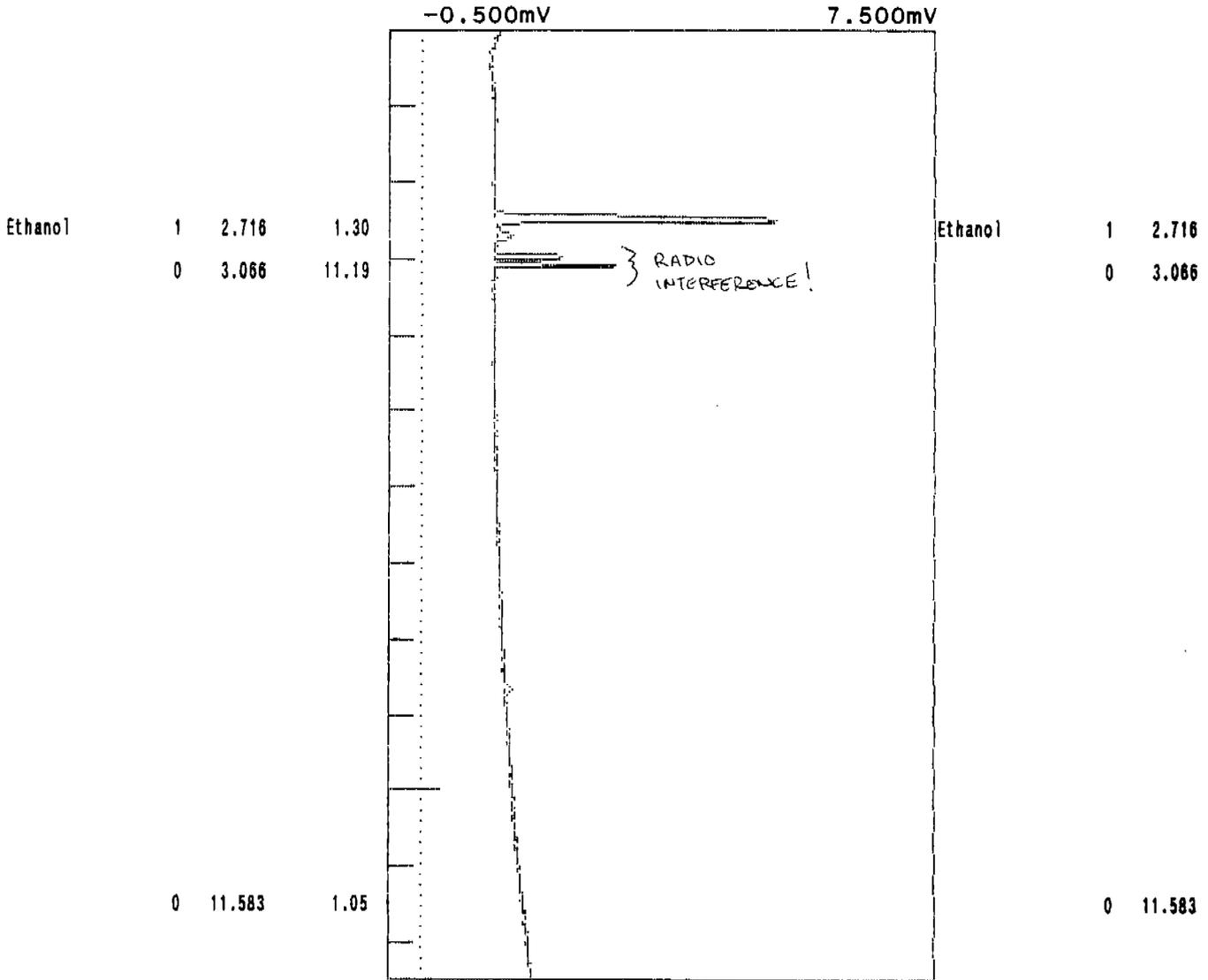
LOCATION NO. 2  
 AMBIENT AIR  
 JND INJECTION



Component	Number	Retention	Area	Units
	0	2.500	19.12	
	0	8.683	1.03	
2			20.15	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2AA3  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 09:20:48

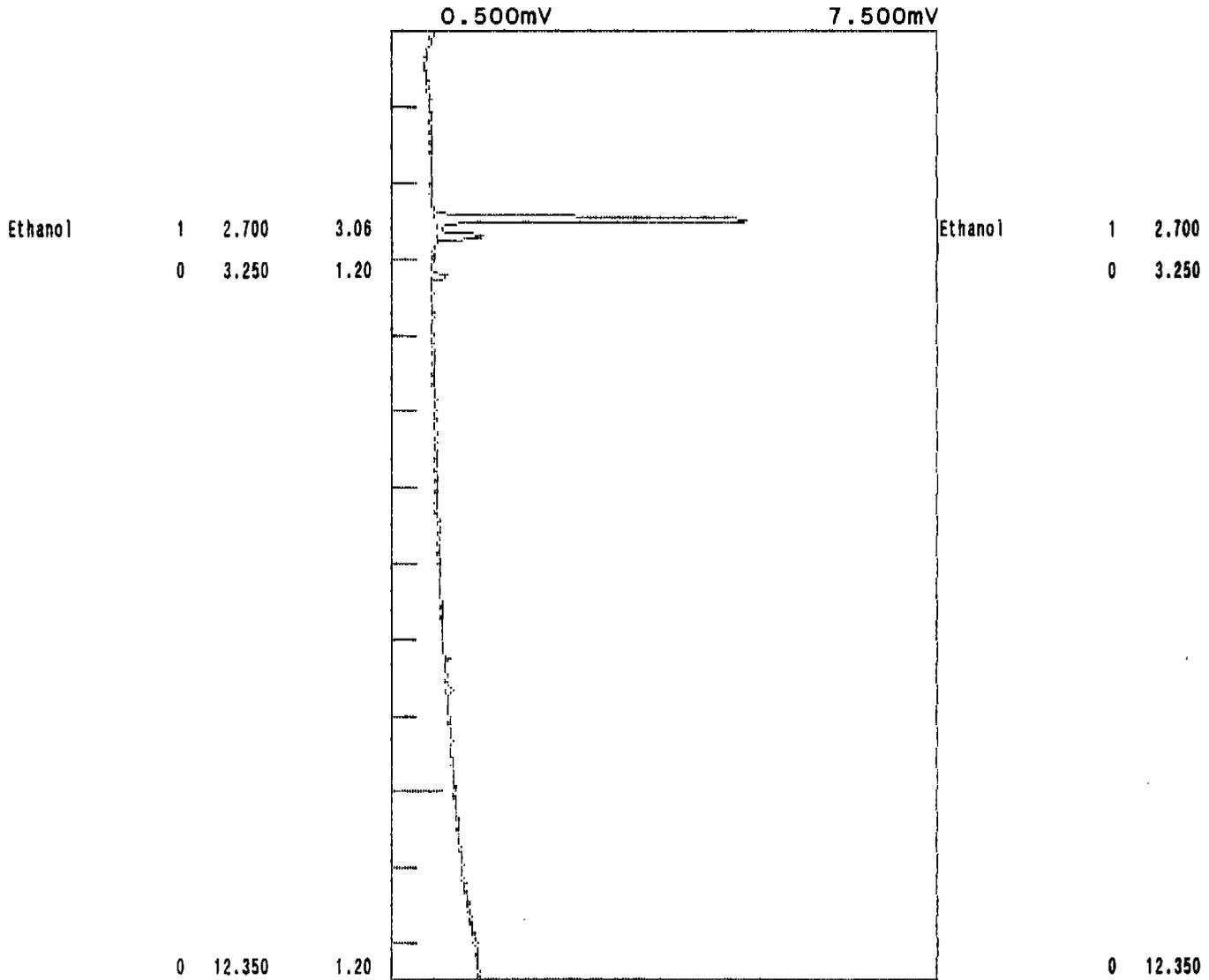
LOCATION NO. 2  
 AMBIENT AIR  
 3<sup>rd</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	20.22	
	1	2.716	1.30	
	0	3.066	11.19	
	0	11.583	1.05	
	4		33.76	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V11  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 09:37:48

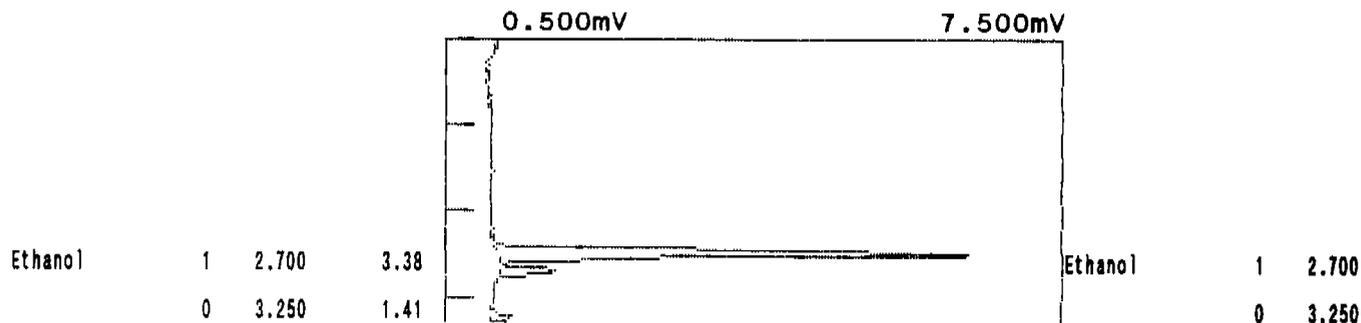
LOCATION NO. 2  
 VENT # 1  
 1<sup>ST</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	19.63	
	1	2.700	3.06	
	0	3.250	1.20	
	0	12.350	1.20	
	4		25.08	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V12  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 09:52:46

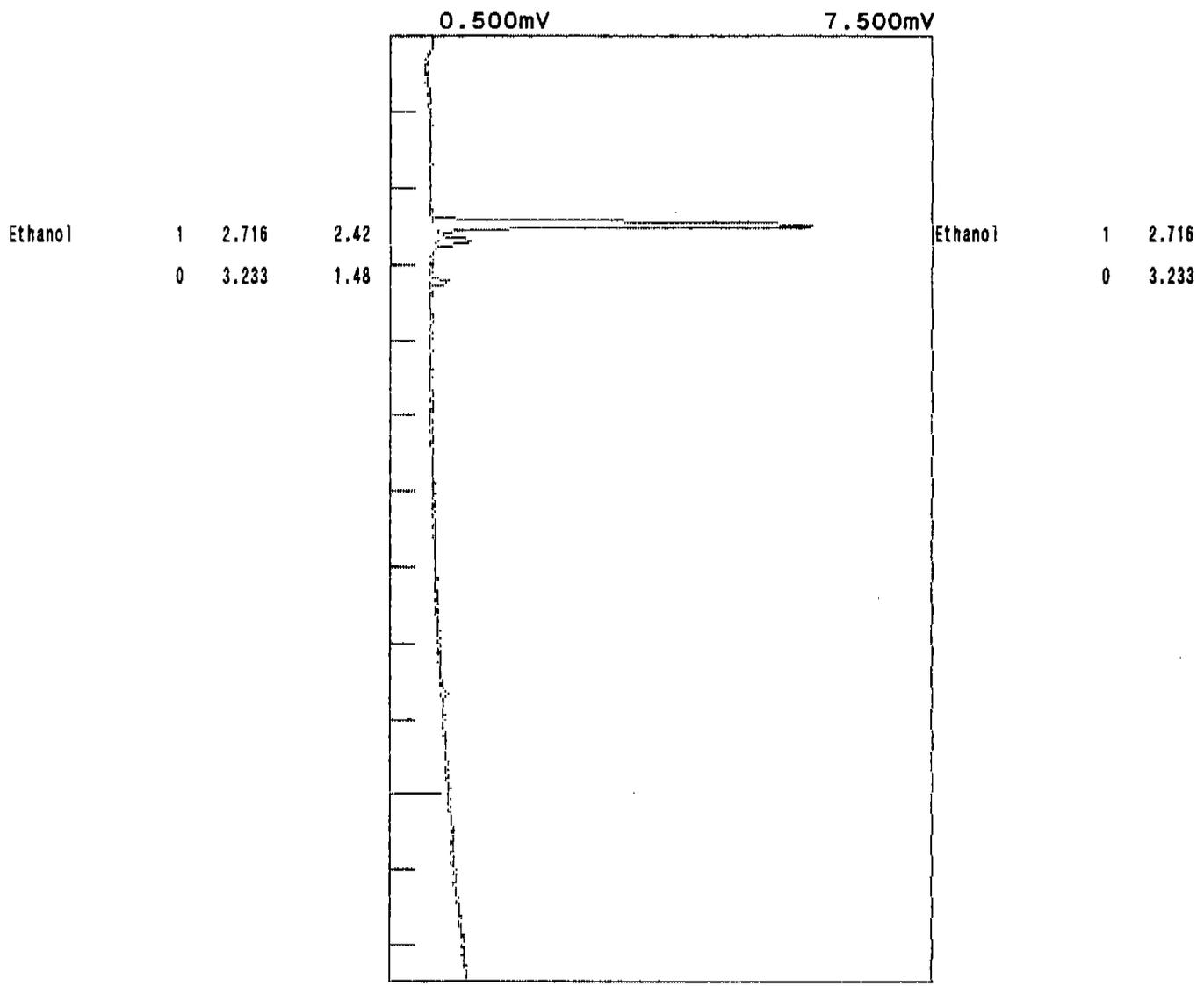
LOCATION No. 2  
 VENT No. 1  
 2ND INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	29.81	
	1	2.700	3.38	
	0	3.250	1.41	
	3		34.60	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V13  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 10:07:48

LOCATION NO. 1  
 VENT No. 1  
 3<sup>RD</sup> INJECTION



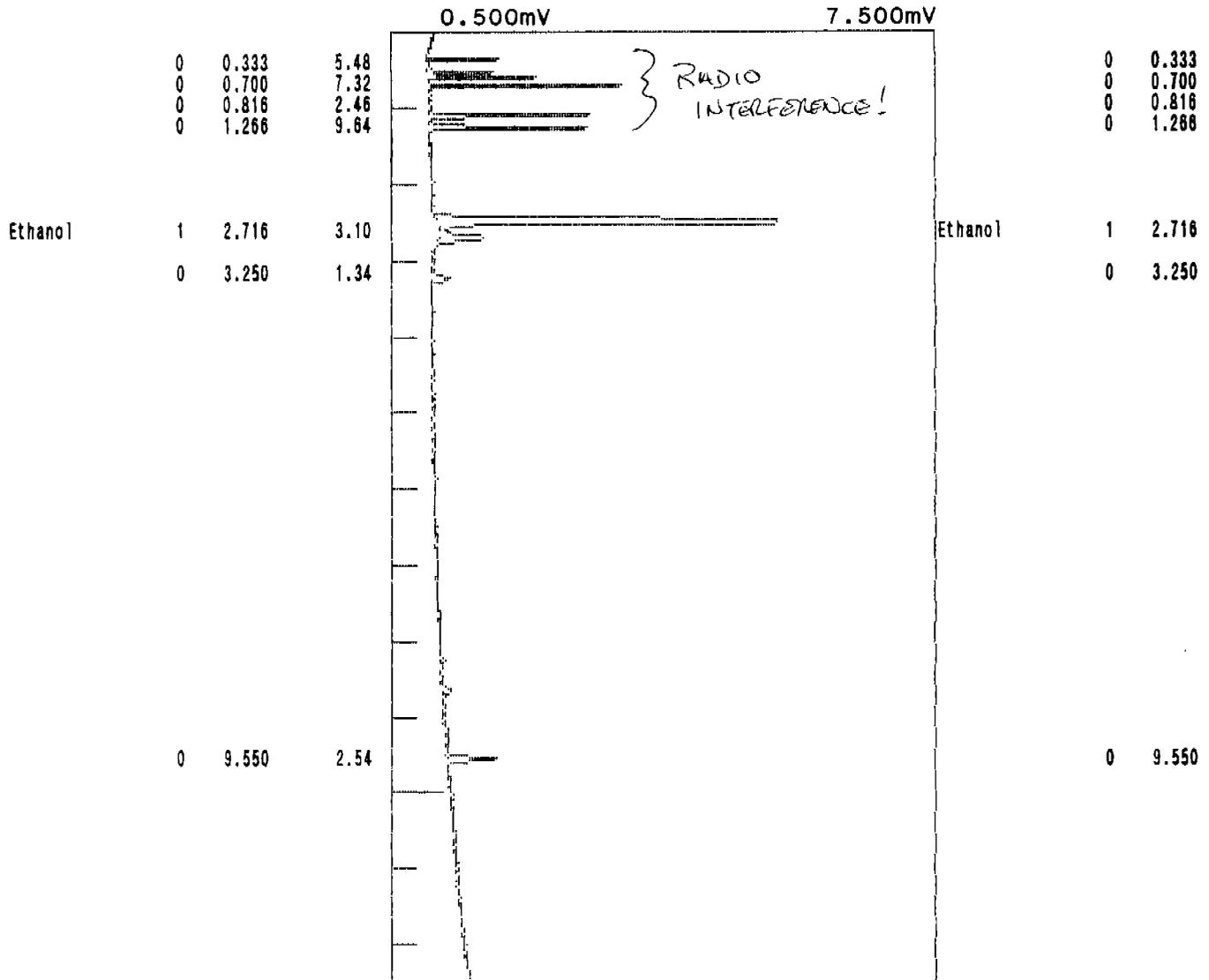
Ethanol 1 2.716 2.42  
 0 3.233 1.48

Ethanol 1 2.716  
 0 3.233

Component	Number	Retention	Area	Units
Ethanol	0	2.500	26.58	
	1	2.716	2.42	
	0	3.233	1.48	
	3		30.48	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V14  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 10:23:07

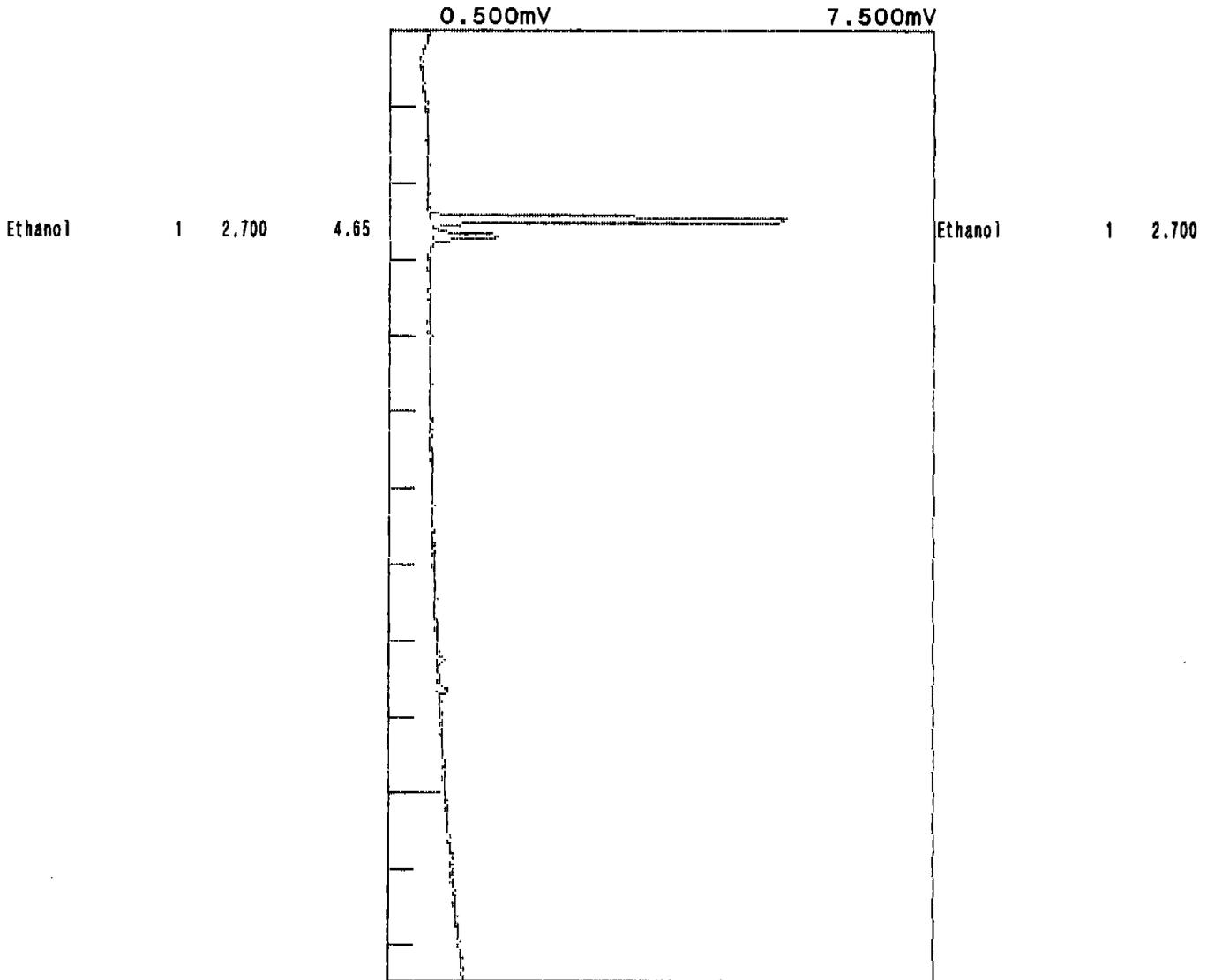
LOCATION NO.2  
 VENT NO.1  
 4<sup>th</sup> INJECTION



Component	Number	Retention	Area	Units
	0	0.333	5.48	
	0	0.533	5.41	
	0	0.700	7.32	
	0	0.816	2.46	
	0	1.083	5.08	
	0	1.266	9.64	
	0	2.483	25.32	
Ethanol	1	2.716	3.10	
	0	3.250	1.34	
	0	9.550	2.54	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V21  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 10:43:30

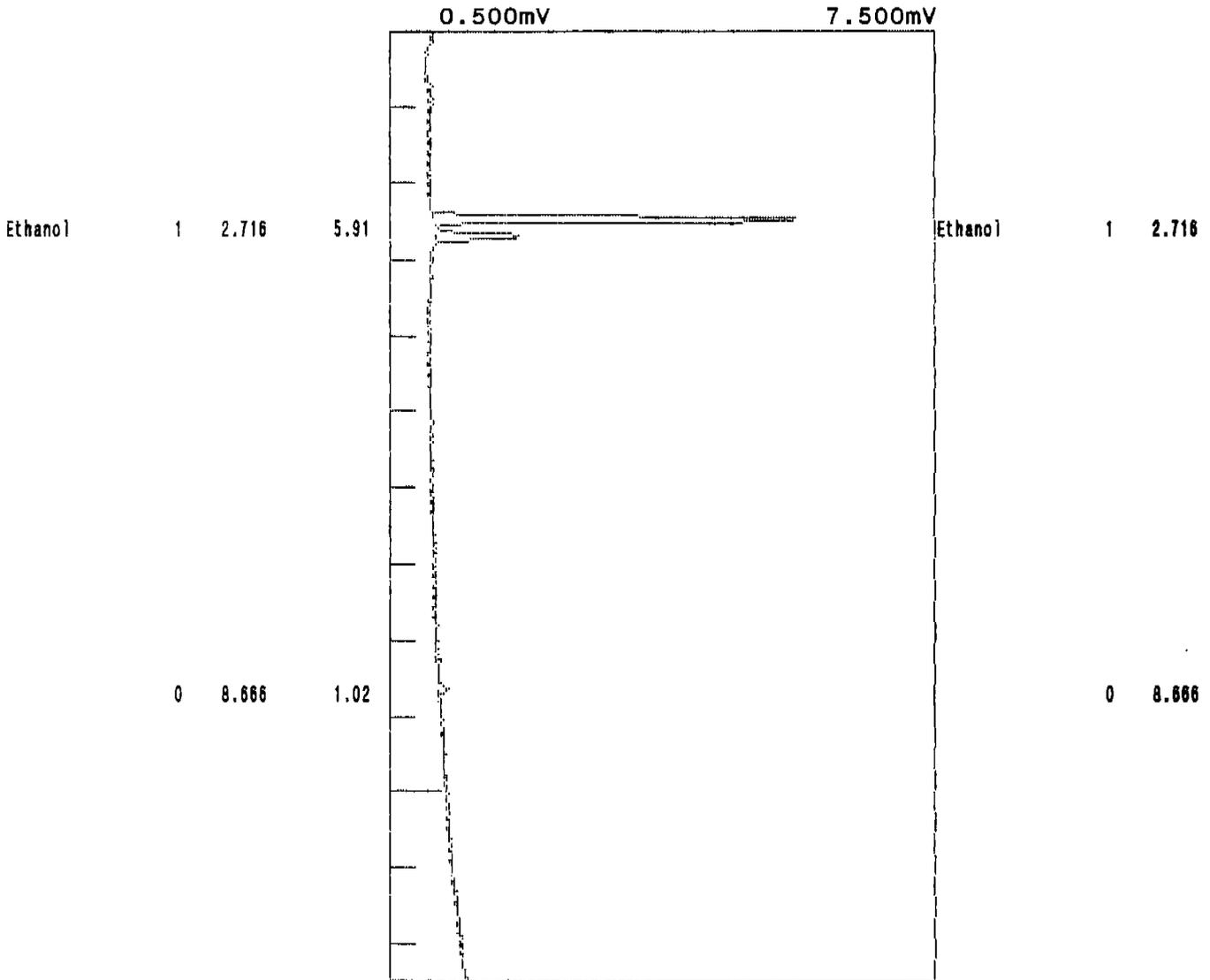
LOCATION NO. 2  
 VENT NO. 2  
 1<sup>st</sup> INJECTION



Component	Number	Retention	Area	Units
	0	2.483	24.25	
Ethanol	1	2.700	4.65	
	2		28.90	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V22  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 10:58:05

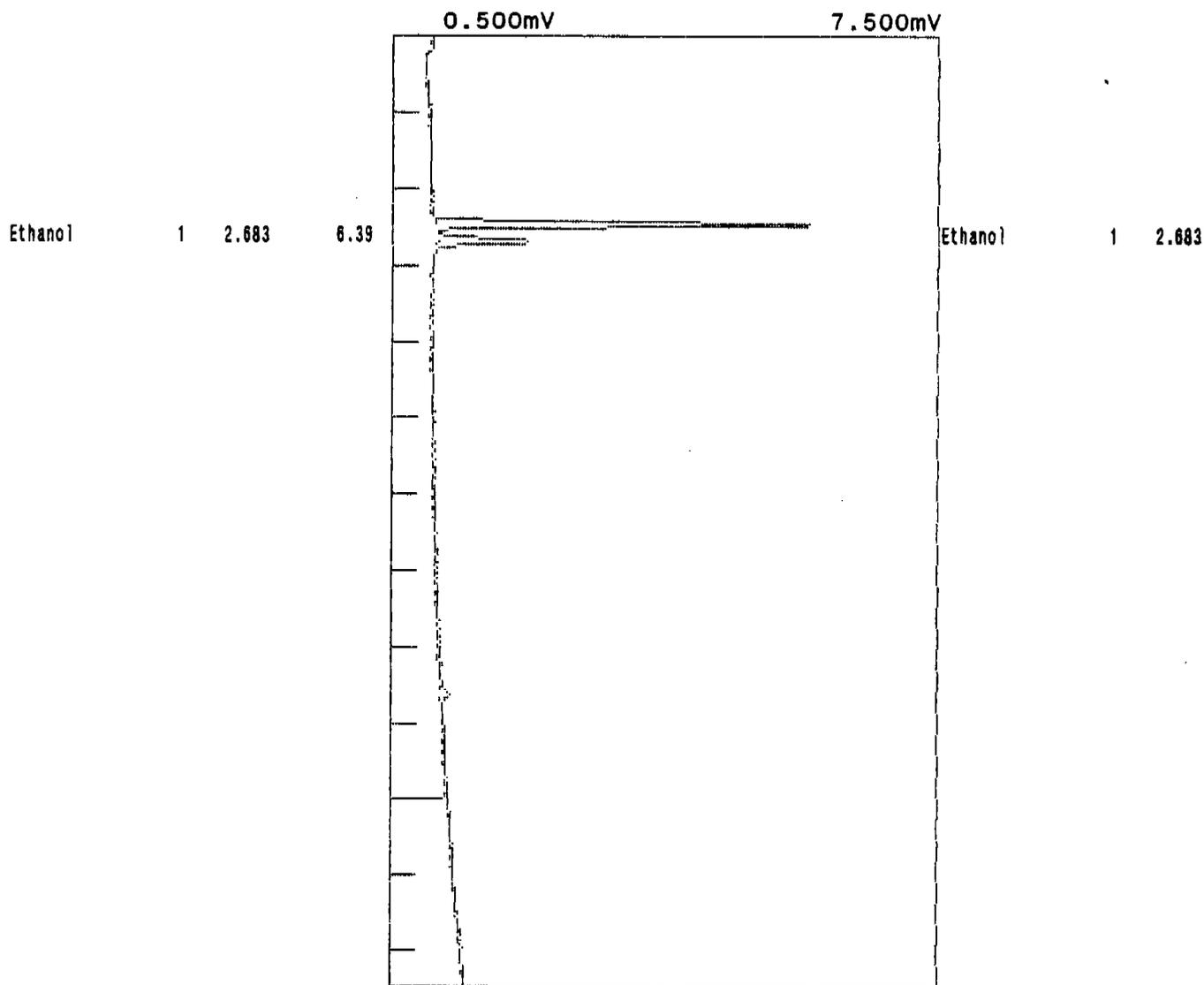
LOCATION NO.2  
 VENT NO.2  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	24.32	
	1	2.716	5.91	
	0	8.666	1.02	
	3		31.26	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V23  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 11:13:43

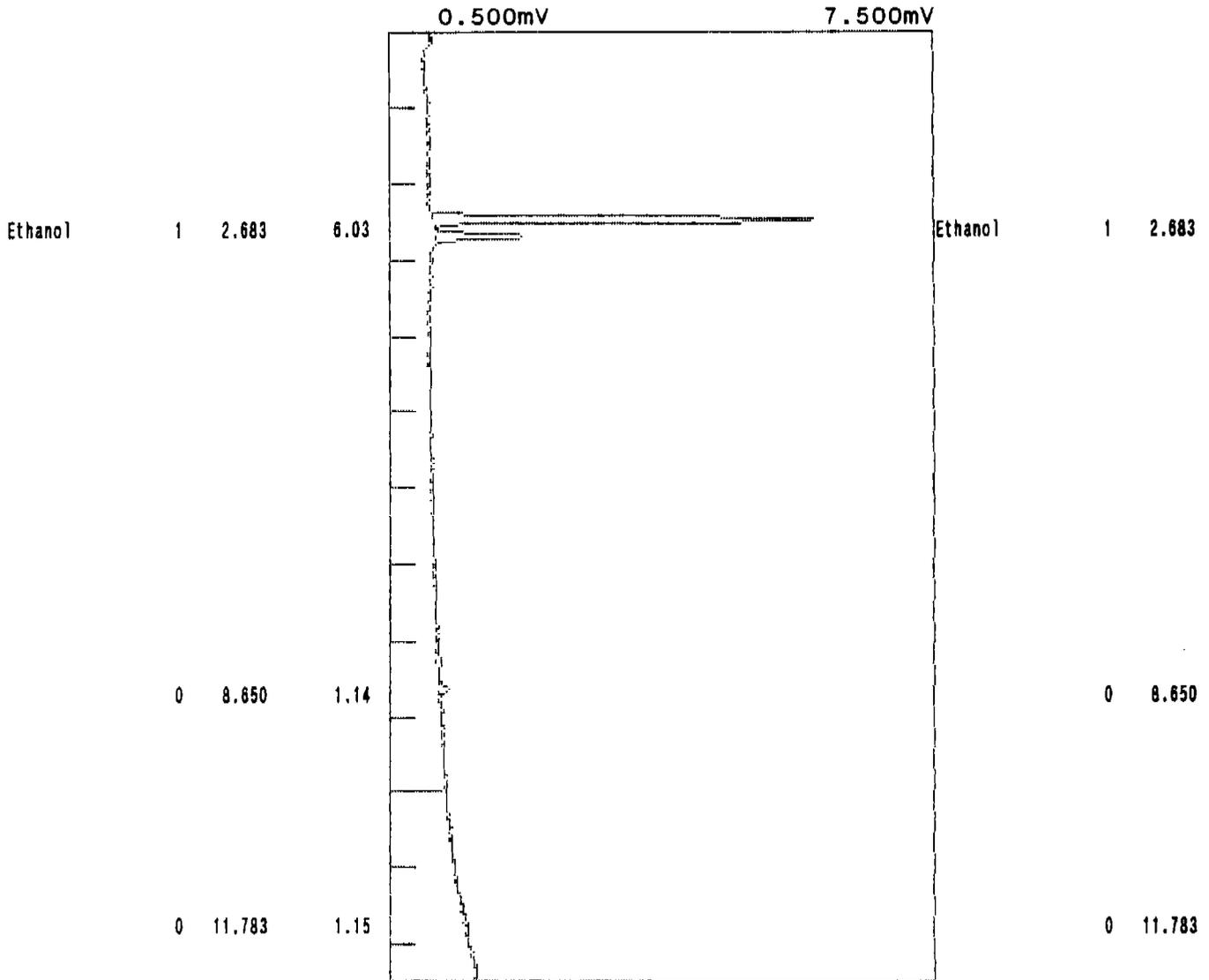
LOCATION NO. 2  
 VENT NO. 2  
 3<sup>RD</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	24.17	
	1	2.683	6.39	
	2		30.56	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V24  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 11:28:21

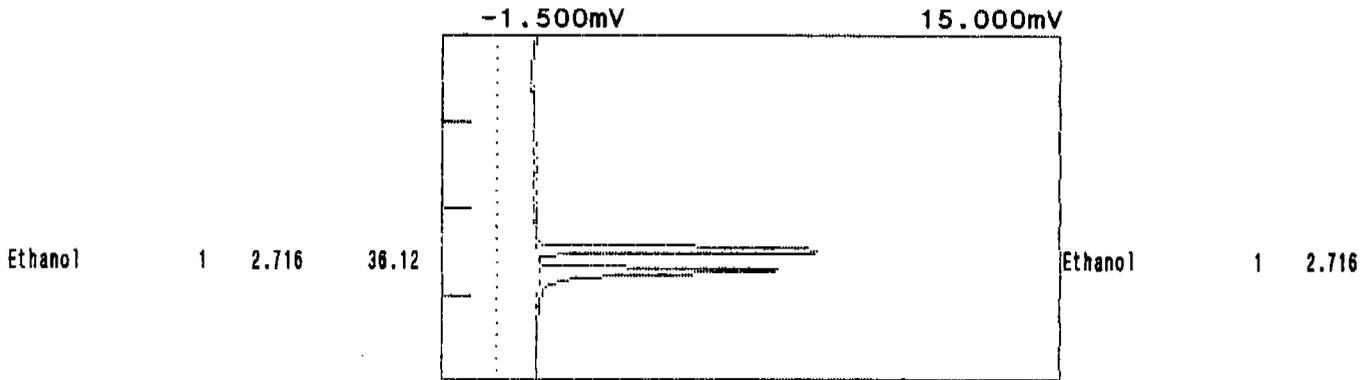
LOCATION NO-2  
 VENT NO. 2  
 4<sup>th</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	27.46	
	1	2.683	6.03	
	0	8.650	1.14	
	0	11.783	1.15	
	4		35.78	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC1  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 11:52:02

LOCATION NO. 2  
 PERFORMANCE CHECK  
 VENTS 1 & 2  
 STD = 5.80PPM  
 Recovery =  $\frac{6.15}{5.80} \times 100 = 106\%$



Component	Number	Retention	Area	Units
Ethanol	0	2.500	40.03	6.15ppm
	1	2.716	36.12	
	2		76.15	

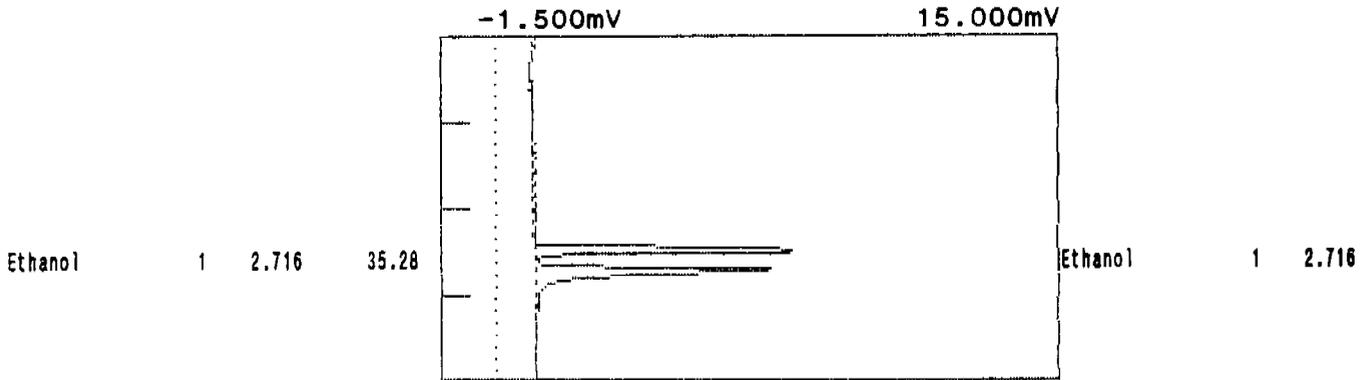
Recovery Factor  
 $\frac{5.80 - 6.15}{6.15 - 5.80} + 1 = 1.06$

0.940  
~~1.06~~

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC2  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 11:57:58

LOCATION NO. 2  
 PERFORMANCE CHECK  
 2<sup>ND</sup> INJECTION  
 STD = 5.80 PPM

$$\text{RECOVERY} = \frac{6.01}{5.80} \times 100 = 103.6\%$$



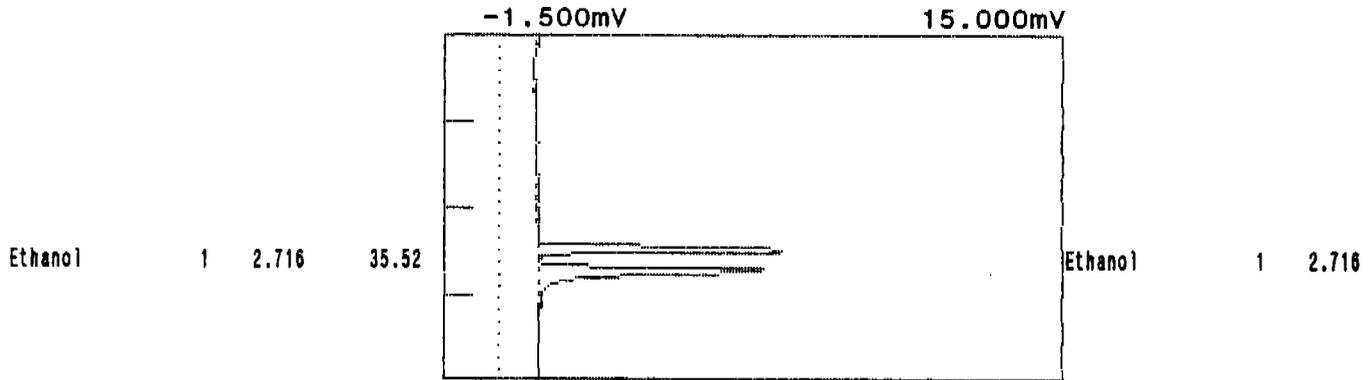
Component	Number	Retention	Area	Units
Ethanol	0	2.500	36.73	6.01 ppm
	1	2.716	35.28	
	2		72.00	

$$\text{RECOVERY FACTOR} = \frac{5.80 - 6.01}{6.01 - 5.80} + 1 = 0.964$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC3  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 12:03:07

LOCATION NO.2  
 PERFORMANCE CHECK  
 3<sup>RD</sup> INJECTION  
 STD = 5.80 PPM

$$\text{RECOVERY} = \frac{6.15}{5.80} \times 100 = 106.0\%$$



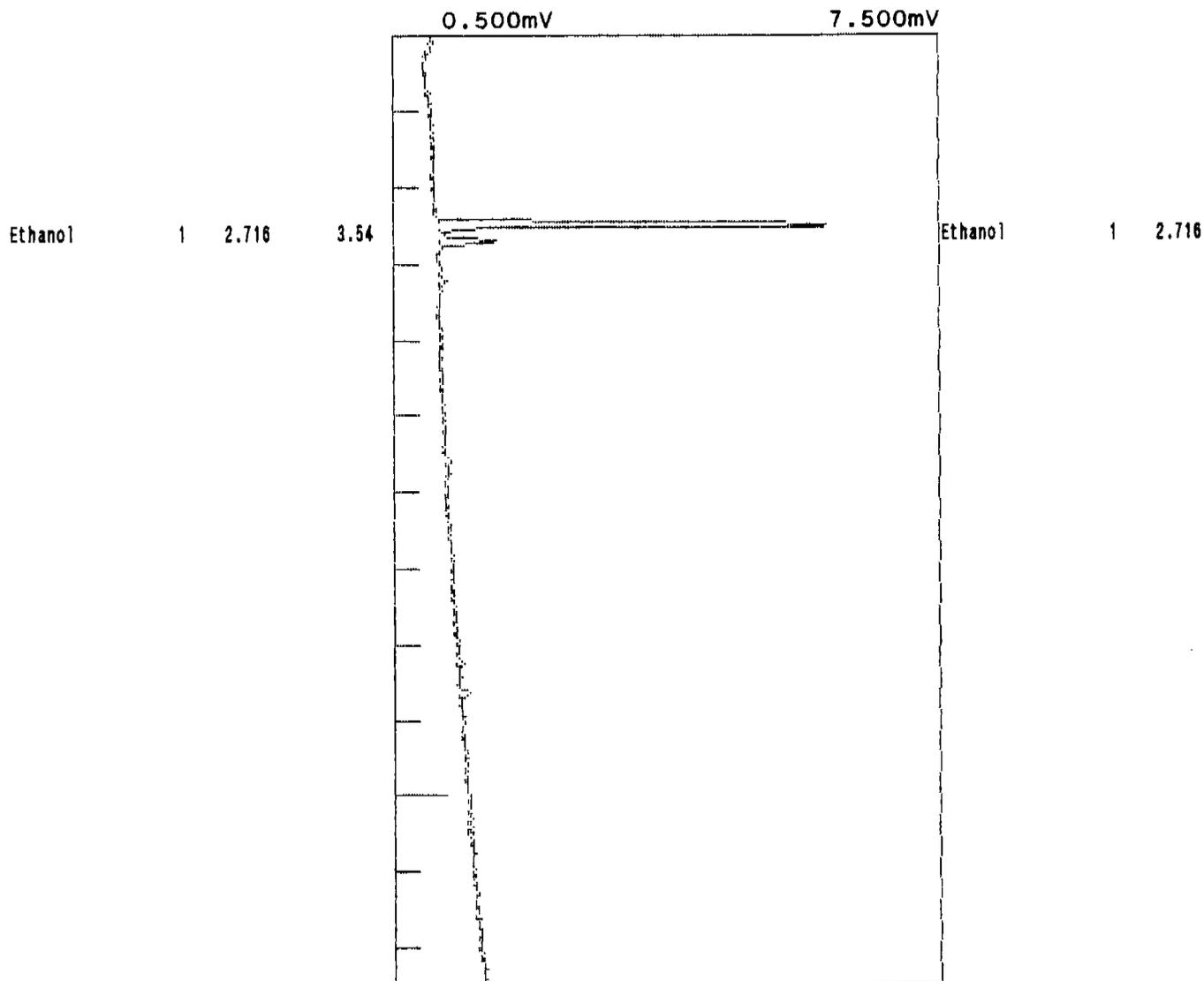
Component	Number	Retention	Area	Units
Ethanol	0	2.500	35.15	6.15ppm
	1	2.716	35.52	
	2		70.67	

RECOVERY FACTOR

$$\frac{5.80 - 6.15}{5.80} + 1 = 0.940$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V31  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 12:39:17

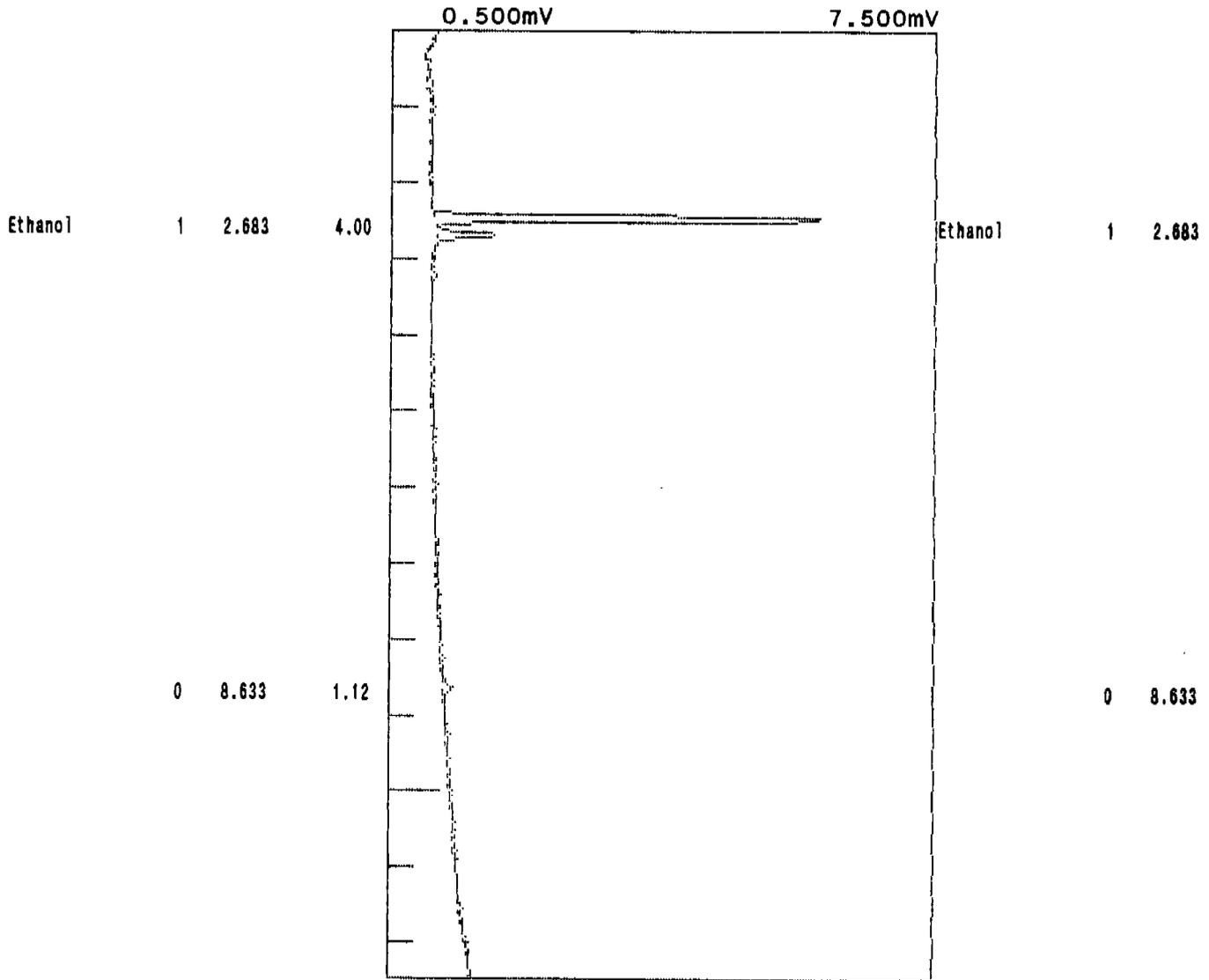
LOCATION NO. 2  
 VENT NO. 3  
 1ST INJECTION



Component	Number	Retention	Area	Units
	0	2.500	22.23	
Ethanol	1	2.716	3.54	
	2		25.77	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V32  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 12:54:08

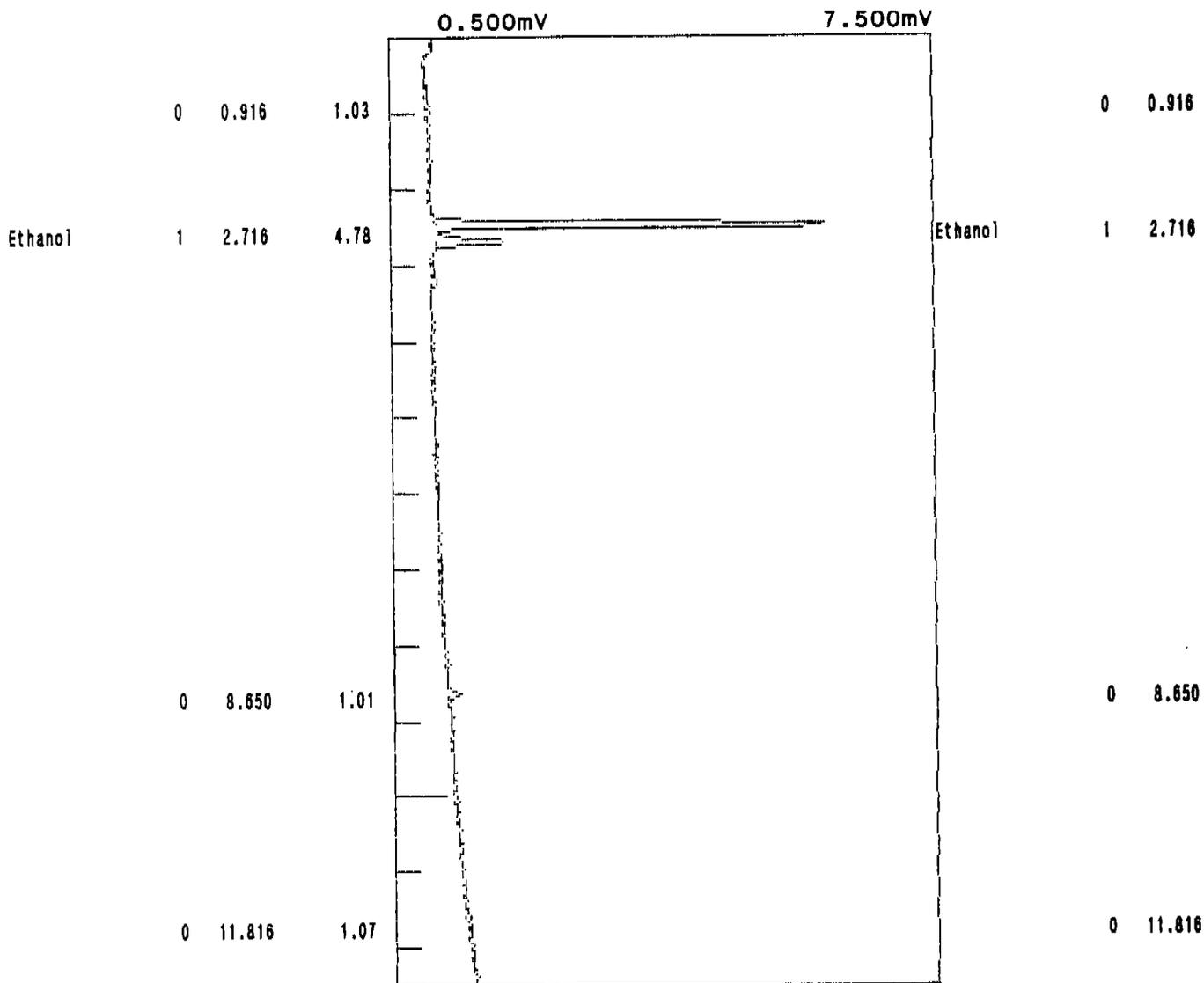
LOCATION NO. 2  
 VENT NO. 3  
 2<sup>nd</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	26.73	
	1	2.683	4.00	
	0	8.633	1.12	
	3		31.85	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V33  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 13:09:08

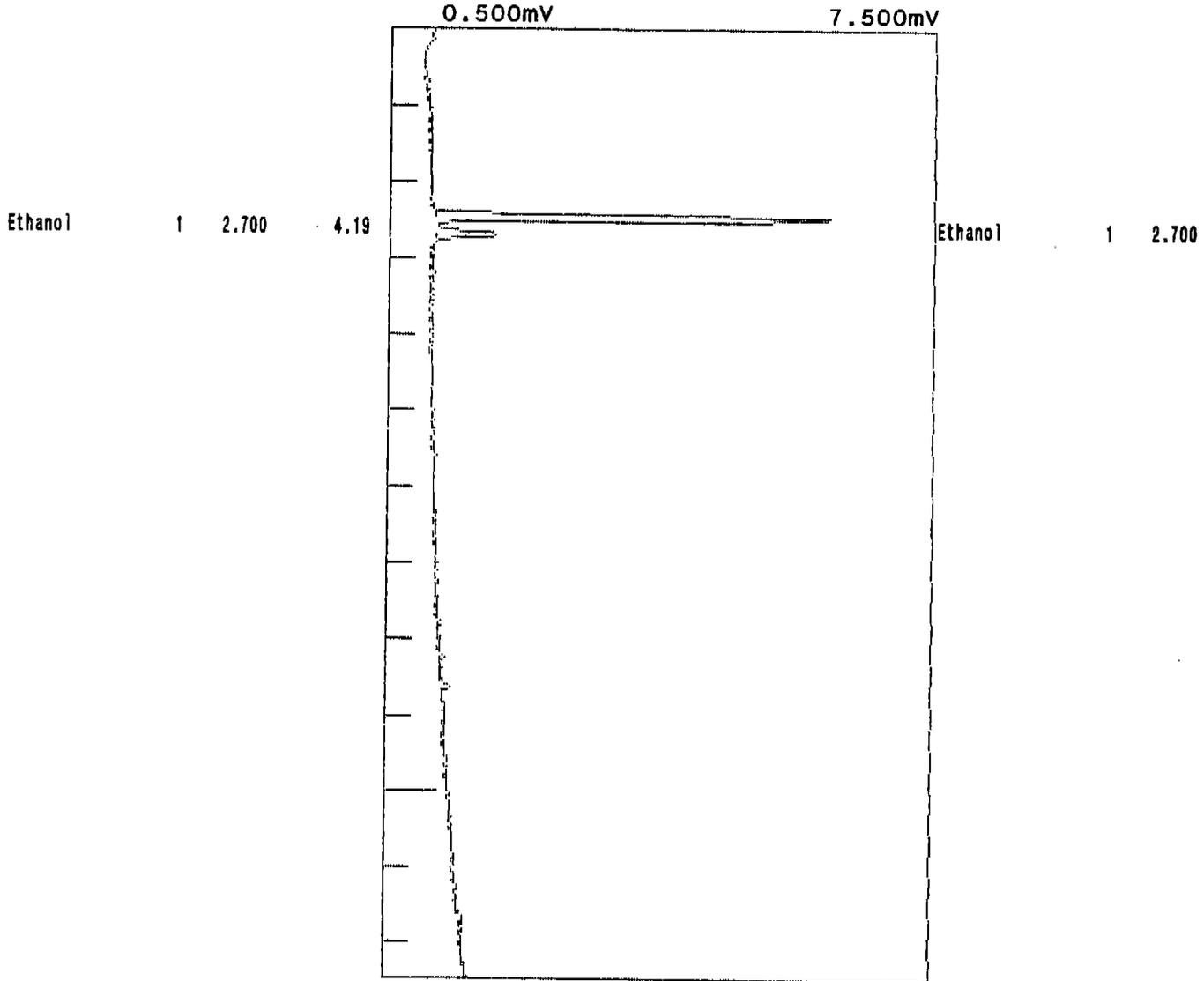
LOCATION No.2  
 VENT No.3  
 3<sup>rd</sup> INJECTION



Component	Number	Retention	Area	Units
	0	0.916	1.03	
	0	2.483	28.66	
Ethanol	1	2.716	4.78	
	0	8.650	1.01	
	0	11.816	1.07	
	5		36.56	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V34  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 13:24:47

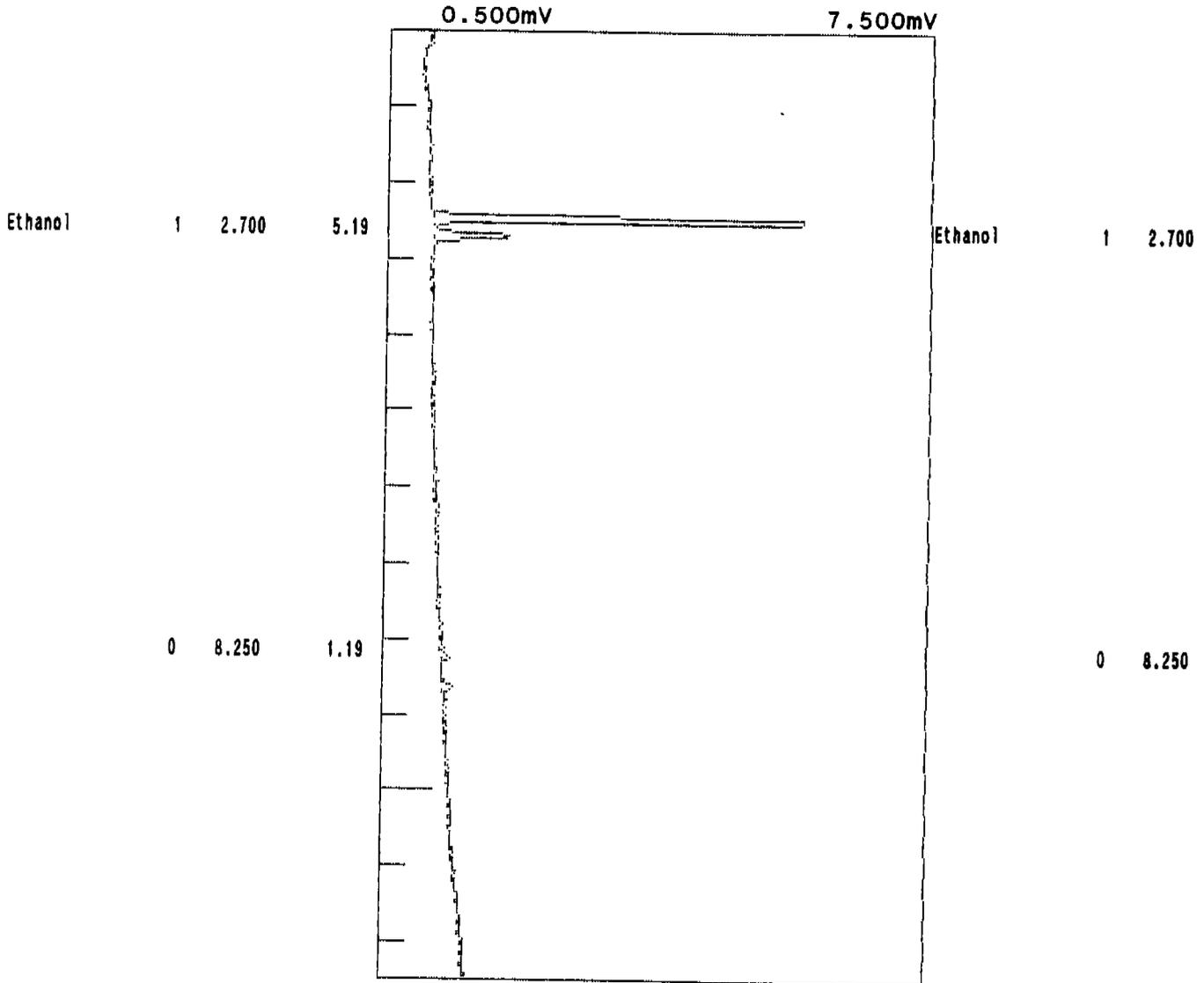
LOCATION NO.2  
 VENT NO.3  
 4th INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.466	27.96	
	1	2.700	4.19	
	2		32.15	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V35  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 13:48:05

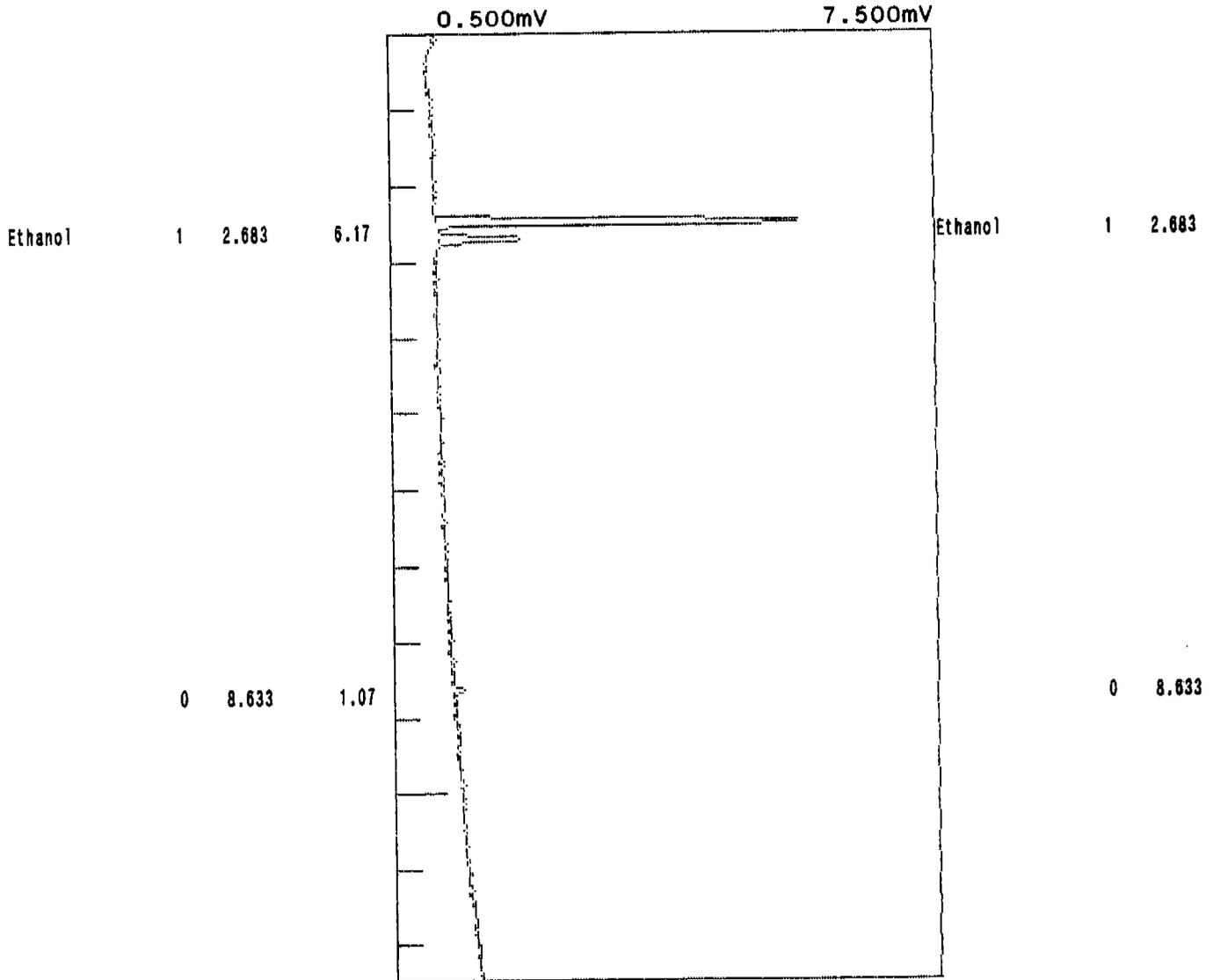
LOCATION NO. 2  
 VENT No. 4  
 1ST INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	24.56	
	1	2.700	5.19	
	0	8.250	1.19	
	3		30.94	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V42  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 14:03:12

LOCATION NO. 2  
 VENT NO. 4  
 2<sup>ND</sup> INJECTION



Ethanol 1 2.683 6.17

Ethanol 1 2.683

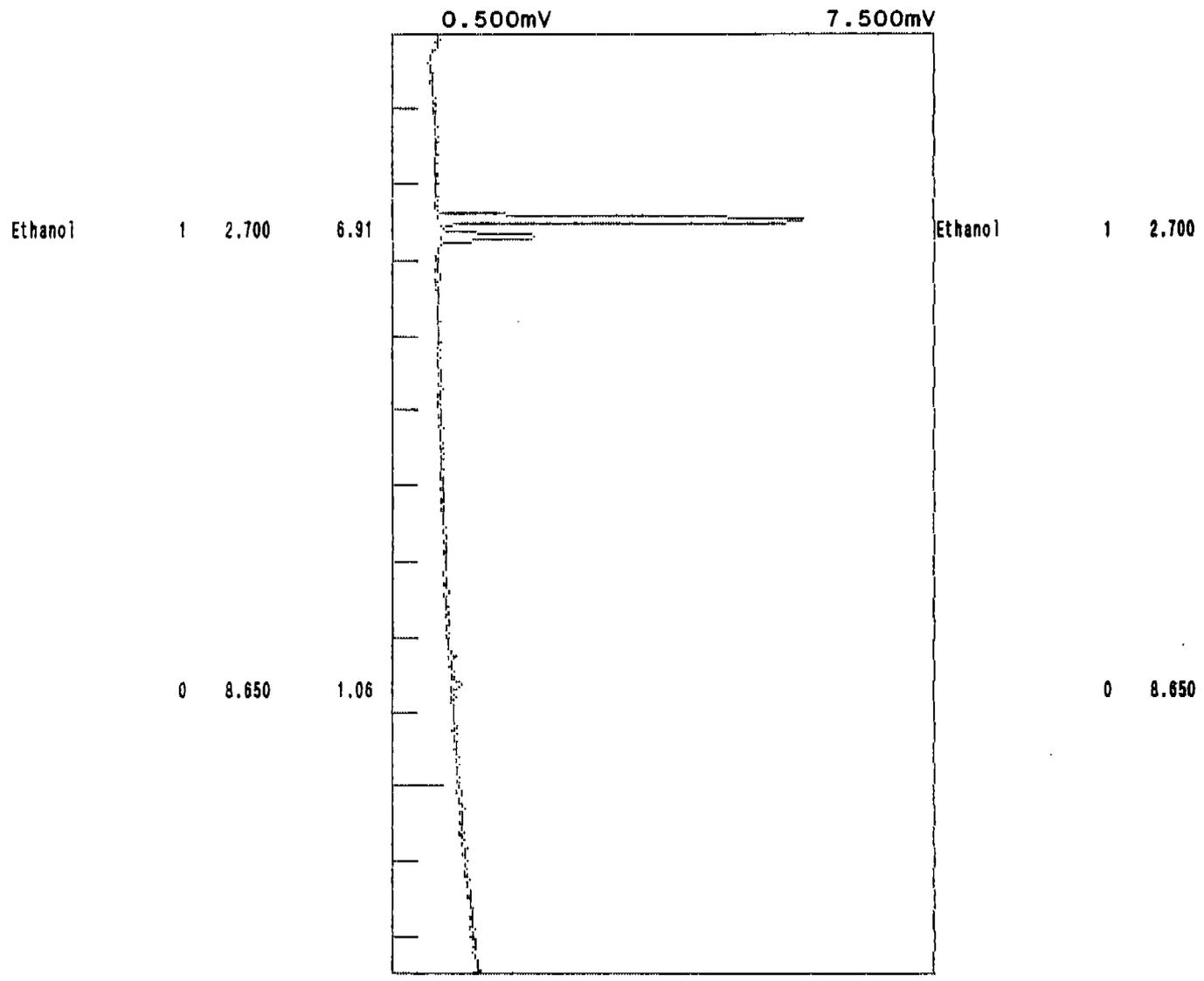
0 8.633 1.07

0 8.633

Component	Number	Retention	Area	Units
	0	2.483	26.22	
Ethanol	1	2.683	6.17	
	0	8.633	1.07	
	3		33.47	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V43  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 14:18:09

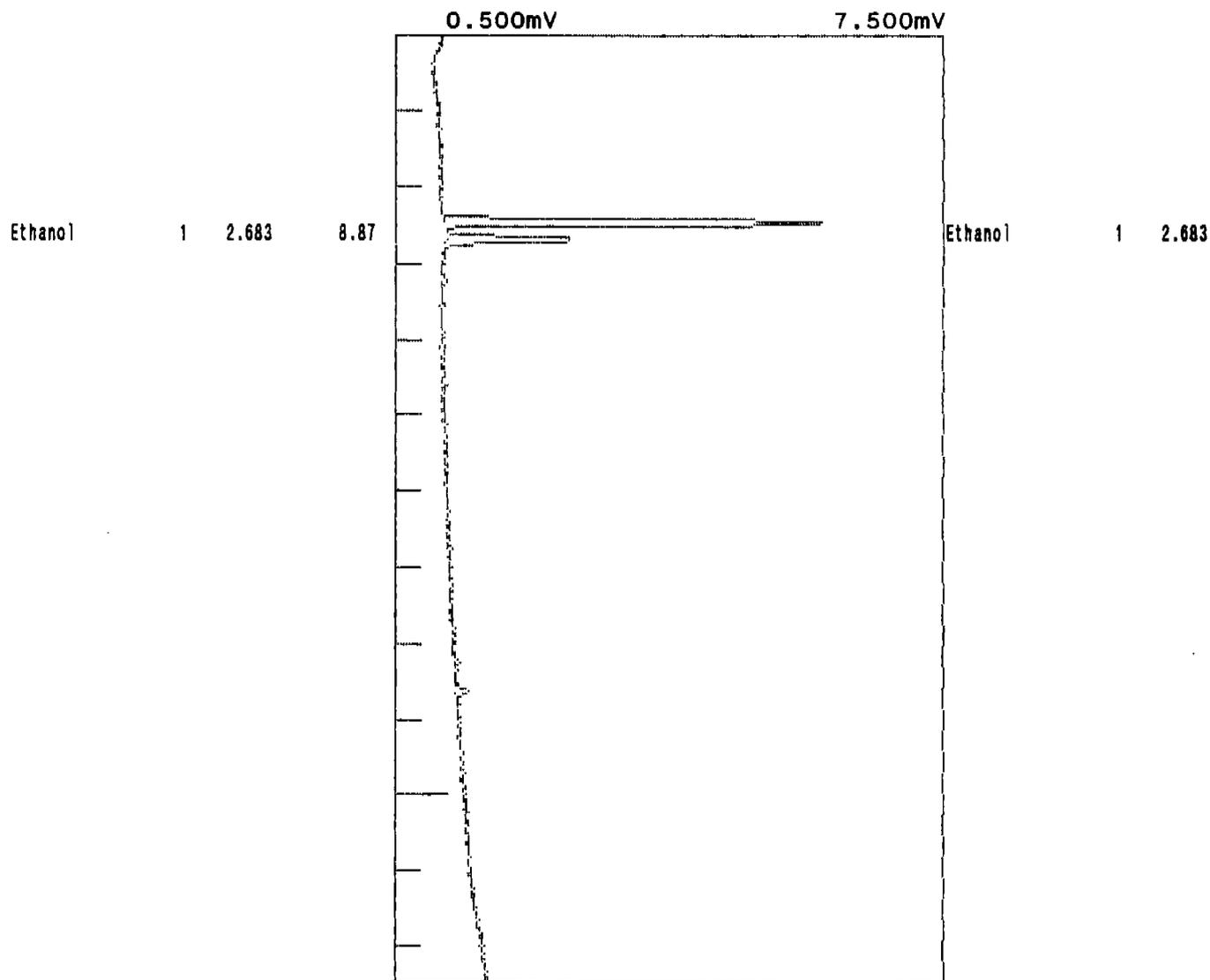
LOCATION NO. 2  
 VENT NO. 4  
 3<sup>RD</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.466	27.62	
	1	2.700	6.91	
	0	8.650	1.06	
	3		35.59	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V44  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 14:33:33

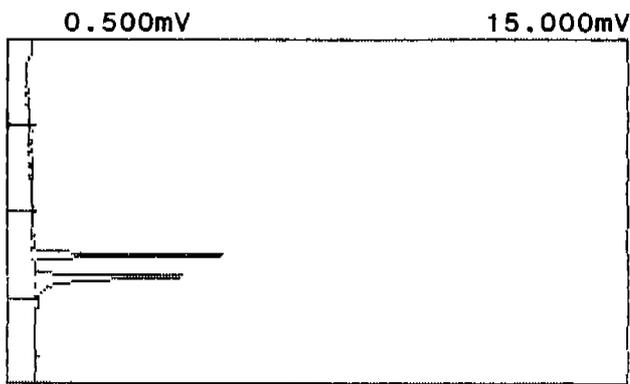
LOCATION No. 2  
 VENT No. 4  
 4<sup>th</sup> INJECTION



Component	Number	Retention	Area	Units
	0	2.483	27.91	
Ethanol	1	2.683	8.87	
	2		36.77	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC4  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 15:09:10

LOCATION NO. 2  
 PERFORMANCE CHECK  
 TOO EARLY!  
 1ST INJECTION  
 NOT ENOUGH FLOW  
 @ PROBE.



Ethanol 0 2.516 14.28  
 1 2.750 16.48

Ethanol 0 2.516  
 1 2.750

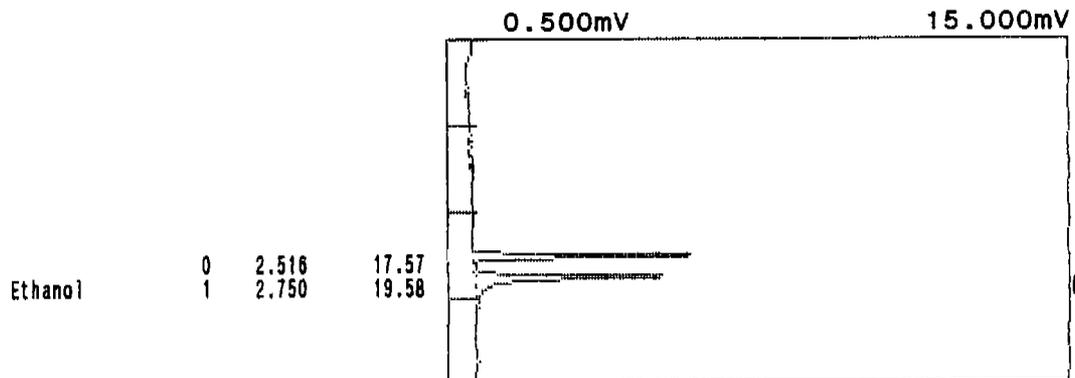
Component	Number	Retention	Area	Units
Ethanol	0	2.516	14.28	
	1	2.750	16.48	
	2		30.76	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC5  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 15:15:12

PERFORMANCE CHECK  
 STD INJECTION  
 LOCATION NO. ●  
 STD. = 5.80 ppm

$$\text{RECOVERY} = \frac{3.96}{5.80} \times 100 = 68.3\%$$

NOT ENOUGH FLOW  
 @ PROBE.



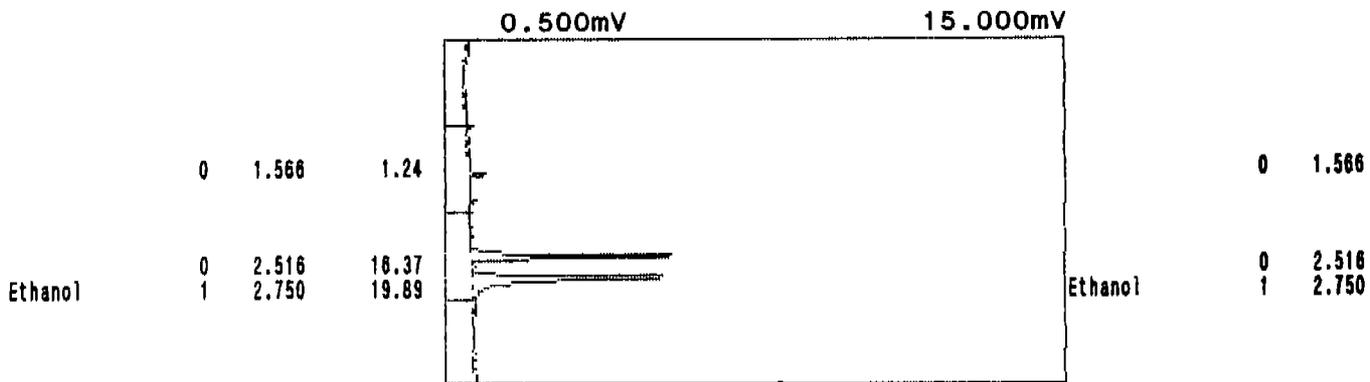
Ethanol 0 2.516 17.57  
 1 2.750 19.58

Ethanol 0 2.516  
 1 2.750

Component	Number	Retention	Area	Units
Ethanol	0	2.516	17.57	3.96 ppm
	1	2.750	19.58	
	2		37.15	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC6  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 15:21:57

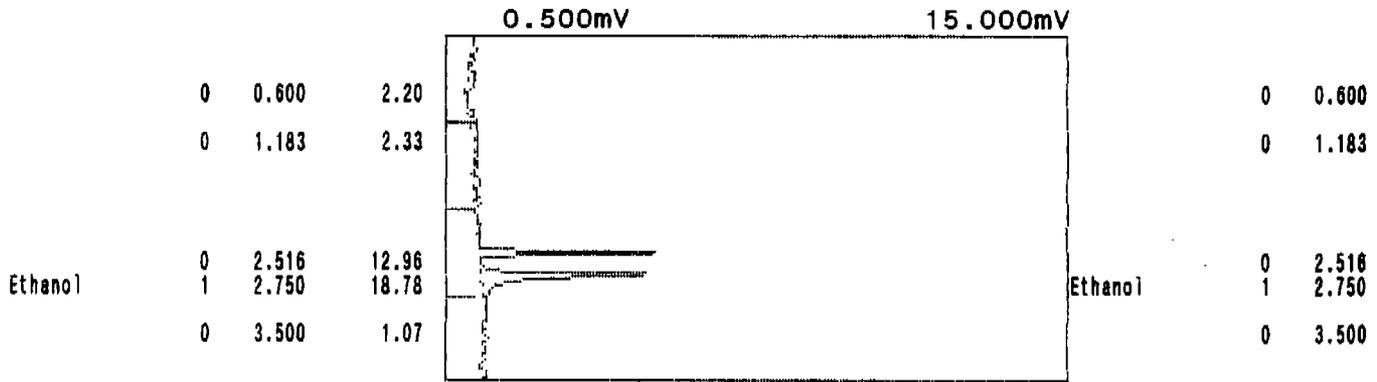
LOCATION NO. 2  
 PERFORMANCE CHECK  
 3<sup>RD</sup> INJECTION  
 NOT ENOUGH FLOW  
 @ PROBS!



Component	Number	Retention	Area	Units
Ethanol	0	1.566	1.24	
	0	2.516	16.37	
	1	2.750	19.89	
	3		37.50	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC7  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 15:28:37

*PERFORMANCE CHECK*  
*LOCATION NO. 2*  
*Too Low!*



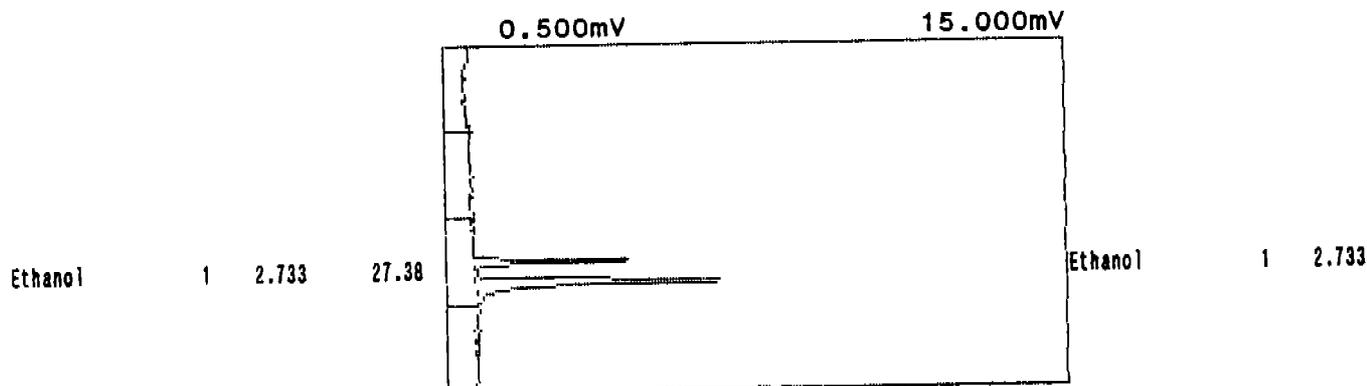
Component	Number	Retention	Area	Units
Ethanol	0	0.600	2.20	
	0	1.183	2.33	
	0	2.516	12.96	
	1	2.750	18.78	
	0	3.500	1.07	
	5		37.34	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC8  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 15:40:01

LOCATION No. 2  
 PERFORMANCE CHECK  
 5th INJECTION

STD = 5.80 ppm

Recovery =  $\frac{4.92}{5.80} \times 100 = 84.8\%$



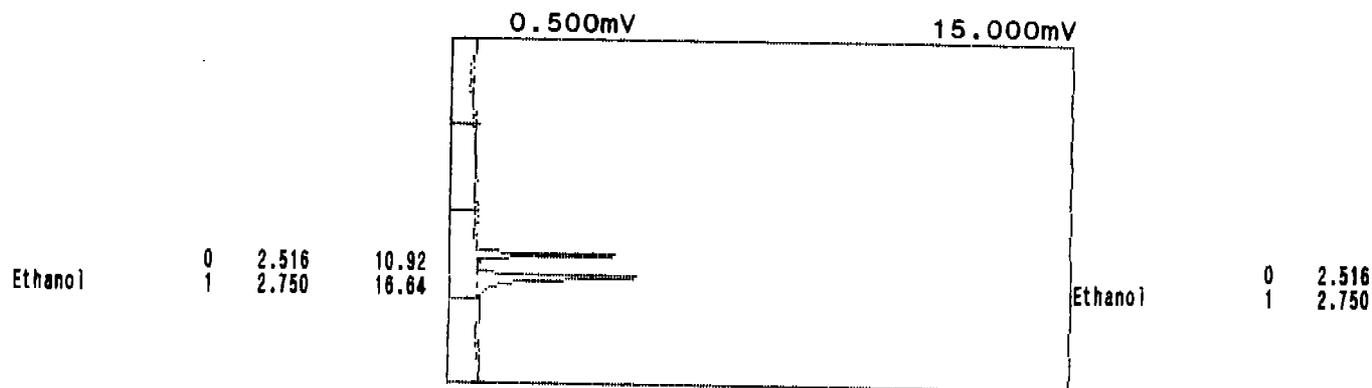
Component	Number	Retention	Area	Units
Ethanol	0	2.516	11.21	4.92 ppm
	1	2.733	27.38	
	2		38.59	

RECOVERY FACTOR

$$\frac{5.80 - 4.92}{5.80} + 1 = 1.15$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC9  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 15:46:13

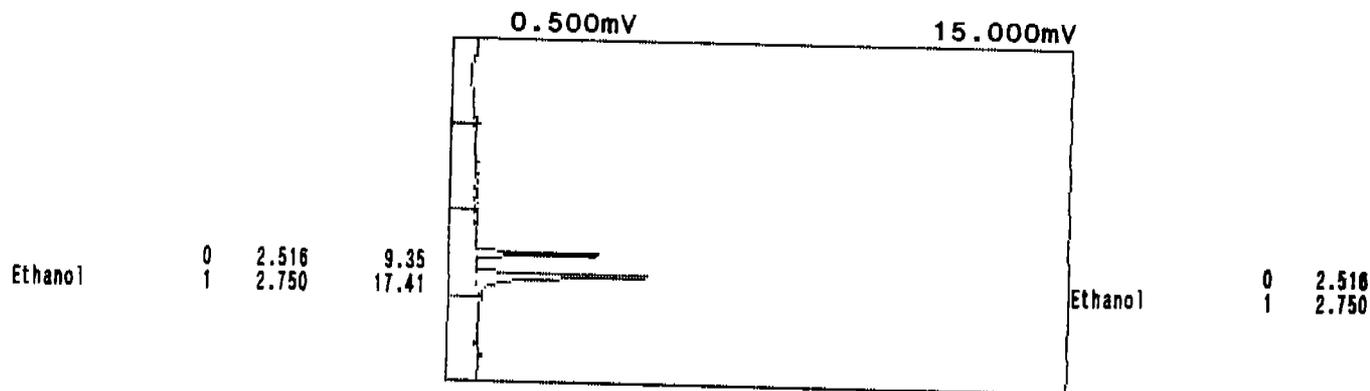
LOCATION No. 2  
 PERFORMANCE CHECK  
 6th INJECTION  
 No GOOD!



Component	Number	Retention	Area	Units
Ethanol	0	2.516	10.92	
	1	2.750	16.64	
	2		27.56	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC10  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 15:55:37

*No on*  
*NO GOOD!*

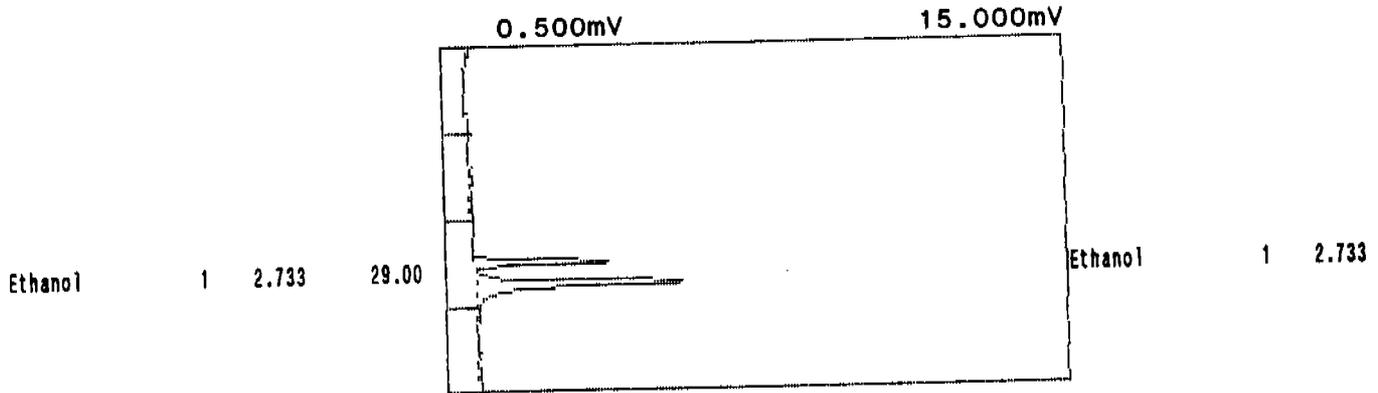


Component	Number	Retention	Area	Units
Ethanol	0	2.516	9.35	
	1	2.750	17.41	
	2		26.76	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC11  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 16:08:33

LOCATION NO. 2  
 PERFORMANCE CHECK  
 7<sup>th</sup> INJECTION  
 STD. = 5.80 ppm

Recovery =  $\frac{5.19}{5.80} \times 100 = 89.5\%$



Component	Number	Retention	Area	Units
Ethanol	0	2.500	13.89	5.19 ppm
	1	2.733	29.00	
	2		42.90	

RECOVERY FACTOR

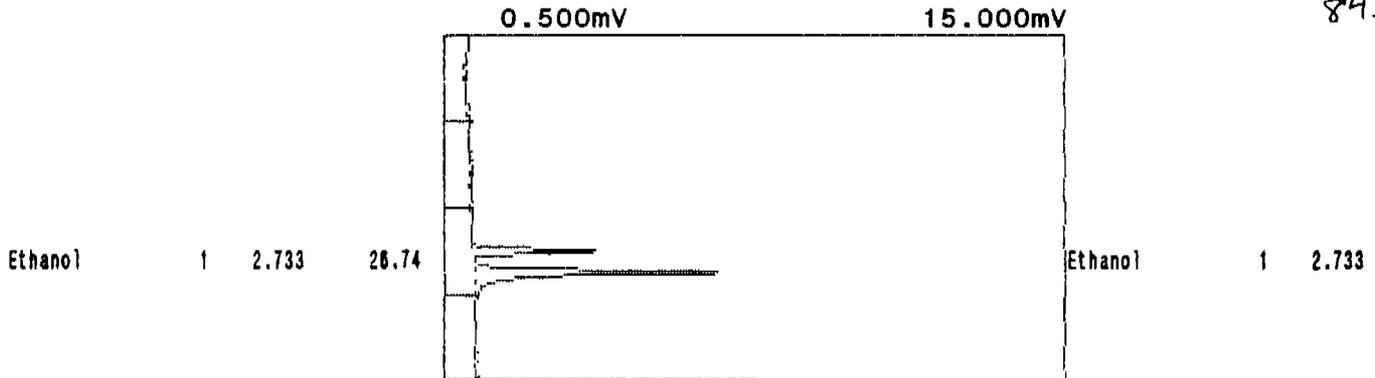
$$\frac{5.80 - 5.19}{5.80} + 1 = 1.10$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC12  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 16:22:55

LOCATION NO. 2  
 PERFORMANCE CHECK

STD. = 5.80ppm

$$\text{RECOVERY} = \frac{4.92}{5.80} \times 100 = 84.8\%$$



Component	Number	Retention	Area	Units
Ethanol	0	2.500	11.41	4.92ppm
	1	2.733	26.74	
	2		38.16	

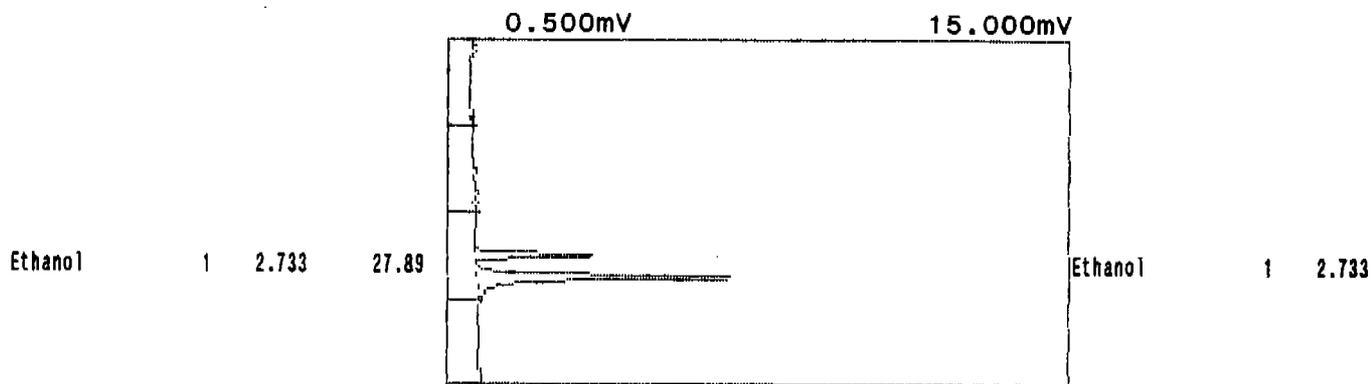
RECOVERY FACTOR

$$\frac{5.80 - 4.92}{5.80} + 1 = 1.15$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC13  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 16:28:58

LOCATION No.2  
 PERFORMANCE CHECK  
 QLS INT.  
 STD = 5.80PPM

$$\text{RECOVERY} = \frac{5.05}{5.80} \times 100 = 87.1\%$$

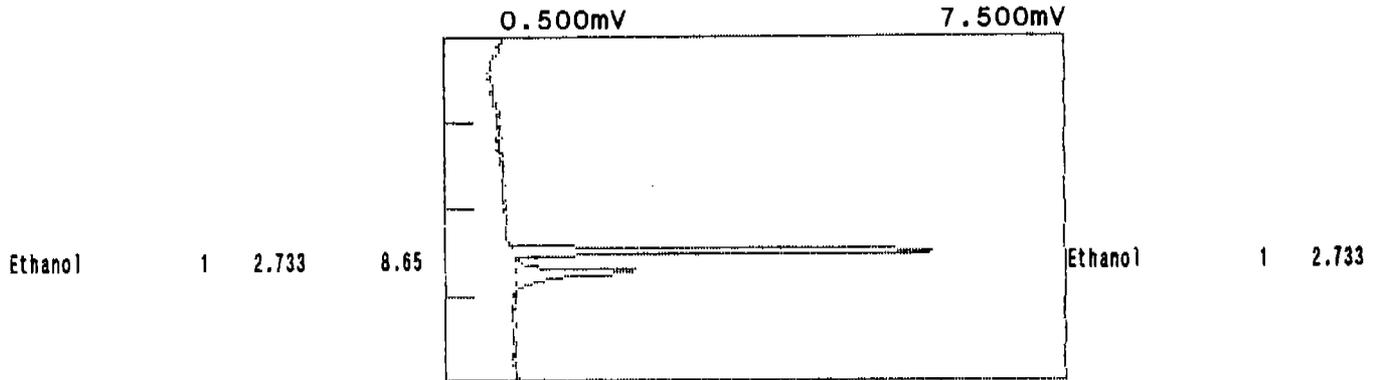


Component	Number	Retention	Area	Units
Ethanol	0	2.500	10.89	
	1	2.733	27.89	5.05 ppm
	2		38.78	

RECOVERY FACTOR  
 $\frac{5.80 - 5.05}{5.80} + 1 = 1.13$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2LC4  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 16:44:53

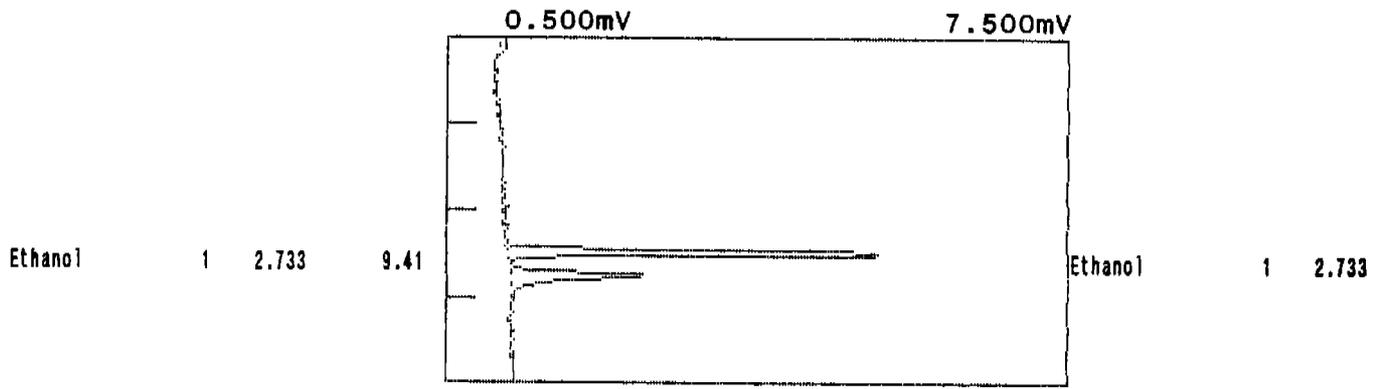
LOCATION No. 2  
 2ND CALIBRATION  
 LOW CAL STD  
 2.00 ppm  
 1ST INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	23.12	
	1	2.733	8.65	
	2		31.77	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2LC5  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 16:50:50

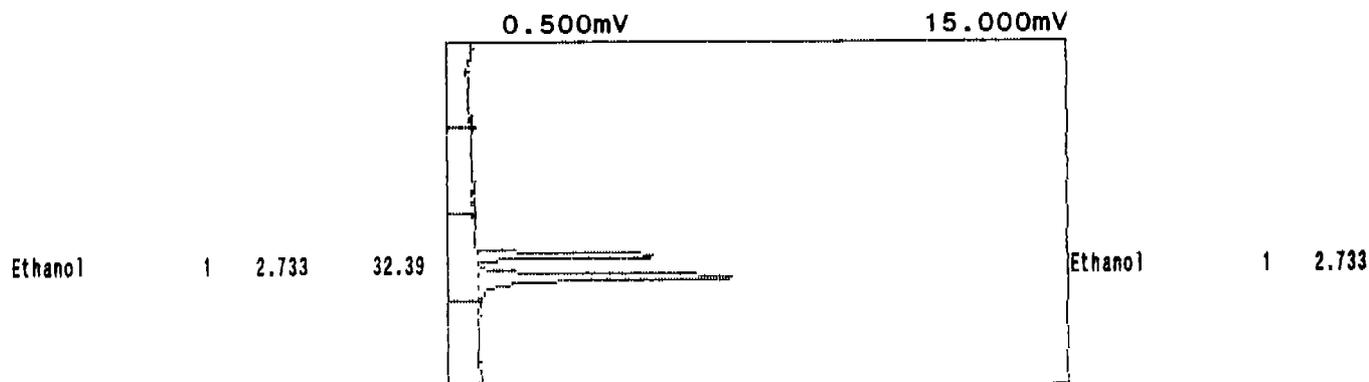
RECALIBRATION  
 LOCATION No. 2  
 LOW CAL STD  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	20.48	
Ethanol	1	2.733	9.41	
	2		29.89	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2LC6  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 16:58:13

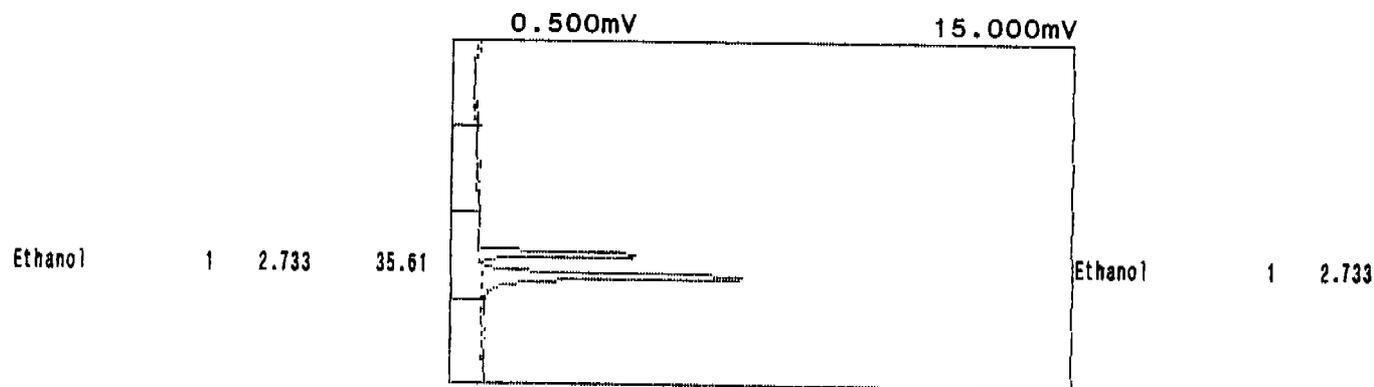
RECALIBRATION  
 LOCATION No-2  
 MID CAL STD  
 1<sup>st</sup> INJECTION



Component	Number	Retention	Area	Units
	0	2.500	19.75	
Ethanol	1	2.733	32.39	
	2		52.14	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2MC5  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 17:04:46

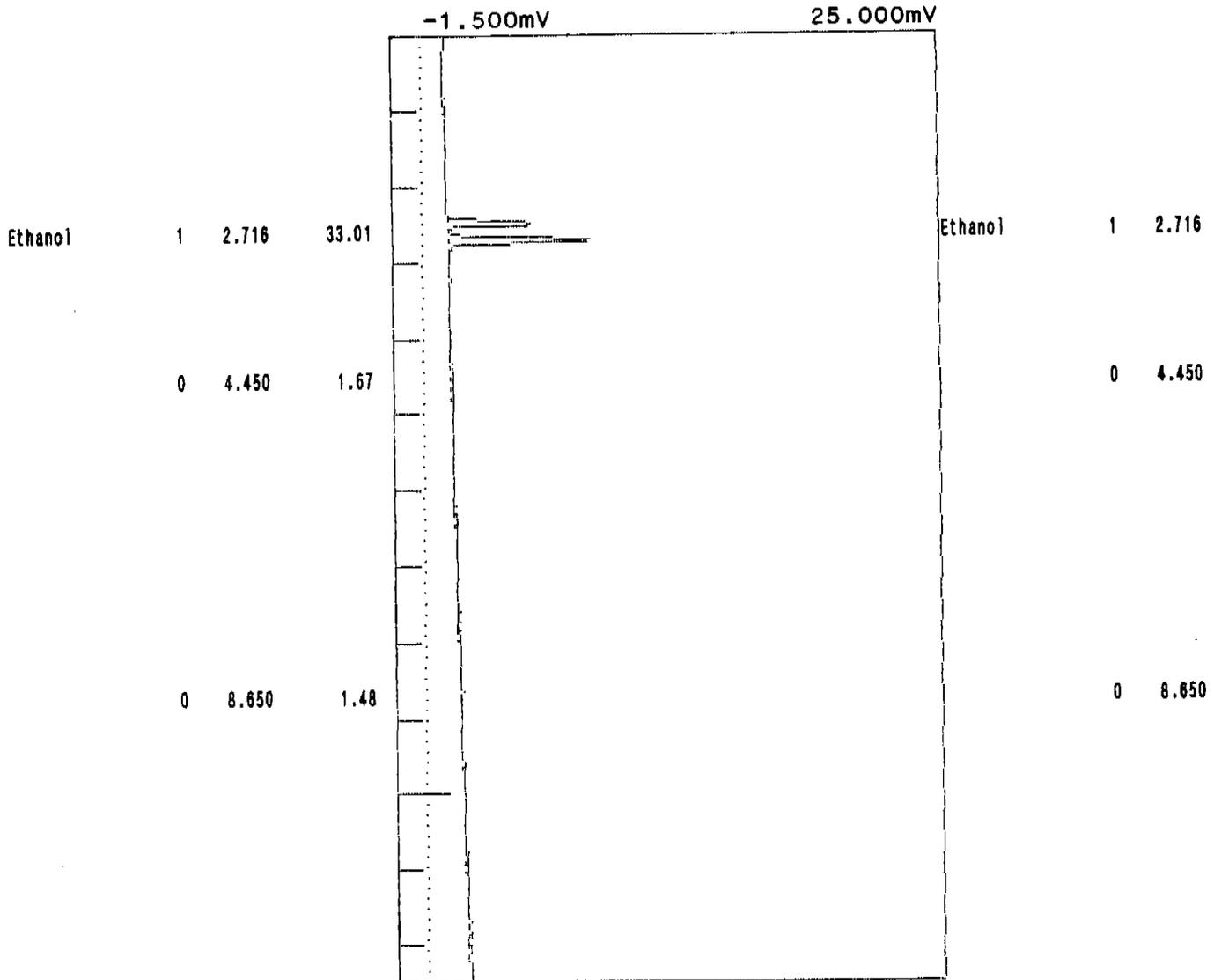
RECALIBRATION  
 LOCATION NO. 2  
 MID CAL STD.  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	17.84	
	1	2.733	35.61	
	2		53.45	

LOCATION No. 2  
 VENT #5  
 1ST INJECTION

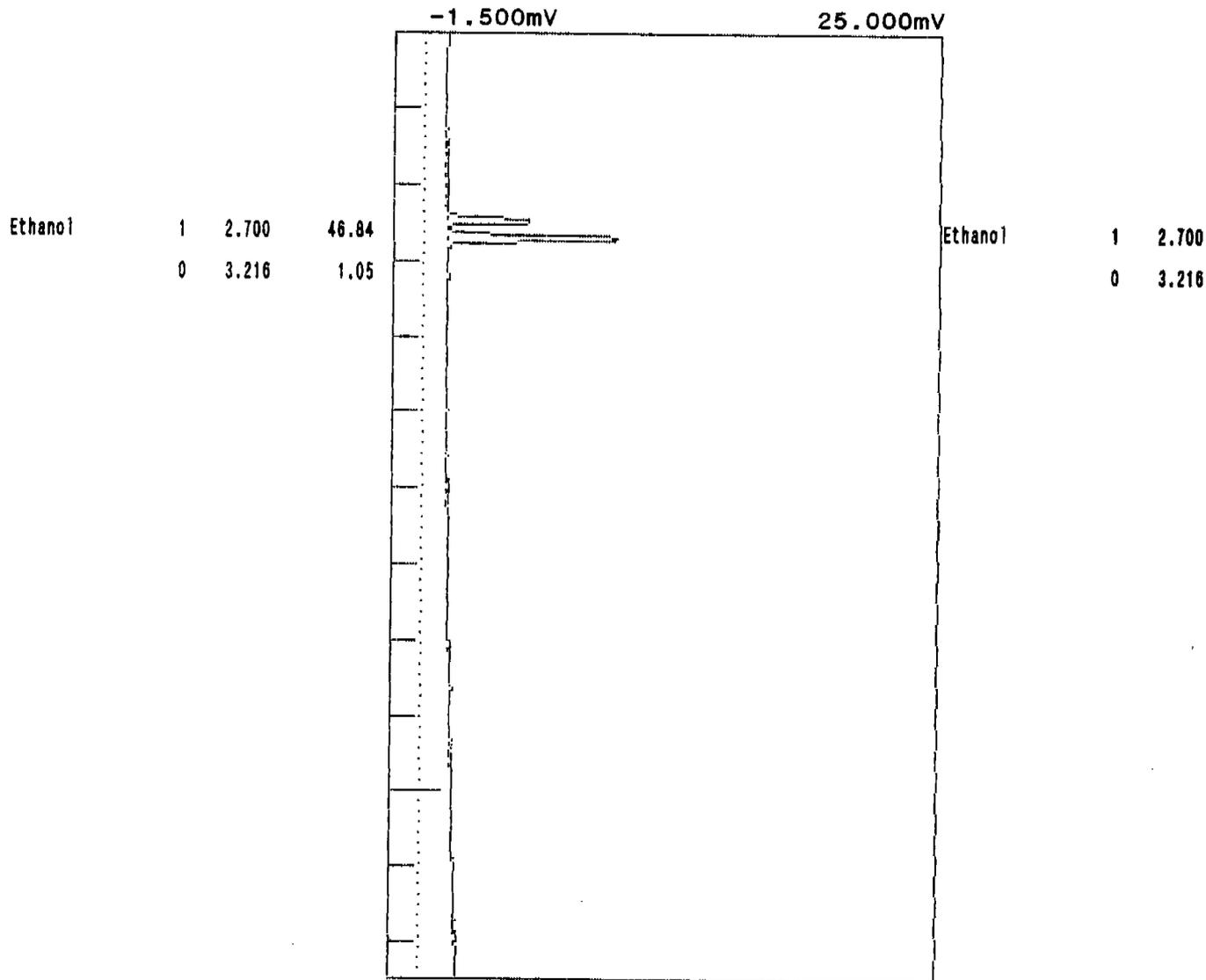
Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V51  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 17:21:40



Component	Number	Retention	Area	Units
Ethanol	0	2.500	17.55	
	1	2.716	33.01	
	0	4.450	1.67	
	0	8.650	1.48	
	4		53.71	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V52  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 17:36:55

LOCATION No. 2  
 VENT No. 5  
 2<sup>ND</sup> INJECTION



Ethanol 1 2.700 46.84  
 0 3.216 1.05

Ethanol 1 2.700  
 0 3.216

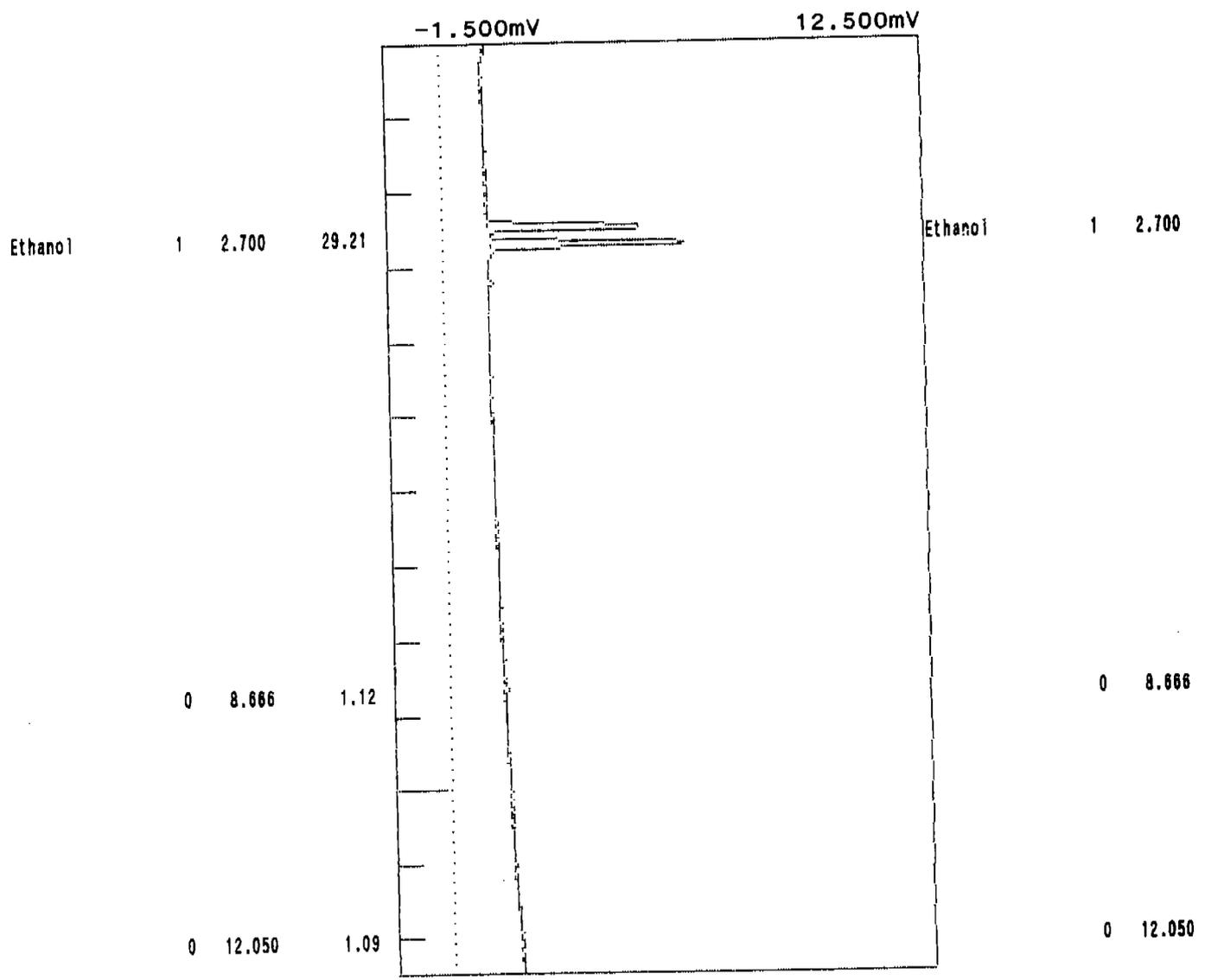
Component	Number	Retention	Area	Units
Ethanol	0	2.466	21.46	
	1	2.700	46.84	
	0	3.216	1.05	

3 69.36

108

LOCATION No. 2  
 VENT #5  
 3<sup>RD</sup> INJECTION

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V53  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 17:52:02



Component	Number	Retention	Area	Units
Ethanol	0	2.483	22.62	
	1	2.700	29.21	
	0	8.666	1.12	
	0	12.050	1.09	

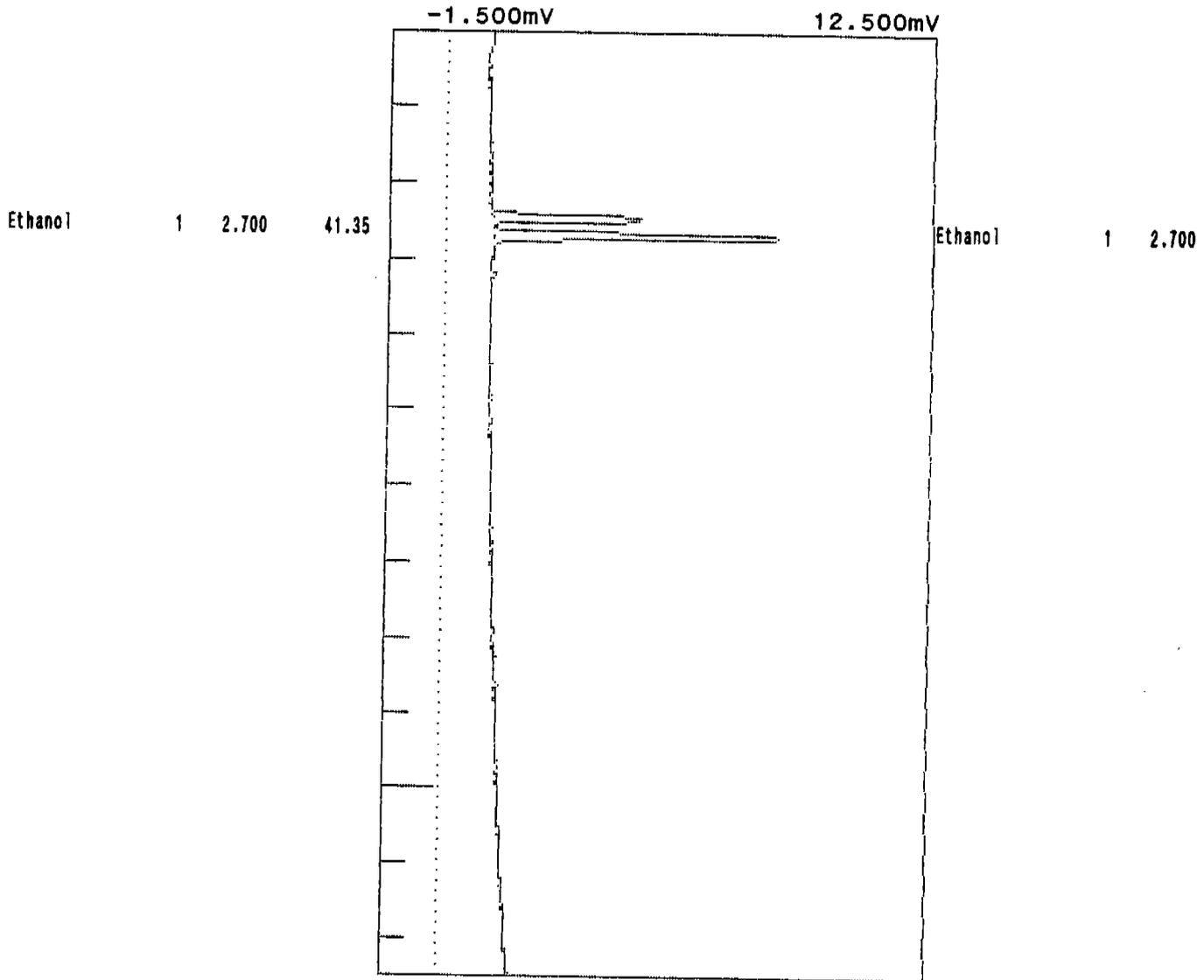
4

54.04

109

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2V54  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 18:07:22

LOCATION No.2  
 VENT#5  
 4th INJECT

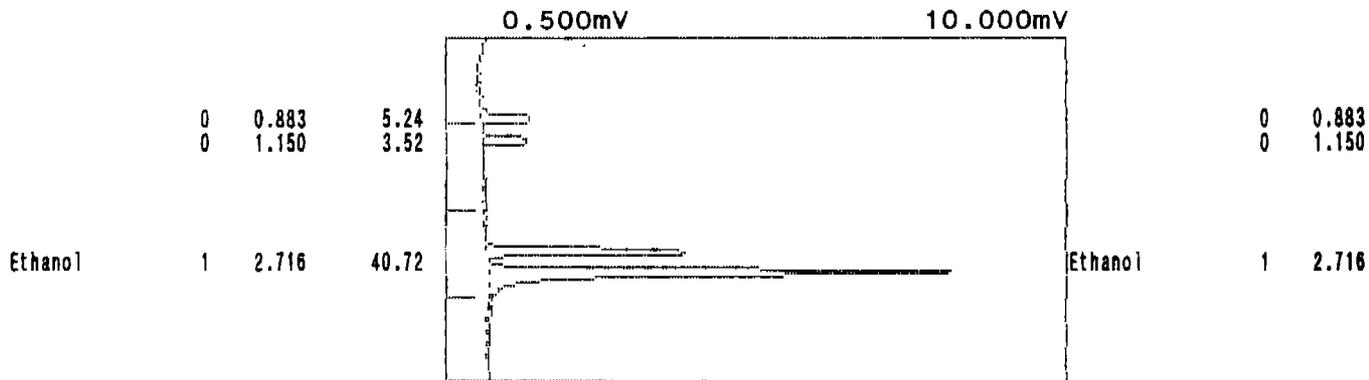


Component	Number	Retention	Area	Units
Ethanol	0	2.483	22.65	
	1	2.700	41.35	
	2		64.00	

110

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC13  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 18:27:20

PERFORMANCE CHECK  
 LOCATION NO. 2  
 1<sup>st</sup> INT.  
 STD. = 5.80ppm  
 RECOVERY =  $\frac{6.84}{5.80} \times 100 = 117.9\%$



Component	Number	Retention	Area	Units
	0	0.883	5.24	
	0	1.150	3.52	
	0	2.500	17.18	
Ethanol	1	2.716	40.72	6.84 ppm
	4		66.66	

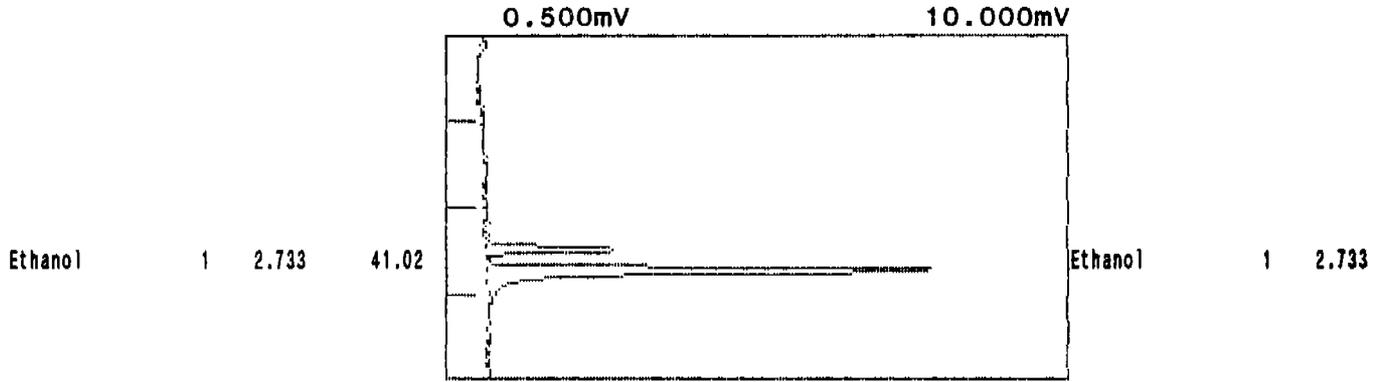
RECOVERY FACTOR

$$\frac{5.80 - 6.84}{5.80} + 1 = 0.821$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC14  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 18:33:23

LOCATION No. 2  
 PERFORMANCE CHECK  
 2ND INJECTION  
 STD = 5.80 ppm

$$\text{Recovery} = \frac{6.84}{5.80} \times 100 = 117.9\%$$



Component	Number	Retention	Area	Units
Ethanol	0	2.500	11.00	6.84 ppm
	1	2.733	41.02	
	2		52.02	

RECOVERY FACTOR

$$\frac{5.80 - 6.84 - 7}{5.80} = 0.821$$

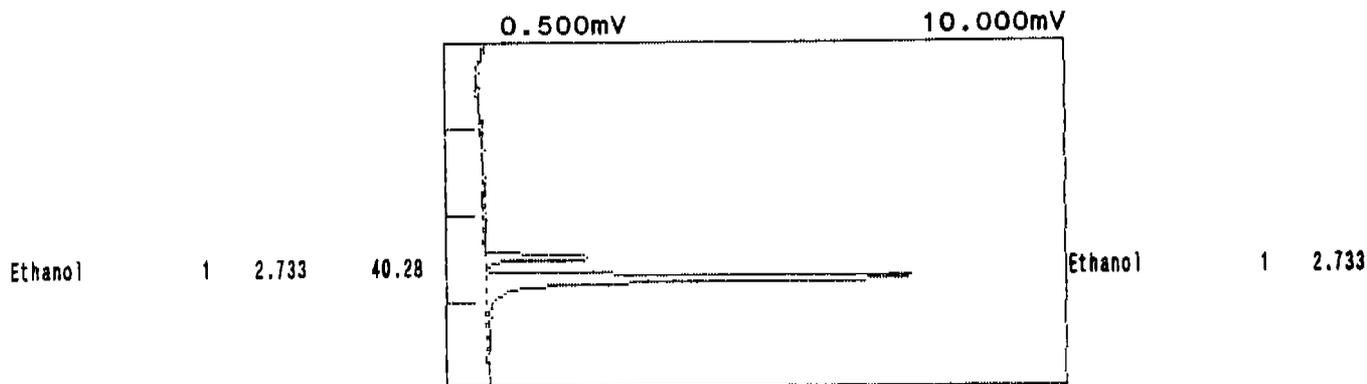
Operator : Gary Mata  
 Description : FID  
 File : D:\21691\2PC15  
 Temperature :  
 Components : ETHOH  
 Date : 07/27/1994  
 Time : 18:39:18

LOCATION No. 2  
PERFORMANCE CHECK

3<sup>RD</sup> INJECTION

STD = 5.80PPM

$$\text{RECOVERY} = \frac{6.70}{5.80} \times 100 = 115.5\%$$



Component	Number	Retention	Area	Units
Ethanol	0	2.483	8.76	6.70PPM
	1	2.733	40.28	
	2		49.04	

RECOVERY FACTOR

$$\frac{5.80 - 6.70}{5.80} + 1 = 0.845$$

## Ethanol

---

2.000	10.70
5.800	41.50
19.000	188.00

## ETHANOL

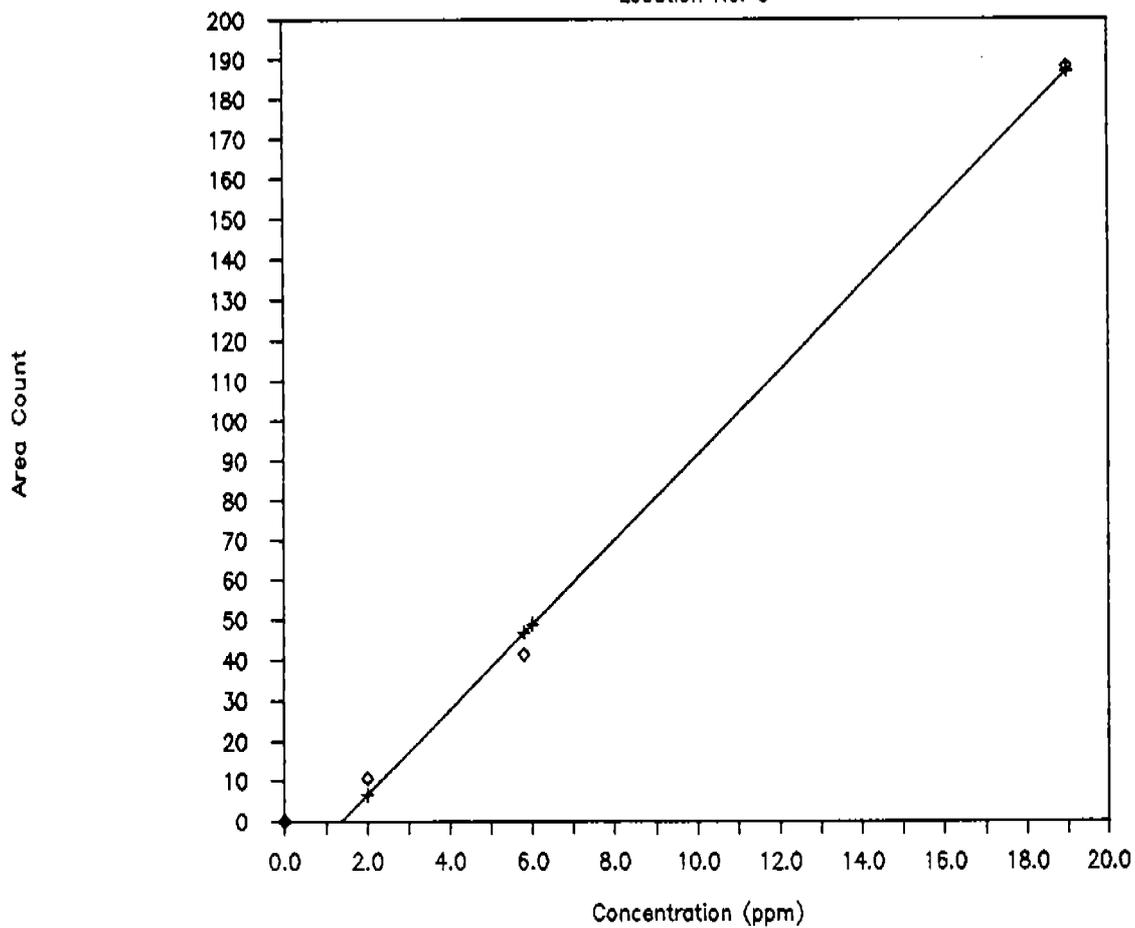
## Regression Output:

Constant	-14.65531
Std Err of Y Est	6.8695435
R Squared	0.9973708
No. of Observations	3
Degrees of Freedom	1

X Coefficient(s)	10.603
Std Err of Coef.	0.54440

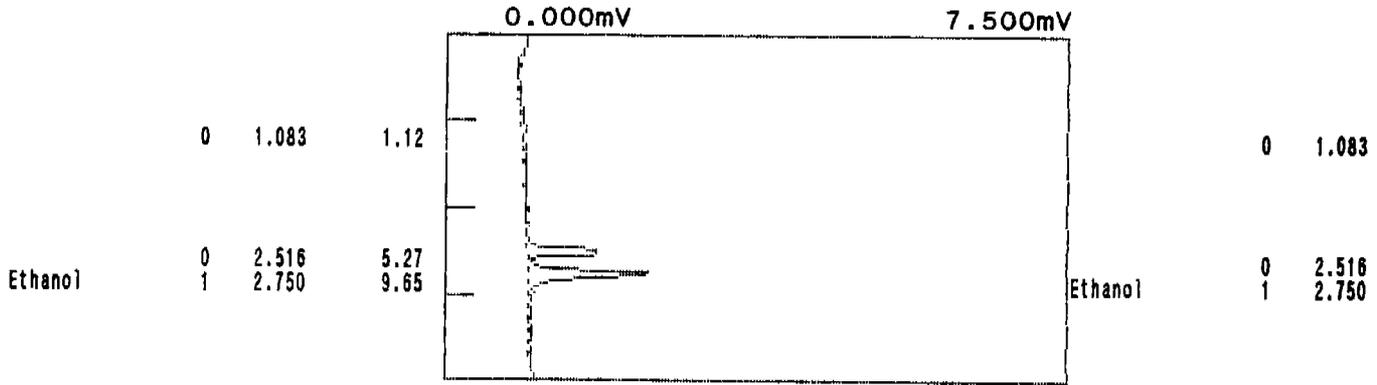
# ETHANOL

Location No. 3



Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3LC1  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 08:38:07

LOCATION NO.3  
 LOW CAL STD  
 2.00 ppm  
 1<sup>ST</sup> INJECTION

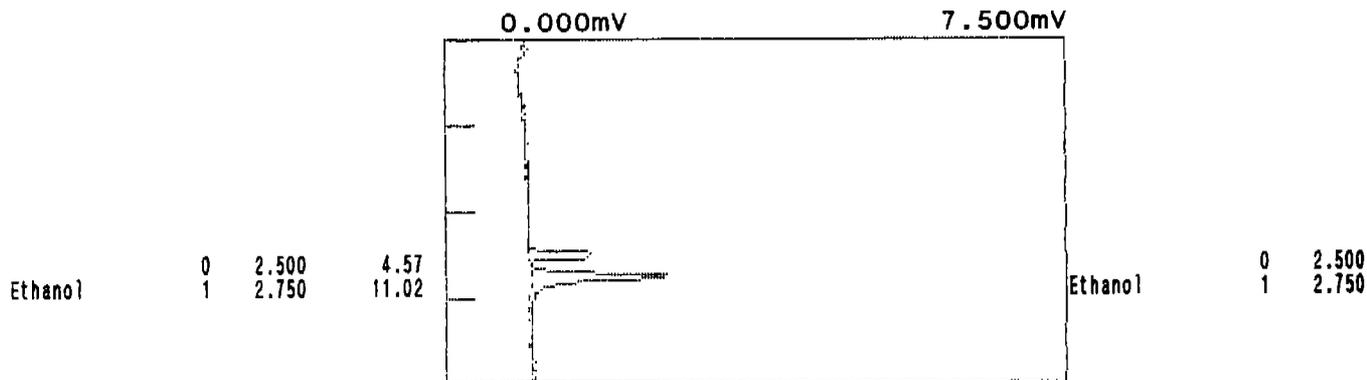


Component	Number	Retention	Area	Units
Ethanol	0	1.083	1.12	
	0	2.516	5.27	
	1	2.750	9.65	
	3		16.05	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3LC2  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 08:44:06

LOCATION No. 3  
 LOW CAL STD (2.00ppm)  
 2<sup>ND</sup> INJECTION

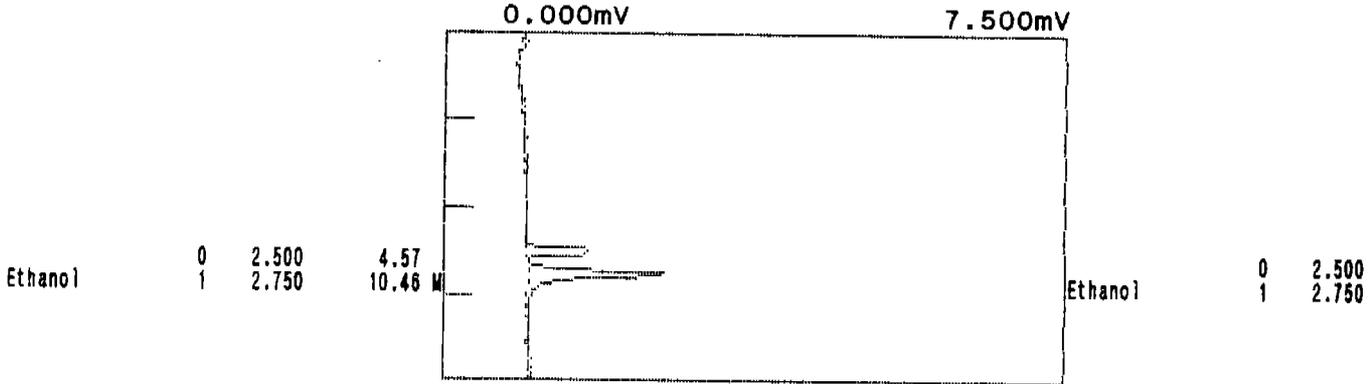
NEEDS REINTEGRATION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	4.57	
	1	2.750	11.02	
	2		15.59	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3LC2  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 08:44:06

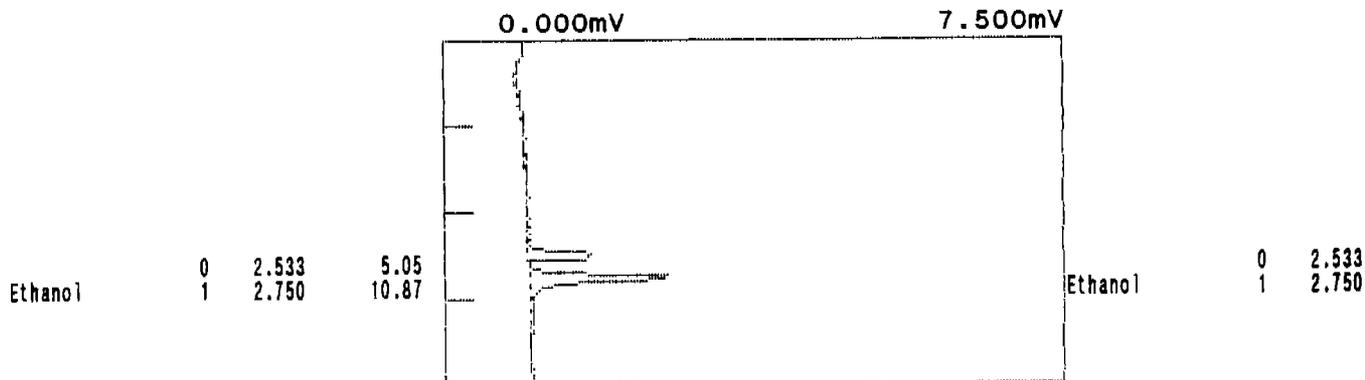
REINTEGRATED  
 LOCATION NO. 3  
 LOW CAL STD  
 (2.00 ppm)  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	4.57	
	1	2.750	10.46 M	
	2		15.03	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3LC3  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 08:49:44

LOCATION NO. 3  
 LOW TSTD CAL STD.  
 5.80 PPM  
 3<sup>RD</sup> INJECTION



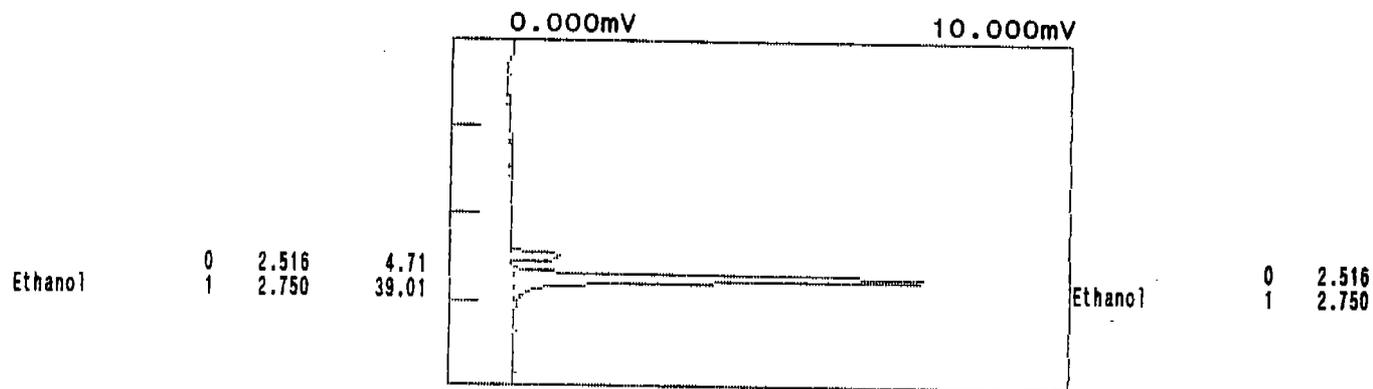
Ethanol 0 2.533 5.05  
 1 2.750 10.87

Ethanol 0 2.533  
 1 2.750

Component	Number	Retention	Area	Units
Ethanol	0	2.533	5.05	
	1	2.750	10.87	
	2		15.92	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3MC1  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 08:56:26

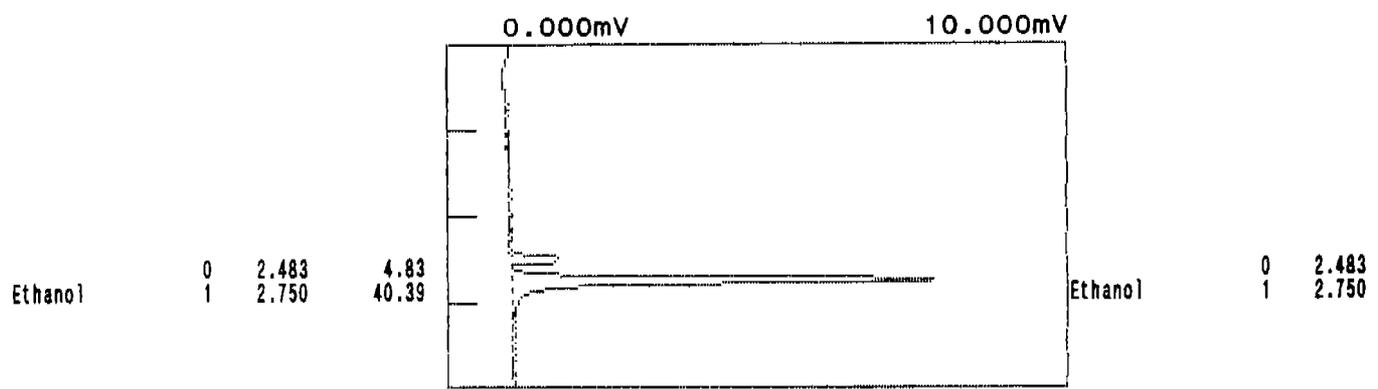
LOCATION NO.3  
 MID CAL STD.  
 5.80ppm



Component	Number	Retention	Area	Units
Ethanol	0	2.516	4.71	
	1	2.750	39.01	
	2		43.72	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3MC2  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 09:02:04

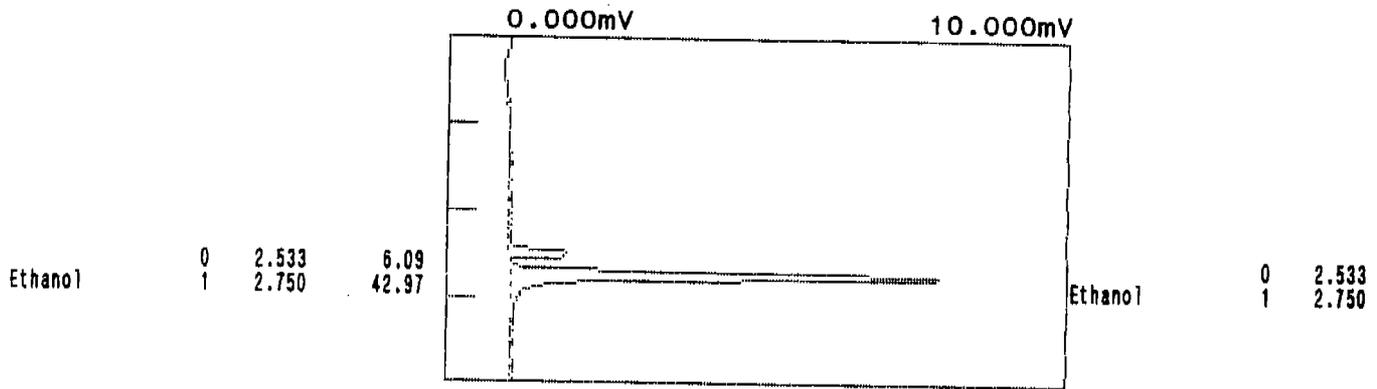
LOCATION NO.3  
 MID CAL SED,  
 (5.80 PPM)  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	4.83	
	1	2.750	40.39	
	2		45.22	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3MC3  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 09:07:47

LOCATION NO.3  
 MID CAL STD  
 (5.80PPM)  
 3<sup>rd</sup> INJECTION

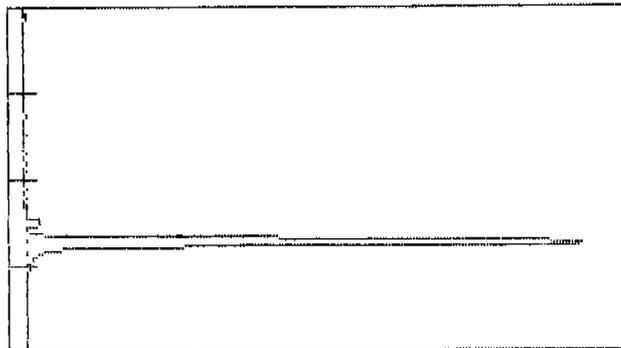


Component	Number	Retention	Area	Units
Ethanol	0	2.533	6.09	
Ethanol	1	2.750	42.97	
	2		49.06	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3HC1  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 09:14:34

LOCATION NO.3  
 HIGH CAL STD  
 19.00 PPM  
 1<sup>ST</sup> INJECTION

0.000mV 35.000mV



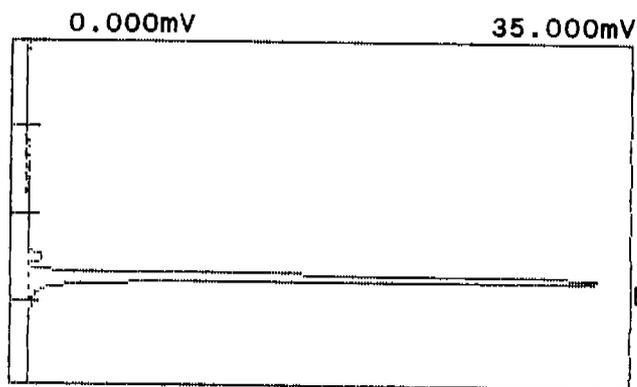
Ethanol 0 2.516 4.70  
 1 2.750 189.51

Ethanol 0 2.516  
 1 2.750

Component	Number	Retention	Area	Units
Ethanol	0	2.516	4.70	
	1	2.750	189.51	
	2		194.21	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3HC2  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 09:20:28

LOCATION NO. 3  
 HIGH CAL STD  
 19.0 ppm  
 (SI INJECTION)



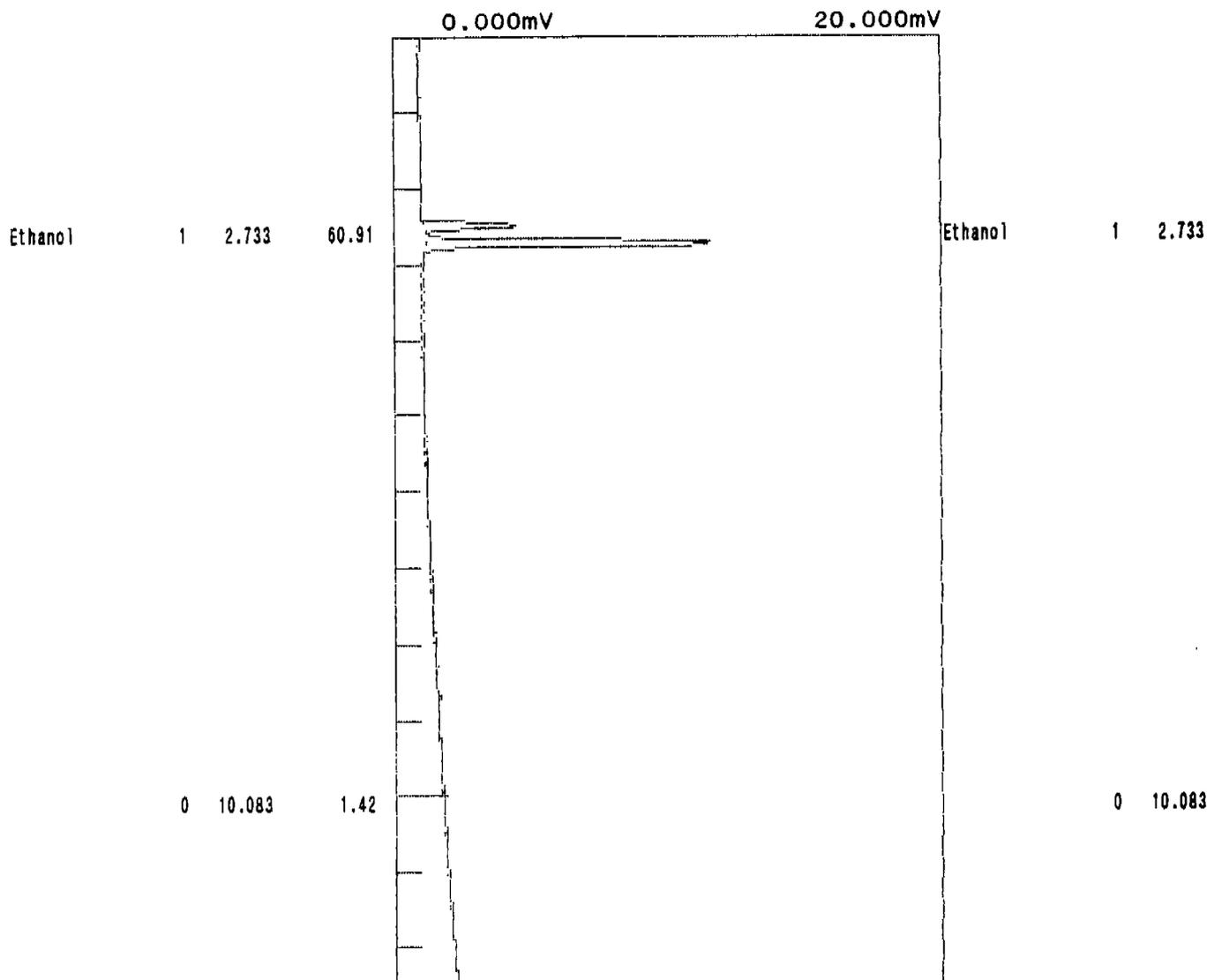
Ethanol 0 2.516 5.00  
 1 2.750 186.66

Ethanol 0 2.516  
 1 2.750

Component	Number	Retention	Area	Units
Ethanol	0	2.516	5.00	
	1	2.750	186.66	
	2		191.66	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R11  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 09:31:06

LOCATION NO. 3  
 VENT NO. 1  
 RUN#1  
 IS INJECTION



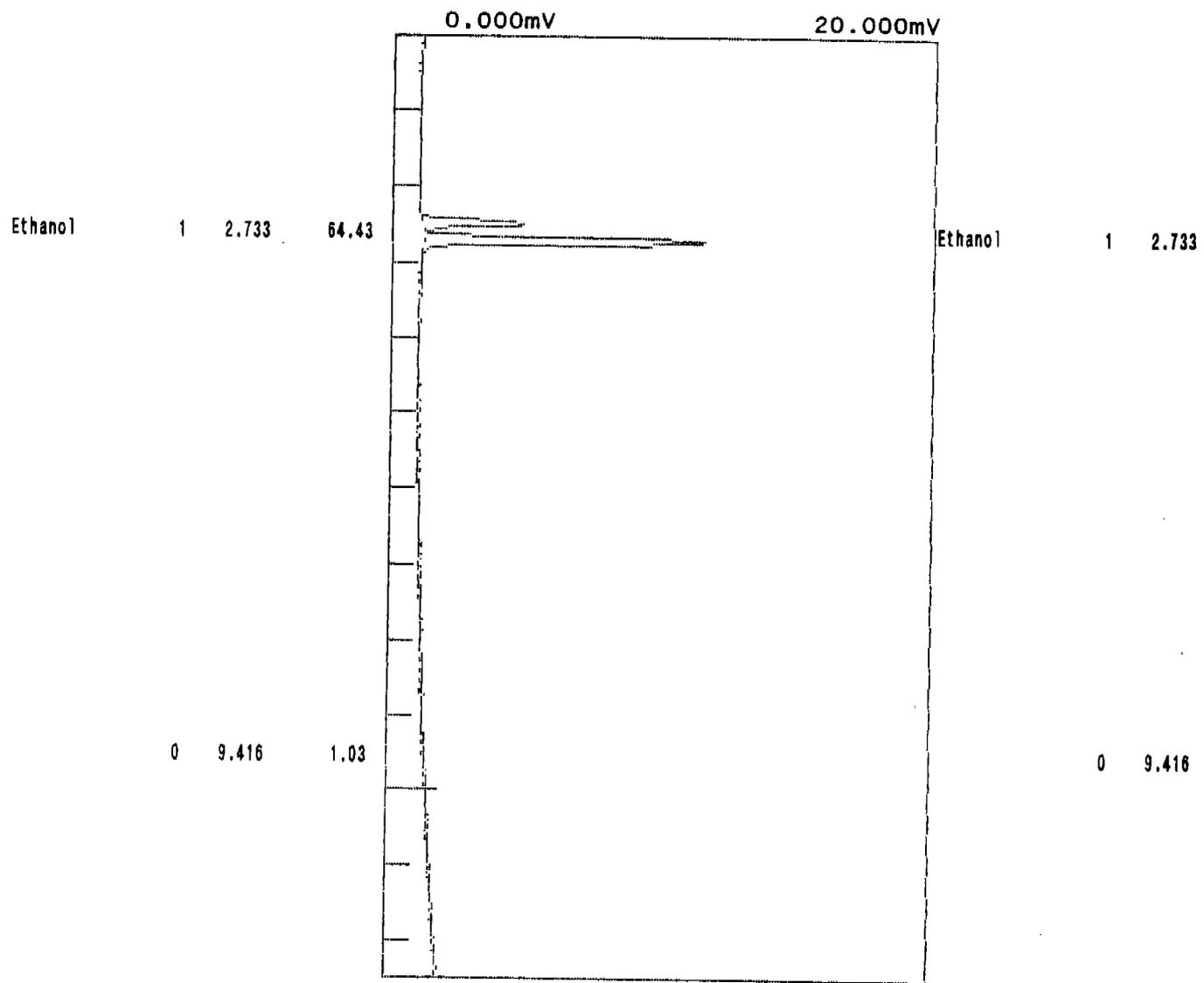
Component	Number	Retention	Area	Units
Ethanol	0	2.500	20.08	
	1	2.733	60.91	
	0	10.083	1.42	

3 82.41

125

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R12  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 09:46:03

LOCATION NO. 3  
 VENT NO. 1 RUN #1  
 2ND INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	23.29	
	1	2.733	64.43	
	0	9.416	1.03	

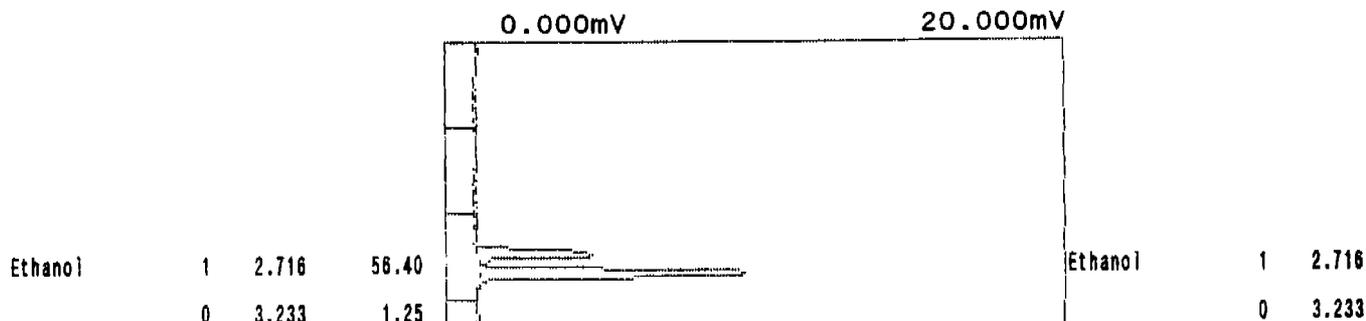
3 88.75

126

**ENTROPY**

LOCATION NO.3  
 VENT NO.1 RUN#1  
 3RD INJECTION

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R13  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 16:01:04



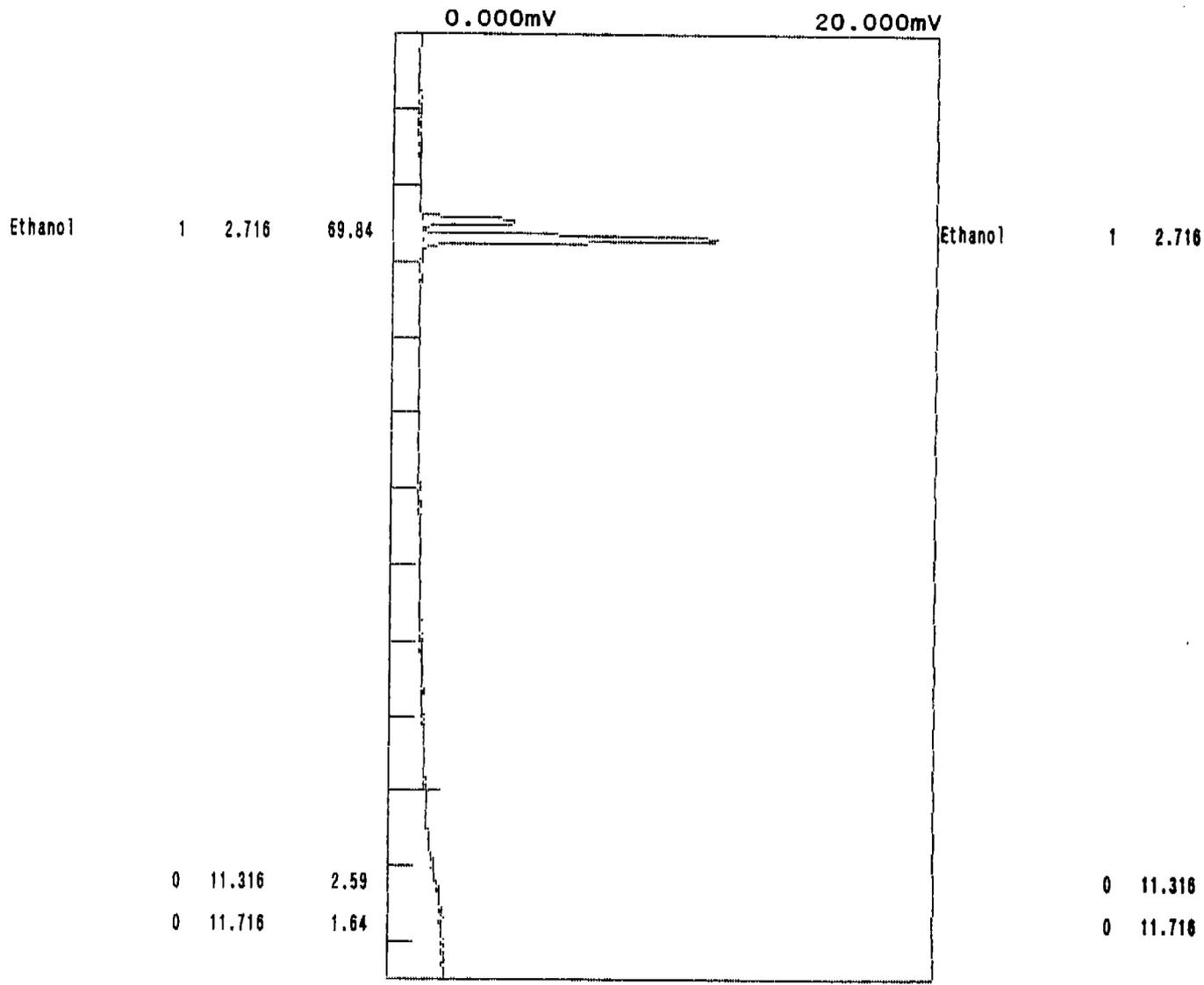
Component	Number	Retention	Area	Units
Ethanol	0	2.500	23.33	
	1	2.716	56.40	
	0	3.233	1.25	

3 80.98

127

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R14  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 10:16:43

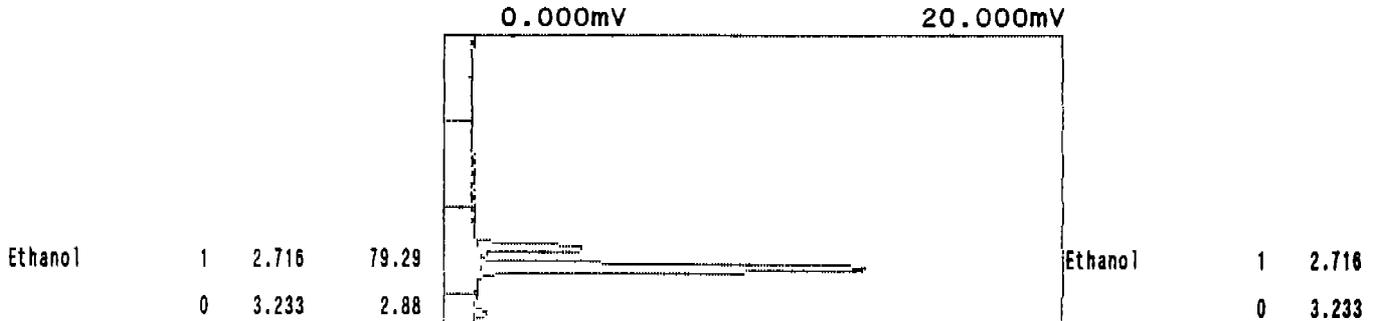
LOCATION NO.3  
 VENT NO.1 RUN#1  
 4th INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	21.60	
	1	2.716	69.84	
	0	11.316	2.59	
	0	11.716	1.64	
	4		95.67	
			128	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R11  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 10:38:06

LOCATION NO.3  
 VENT NO.2  
 RUN#1  
 1ST INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	20.42	
	1	2.716	79.29	
	0	3.233	2.88	

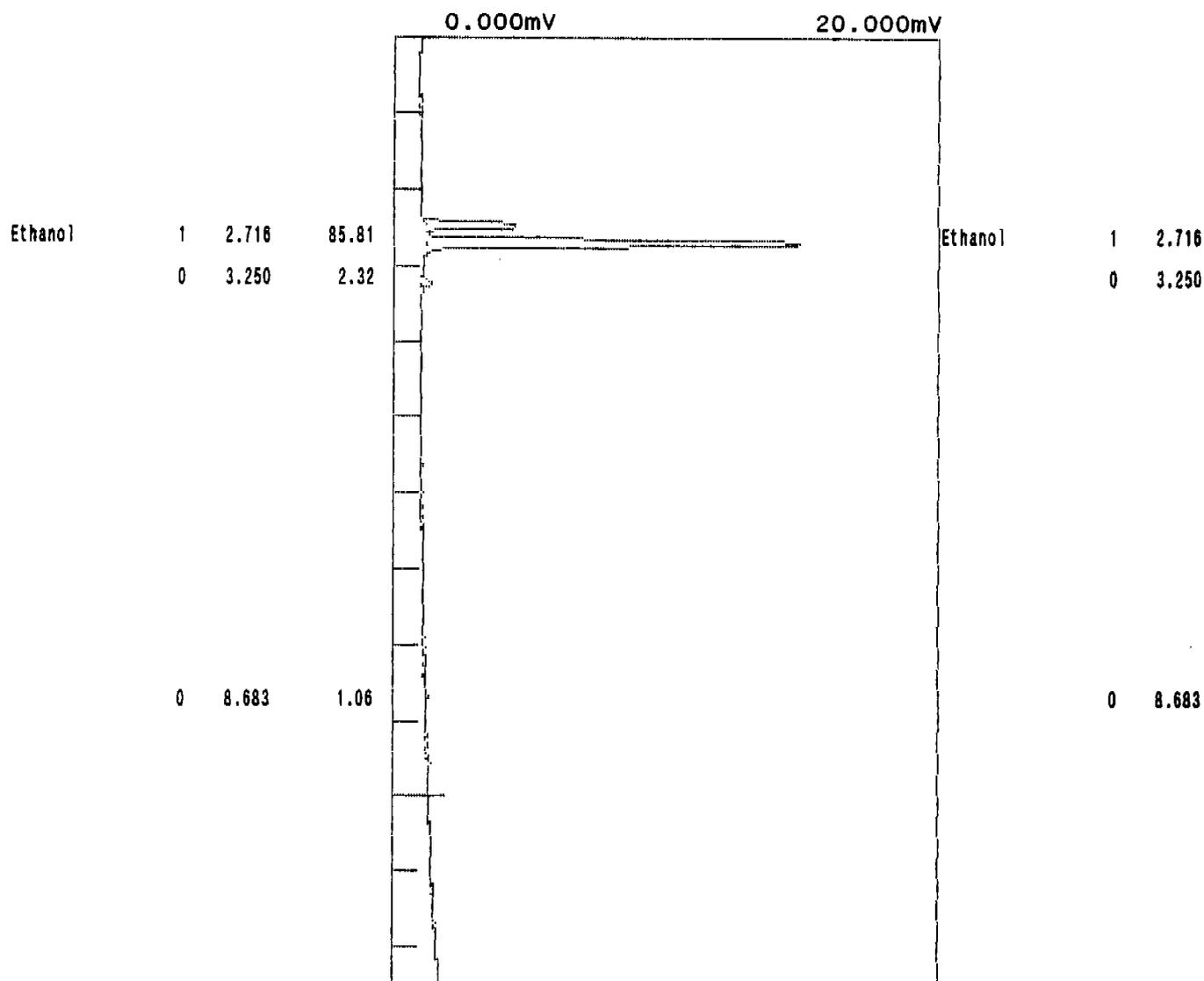
3

102.60

129

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R12  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 10:53:18

LOCATION No. 3  
 VENT No. 2 RUN#/  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	20.97	
	1	2.716	85.81	
	0	3.250	2.32	
	0	8.683	1.06	

4

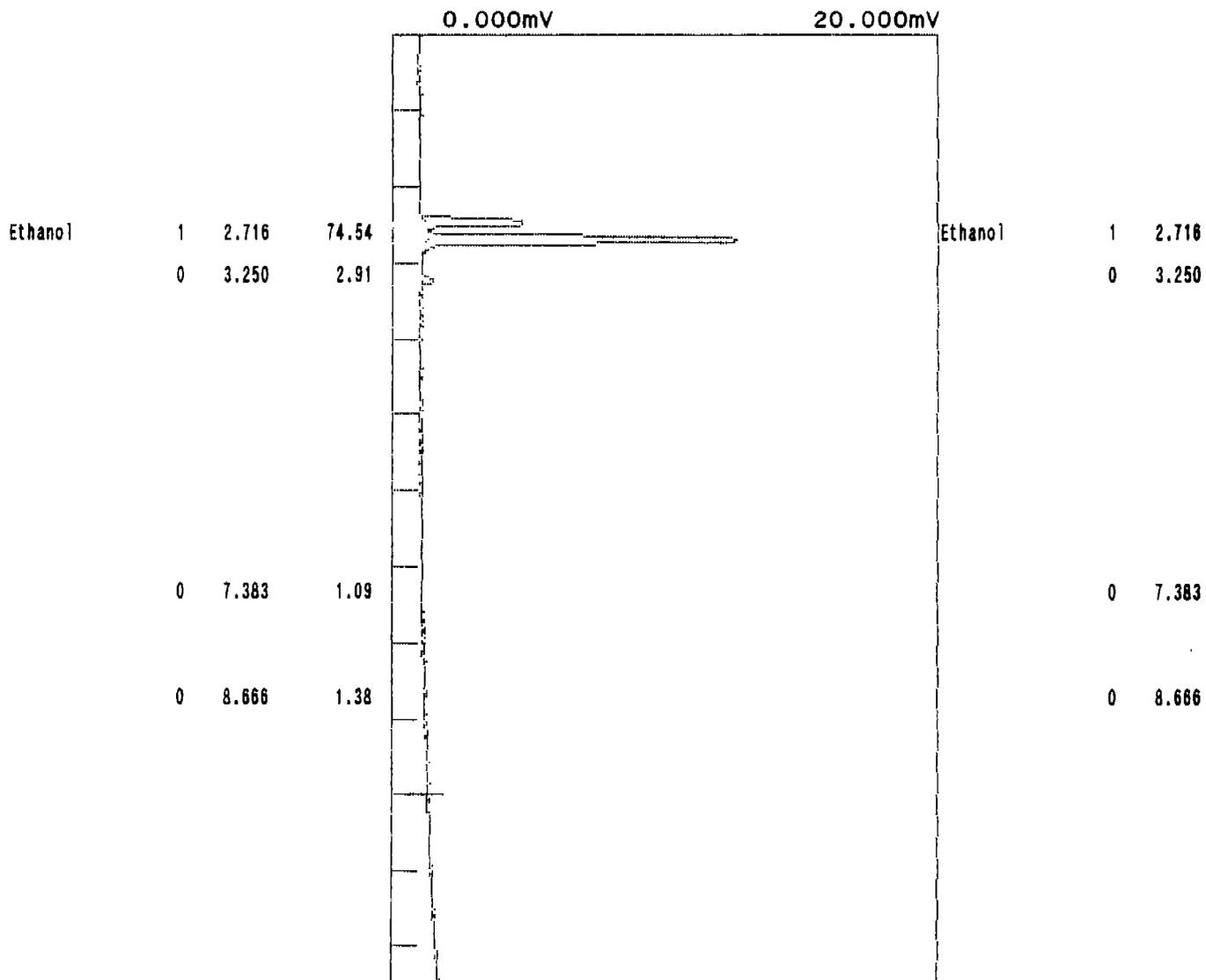
110.16

130

**ENTROPY**

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R13  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 11:08:18

LOCATION NO. 3  
 VENT NO. 2 RUN # 1  
 3<sup>RD</sup> INJECTION



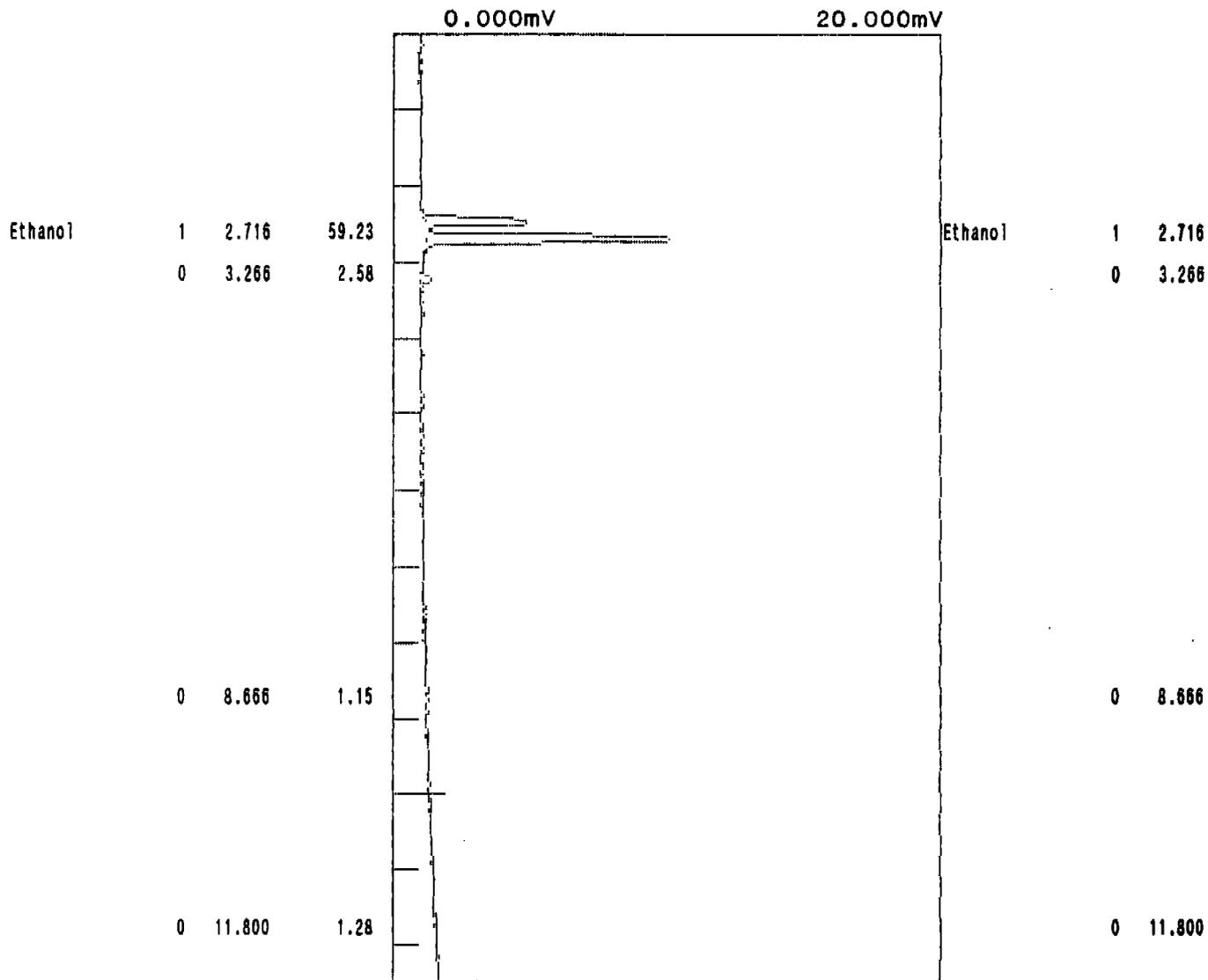
Component	Number	Retention	Area	Units
Ethanol	0	2.500	23.19	
	1	2.716	74.54	
	0	3.250	2.91	
	0	7.383	1.09	
	0	8.666	1.38	

5

103.11  
131

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R14  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 11:23:36

LOCATION No. 3  
 VENT No. 2 RUN#1  
 4th INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	23.25	
	1	2.716	59.23	
	0	3.266	2.58	
	0	8.666	1.15	
	0	11.800	1.28	

5

87.49

132

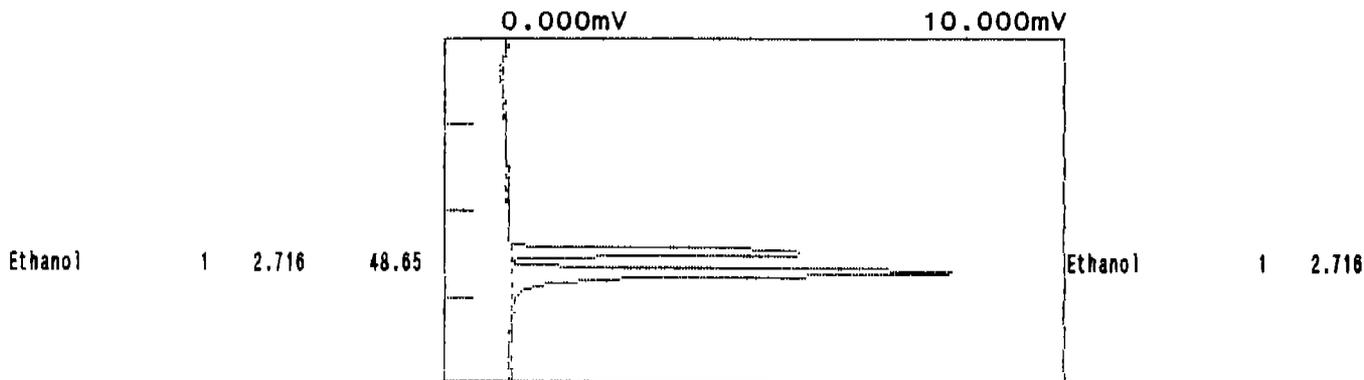
**ENTROPY**

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3PCR11  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 11:42:00

LOCATION No.3  
 PERFORMANCE CHECK  
 Run #1

1st INJECTION  
 STD = 5.80 PPM

$$\text{RECOVERY} = \frac{6.00}{5.80} \times 100 = 103.4\%$$



Component	Number	Retention	Area	Units
Ethanol	0	2.483	31.94	6.00 PPM
	1	2.716	48.65	
	2		80.59	

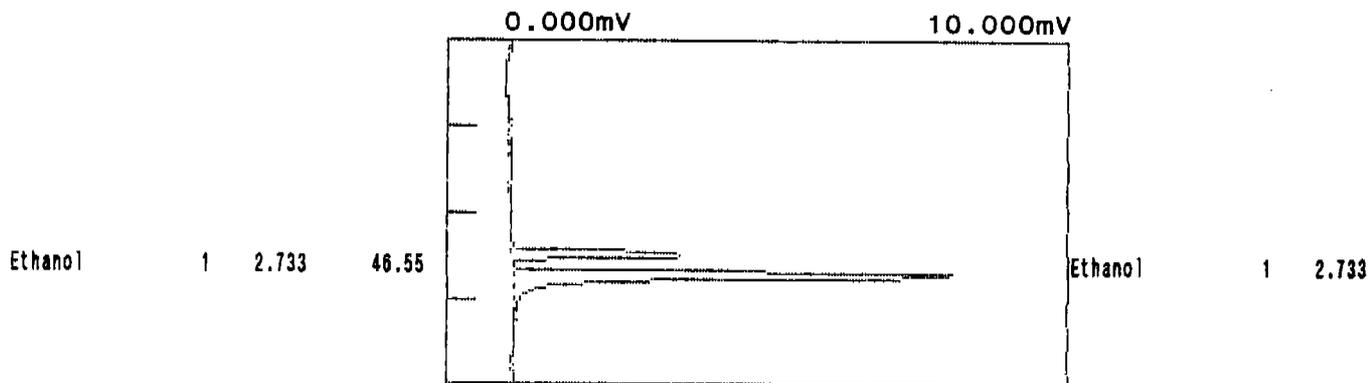
RECOVERY FACTOR

$$\frac{5.80 - 6.00}{5.80} + 1 = 0.966$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3PCR12  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 11:47:50

LOCATION No. 3  
 PERFORMANCE CHECK  
 RUN # 1  
 STD = 5.80 PPM

$$\text{Recovery} = \frac{5.81}{5.80} \times 100 = 100.2\%$$



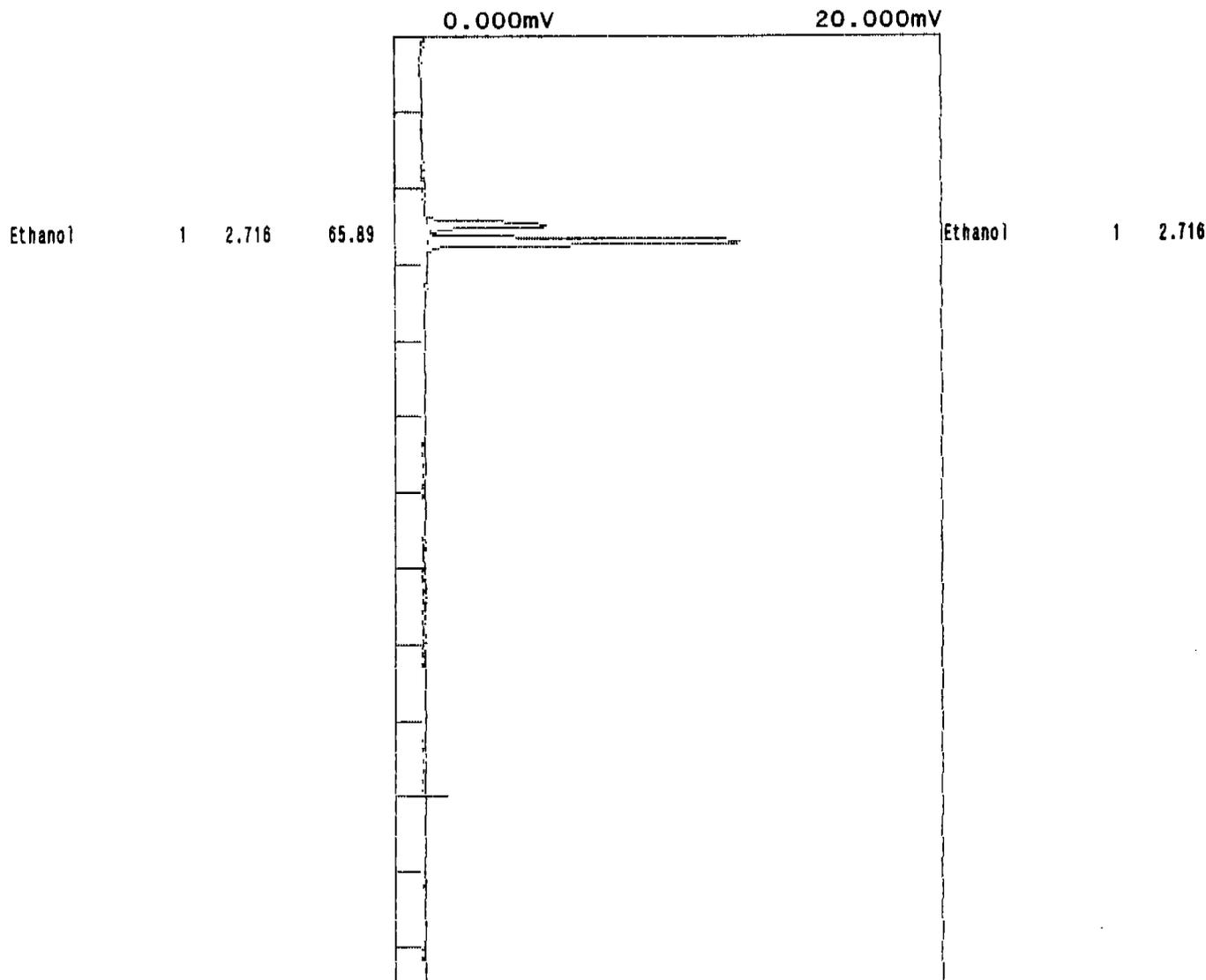
Component	Number	Retention	Area	Units
Ethanol	0	2.500	17.11	5.81 ppm
	1	2.733	46.55	
	2		63.66	

RECOVERY FACTOR  
 $\frac{5.80 - 5.81}{5.80} + 1 = 0.998$

$$\frac{0.966 + 0.998}{2} = 0.982$$

LOCATION No. 3  
VENT NO. 1 RUN#2  
INJECTION

Operator : Gary Mata  
Description : FID  
File : D:\21691\3V1R21  
Temperature :  
Components : ETHOH  
Date : 07/28/1994  
Time : 12:12:28



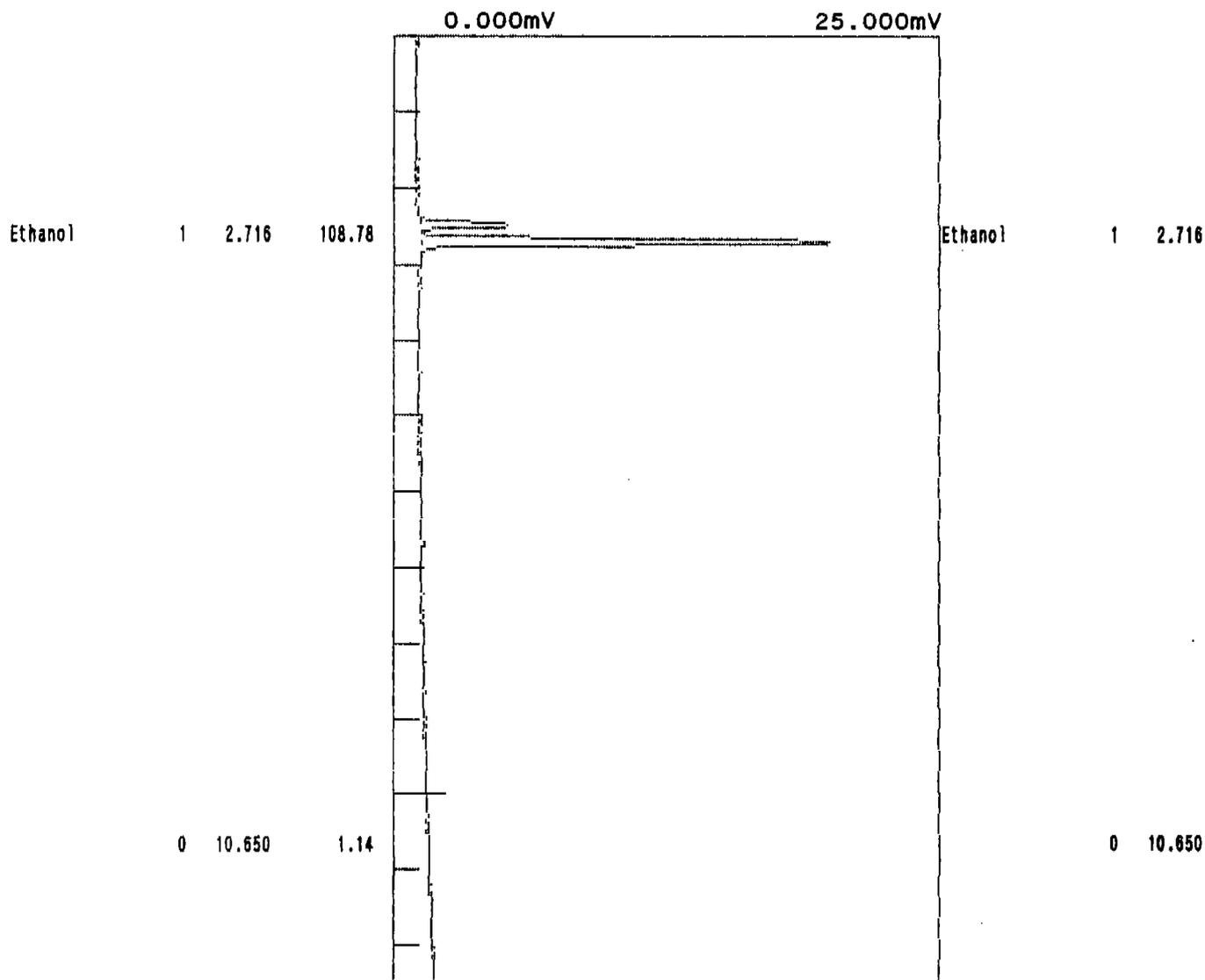
Component	Number	Retention	Area	Units
	0	2.500	24.54	
Ethanol	1	2.716	65.89	
	2		90.44	

135

**ENTROPY**

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R22  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 12:27:09

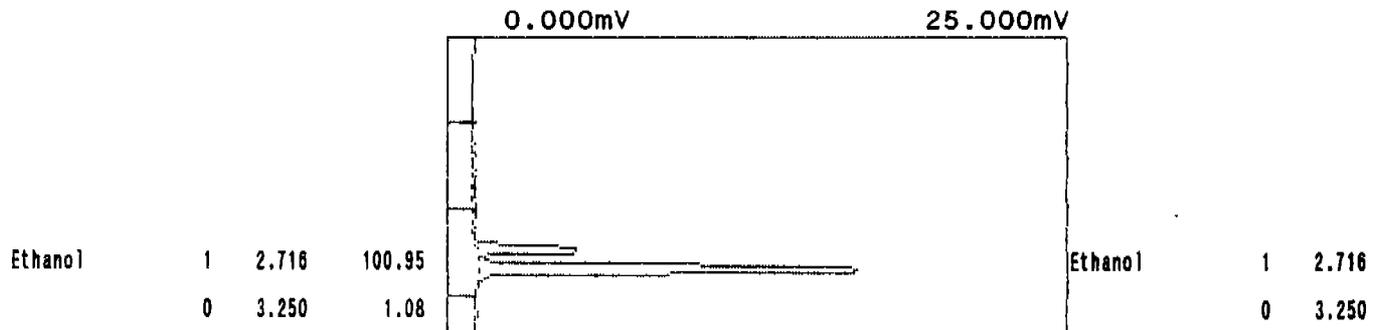
LOCATION No.2  
 VENT No.1 RUN#2  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	21.01	
	1	2.716	108.78	
	0	10.650	1.14	
	3		130.92	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R23  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 12:42:10

LOCATION NO.3  
 VENT No.1 RUN#2  
 3<sup>RD</sup> INJECTION

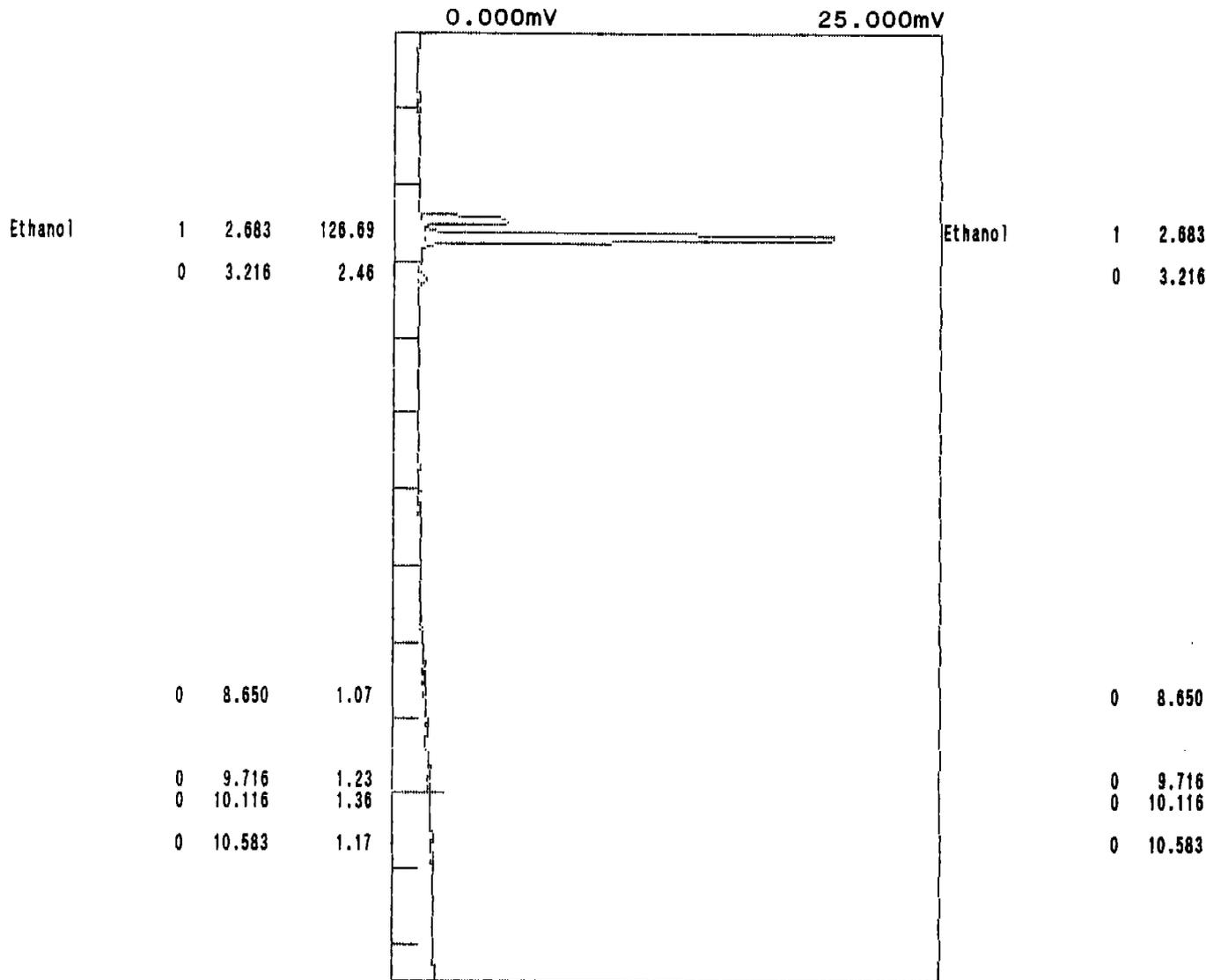


Component	Number	Retention	Area	Units
Ethanol	0	2.500	24.47	
	1	2.716	100.95	
	0	3.250	1.08	

3 126.50

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R24  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 12:57:09

LOCATION NO.3  
 VENT NO.1 RUN#2  
 4th INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	26.05	
	1	2.683	126.69	
	0	3.216	2.46	
	0	8.650	1.07	
	0	9.716	1.23	
	0	10.116	1.36	
	0	10.583	1.17	

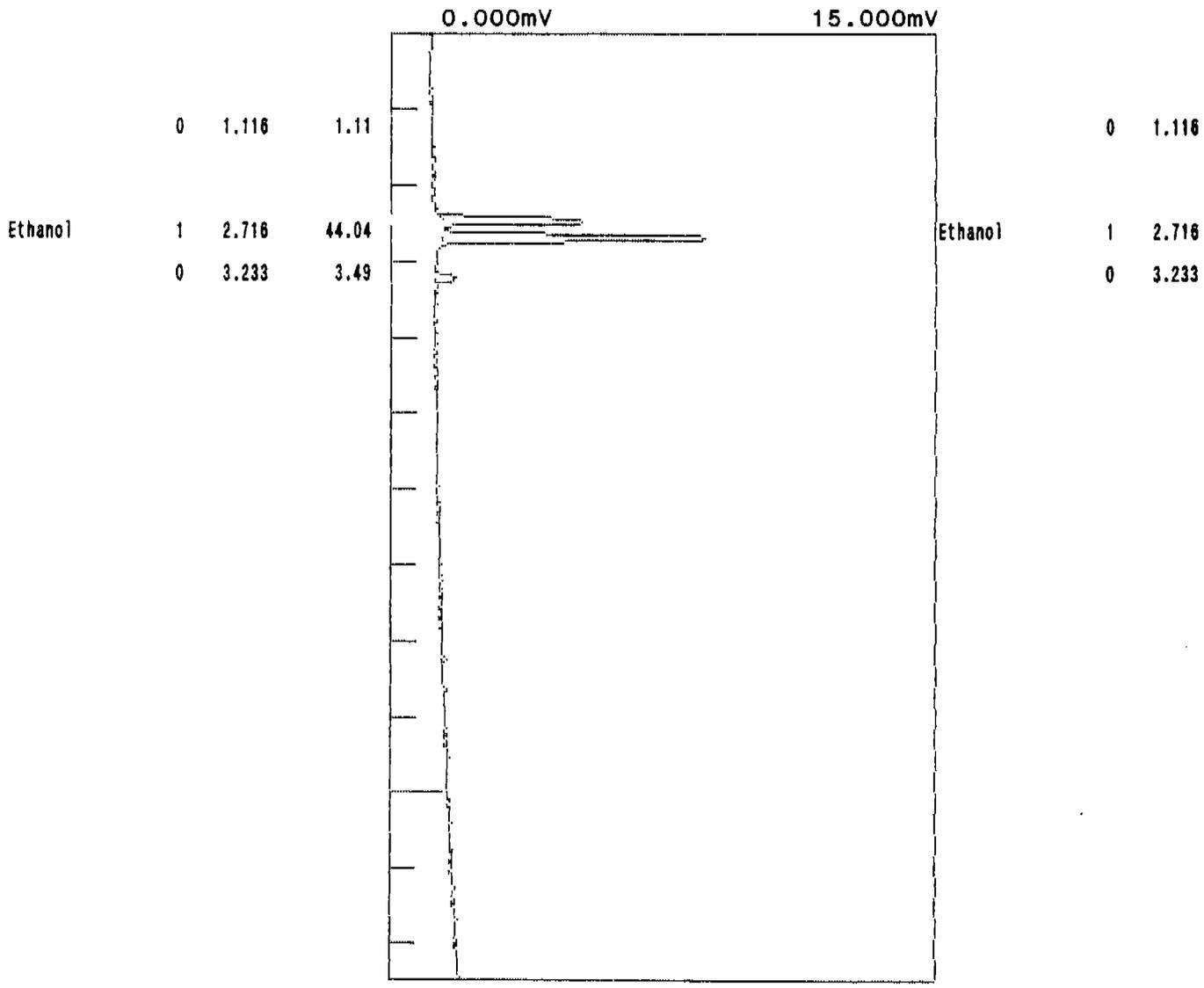
7

160.03

138

LOCATION NO.3  
 VENT No.2 Run #2  
 1<sup>st</sup> INJECTION

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R21  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 13:21:12

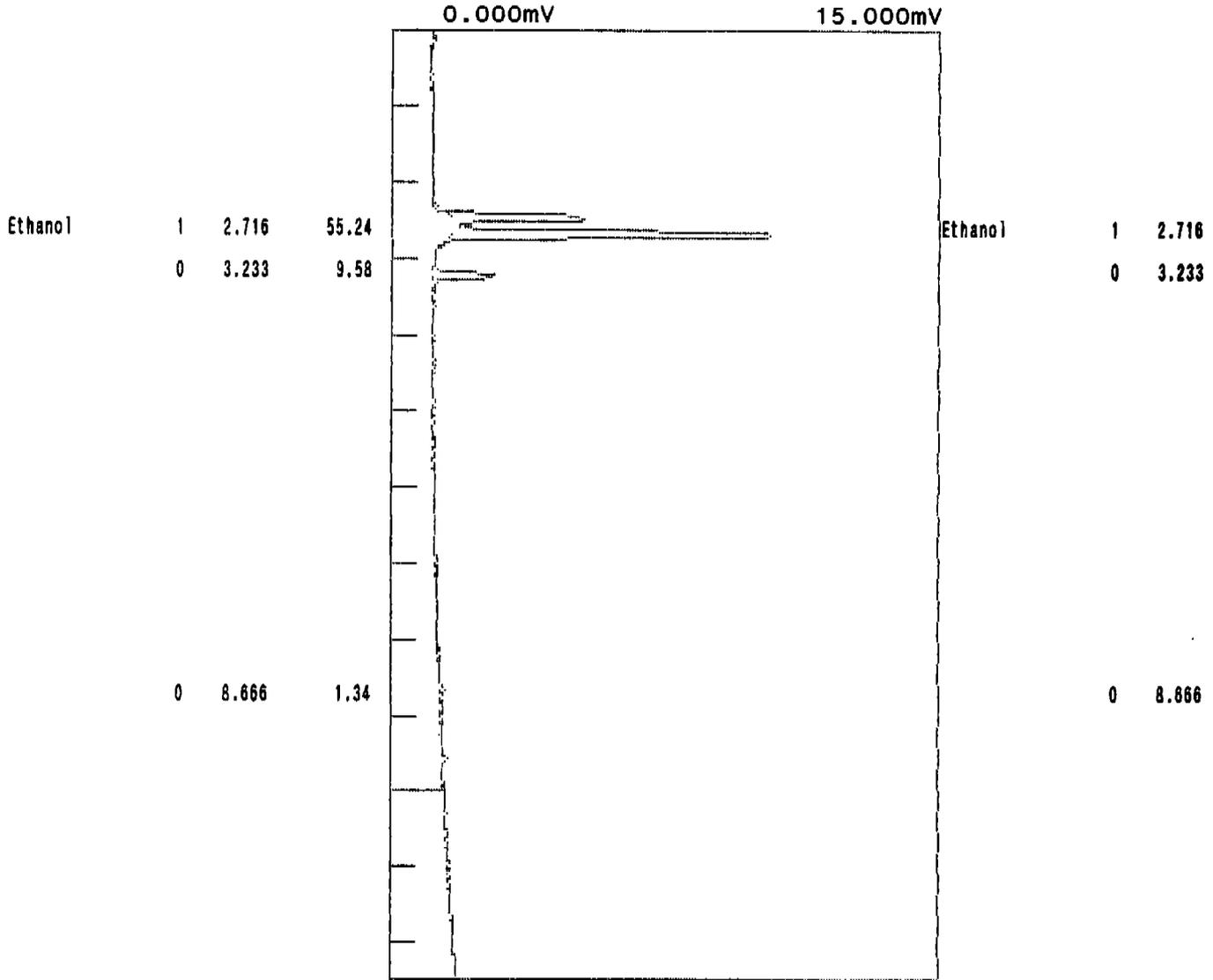


Component	Number	Retention	Area	Units
Ethanol	0	1.116	1.11	
	0	2.466	21.62	
	1	2.716	44.04	
	0	3.233	3.49	
	4		70.26	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R22  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 13:36:14

LOCATION No. 3  
 VENT No. 2 RUN#  
 2ND INJECTION

NEEDS REINTEGRATION!



Component	Number	Retention	Area	Units
Ethanol	0	2.500	21.85	
	1	2.716	55.24	
	0	3.233	9.58	
	0	8.666	1.34	

4

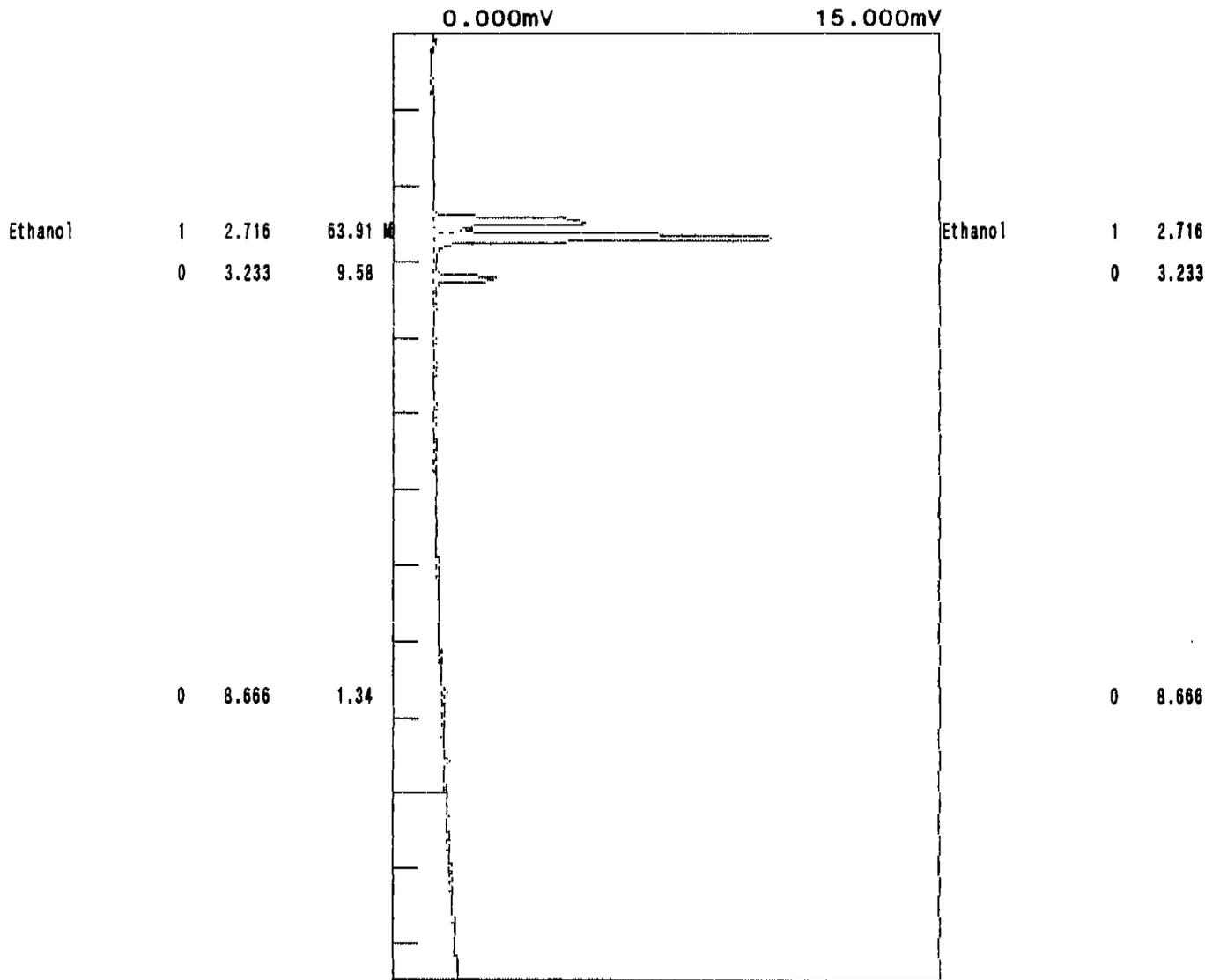
88.02

140

**ENTROPY**

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R22  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 13:36:14

REINTEGRATION  
 LOCATION No. 3  
 VENT No. 2 RUN#2  
 2<sup>ND</sup> INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	29.27	M
	1	2.716	63.91	M
	0	3.233	9.58	
	0	8.666	1.34	

4

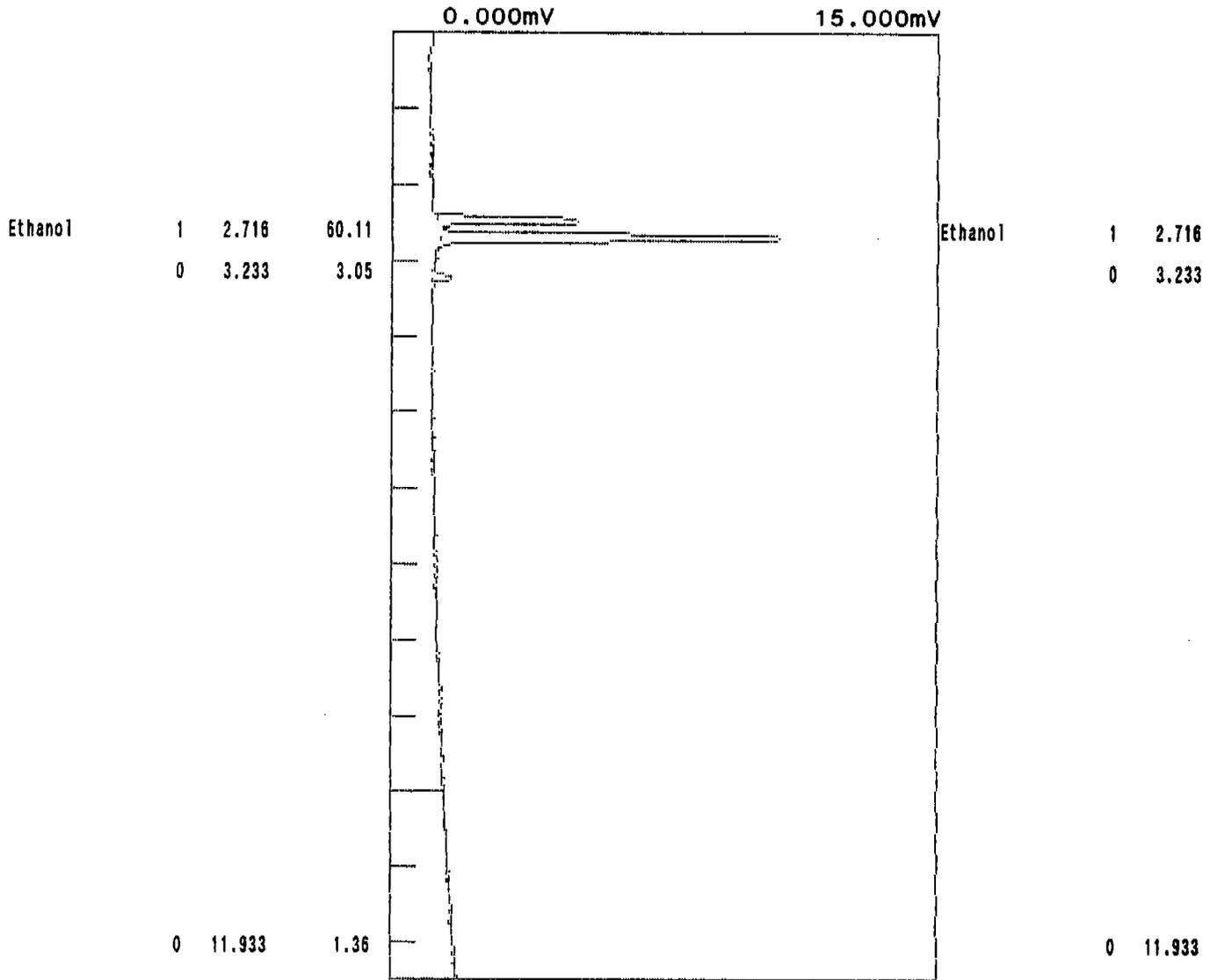
104.10

141

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R23  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 13:51:33

LOCATION No.3  
 VENT No. 2 RUN# 2  
 3<sup>RD</sup> INJECTION

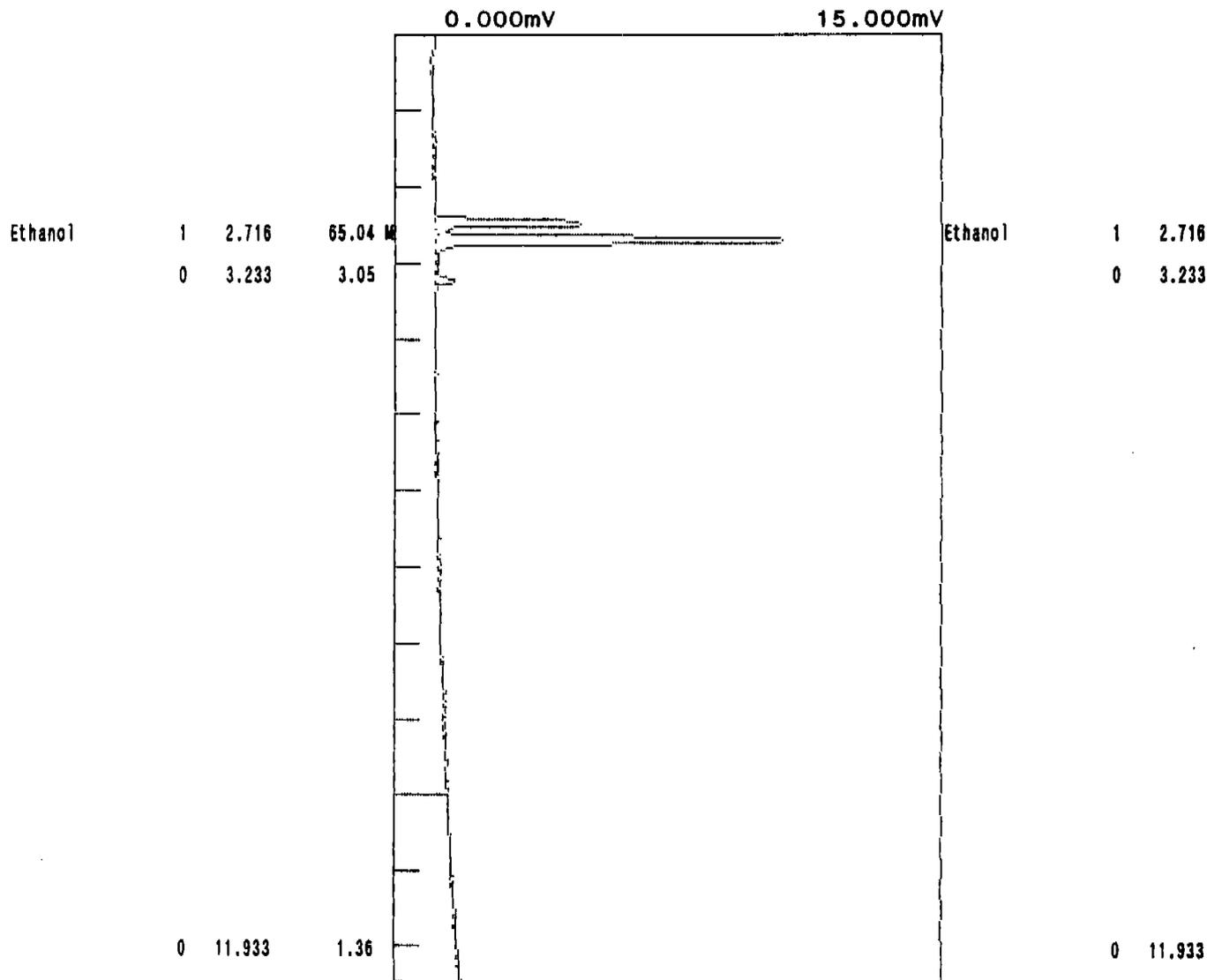
NEEDS TO BE REINTEL.



Component	Number	Retention	Area	Units
Ethanol	0	2.500	24.94	
	1	2.716	60.11	
	0	3.233	3.05	
	0	11.933	1.36	
	4		89.46	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R23  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 13:51:33

REINTEGRATED  
 LOCATION No.3  
 VENT No.2 RUN#2  
 3RD INJECTION

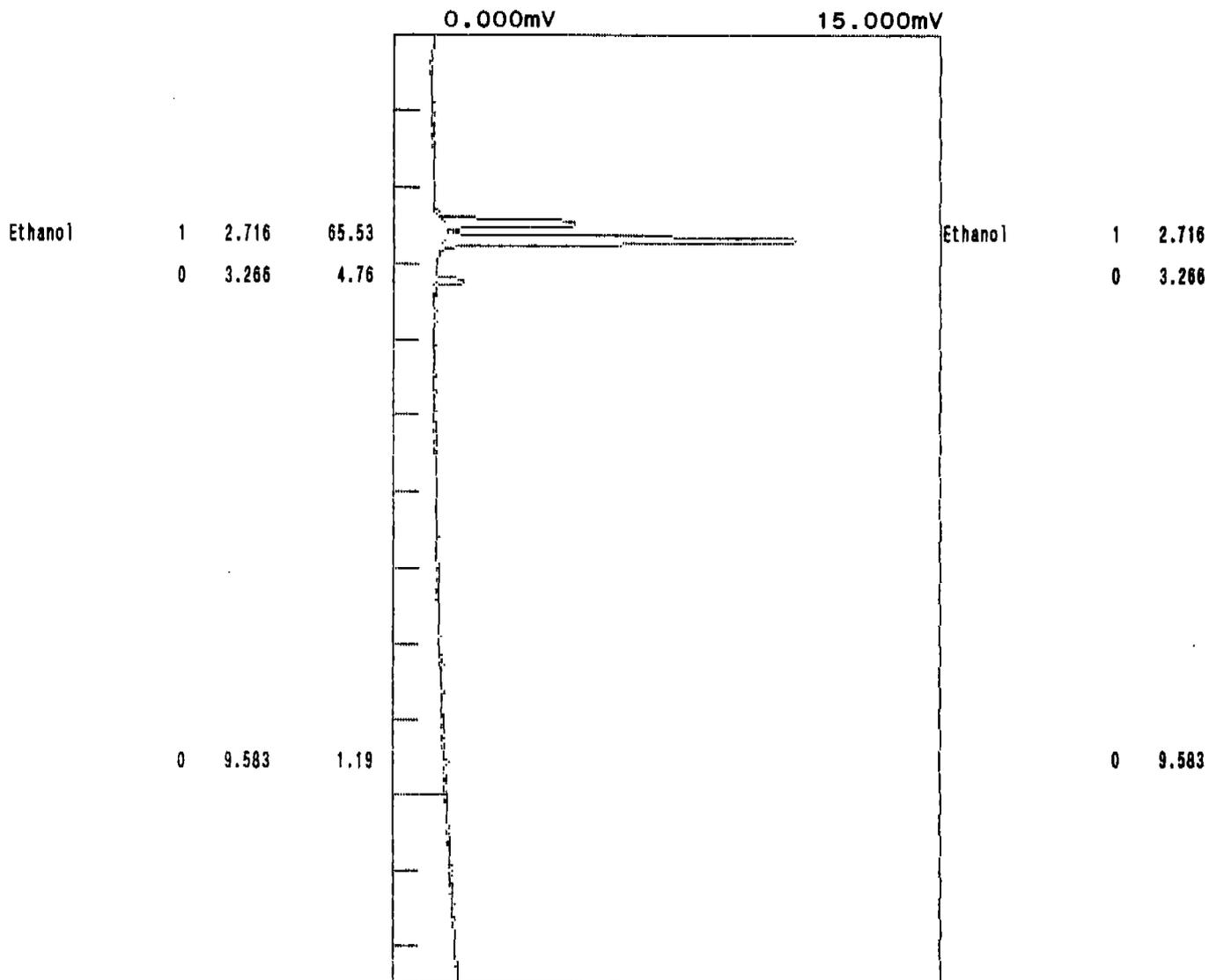


Component	Number	Retention	Area	Units
Ethanol	0	2.500	27.63	M
	1	2.716	65.04	M
	0	3.233	3.05	
	0	11.933	1.36	
	4		97.08	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R24  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 14:06:57

LOCATION No. 3  
 VENT No. 2 RUN  
 4th INJECTION

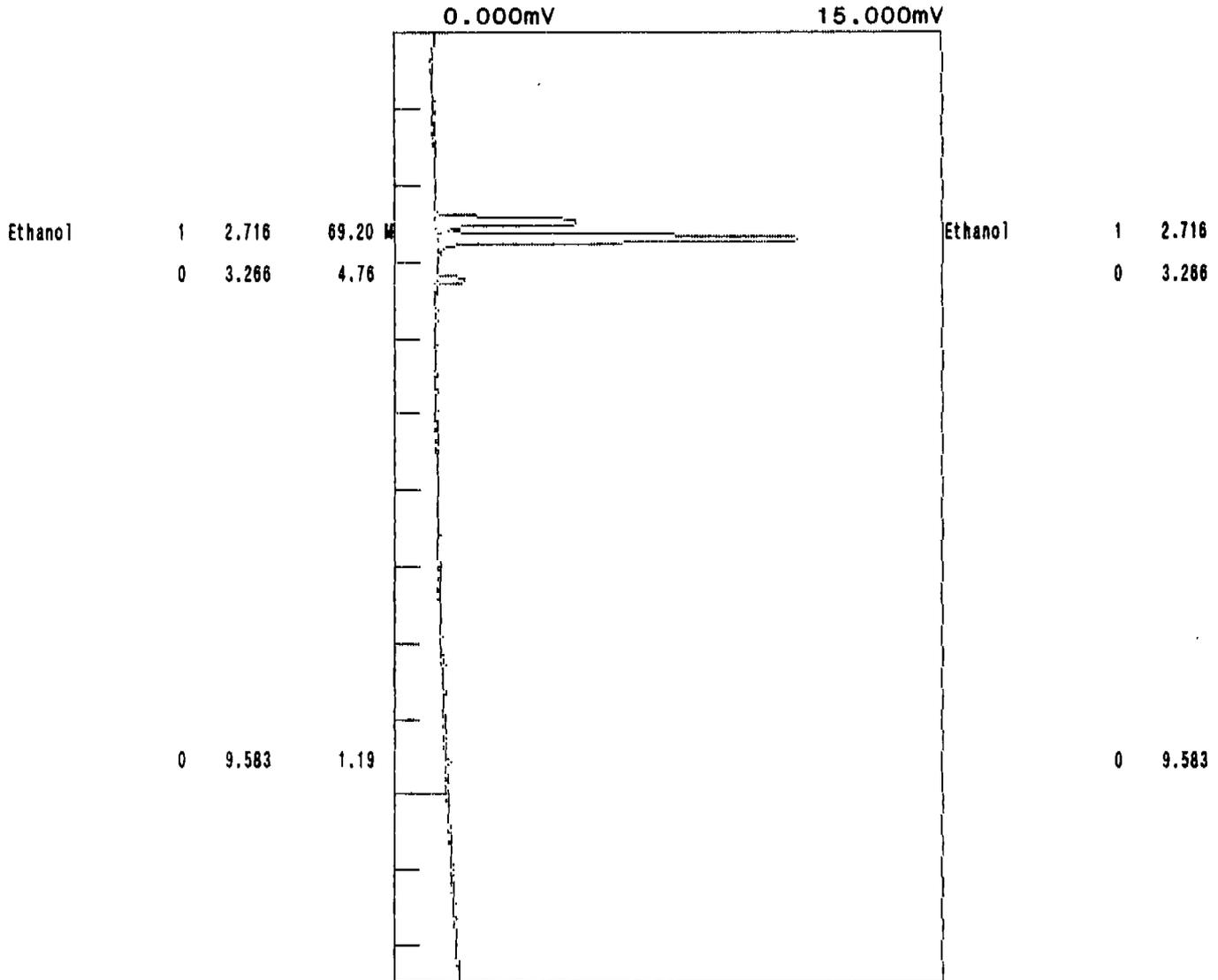
NEEDS REINTEGRATION!



Component	Number	Retention	Area	Units
Ethanol	0	2.500	22.31	
	1	2.716	65.53	
	0	3.266	4.76	
	0	9.583	1.19	
	4		93.80	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R24  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 14:06:57

REINTEGRATED  
 LOCATION No. 3  
 VENT No. 2 RUN# 2  
 4th INJECTION

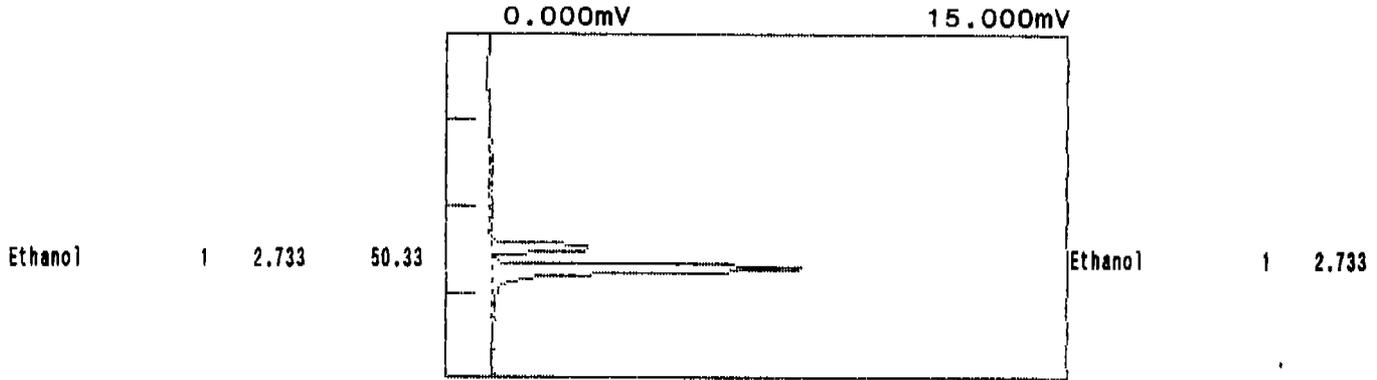


Component	Number	Retention	Area	Units
Ethanol	0	2.500	26.74	M
	1	2.716	69.20	M
	0	3.266	4.76	
	0	9.583	1.19	
	4		101.90	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3PCR21  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 14:26:50

LOCATION No. 3  
 PERFORMANCE CHECK  
 RUN #2  
 1ST INJECTION  
 STD = 5.80ppm

$$\text{RECOVERY} = \frac{6.10}{5.80} \cdot 100 = 105.2\%$$



Component	Number	Retention	Area	Units
Ethanol	0	2.500	15.34	6.10 ppm
	1	2.733	50.33	
	2		65.67	

RECOVERY FACTOR

$$\frac{5.80 - 6.10}{5.80} + 1 = 0.948$$

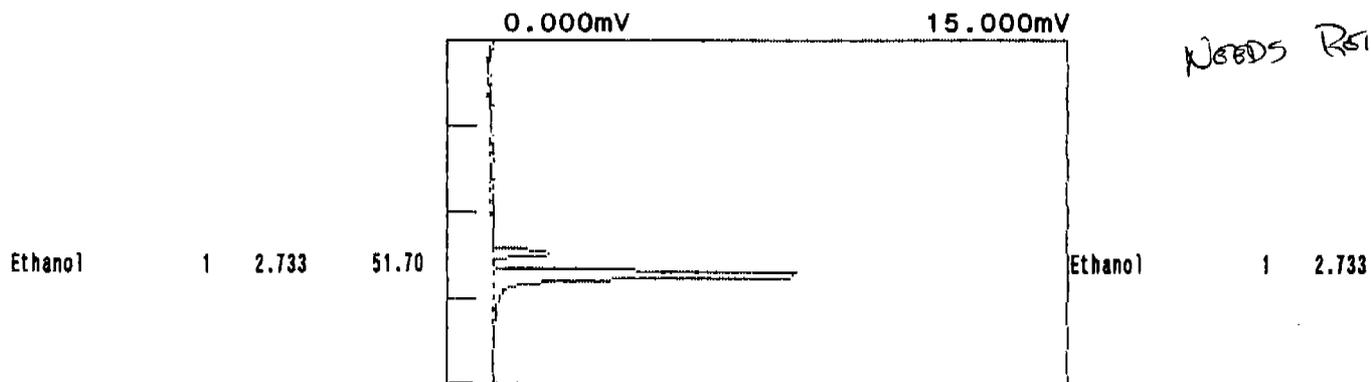
Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3PCR22  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 14:32:42

LOCATION No. 3  
 PERFORMANCE CHECK  
 RUN # 2

2<sup>ND</sup> INJECTION  
 STD = 5.80 ppm

$$\text{RECOVERY} = \frac{6.10}{5.80} \times 100 = 105.17\%$$

NEEDS REINTEGRATION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	8.55	6.10ppm
	1	2.733	51.70	
	2		60.25	

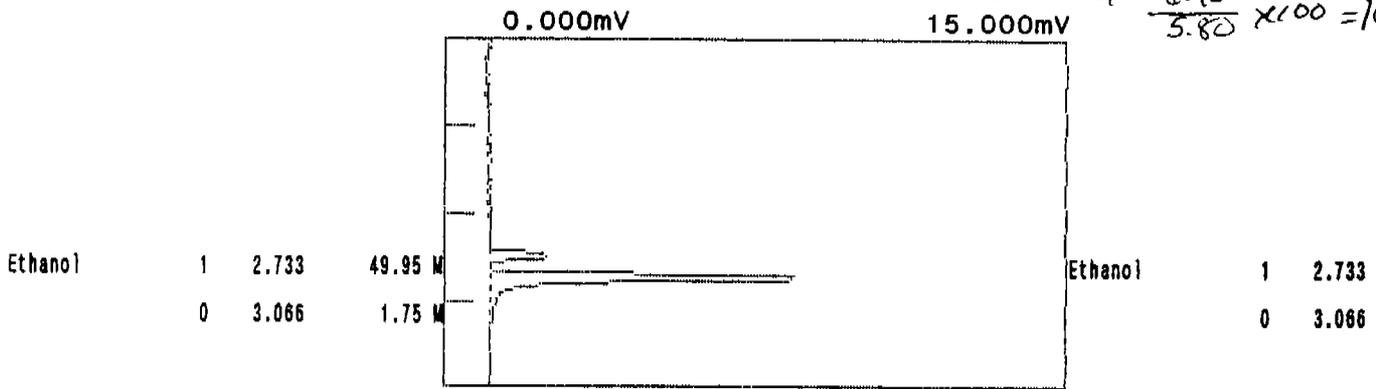
RECOVERY FACTOR

$$\frac{5.80 - 6.10}{5.80} + 1 = 0.944$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3PCR22  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 14:32:42

REINTEGRATION  
 LOCATION No. 3  
 PERFORMANCE CHECK  
 RUN # 2  
 2ND INJECTION  
 STD = 5.80 ppm

Recovery =  $\frac{6.10}{5.80} \times 100 = 105.2\%$



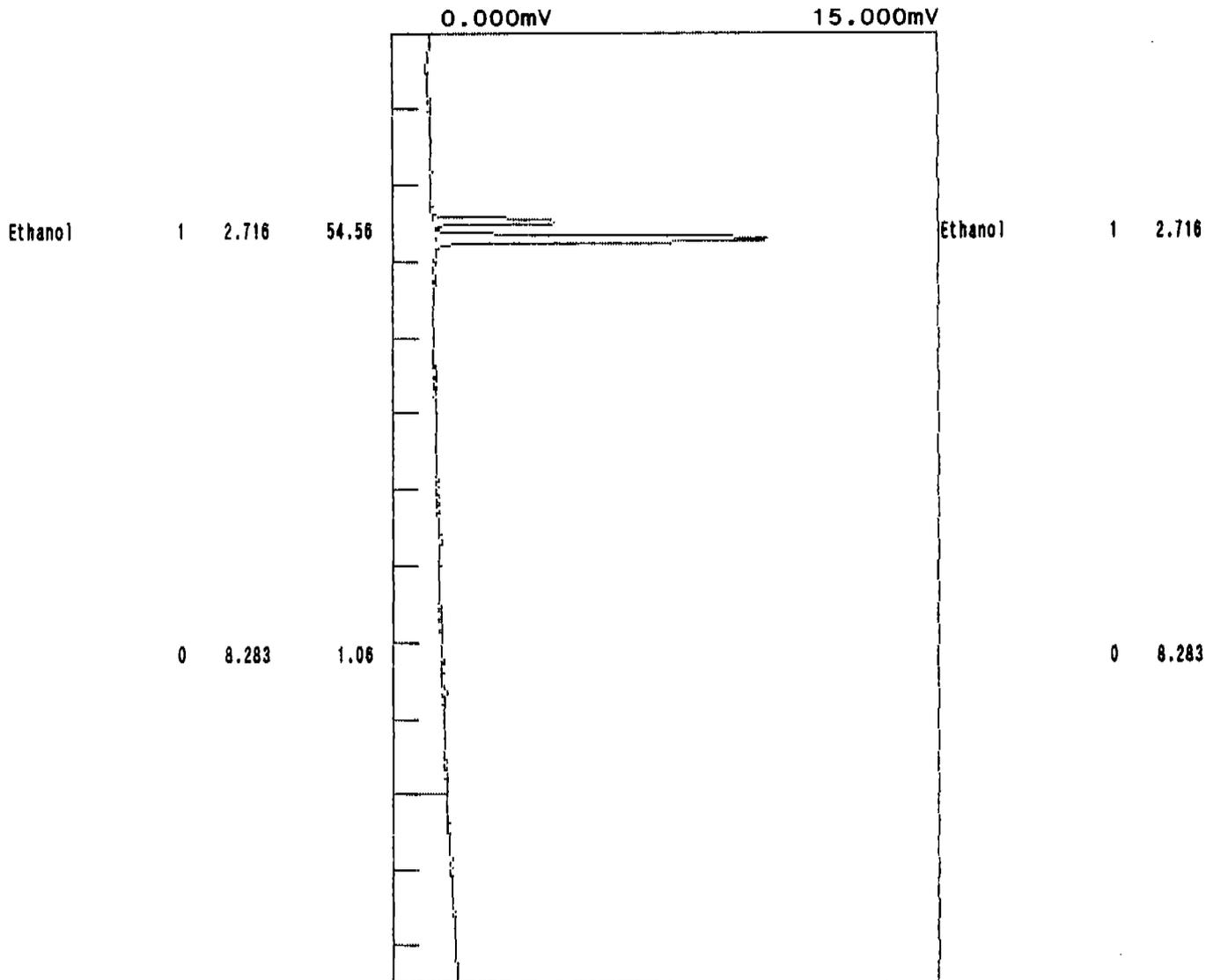
Ethanol	1	2.733	49.95 M	Ethanol	1	2.733
	0	3.066	1.75 M		0	3.066

Component	Number	Retention	Area	Units
	0	2.500	8.55	
Ethanol	1	2.733	49.95 M	6.10 ppm
	0	3.066	1.75 M	6.10
3			60.26	

RECOVERY FACTOR  
 $\frac{5.80 - 6.10}{5.80} + 1 = 0.948$

LOCATION NO. 3  
VENT NO. 1 RUN 3  
1<sup>ST</sup> INJECTION

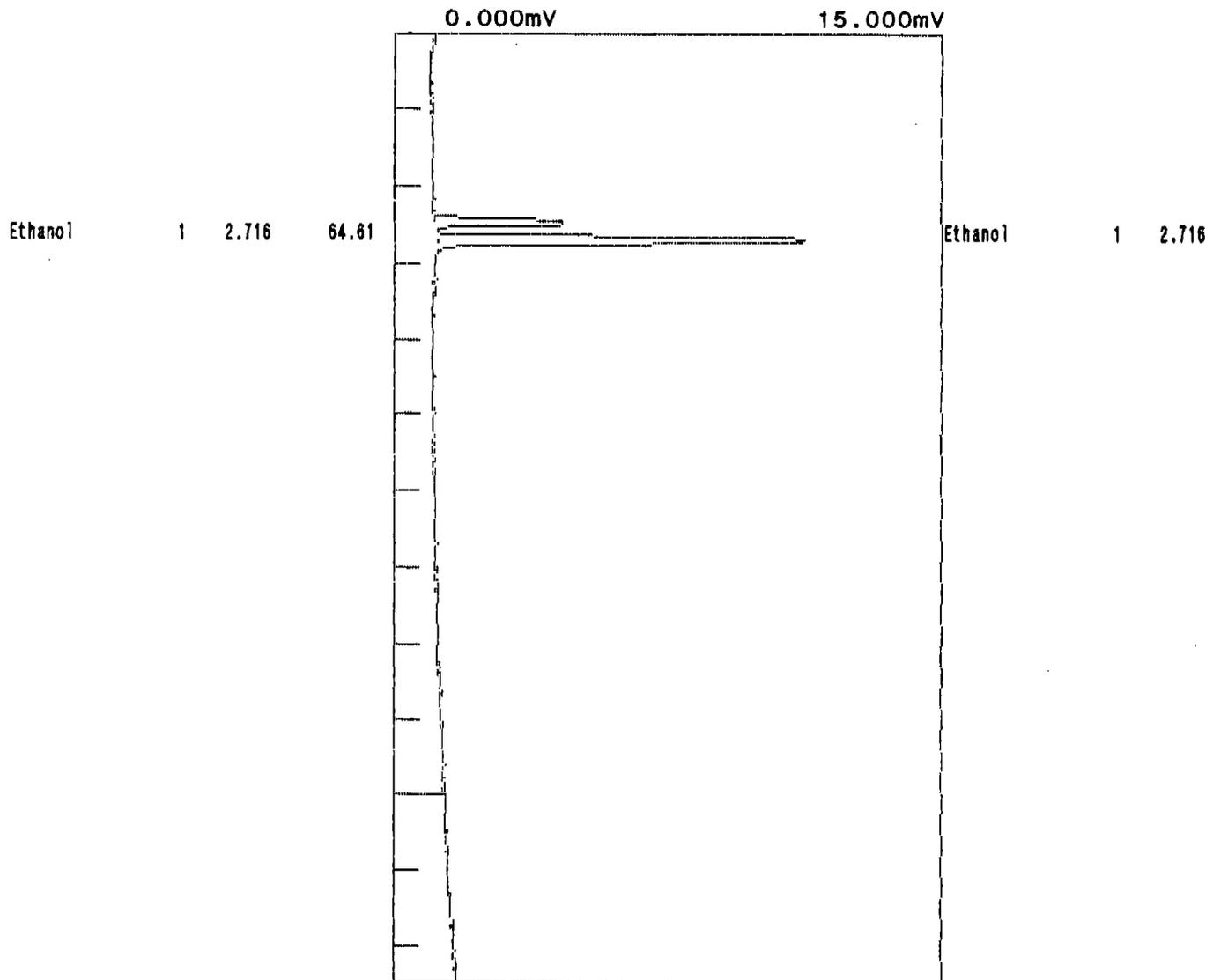
Operator : Gary Mata  
Description : FID  
File : D:\21691\3V1R31  
Temperature :  
Components : ETHOH  
Date : 07/28/1994  
Time : 14:47:40



Component	Number	Retention	Area	Units
Ethanol	0	2.500	19.38	
	1	2.716	54.56	
	0	8.283	1.06	
	3		75.00	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R32  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 15:02:42

LOCATION NO. 3  
 VENT. NO. 1 RUN#3  
 2<sup>ND</sup> INJECTION



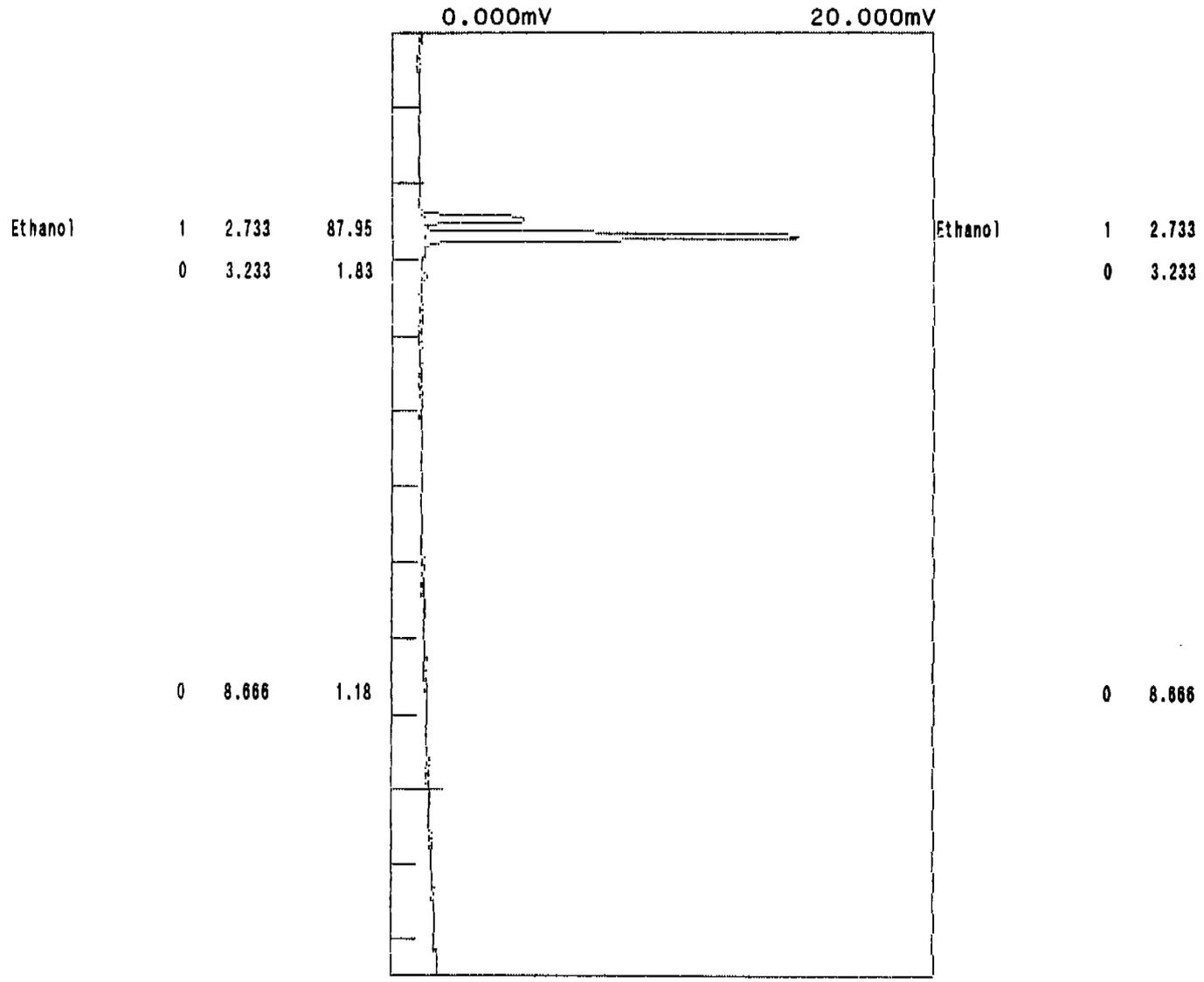
Component	Number	Retention	Area	Units
Ethanol	0	2.500	21.88	
	1	2.716	64.61	
	2		86.48	

150

**ENTROPY**

LOCATION NO. 3  
 VENT No. 1 RUN#3  
 3RD INJECTION

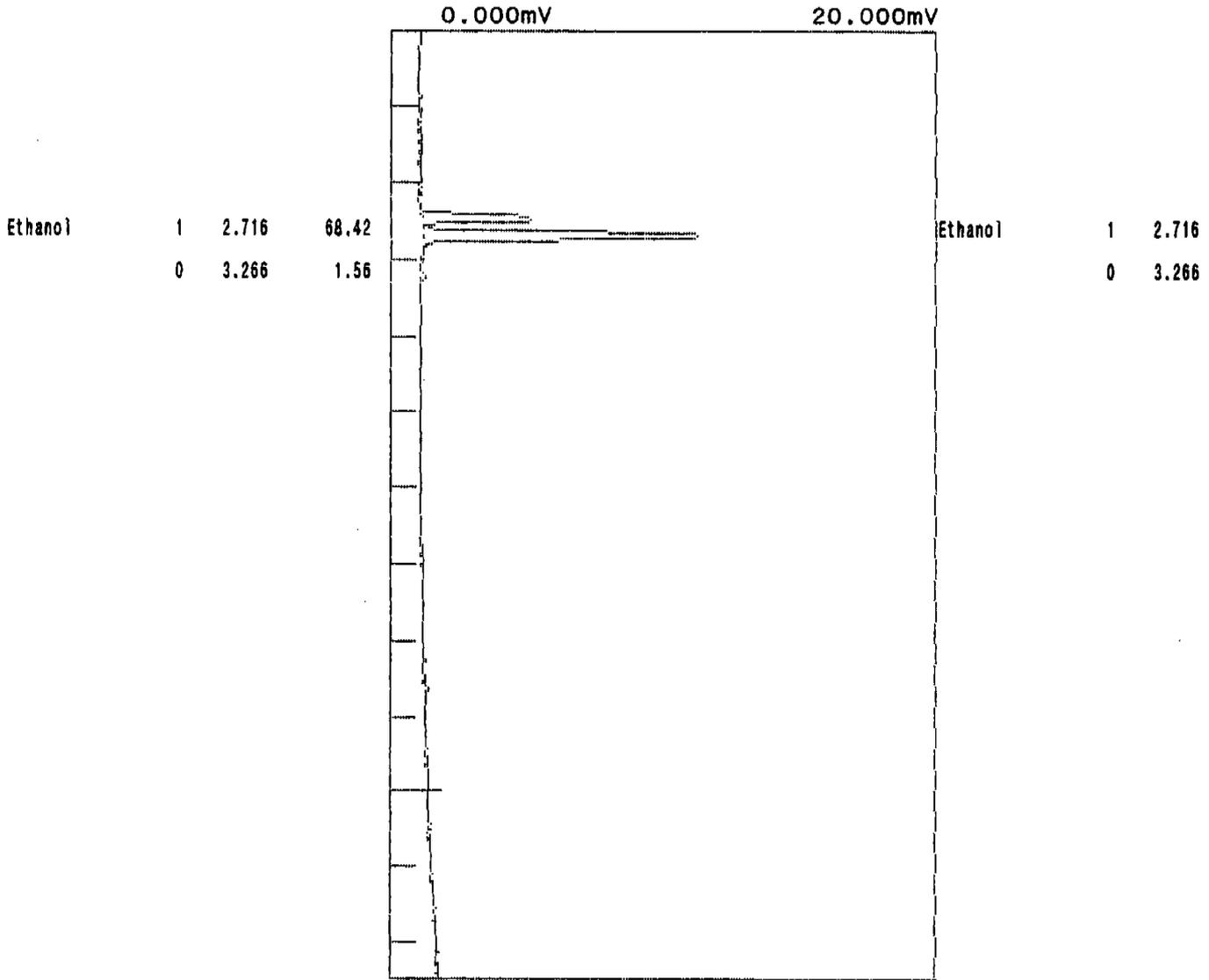
Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R33  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 15:17:42



Component	Number	Retention	Area	Units
Ethanol	0	2.500	24.73	
	1	2.733	87.95	
	0	3.233	1.83	
	0	8.666	1.18	
	4		115.70	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V1R34  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 15:32:36

LOCATION No. 3  
 VENT No. 1 RUN# 3  
 4th INJECTION

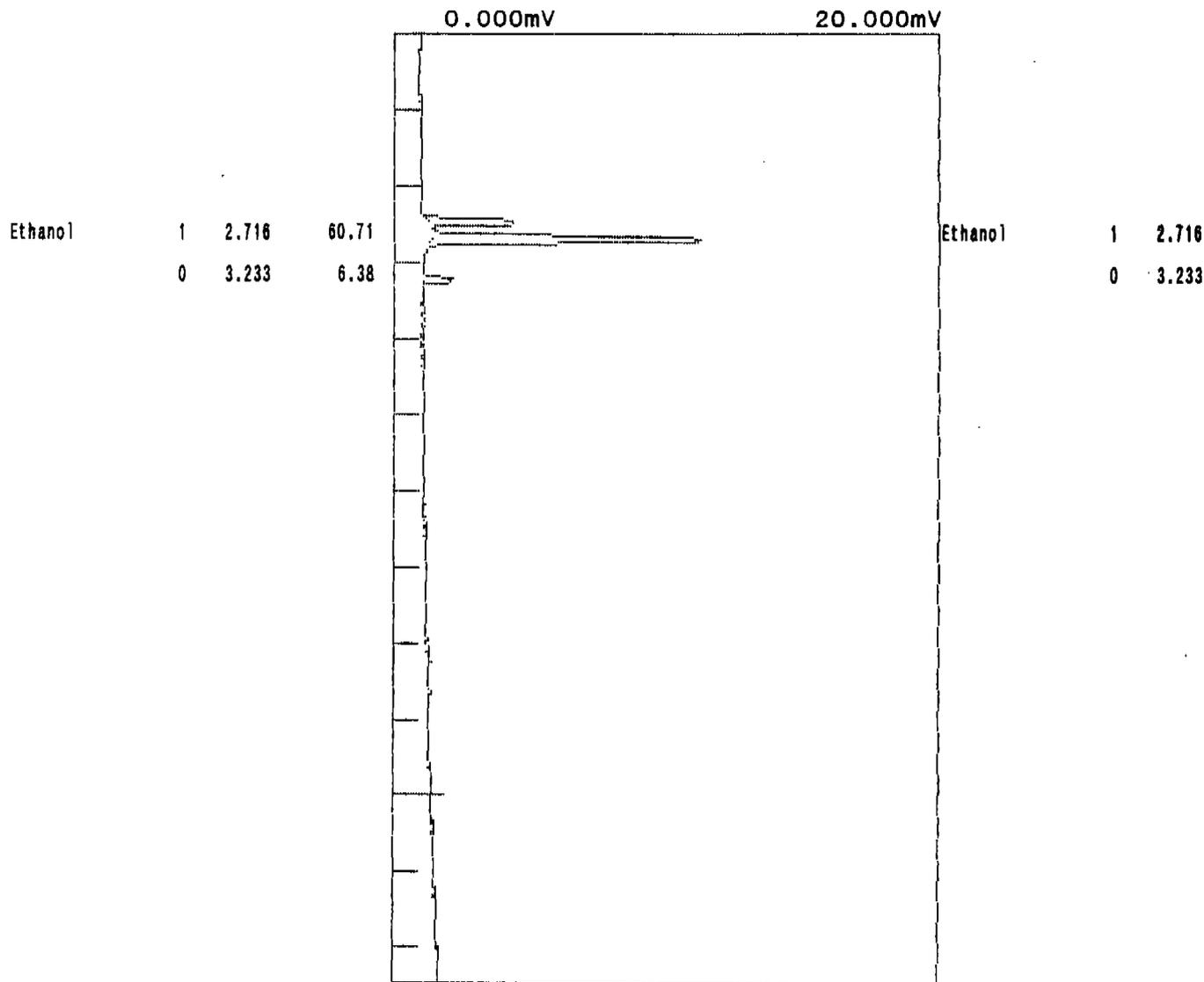


Component	Number	Retention	Area	Units
Ethanol	0	2.500	25.63	
	1	2.716	68.42	
	0	3.266	1.56	
	3		95.61	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R31  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 15:54:22

LOCATION NO.3  
 VENT NO.2 RUN#3  
 (SI INJECTION)

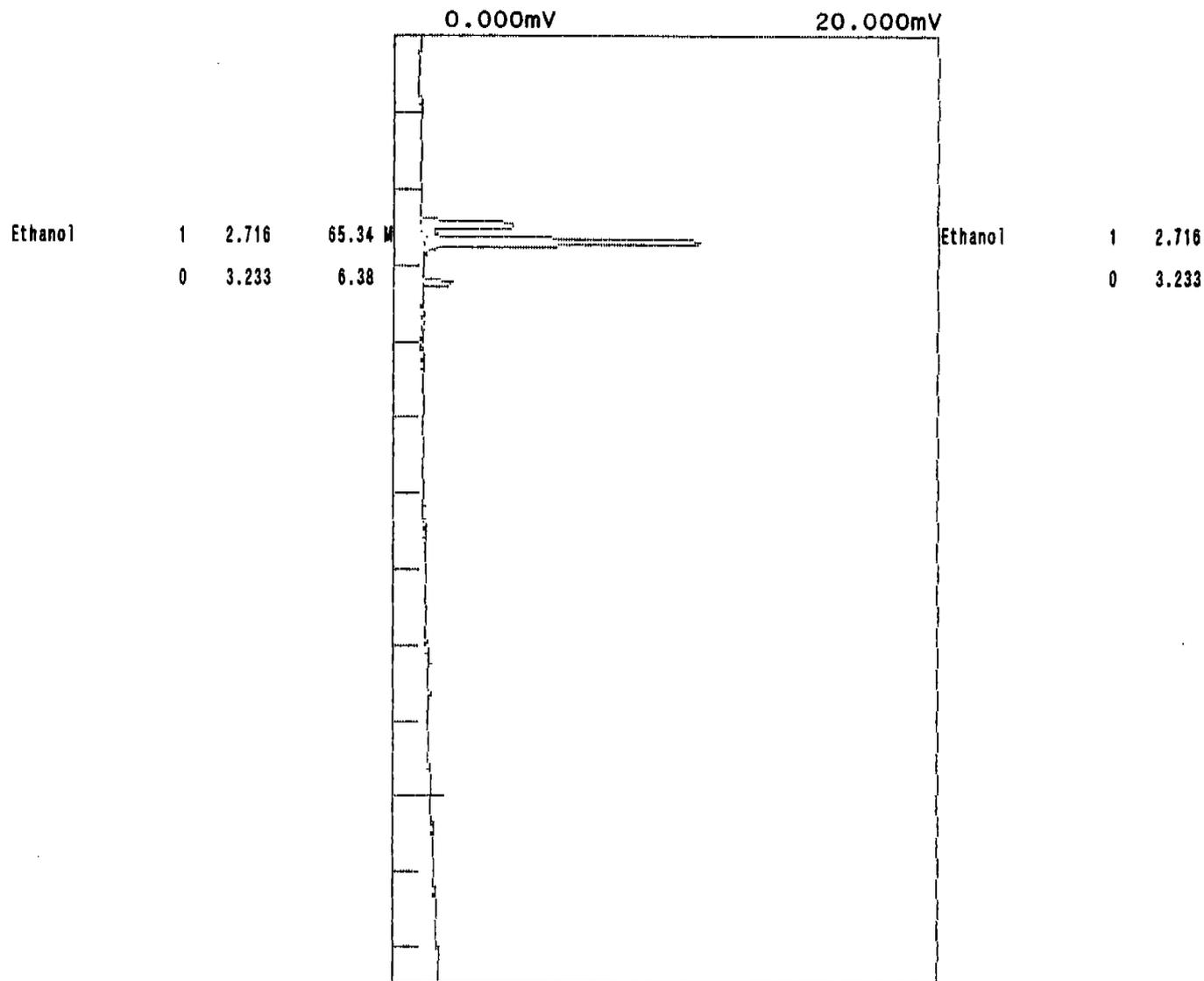
NEEDS REINTEGRATION



Component	Number	Retention	Area	Units
Ethanol	0	2.483	18.46	
	1	2.716	60.71	
	0	3.233	6.38	
	3		85.55	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R31  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 15:54:22

REINTEGRATION  
 LOCATION NO.3  
 VENT No.2 RUN#3  
 1<sup>ST</sup> INJECTION

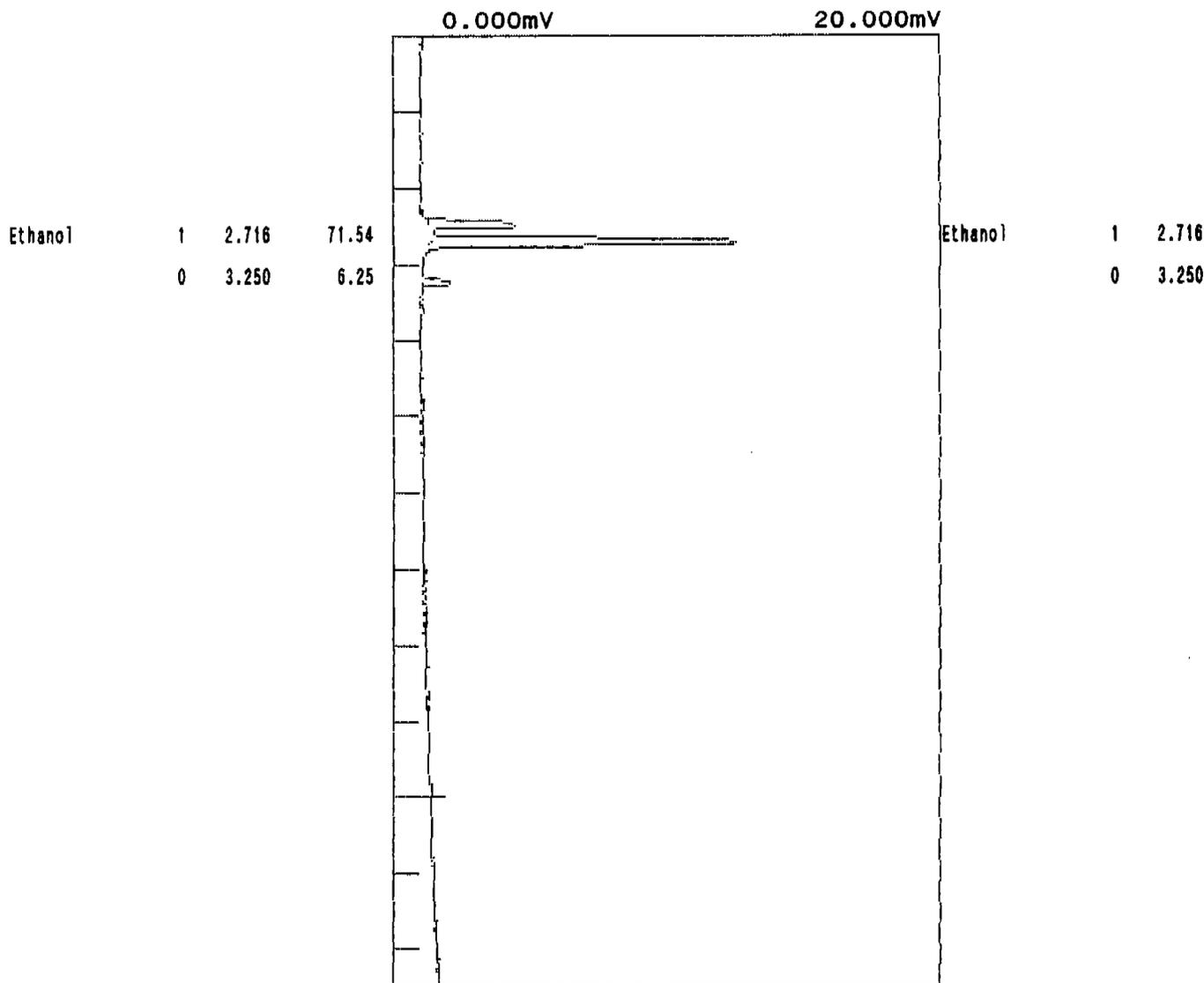


Component	Number	Retention	Area	Units
Ethanol	0	2.483	22.21 M	
	1	2.716	65.34 M	
	0	3.233	6.38	
	3		93.93	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R32  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 16:09:14

LOCATION NO. 3  
 VENT NO. 2 RUN#3  
 2ND INJECTION

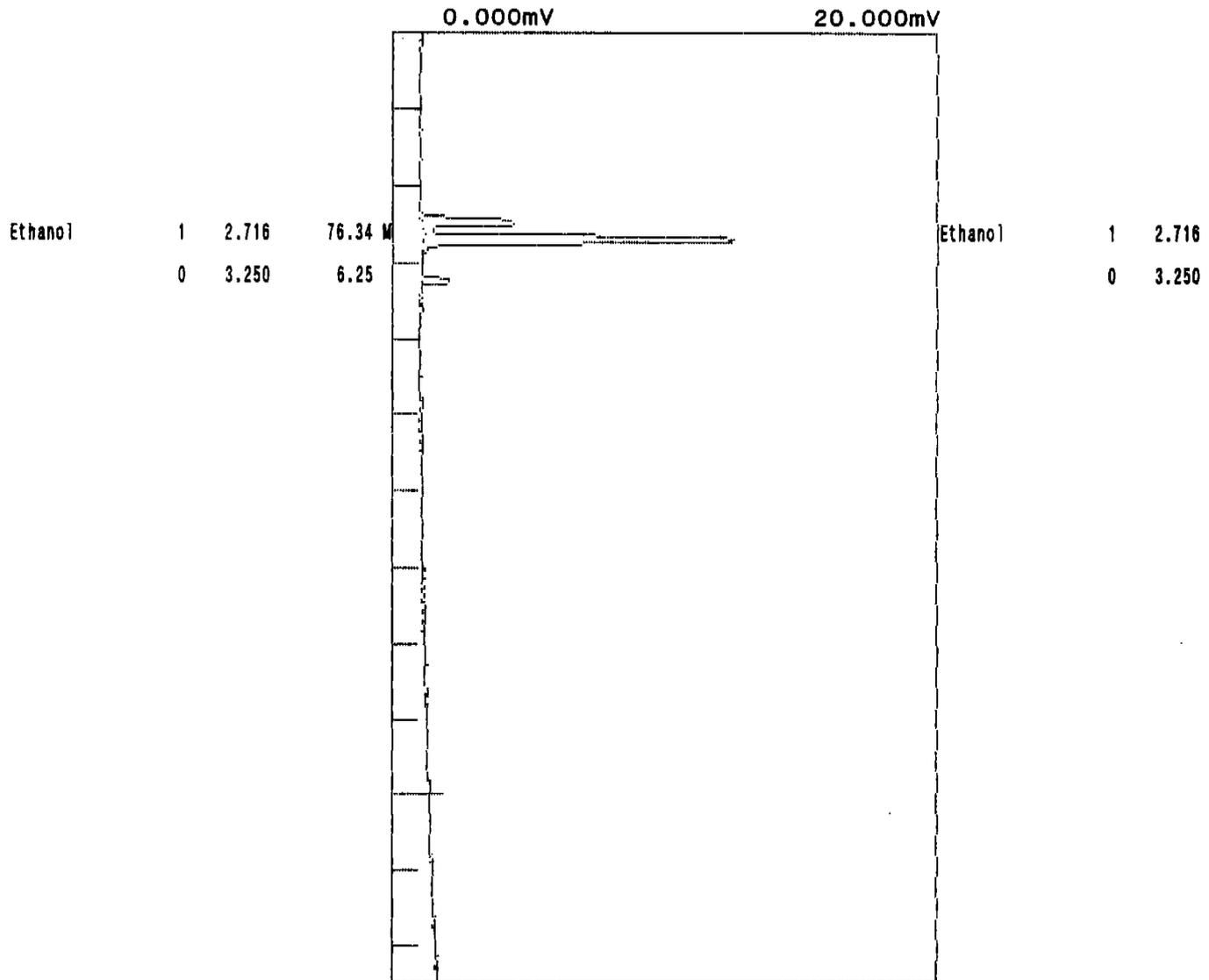
NEEDS REINTEGRATION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	18.61	
	1	2.716	71.54	
	0	3.250	6.25	
	3		96.40	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R32  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 16:09:14

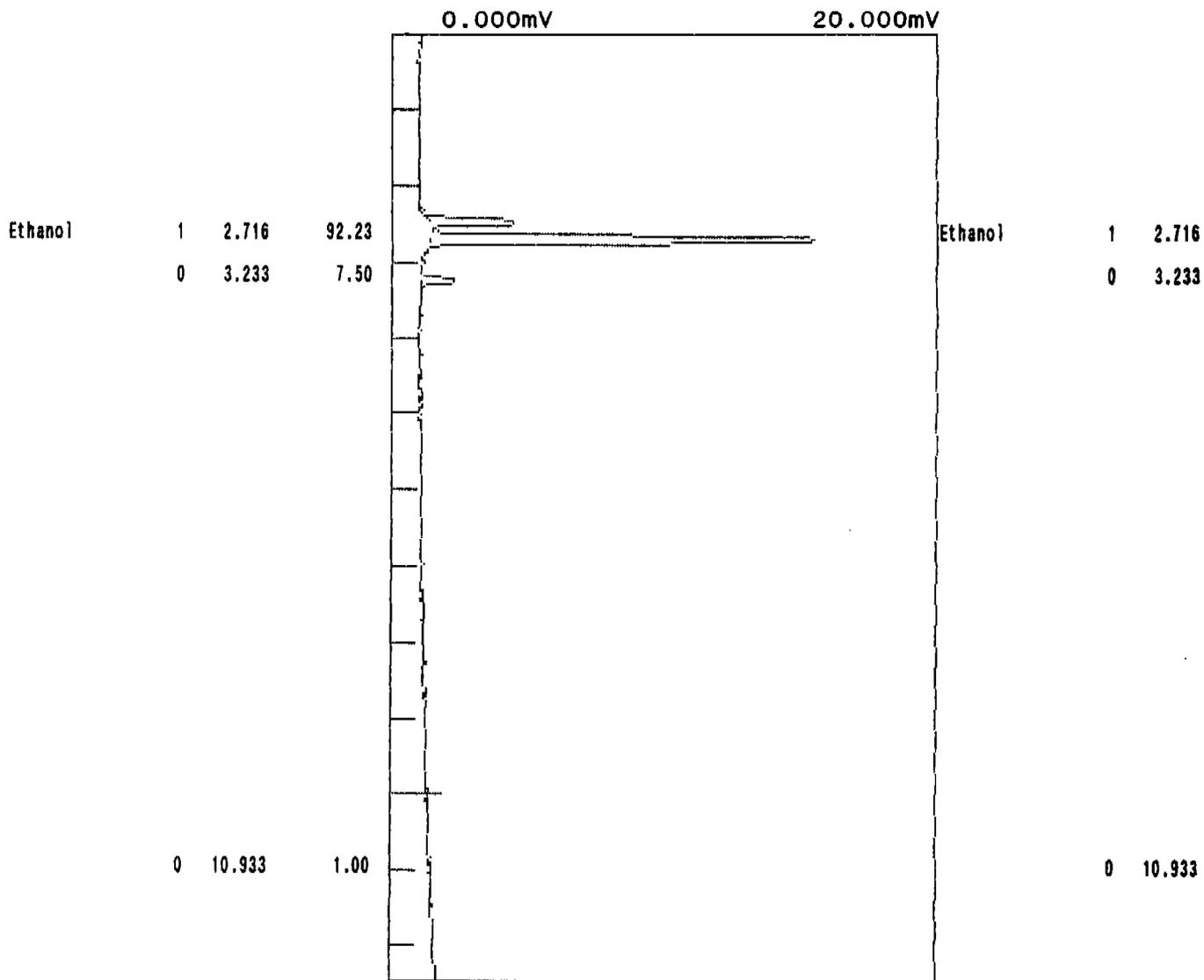
REINTEGRATED  
 LOCATION NO. 3  
 VENT No. 2 RUN  
 3RD INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	22.61	M
	1	2.716	76.34	M
	0	3.250	6.25	
	3		105.20	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R33  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 16:24:30

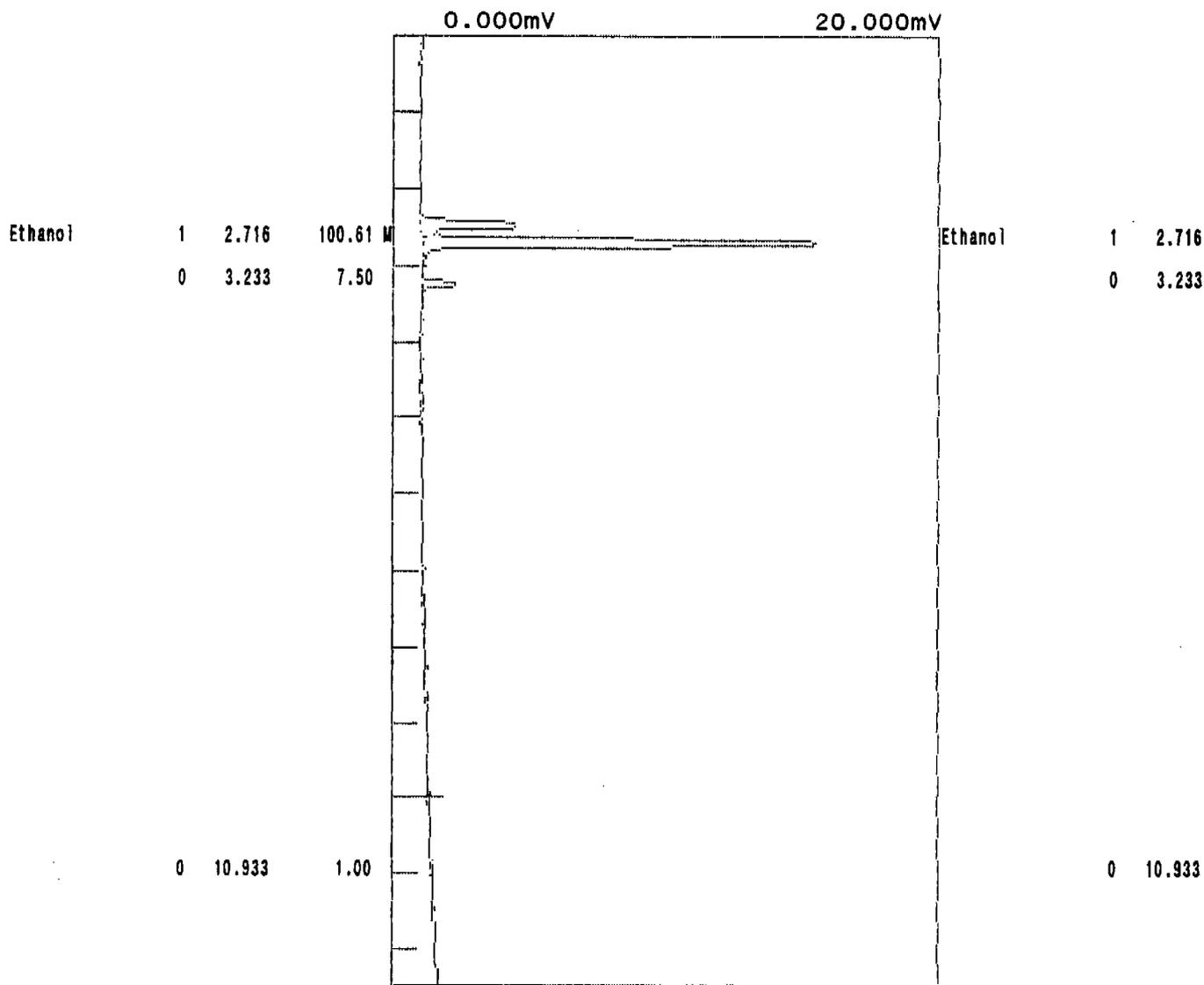
LOCATION No. 3  
 VENT No. 2 RUN# 3  
 3<sup>rd</sup> INJECTION  
 NEEDS REINTEGRATION!



Component	Number	Retention	Area	Units
Ethanol	0	2.500	18.80	
	1	2.716	92.23	
	0	3.233	7.50	
	0	10.933	1.00	
	4		119.53	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R33  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 16:24:30

REINTEGRATION  
 LOCATION No. 3  
 VENT No. 2 Run 3  
 3RD INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	24.22	M
	1	2.716	100.61	M
	0	3.233	7.50	
	0	10.933	1.00	

4

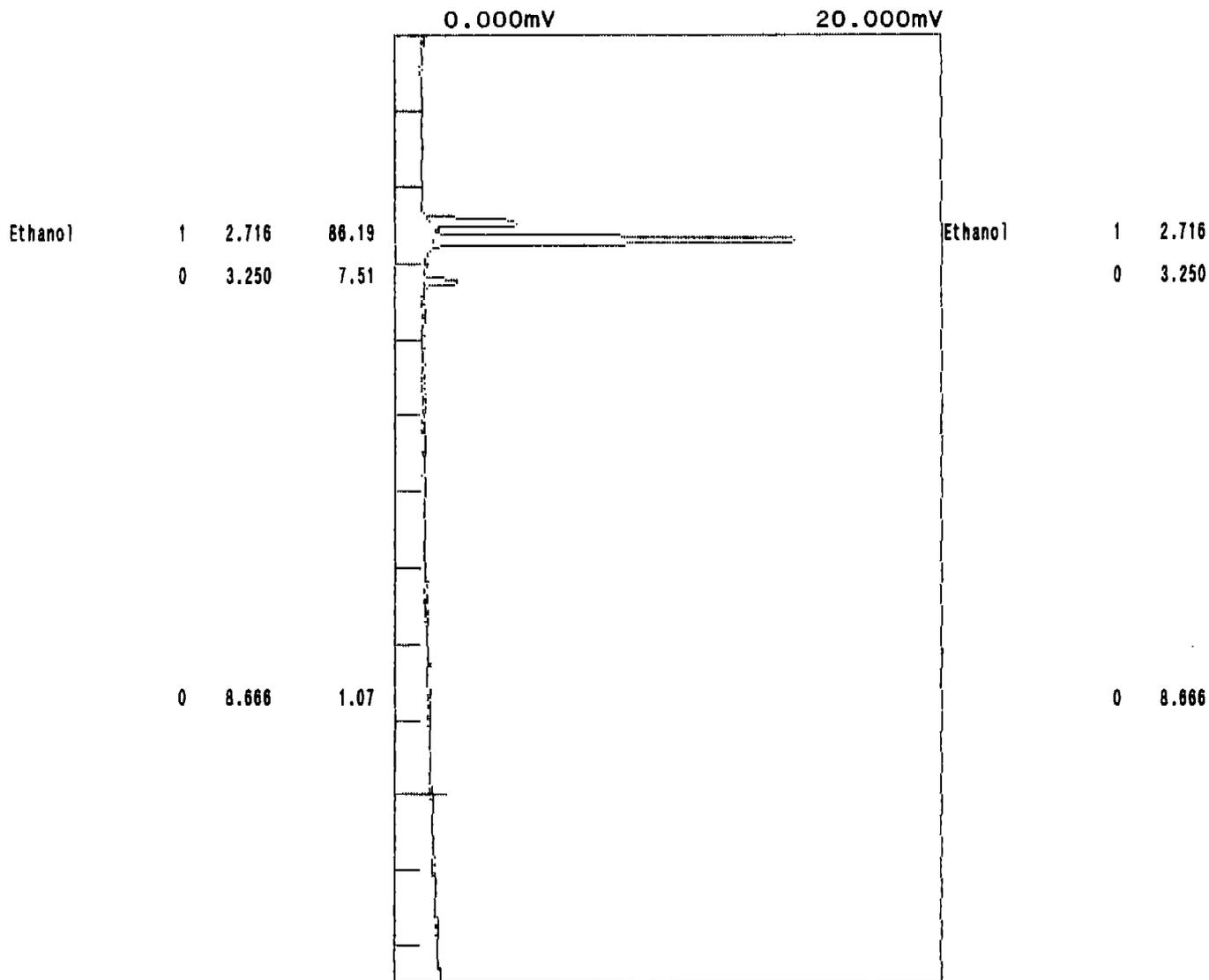
133.33

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**ENTROPY**

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R34  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 16:39:54

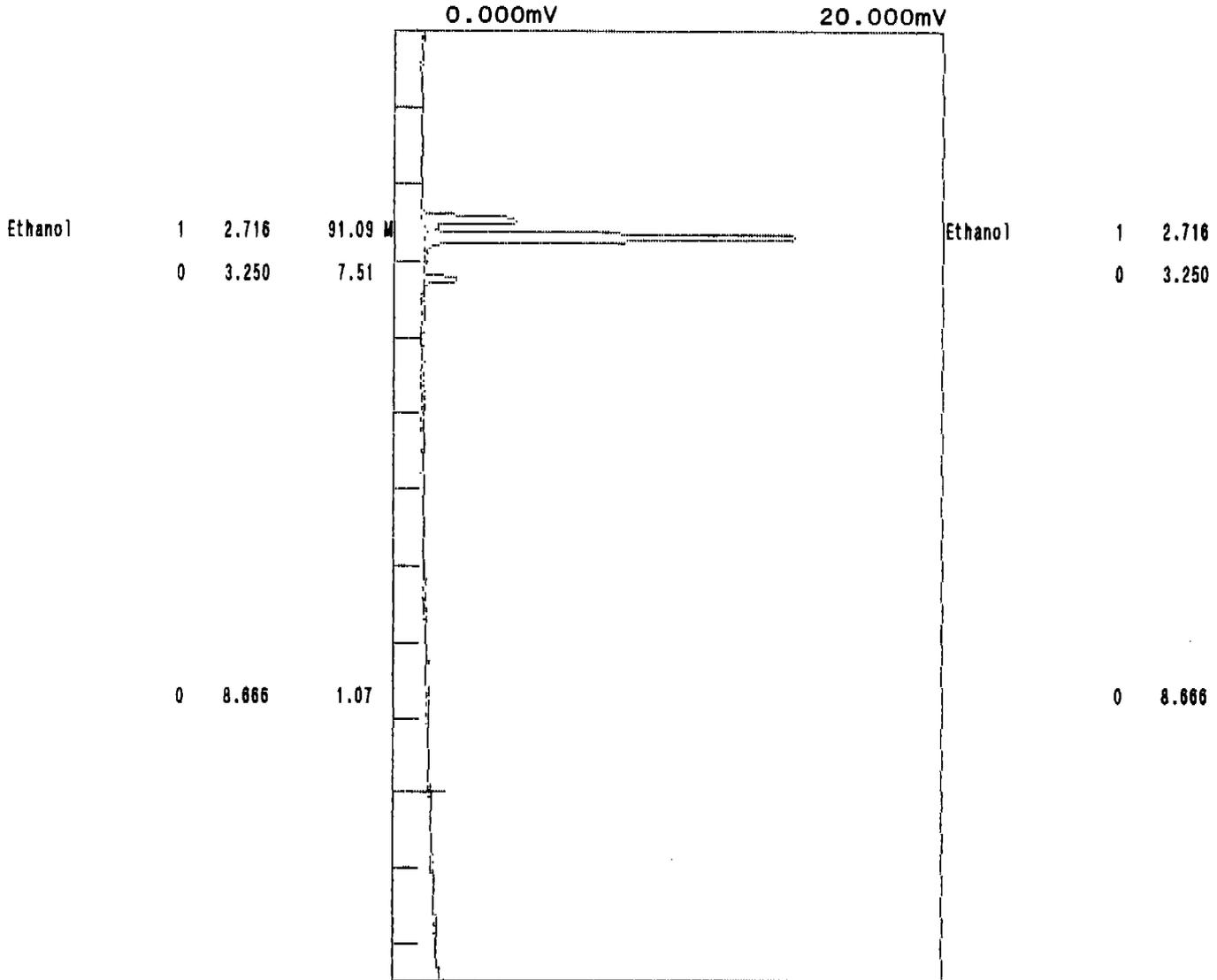
LOCATION No. 3  
 VENT No. 2 RUN#3  
 4th INJECTION  
~~ALIAS~~  
 NEEDS REINTEGRATION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	20.08	
	1	2.716	86.19	
	0	3.250	7.51	
	0	8.666	1.07	
	4		114.85	

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3V2R34  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 16:39:54

REMEDIATION  
 LOCATION NO. 3  
 VENT NO. 2  
 RUN #3  
 4th INJECTION



Component	Number	Retention	Area	Units
Ethanol	0	2.500	23.82	M
	1	2.716	91.09	M
	0	3.250	7.51	
	0	8.666	1.07	

4

123.49

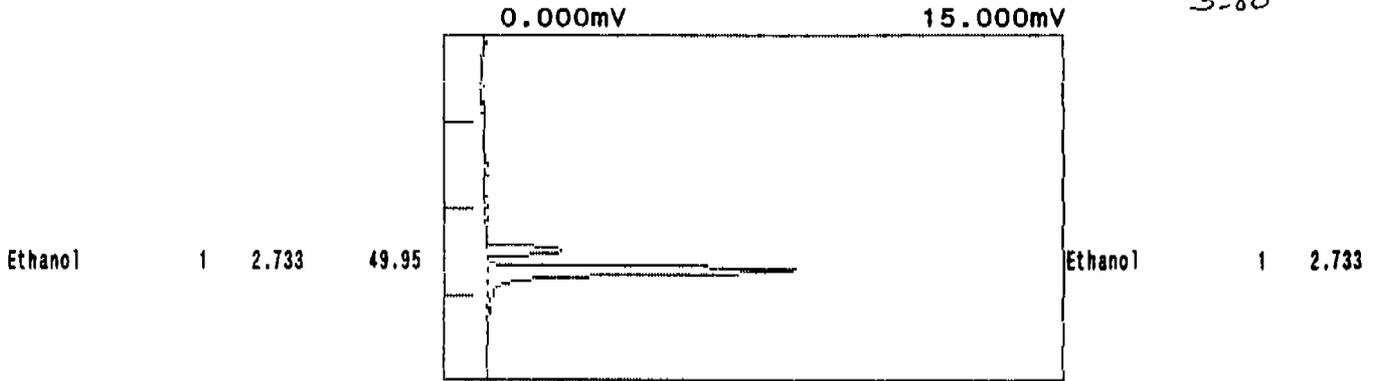
160

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3PCR31  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 17:01:36

LOCATION No.3  
 PERFORMANCE CHECK  
 RUN# 3

1 $\mu$ L INJECTION  
 STD = 5.80 ppm

$$\text{RECOVERY} = \frac{6.10}{5.80} \times 100 = 105.17\%$$



Component	Number	Retention	Area	Units
Ethanol	0	2.500	11.63	6.10 ppm
	1	2.733	49.95	
	2		61.59	

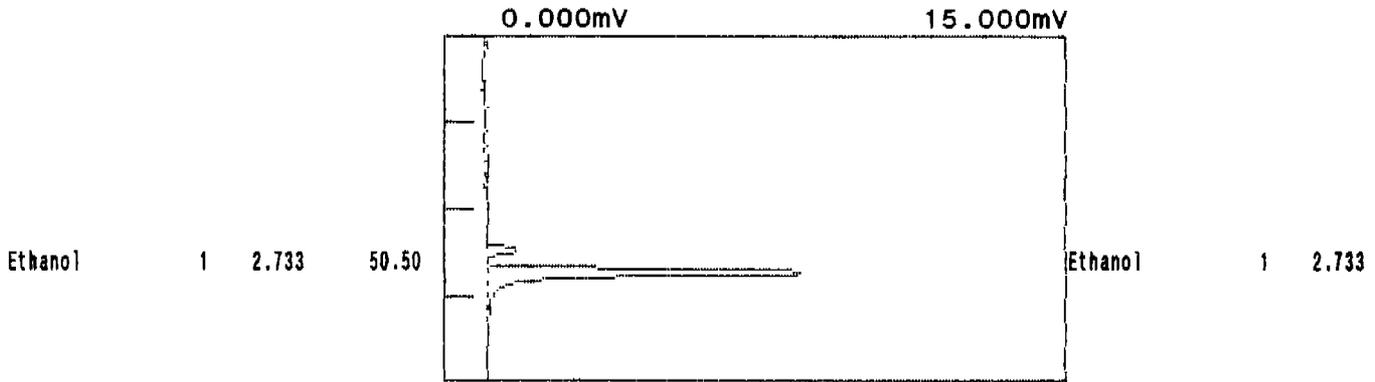
RECOVERY FACTOR

$$\frac{5.80 - 6.10}{5.80} + 1 = 0.948$$

Operator : Gary Mata  
 Description : FID  
 File : D:\21691\3PCR32  
 Temperature :  
 Components : ETHOH  
 Date : 07/28/1994  
 Time : 17:07:22

LOCATION No. 3  
 PERFORMANCE CHECK  
 RUN #3  
 STD = 5.80PPM

$$\text{RECOVERY} = \frac{6.10}{5.80} \times 100 = 105.2\%$$



Component	Number	Retention	Area	Units
Ethanol	0	2.516	4.38	
	1	2.733	50.50	6.10 ppm
	2		54.88	

RECOVERY FACTOR

$$\frac{5.80 - 6.10}{5.80} + 1 = 0.948$$

**APPENDIX B:  
METHOD 25A FIELD DATA AND TEST  
RESULTS**



**ANHEUSER BUSCH BREWERY  
TEST RESULTS SUMMARY**

<u>Test Location</u>	<u>Test 1</u>	<u>Test 2</u>	<u>Test 3</u>	<u>Average</u>
Location 1 - Vent 1	1.9	2.2	5.7	3.27
Location 1 - Vent 2	3.6	6.6	6.0	5.40
Location 2 - Vent 1 (#212)	0.0			0.00
Location 2 - Vent 2 (#213)	0.3			0.30
Location 2 - Vent 3 (#233)	0.3			0.30
Location 2 - Vent 4 (#260)	0.4			0.40
Location 2 - Vent 5 (#257)	5.2			5.20
Location 3 - Vent 1 (#211)	8.5	12.2	10.3	10.33
Location 3 - Vent 2 (#214)	10.0	8.8	10.3	9.70



































## SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Company

TEST DATE: 7/26/94

RUN NUMBER: Location 1 - Vents 1 and 2 (1115-1524)

SPAN VALUE: 30 ppm THC *as C1*

	-----INITIAL VALUES-----			-----FINAL VALUES-----		
	ANALYZER CAL. RESPONSE	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	DRIFT (% OF SPAN)
THC ZERO GAS	#N/A	0.00	#N/A	2.10	#N/A	7.00
THC UP-SCALE	#N/A	9.30	#N/A	11.20	#N/A	6.33

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Brewery - Location 1

TEST DATE: 7/26/94

RUN NUMBER: Vents 1 and 2 - Run 2 (1538-1839)

SPAN VALUE: 30 ppm THC as C1

	ANALYZER CAL. RESPONSE	-----INITIAL VALUES-----		-----FINAL VALUES-----		DRIFT (% OF SPAN)
		SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	
THC ZERO GAS	#N/A	0.00	#N/A	-6.50	#N/A	-21.67
THC UP-SCALE	#N/A	9.30	#N/A	3.60	#N/A	-19.00

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

## SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Brewery - Location 1

TEST DATE: 7/26/94

RUN NUMBER: Vents 1 and 2 - Run 3 (1839-2121)

SPAN VALUE: 30 ppm THC as C1

	-----INITIAL VALUES-----			-----FINAL VALUES-----		
	ANALYZER CAL. RESPONSE	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	DRIFT (% OF SPAN)
THC ZERO GAS	#N/A	0.10	#N/A	-1.20	#N/A	-4.33
THC UP-SCALE	#N/A	9.10	#N/A	7.90	#N/A	-4.00

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Brewery - Location 2

TEST DATE: 7/27/94

RUN NUMBER: Vents 1 and 2 (0719-1213)

SPAN VALUE: 30 ppm THC as C1

		-----INITIAL VALUES-----		-----FINAL VALUES-----		
	ANALYZER CAL. RESPONSE	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	DRIFT (% OF SPAN)
THC ZERO GAS	#N/A	0.10	#N/A	7.00	#N/A	23.00
THC UP-SCALE	#N/A	8.90	#N/A	16.50	#N/A	25.33

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Brewery - Location 2

TEST DATE: 7/27/94

RUN NUMBER: Vents 3 and 4 (1213-1648)

SPAN VALUE: 30 ppm THC *no C1*

	ANALYZER CAL. RESPONSE	-----INITIAL VALUES-----		-----FINAL VALUES-----		DRIFT (% OF SPAN)
		SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	
THC ZERO GAS	#N/A	0.00	#N/A	0.00	#N/A	0.00
THC UP-SCALE	#N/A	9.00	#N/A	8.90	#N/A	-0.33

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Brewery - Location 2

TEST DATE: 7/27/94

RUN NUMBER: Vent 5, No. 257 (1720-1820)

SPAN VALUE: 30 ppm THC as C1

	ANALYZER CAL. RESPONSE	-----INITIAL VALUES-----		-----FINAL VALUES-----		DRIFT (% OF SPAN)
		SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	
THC ZERO GAS	#N/A	-0.40	#N/A	-1.70	#N/A	-4.33
THC UP-SCALE	#N/A	7.70	#N/A	6.20	#N/A	-5.00

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Brewery - Location 3

TEST DATE: 7/28/94

RUN NUMBER: Vents 1 and 2 - Run 1 (0826-1158)

SPAN VALUE: 30 ppm THC as C1

	ANALYZER CAL. RESPONSE	-----INITIAL VALUES-----		-----FINAL VALUES-----		DRIFT (% OF SPAN)
		SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	
THC ZERO GAS	#N/A	0.00	#N/A	3.10	#N/A	10.33
THC UP-SCALE	#N/A	9.00	#N/A	12.10	#N/A	10.33

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

## SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Brewery - Location 3

TEST DATE: 7/28/94

RUN NUMBER: Vents 1 and 2 - Run 2 (1158-1442)

SPAN VALUE: 30 ppm THC as Cl

	ANALYZER CAL. RESPONSE	-----INITIAL VALUES-----		-----FINAL VALUES-----		DRIFT (% OF SPAN)
		SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	
THC ZERO GAS	#N/A	3.10	#N/A	0.90	#N/A	-7.33
THC UP-SCALE	#N/A	12.10	#N/A	10.10	#N/A	-6.67

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

SYSTEM CALIBRATION BIAS AND DRIFT CALCULATIONS

SOURCE: Anheuser Busch Brewery - Location 3

TEST DATE: 7/28/94

RUN NUMBER: Vents 1 and 2 - Run 3 (1423-1718)

SPAN VALUE: 30 ppm THC as C1

		-----INITIAL VALUES-----		-----FINAL VALUES-----		
	ANALYZER CAL. RESPONSE	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	SYSTEM CAL. RESPONSE	SYSTEM CAL. BIAS (% OF SPAN)	DRIFT (% OF SPAN)
THC ZERO GAS	#N/A	0.90	#N/A	0.20	#N/A	-2.33
THC UP-SCALE	#N/A	10.10	#N/A	9.20	#N/A	-3.00

$$\text{SYSTEM CAL. BIAS} = \frac{\text{SYSTEM CAL. RESPONSE} - \text{ANALYZER CAL. RESPONSE}}{\text{SPAN}} \times 100$$

$$\text{DRIFT} = \frac{\text{FINAL SYSTEM CAL. RESPONSE} - \text{INITIAL CAL. RESPONSE}}{\text{SPAN}} \times 100$$

# CALIBRATION SUMMARY

SOURCE: Ratfisch EI No.6 Calibration for Ethanol Interferences

REASON: INITIAL SYSTEM CALIBRATION FOR RATF6

DATE : 07-22-1994      TIME: 11:21 - 11:24

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
7	RATF6	ppmC1	0.0	-0.0
7	RATF6	ppmC1	9.0	9.8
7	RATF6	ppmC1	15.0	15.6
7	RATF6	ppmC1	25.5	25.2

Ratfisch EI No.6 Calibration for Ethanol Interferences

07-22-1994

CHAN 7  
RATF6

TIME	ppmC1
11:27	-0.1
11:28	-0.0
11:29	-0.1
11:30	5.3
11:31	6.7
11:32	6.9
11:33	7.0
11:34	7.1
11:35	7.1
11:36	7.2
11:37	7.2
11:38	7.2
11:39	7.3
11:40	7.3
11:41	7.3

*5.8 ppm C<sub>2</sub>H<sub>5</sub>OH*

AVERAGE VALUES FOR THE LAST 15 MINUTES

11:41	5.6
11:42	7.3
11:43	7.4
11:44	7.4
11:45	7.3
11:46	6.5
11:47	2.2
11:48	2.1
11:49	2.1
11:50	2.1
11:51	2.1
11:52	2.1

*2.0 ppm C<sub>2</sub>H<sub>5</sub>OH*

COMMENTS: END ETHANOL TEST

# CALIBRATION SUMMARY

SOURCE: Ratfisch EI No.6 Calibration for Ethanol Interferences

REASON: POST TEST SYSTEM CALIBRATION CHECK

DATE : 07-22-1994 TIME: 11:53 - 11:55

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
7	RATF6	ppmC1	0.0	0.1
7	RATF6	ppmC1	15.0	15.7

### CALIBRATION SUMMARY

SOURCE: Ratfisch EI No.6 Calibration for Ethanol Interferences

REASON: CALIBRATION PRIOR TO ETHANOL RESPONSE FACTOR STUDY ON FID

DATE : 07-22-1994      TIME: 14:35 - 14:48

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
7	RATF6	ppmC1	0.0	-0.0
7	RATF6	ppmC1	9.0	9.4
7	RATF6	ppmC1	15.0	15.3
7	RATF6	ppmC1	25.5	25.4

CHAN 7  
RATF6  
TIME      ppmC1  
14:53      7.3  
14:54      7.4

## AVERAGE VALUES FOR THE LAST 2 MINUTES

14:54      7.3

14:55      7.4

14:56      7.5

*sample @ 9.5 psi*      *Frank*      *7.5*  
*Boyle*      *7.5*

## AVERAGE VALUES FOR THE LAST 2 MINUTES

14:56      7.4

14:57      7.8

14:58      7.9

*Call to 7.5 psi*

## AVERAGE VALUES FOR THE LAST 2 MINUTES

14:58      7.8

14:59      7.9

15:00      7.9

## AVERAGE VALUES FOR THE LAST 2 MINUTES

15:00      7.9

15:01      7.9

15:02      7.9

*inc down to 4.5*

## AVERAGE VALUES FOR THE LAST 2 MINUTES

15:02      7.9

15:03      16.1

15:04      15.8

## AVERAGE VALUES FOR THE LAST 2 MINUTES

15:04      15.9

15:05      15.3

15:06      -5.6

## AVERAGE VALUES FOR THE LAST 2 MINUTES

15:06      4.9

15:07      -2.9

15:08      -2.5

## AVERAGE VALUES FOR THE LAST 2 MINUTES

15:08      -2.7

## CALIBRATION SUMMARY

SOURCE: Ratfisch EI No.6 Calibration for Ethanol Interferences

REASON: System Calibration Check

DATE : 07-26-1994      TIME: 11:15 - 12:03

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	-0.0
11	RATF6	ppmC1	2.0	2.7
11	RATF6	ppmC1	5.8	6.7
<del>11</del>	<del>RATF6</del>	<del>ppmC1</del>	<del>5.8</del>	<del>5.9</del>
11	RATF6	ppmC1	9.0	9.3
11	RATF6	ppmC1	15.0	15.0
11	RATF6	ppmC1	19.0	27.5
11	RATF6	ppmC1	25.4	25.2

Anheuser Busch Brewery - Fort Collins-CO

07-26-1994

CHAN11  
RATF6  
TIME      ppmCl  
12:09          1.6  
12:10          1.3  
12:11          1.2  
12:12          1.3  
12:13          1.2  
12:14          1.0  
12:15          1.2  
12:16          4.4  
12:17          4.0  
12:18          1.9  
12:19          1.5  
12:20          1.6  
12:21          2.2  
12:22          2.7  
12:23          1.7

AVERAGE VALUES FOR THE LAST 15 MINUTES

12:23          1.9

12:24          0.8  
12:25          0.7  
12:26          0.7  
12:27          0.6  
12:28          0.7  
12:29          1.2  
12:30          1.7  
12:31          2.1  
12:32          2.5  
12:33          2.7  
12:34          2.7  
12:35          2.5  
12:36          2.8  
12:37          3.1  
12:38          3.3

AVERAGE VALUES FOR THE LAST 15 MINUTES

12:38          1.9

12:39          3.8  
12:40          3.8  
12:41          3.6  
12:42          3.2  
12:43          3.2  
12:44          3.7  
12:45          3.8  
12:46          3.9  
12:47          4.3  
12:48          4.5  
12:49          5.0  
12:50          5.2  
12:51          4.8  
12:52          4.8  
12:53          5.0

Anheuser Busch Brewery - Fort Collins-CO

07-26-1994

CHAN11

RATF6

TIME      ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

12:53          4.2

12:54          5.1

12:55          5.1

12:56          5.4

12:57          5.3

12:58          5.0

12:59          4.2

13:00          3.6

13:01          3.4

13:02          3.3

13:03          3.1

13:04          3.2

13:05          3.7

13:06          3.2

13:07          2.8

13:08          2.5

AVERAGE VALUES FOR THE LAST 15 MINUTES

13:08          3.9

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

13:08          3.0  
-----

COMMENTS: Vent 1 - Test Run 1

TIME	ppmC1
13:34	5.3
13:35	5.0
13:36	4.7
13:37	4.8
13:38	5.1
13:39	5.2
13:40	4.9
13:41	4.1
13:42	3.8
13:43	3.5
13:44	3.6
13:45	4.1
13:46	4.2
13:47	4.1
13:48	4.0

## AVERAGE VALUES FOR THE LAST 15 MINUTES

13:48	4.4
13:49	4.3
13:50	4.9
13:51	5.2
13:52	5.3
13:53	5.1
13:54	4.9
13:55	4.7
13:56	4.6
13:57	4.3
13:58	4.1
13:59	4.1
14:00	4.1
14:01	4.1
14:02	4.6
14:03	4.8

## AVERAGE VALUES FOR THE LAST 15 MINUTES

14:03	4.6
14:04	5.0
14:05	4.9
14:06	4.7
14:07	4.8
14:08	5.0
14:09	5.4
14:10	5.1
14:11	5.1
14:12	5.4
14:13	5.2
14:14	4.6
14:15	4.1
14:16	4.0
14:17	3.7
14:18	3.8

Anheuser Busch Brewery - Fort Collins-CO

07-26-1994

CHAN11

RATF6

TIME     ppmCl

AVERAGE VALUES FOR THE LAST 15 MINUTES

14:18        4.7

14:19        4.3

14:20        5.0

14:21        5.1

14:22        5.6

14:23        5.7

14:24        5.5

14:25        5.6

14:26        5.3

14:27        5.4

14:28        5.2

14:29        4.9

14:30        4.6

14:31        4.6

14:32        5.0

14:33        5.1

AVERAGE VALUES FOR THE LAST 15 MINUTES

14:33        5.1

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

14:33        4.7  
-----

COMMENTS: Vent 2 - Test Run 1

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-26-1994      TIME: 14:33 - 15:24

<u>A/D CHAN</u>	<u>MONITOR DESCRIPTION</u>	<u>UNITS</u>	<u>GAS VALUE</u>	<u>MONITOR RESPONSE</u>
11	RATF6	ppmC1	0.0	2.1
11	RATF6	ppmC1	5.8	8.3
11	RATF6	ppmC1	9.0	11.2

## CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check after adjustment

DATE : 07-26-1994      TIME: 15:38 - 15:44

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	0.0
11	RATF6	ppmC1	9.0	9.3

CHAN11

RATF6

TIME	ppmC1
15:49	-0.3
15:50	-0.3
15:51	-0.0
15:52	0.1
15:53	0.2
15:54	0.3
15:55	0.2
15:56	-0.1
15:57	0.1
15:58	0.3
15:59	-0.3
16:00	-0.4
16:01	-0.3
16:02	-0.2
16:03	-0.2

## AVERAGE VALUES FOR THE LAST 15 MINUTES

16:03 -0.1

16:04	-0.5
16:05	-0.6
16:06	-0.7
16:07	-1.0
16:08	-1.3
16:09	-1.4
16:10	-1.9
16:11	-2.0
16:12	-2.1
16:13	-2.5
16:14	-2.7
16:15	-2.9
16:16	-2.9
16:17	-2.9
16:18	-0.7

## AVERAGE VALUES FOR THE LAST 15 MINUTES

16:18 -1.7

16:19	-0.2
16:20	-0.1
16:21	0.1
16:22	-0.4
16:23	-0.4
16:24	-0.5
16:25	-0.8
16:26	-0.8
16:27	-0.8
16:28	-0.8
16:29	-0.9
16:30	-1.0
16:31	-0.9
16:32	-0.8
16:33	-0.4

Anheuser Busch Brewery - Fort Collins-CO

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CHAN11

RATF6

TIME     ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

16:33     -0.6

16:34     -0.6

16:35     -0.7

16:36     -0.7

16:37     -0.9

16:38     -1.1

16:39     -1.2

16:40     -1.1

16:41     -1.4

16:42     -1.4

16:43     -1.4

16:44     -1.4

16:45     -1.6

16:46     -1.5

16:47     -1.5

16:48     -1.3

AVERAGE VALUES FOR THE LAST 15 MINUTES

16:48     -1.2

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

16:48     -0.9

-----  
16:49     -1.2

16:50     -1.2

16:51     -1.3

16:52     -1.3

16:53     -1.5

16:54     -1.4

16:55     -1.3

16:56     -2.1

16:57     -0.1

16:58     32.9

16:59     0.3

17:00     0.4

COMMENTS: vent 1 test run 2

CHAN11  
 RATF6  
TIME      ppmC1

17:03	-0.0
17:04	-0.2
17:05	-0.1
17:06	-1.4
17:07	-2.6
17:08	0.3
17:09	1.5
17:10	0.9
17:11	0.8
17:12	1.0
17:13	1.6
17:14	1.3
17:15	1.3
17:16	0.9
17:17	0.7

AVERAGE VALUES FOR THE LAST 15 MINUTES

17:17      0.4

17:18	1.1
17:19	1.8
17:20	2.0
17:21	1.8
17:22	2.0
17:23	2.2
17:24	1.8
17:25	1.6
17:26	1.2
17:27	1.3
17:28	0.9
17:29	0.8
17:30	1.0
17:31	1.6
17:32	1.5

AVERAGE VALUES FOR THE LAST 15 MINUTES

17:32      1.5

17:33	1.9
17:34	2.3
17:35	2.7
17:36	2.6
17:37	2.8
17:38	2.5
17:39	2.3
17:40	2.9
17:41	5.1
17:42	9.9
17:43	12.6
17:44	9.3
17:45	10.7
17:46	16.2
17:47	16.2

Anheuser Busch Brewery - Fort Collins-CO

07-26-1994

CHAN11

RATF6

TIME      ppmCl

AVERAGE VALUES FOR THE LAST 15 MINUTES

17:47          6.7

17:48          10.9

17:49          7.0

17:50          4.9

17:51          4.6

17:52          8.0

17:53          11.5

17:54          11.4

17:55          11.3

17:56          8.9

17:57          6.9

17:58          5.5

17:59          3.9

18:00          4.1

18:01          3.2

18:02          3.6

AVERAGE VALUES FOR THE LAST 15 MINUTES

18:02          7.0

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

18:02          3.9  
-----

COMMENTS: Vent 2 - Test Run 2

CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-26-1994 TIME: 18:02 - 18:39

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	-6.5
11	RATF6	ppmC1	5.8	1.0
11	RATF6	ppmC1	9.0	3.6

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check after adjustment

DATE : 07-26-1994      TIME: 18:39 - 18:53

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	0.1
11	RATF6	ppmC1	5.8	6.6
11	RATF6	ppmC1	9.0	9.1
11	RATF6	ppmC1	15.0	15.0

CHAN11

RATF6

TIME ppmC1

18:57	6.1	- Pt 1
18:58	5.9	
18:59	5.7	
19:00	5.6	
19:01	5.4	
19:02	5.3	
19:03	5.4	
19:04	5.5	
19:05	5.4	
19:06	5.4	
19:07	5.5	
19:08	5.5	
19:09	5.4	
19:10	5.6	
19:11	5.7	

AVERAGE VALUES FOR THE LAST 15 MINUTES

19:11 5.6

19:12	5.7	
19:13	5.6	
19:14	5.4	
19:15	5.4	
19:16	5.7	
19:17	5.7	- Pt 2
19:18	5.7	
19:19	5.8	
19:20	5.8	
19:21	5.8	
19:22	6.0	
19:23	5.9	
19:24	5.3	
19:25	5.0	
19:26	5.4	

AVERAGE VALUES FOR THE LAST 15 MINUTES

19:26 5.6

19:27	5.5	
19:28	5.3	
19:29	6.8	
19:30	6.8	
19:31	5.3	
19:32	4.9	
19:33	4.8	
19:34	4.9	
19:35	5.1	
19:36	4.7	
19:37	6.2	- Pt 3
19:38	5.1	
19:39	5.0	
19:40	5.3	
19:41	5.7	

Anheuser Busch Brewery - Fort Collins-CO

07-26-1994

CHAN11

RATF6

TIME      ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

19:41          5.4

19:42          5.6

19:43          5.2

19:44          5.3

19:45          5.0

19:46          4.2

19:47          3.7

19:48          3.8

19:49          3.8

19:50          4.0

19:51          4.0

19:52          4.0

19:53          3.9

19:54          3.9

19:55          3.8

19:56          3.7

AVERAGE VALUES FOR THE LAST 15 MINUTES

19:56          4.3

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

19:56          5.2  
-----

COMMENTS: Vent 1 - Test Run 3

CHAN11  
RATF6  
TIME      ppmC1

20:04      4.3      - Pt 1  
20:05      4.4  
20:06      4.5  
20:07      4.5  
20:08      4.5  
20:09      4.4  
20:10      4.5  
20:11      4.3  
20:12      4.2  
20:13      4.1  
20:14      4.0  
20:15      4.1  
20:16      4.3  
20:17      4.4  
20:18      4.8

AVERAGE VALUES FOR THE LAST 15 MINUTES  
20:18      4.4

20:19      4.6  
20:20      4.7  
20:21      4.8  
20:22      4.8  
20:23      5.0  
20:24      5.1      - Pt 2  
20:25      5.2  
20:26      4.9  
20:27      5.1  
20:28      5.1  
20:29      6.0  
20:30      6.3  
20:31      6.6  
20:32      6.3  
20:33      6.2

AVERAGE VALUES FOR THE LAST 15 MINUTES  
20:33      5.4

20:34      5.8  
20:35      5.6  
20:36      5.7  
20:37      5.9  
20:38      6.1  
20:39      6.1  
20:40      5.6  
20:41      5.7  
20:42      5.5  
20:43      5.3  
20:44      5.0      - Pt 3  
20:45      5.0  
20:46      5.0  
20:47      4.9  
20:48      5.6

Anheuser Busch Brewery - Fort Collins-CO

07-26-1994

CHAN11

RATF6

TIME      ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

20:48          5.5

20:49          5.9

20:50          6.8

20:51          7.1

20:52          6.9

20:53          7.2

20:54          7.0

20:55          7.0

20:56          6.7

20:57          6.9

20:58          6.5

20:59          6.7

21:00          6.7

21:01          7.0

21:02          7.1

21:03          7.3

AVERAGE VALUES FOR THE LAST 15 MINUTES

21:03          6.9

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

21:03          5.5  
-----

COMMENTS: Vent 2 - Test Run <sup>23</sup> 23

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-26-1994      TIME: 21:04 - 21:21

<u>A/D CHAN</u>	<u>MONITOR DESCRIPTION</u>	<u>UNITS</u>	<u>GAS VALUE</u>	<u>MONITOR RESPONSE</u>
11	RATF6	ppmC1	0.0	-1.2
11	RATF6	ppmC1	5.8	5.7
11	RATF6	ppmC1	9.0	7.9

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: Pretest System Calibration

DATE : 07-27-1994      TIME: 07:19 - 08:42

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	0.0
11	RATF6	ppmC1	2.0	1.8
11	RATF6	ppmC1	5.8	7.0
11	RATF6	ppmC1	9.0	8.9
11	RATF6	ppmC1	15.0	15.1
11	RATF6	ppmC1	19.0	32.1
11	RATF6	ppmC1	25.4	25.4

CHAN11

RATF6

TIME      ppmC1

08:51	1.6
08:52	1.5
08:53	1.5
08:54	1.6
08:55	1.6
08:56	1.5
08:57	1.6
08:58	1.5
08:59	1.5
09:00	1.5
09:01	1.5
09:02	1.4
09:03	1.4
09:04	1.5
09:05	1.4

AVERAGE VALUES FOR THE LAST 15 MINUTES

09:05      1.5

09:06	1.5
09:07	1.5
09:08	1.5
09:09	1.4
09:10	1.5
09:11	1.5
09:12	1.5
09:13	1.5
09:14	1.5
09:15	1.5
09:16	1.5
09:17	1.5
09:18	1.6
09:19	1.5
09:20	1.7

AVERAGE VALUES FOR THE LAST 15 MINUTES

09:20      1.5

COMMENTS: Location 2 - Ambient Air

CHAN11  
RATF6  
TIME      ppmC1  
09:38          2.5  
09:39          2.4  
09:40          2.3  
09:41          2.3  
09:42          2.3  
09:43          2.4  
09:44          2.9  
09:45          3.2  
09:46          3.4  
09:47          3.5  
09:48          2.8  
09:49          2.9  
09:50          3.7  
09:51          3.8  
09:52          3.8

## AVERAGE VALUES FOR THE LAST 15 MINUTES

09:52          3.0

09:53          3.7  
09:54          3.6  
09:55          3.8  
09:56          4.1  
09:57          3.5  
09:58          3.3  
09:59          3.3  
10:00          3.2  
10:01          3.1  
10:02          3.2  
10:03          3.3  
10:04          3.4  
10:05          3.3  
10:06          3.3  
10:07          3.2

## AVERAGE VALUES FOR THE LAST 15 MINUTES

10:07          3.4

10:08          3.2  
10:09          3.1  
10:10          3.2  
10:11          3.1  
10:12          3.1  
10:13          3.2  
10:14          3.3  
10:15          3.3  
10:16          3.5  
10:17          3.6  
10:18          3.7  
10:19          3.7  
10:20          3.8  
10:21          3.8  
10:22          3.6

CHAN11

RATF6

TIME      ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

10:22          3.4

10:23          3.4

10:24          3.6

10:25          3.7

10:26          3.7

10:27          3.7

10:28          3.7

10:29          3.7

10:30          3.6

10:31          3.5

10:32          3.5

10:33          3.4

10:34          3.5

10:35          3.6

10:36          3.6

10:37          3.9

AVERAGE VALUES FOR THE LAST 15 MINUTES

10:37          3.6

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

10:37          3.3  
-----

COMMENTS: Location 2 - Vent 1  
            (Vent 212)

CHAN11  
RATF6  
TIME      ppmC1  
10:43          3.4  
10:44          3.3  
10:45          3.4  
10:46          3.3  
10:47          3.2  
10:48          3.3  
10:49          3.3  
10:50          3.3  
10:51          3.3  
10:52          3.4  
10:53          3.3  
10:54          3.5  
10:55          3.6  
10:56          3.6  
10:57          3.8

## AVERAGE VALUES FOR THE LAST 15 MINUTES

10:57          3.4

10:58          3.8

10:59          3.9

11:00          3.9

11:01          3.8

11:02          3.7

11:03          3.8

11:04          3.8

11:05          4.0

11:06          4.0

11:07          4.2

11:08          4.2

11:09          4.2

11:10          4.0

11:11          3.9

11:12          3.9

## AVERAGE VALUES FOR THE LAST 15 MINUTES

11:12          4.0

11:13          4.1

11:14          4.0

11:15          4.0

11:16          4.1

11:17          4.0

11:18          3.7

11:19          3.9

11:20          4.2

11:21          3.8

11:22          3.8

11:23          4.0

11:24          4.1

11:25          4.0

11:26          4.1

11:27          4.1

CHAN11

RATF6

TIME      ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

11:27	4.0
11:28	4.3
11:29	4.4
11:30	4.3
11:31	4.5
11:32	4.4
11:33	4.4
11:34	4.3
11:35	4.4
11:36	4.2
11:37	4.1
11:38	4.1
11:39	4.2
11:40	4.2
11:41	4.3
11:42	4.4

AVERAGE VALUES FOR THE LAST 15 MINUTES

11:42	4.3
-------	-----

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

11:42	3.9
-------	-----

-----  
11:43      4.5

COMMENTS: Location 2 - Vent 2  
(Vent 213)

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-27-1994      TIME: 11:43 - 12:13

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	7.0
11	RATF6	ppmC1	5.8	13.4
11	RATF6	ppmC1	9.0	16.5

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check after adjustments

DATE : 07-27-1994      TIME: 12:13 - 12:20

<u>A/D CHAN</u>	<u>MONITOR DESCRIPTION</u>	<u>UNITS</u>	<u>GAS VALUE</u>	<u>MONITOR RESPONSE</u>
11	RATF6	ppmC1	0.0	0.0
11	RATF6	ppmC1	9.0	9.0
11	RATF6	ppmC1	15.0	14.9

TIME	ppmC1
12:40	0.0
12:41	0.1
12:42	0.0
12:43	-0.0
12:44	-0.0
12:45	-0.0
12:46	0.0
12:47	0.1
12:48	0.1
12:49	0.1
12:50	0.0
12:51	-0.0
12:52	-0.0
12:53	0.1
12:54	0.2

## AVERAGE VALUES FOR THE LAST 15 MINUTES

12:54	0.1
12:55	0.3
12:56	0.2
12:57	0.2
12:58	0.2
12:59	0.1
13:00	0.0
13:01	-0.0
13:02	-0.0
13:03	-0.0
13:04	-0.0
13:05	0.0
13:06	0.1
13:07	0.1
13:08	0.3
13:09	0.4

## AVERAGE VALUES FOR THE LAST 15 MINUTES

13:09	0.1
13:10	0.4
13:11	0.5
13:12	0.6
13:13	0.5
13:14	0.6
13:15	0.5
13:16	0.5
13:17	0.5
13:18	0.5
13:19	0.5
13:20	0.5
13:21	0.5
13:22	0.3
13:23	0.4
13:24	0.4

CHAN11

RATF6

TIME      ppmC1

## AVERAGE VALUES FOR THE LAST 15 MINUTES

13:24          0.5

13:25          0.5

13:26          0.4

13:27          0.4

13:28          0.4

13:29          0.4

13:30          0.4

13:31          0.5

13:32          0.4

13:33          0.3

13:34          0.3

13:35          0.2

13:36          0.3

13:37          0.2

13:38          0.3

13:39          0.3

## AVERAGE VALUES FOR THE LAST 15 MINUTES

13:39          0.4

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

13:39          0.3

-----  
13:40          0.3

13:41          0.4

13:42          0.5

COMMENTS: Location 2 - Vent 3  
(Vent 233)

CHAN11  
RATF6  
TIME      ppmC1

13:49	0.4
13:50	0.4
13:51	0.3
13:52	0.4
13:53	0.3
13:54	0.3
13:55	0.3
13:56	0.3
13:57	0.4
13:58	0.4
13:59	0.4
14:00	0.6
14:01	0.6
14:02	0.3
14:03	0.2

## AVERAGE VALUES FOR THE LAST 15 MINUTES

14:03      0.4

14:04	0.2
14:05	0.4
14:06	0.3
14:07	0.3
14:08	0.4
14:09	0.6
14:10	0.5
14:11	0.6
14:12	0.5
14:13	0.4
14:14	0.5
14:15	1.0
14:16	0.5
14:17	0.2
14:18	0.5

## AVERAGE VALUES FOR THE LAST 15 MINUTES

14:18      0.5

14:19	0.8
14:20	0.7
14:21	0.7
14:22	-0.0
14:23	0.4
14:24	0.3
14:25	0.4
14:26	0.2
14:27	0.2
14:28	0.4
14:29	0.1
14:30	0.4
14:31	0.5
14:32	0.7
14:33	0.7

CHAN11

RATF6

TIME      ppmCl

AVERAGE VALUES FOR THE LAST 15 MINUTES

14:33            0.4

14:34            0.7

14:35            0.6

14:36            0.3

14:37            0.2

14:38            0.4

14:39            0.2

14:40            0.1

14:41            0.2

14:42            0.1

14:43            -0.1

14:44            -0.0

14:45            -0.1

14:46            -0.1

14:47            0.1

14:48            0.1

AVERAGE VALUES FOR THE LAST 15 MINUTES

14:48            0.2

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

14:48            0.4  
-----

COMMENTS: Location 2 - Vent 4\  
(Vent 260)

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-27-1994      TIME: 14:48 - 16:48

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	0.0
11	RATF6	ppmC1	5.8	6.9
11	RATF6	ppmC1	9.0	8.9

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check with additional sample line

DATE : 07-27-1994      TIME: 16:48 - 17:18

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	-0.4
11	RATF6	ppmC1	2.0	2.0
11	RATF6	ppmC1	5.8	6.3
11	RATF6	ppmC1	9.0	7.7

TIME	ppmC1
17:21	4.4
17:22	4.5
17:23	4.5
17:24	4.5
17:25	4.8
17:26	5.0
17:27	4.7
17:28	5.0
17:29	5.5
17:30	4.6
17:31	4.3
17:32	4.4
17:33	3.8
17:34	3.9
17:35	4.2

## AVERAGE VALUES FOR THE LAST 15 MINUTES

17:35 4.5

17:36	4.8
17:37	4.3
17:38	3.7
17:39	4.1
17:40	3.6
17:41	3.7
17:42	3.3
17:43	4.1
17:44	4.6
17:45	4.1
17:46	4.1
17:47	3.7
17:48	3.4
17:49	3.1
17:50	2.7

## AVERAGE VALUES FOR THE LAST 15 MINUTES

17:50 3.8

17:51	2.9
17:52	2.5
17:53	2.2
17:54	2.4
17:55	2.3
17:56	2.1
17:57	1.9
17:58	2.0
17:59	2.3
18:00	2.4
18:01	3.2
18:02	3.9
18:03	3.3
18:04	3.5
18:05	3.4

CHAN11

RATF6

TIME      ppmCl

AVERAGE VALUES FOR THE LAST 15 MINUTES

18:05	2.7
18:06	3.8
18:07	3.9
18:08	4.2
18:09	3.7
18:10	3.1
18:11	3.4
18:12	3.1
18:13	3.0
18:14	2.7
18:15	2.7
18:16	3.4
18:17	3.4
18:18	3.7
18:19	3.7
18:20	3.6

AVERAGE VALUES FOR THE LAST 15 MINUTES

18:20	3.4
-------	-----

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

18:20	3.6
-------	-----

-----

COMMENTS: Location 2 - Vent 5  
(Vent 257)

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-27-1994      TIME: 18:20 - 18:48

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	-1.7
11	RATF6	ppmC1	5.8	4.5
11	RATF6	ppmC1	9.0	6.2

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: Pretest System Calibration

DATE : 07-28-1994      TIME: 08:26 - 09:27

<u>A/D CHAN</u>	<u>MONITOR DESCRIPTION</u>	<u>UNITS</u>	<u>GAS VALUE</u>	<u>MONITOR RESPONSE</u>
11	RATF6	ppmC1	0.0	0.0
11	RATF6	ppmC1	2.0	2.2
11	RATF6	ppmC1	5.8	7.4
11	RATF6	ppmC1	9.0	9.0
11	RATF6	ppmC1	15.0	15.0
11	RATF6	ppmC1	19.0	33.4
11	RATF6	ppmC1	25.4	25.4

CHAN11  
RATF6  
TIME      ppmC1  
09:32      10.4  
09:33      9.7  
09:34      12.4  
09:35      11.1  
09:36      10.5  
09:37      9.7  
09:38      18.1  
09:39      13.7  
09:40      12.0  
09:41      11.1  
09:42      13.0  
09:43      13.4  
09:44      9.4  
09:45      9.9  
09:46      9.7

## AVERAGE VALUES FOR THE LAST 15 MINUTES

09:46      11.6  
  
09:47      8.2  
09:48      7.8  
09:49      8.2  
09:50      8.0  
09:51      8.0  
09:52      8.2  
09:53      8.2  
09:54      7.4  
09:55      8.0  
09:56      8.0  
09:57      9.2  
09:58      9.0  
09:59      9.2  
10:00      9.3  
10:01      8.5

## AVERAGE VALUES FOR THE LAST 15 MINUTES

10:01      8.4  
  
10:02      8.8  
10:03      8.7  
10:04      8.3  
10:05      8.2  
10:06      8.6  
10:07      8.0  
10:08      9.7  
10:09      9.9  
10:10      8.4  
10:11      8.9  
10:12      8.4  
10:13      9.0  
10:14      8.1  
10:15      9.4  
10:16      9.9

CHAN11

RATF6

TIME      ppmC1

## AVERAGE VALUES FOR THE LAST 15 MINUTES

10:16          8.8

10:17          9.0

10:18          9.2

10:19          10.4

10:20          11.1

10:21          11.4

10:22          11.8

10:23          11.1

10:24          11.4

10:25          11.6

10:26          12.0

10:27          11.9

10:28          11.8

10:29          10.9

10:30          12.4

10:31          11.8

## AVERAGE VALUES FOR THE LAST 15 MINUTES

10:31          11.2

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA10:31          10.0  
-----COMMENTS: Location 3 - Vent 1  
            (Vent 211)  
            Test Run 1

TIME	ppmC1
10:39	12.9
10:40	13.6
10:41	12.5
10:42	12.8
10:43	12.9
10:44	13.1
10:45	12.3
10:46	12.9
10:47	13.7
10:48	12.8
10:49	12.7
10:50	12.6
10:51	12.9
10:52	13.2
10:53	13.0

## AVERAGE VALUES FOR THE LAST 15 MINUTES

10:53	12.9
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10:54	12.9
10:55	13.4
10:56	13.5
10:57	13.5
10:58	13.3
10:59	13.4
11:00	13.2
11:01	12.2
11:02	11.4
11:03	10.8
11:04	11.4
11:05	10.9
11:06	11.8
11:07	11.6
11:08	11.7

## AVERAGE VALUES FOR THE LAST 15 MINUTES

11:08	12.3
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11:09	11.2
11:10	12.2
11:11	12.4
11:12	12.4
11:13	12.5
11:14	12.5
11:15	12.1
11:16	11.9
11:17	11.8
11:18	11.7
11:19	11.2
11:20	10.4
11:21	10.3
11:22	9.9
11:23	9.7

CHAN11

RATF6

TIME      ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

11:23	11.5
11:24	9.2
11:25	9.4
11:26	9.3
11:27	9.5
11:28	9.2
11:29	8.4
11:30	7.9
11:31	7.5
11:32	8.6
11:33	8.9
11:34	9.4
11:35	9.8
11:36	9.8
11:37	10.1
11:38	9.8

AVERAGE VALUES FOR THE LAST 15 MINUTES

11:38	9.1
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-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

11:38	11.5
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COMMENTS: Location 3 - Vent 2  
          (Vent 214)  
          Test Run 1

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-28-1994      TIME: 11:39 - 11:58

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	3.1
11	RATF6	ppmC1	5.8	9.8
11	RATF6	ppmC1	9.0	12.1
11	RATF6	ppmC1	15.0	18.0

CHAN11

RATF6

TIME      ppmC1

12:13	11.7	- Pt 1
12:14	11.4	
12:15	10.9	
12:16	11.4	
12:17	11.9	
12:18	11.2	
12:19	10.9	
12:20	11.2	
12:21	15.0	
12:22	16.8	
12:23	14.9	
12:24	14.6	
12:25	14.6	
12:26	17.8	
12:27	15.1	

AVERAGE VALUES FOR THE LAST 15 MINUTES

12:27      13.3

12:28	13.9	
12:29	13.3	
12:30	13.4	
12:31	13.2	
12:32	12.4	
12:33	13.2	- Pt 2
12:34	14.0	
12:35	14.8	
12:36	15.8	
12:37	16.2	
12:38	14.3	
12:39	13.8	
12:40	13.6	
12:41	13.8	
12:42	15.3	

AVERAGE VALUES FOR THE LAST 15 MINUTES

12:42      14.1

12:43	14.6	
12:44	15.4	
12:45	15.4	
12:46	15.1	
12:47	15.4	
12:48	14.4	
12:49	14.0	
12:50	14.8	
12:51	15.6	
12:52	15.4	
12:53	15.7	- Pt 3
12:54	15.9	
12:55	17.1	
12:56	17.0	
12:57	17.3	

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**ENTROPY**

CHAN11  
RATF6  
TIME     ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

12:57	15.5
12:58	18.1
12:59	15.6
13:00	17.1
13:01	17.5
13:02	15.7
13:03	15.2
13:04	12.3
13:05	12.8
13:06	12.9
13:07	12.9
13:08	13.1
13:09	11.5
13:10	11.5
13:11	13.3
13:12	13.2

AVERAGE VALUES FOR THE LAST 15 MINUTES

13:12	14.2
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-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

13:12	14.3
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-----  
13:13     12.5

COMMENTS: Location 3 - Vent 1  
            (Vent 211)  
            Test Run 2

CHAN11

RATF6

TIME      ppmC1

13:22      10.0      - Pt 1  
13:23      9.4  
13:24      9.8  
13:25      9.6  
13:26      8.5  
13:27      8.3  
13:28      9.3  
13:29      10.4  
13:30      11.1  
13:31      11.1  
13:32      11.1  
13:33      11.3  
13:34      12.0  
13:35      11.4  
13:36      12.5

AVERAGE VALUES FOR THE LAST 15 MINUTES

13:36      10.4

13:37      13.3  
13:38      12.4  
13:39      12.2  
13:40      11.4  
13:41      11.7  
13:42      11.3      - Pt 2  
13:43      10.5  
13:44      10.7  
13:45      11.2  
13:46      10.9  
13:47      10.9  
13:48      11.7  
13:49      11.8  
13:50      11.4  
13:51      11.2

AVERAGE VALUES FOR THE LAST 15 MINUTES

13:51      11.5

13:52      10.8  
13:53      10.5  
13:54      10.9  
13:55      11.2  
13:56      10.9  
13:57      11.6  
13:58      11.8  
13:59      11.8  
14:00      11.1  
14:01      10.9  
14:02      10.0      - Pt 3  
14:03      10.4  
14:04      11.1  
14:05      11.4  
14:06      11.4

CHAN11  
RATF6  
TIME     ppmCl

AVERAGE VALUES FOR THE LAST 15 MINUTES

14:06	11.0
14:07	10.6
14:08	10.6
14:09	10.0
14:10	9.0
14:11	9.7
14:12	11.1
14:13	10.3
14:14	10.7
14:15	10.0
14:16	11.4
14:17	12.0
14:18	11.8
14:19	10.9
14:20	10.6
14:21	10.3

AVERAGE VALUES FOR THE LAST 15 MINUTES

14:21	10.6
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AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

14:21	10.9
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-----  
14:22     11.3

COMMENTS: Location 3 - Vent 2  
            (Vent 214)  
            Test Run 2

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-28-1994      TIME: 14:23 - 14:42

A/D CHAN	MONITOR DESCRIPTION	UNITS	GAS VALUE	MONITOR RESPONSE
11	RATF6	ppmC1	0.0	0.9
11	RATF6	ppmC1	5.8	8.6
11	RATF6	ppmC1	9.0	10.1
11	RATF6	ppmC1	15.0	15.9

TIME	ppmC1
14:48	10.4
14:49	10.1
14:50	9.9
14:51	10.1
14:52	10.7
14:53	9.4
14:54	10.1
14:55	9.9
14:56	10.0
14:57	9.6
14:58	10.3
14:59	10.5
15:00	9.3
15:01	9.3
15:02	10.3

## AVERAGE VALUES FOR THE LAST 15 MINUTES

15:02	10.0
15:03	10.2
15:04	9.5
15:05	9.7
15:06	9.2
15:07	8.9
15:08	9.5
15:09	11.9
15:10	12.6
15:11	12.5
15:12	13.0
15:13	12.2
15:14	12.8
15:15	12.8
15:16	13.1
15:17	13.3

## AVERAGE VALUES FOR THE LAST 15 MINUTES

15:17	11.4
15:18	14.6
15:19	13.0
15:20	12.7
15:21	10.6
15:22	10.8
15:23	12.5
15:24	13.5
15:25	13.0
15:26	12.9
15:27	13.0
15:28	12.6
15:29	11.2
15:30	10.8
15:31	11.9
15:32	10.2

CHAN11

RATF6

TIME      ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

15:32      12.2

15:33      9.8

15:34      10.3

15:35      9.7

15:36      10.4

15:37      10.4

15:38      13.9

15:39      12.1

15:40      9.0

15:41      9.5

15:42      10.9

15:43      9.7

15:44      10.1

15:45      9.8

15:46      9.1

15:47      8.9

AVERAGE VALUES FOR THE LAST 15 MINUTES

15:47      10.2

-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

15:47      11.0  
-----

COMMENTS: Location 3 - Vent 1  
            (Vent 211)  
            Test Run 3

TIME	ppmC1
15:55	11.0
15:56	11.0
15:57	11.2
15:58	10.9
15:59	10.7
16:00	11.0
16:01	11.1
16:02	11.1
16:03	11.5
16:04	11.2
16:05	11.6
16:06	11.7
16:07	11.3
16:08	11.7
16:09	12.0

## AVERAGE VALUES FOR THE LAST 15 MINUTES

16:09	11.3
16:10	12.1
16:11	12.5
16:12	12.2
16:13	12.3
16:14	14.8
16:15	14.6
16:16	15.1
16:17	14.8
16:18	14.9
16:19	14.2
16:20	14.3
16:21	14.9
16:22	15.0
16:23	14.8
16:24	14.5

## AVERAGE VALUES FOR THE LAST 15 MINUTES

16:24	14.1
16:25	14.7
16:26	14.4
16:27	14.6
16:28	14.4
16:29	15.6
16:30	14.6
16:31	14.4
16:32	14.4
16:33	13.9
16:34	14.5
16:35	14.1
16:36	13.7
16:37	13.7
16:38	14.6
16:39	13.4

CHAN11

RATF6

TIME      ppmC1

AVERAGE VALUES FOR THE LAST 15 MINUTES

16:39	14.3
16:40	9.4
16:41	4.7
16:42	4.6
16:43	5.4
16:44	7.1
16:45	4.5
16:46	4.3
16:47	3.5
16:48	2.6
16:49	3.2
16:50	2.6
16:51	3.1
16:52	3.8
16:53	3.0
16:54	3.1

AVERAGE VALUES FOR THE LAST 15 MINUTES

16:54	4.3
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-----  
AVERAGE VALUES FOR THE LAST HOUR: 60 MINUTES OF VALID DATA

16:54	11.0
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-----  
16:55      3.4  
16:56      3.5  
16:57      3.7

COMMENTS: Location 3 - Vent 2  
            (Vent 214)  
            Test Run 3

# CALIBRATION SUMMARY

SOURCE: Anheuser Busch Brewery - Fort Collins-CO

REASON: System Calibration Check

DATE : 07-28-1994      TIME: 17:01 - 17:18

<u>A/D CHAN</u>	<u>MONITOR DESCRIPTION</u>	<u>UNITS</u>	<u>GAS VALUE</u>	<u>MONITOR RESPONSE</u>
11	RATF6	ppmC1	0.0	0.2
11	RATF6	ppmC1	5.8	8.0
11	RATF6	ppmC1	9.0	9.2
11	RATF6	ppmC1	15.0	15.2



**APPENDIX C:  
FTIR FIELD DATA AND TEST RESULTS**



FTIR TEST DATA SUMMARY

VENT: 227 RUN: 1 OF 3

DATE TESTED: 7/26/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v1 r101	2.7	3.2
v1 r102	3.1	3.6
v1 r103	4.4	5.1
v1 r104	4.1	4.8
v1 r105	2.8	3.3
v1 r106	3.1	3.6
v1 r107	3.5	4.1
v1 r108	3.7	4.4
v1 r109	3.3	3.9
v1 r110	3.8	4.4
v1 r111	3.7	4.3
v1 r112	3.8	4.4
AVERAGE	3.49	4.08

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
local01	16.1	18.8	19.0	1.2	Local Span
local02	19.3	22.6	22.1	2.3	Local Span
local03	18.2	21.3	22.1	3.5	Local Span
local04	16.6	19.4	19.0	2.1	Local Span

FTIR TEST DATA SUMMARY  
VENT: 227 RUN: 2 OF 3  
DATE TESTED: 7/26/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v1 r203	4.8	5.6
v1 r204	5.0	5.9
v1 r205	5.2	6.1
v1 r206	4.5	5.2
v1 r207	4.4	5.2
v1 r208	3.0	3.5
v1 r209	2.9	3.4
v1 r210	2.9	3.4
v1 r211	3.4	4.0
v1 r212	3.1	3.7
AVERAGE	3.93	4.59

FTIR TEST DATA SUMMARY  
 VENT: 227 RUN: 3 OF 3  
 DATE TESTED: 7/26/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v1 r301	3.2	3.7
v1 r302	3.1	3.7
v1 r303	2.7	3.2
v1 r304	3.2	3.8
v1 r305	3.7	4.3
v1 r306	3.7	4.3
v1 r307	3.0	3.5
v1 r308	3.7	4.3
v1 r309	3.2	3.8
v1 r310	3.5	4.1
v1 r311	3.8	4.4
v1 r312	3.4	3.9
v1 r313	2.7	3.2
v1 r314	2.8	3.2
AVERAGE	3.25	3.81

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remcal05	16.0	18.7	19	1.51	System Span
local05	16.1	18.8	19	1.03	Local Span

FTIR TEST DATA SUMMARY

VENT: 224 RUN: 1 Of 3

DATE TESTED: 7/26/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v2 r101	5.0	5.8
v2 r102	4.3	5.0
v2 r103	4.6	5.4
v2 r104	4.5	5.2
v2 r105	5.1	5.9
v2 r106	5.2	6.1
v2 r107	4.7	5.5
v2 r108	4.0	4.6
v2 r109	4.9	5.7
v2 r110	4.8	5.6
v2 r111	4.3	5.0
<b>AVERAGE</b>	<b>4.66</b>	<b>5.45</b>

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remzero0	0.7	0.8	0	NA	System Zero
remcal03	16.2	18.9	19	0.34	System Span
remcal04	16.3	19.1	19	0.60	System Span

FTIR TEST DATA SUMMARY

VENT: 224 RUN: 2 Of 3

DATE TESTED: 7/26/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v2 r201	2.1	2.4
v2 r202	2.6	3.1
v2 r203	2.3	2.7
v2 r204	2.4	2.8
v2 r205	2.4	2.8
v2 r206	2.4	2.8
v2 r207	2.4	2.9
v2 r208	4.5	5.3
v2 r209	5.7	6.7
v2 r210	3.3	3.8
v2 r211	4.3	5.0
AVERAGE	3.13	3.66

FTIR TEST DATA SUMMARY

VENT: 224 RUN: 3 OF 3

DATE TESTED: 7/26/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v2 r301	2.2	2.6
v2 r302	2.6	3.0
v2 r303	2.6	3.0
v2 r304	2.7	3.1
v2 r305	3.1	3.7
v2 r306	3.2	3.7
v2 r307	3.4	4.0
v2 r308	3.4	4.0
v2 r309	3.0	3.5
v2 r310	3.6	4.2
v2 r311	3.8	4.5
v2 r312	4.1	4.8
v2 r313	4.5	5.2
<b>AVERAGE</b>	<b>3.24</b>	<b>3.79</b>

FTIR TEST DATA SUMMARY

VENT: 212 RUN: 1 OF 1

DATE TESTED: 7/27/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v1 03	0.6	0.7
v1 04	1.1	1.3
v1 05	1.1	1.2
v1 06	1.4	1.6
v1 07	1.0	1.1
v1 08	1.3	1.6
v1 09	1.1	1.2
v1 10	1.0	1.2
v1 11	0.8	1.0
v1 12	1.1	1.3
v1 13	0.5	0.6
v1 14	1.0	1.2
AVERAGE	1.00	1.17

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
local06	17.2	20.1	19	5.86	Local Span
remcal06	16.1	18.8	19	1.21	System Span
remzero3	0.1	0.1	0	NA	System Zero

FTIR TEST DATA SUMMARY  
 VENT: 213 RUN: 1 OF 1  
 DATE TESTED: 7/27/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v2 01	0.7	0.8
v2 02	0.5	0.6
v2 03	0.8	1.0
v2 04	0.9	1.0
v2 05	0.8	0.9
v2 06	0.7	0.8
v2 07	0.6	0.7
v2 08	1.1	1.3
v2 09	0.7	0.9
v2 10	0.5	0.6
v2 11	1.1	1.3
v2 12	1.1	1.3
v2 13	0.8	0.9
<b>AVERAGE</b>	<b>0.83</b>	<b>0.97</b>

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remcal07	15.8	18.5	19	2.71	System Span
remcal08	16.0	18.7	19	1.62	System Span
remcal09	16.2	18.9	19	0.58	System Span
remcal10	16.4	19.1	19	0.69	System Span
remzero4	0.1	0.2	0	NA	System Zero
remzero5	-0.2	-0.2	0	NA	System Zero
loczero1	-0.3	-0.3	0	NA	Local Zero

FTIR TEST DATA SUMMARY  
VENT: 233 RUN: 1 OF 1  
DATE TESTED: 7/27/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v3 01	1.0	1.2
v3 02	0.5	0.6
v3 03	0.9	1.1
v3 04	1.0	1.1
v3 05	1.2	1.4
v3 06	1.4	1.6
v3 07	1.0	1.1
v3 08	1.3	1.5
v3 09	1.5	1.7
v3 10	0.6	0.7
v3 11	1.1	1.2
AVERAGE	1.03	1.21

FTIR TEST DATA SUMMARY  
 VENT: 260 RUN: 1 OF 1  
 DATE TESTED: 7/27/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v4 01	0.8	1.0
v4 02	1.2	1.4
v4 03	0.9	1.1
v4 04	1.3	1.5
v4 05	1.1	1.3
v4 06	1.5	1.7
v4 07	1.9	2.2
v4 08	1.3	1.5
v4 09	1.2	1.3
v4 10	1.5	1.8
v4 11	1.4	1.6
v4 12	0.6	0.7
v4 13	0.8	0.9
v4 14	1.1	1.3
AVERAGE	1.18	1.38

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remzero6	0.1	0.1	0	NA	System Zero
remzero7	0.4	0.5	0	NA	System Zero
remcal11	16.5	19.3	19	1.55	System Span
remcal12	16.6	19.4	19	2.13	System Span
remcal13	16.4	19.2	19	0.94	System Span

FTIR TEST DATA SUMMARY  
 VENT: 257 RUN: 1 OF 1  
 DATE TESTED: 7/27/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v5 04	4.7	5.5
v5 05	5.2	6.1
v5 06	5.0	5.9
v5 07	4.0	4.6
v5 08	4.0	4.7
v5 09	4.8	5.6
v5 10	3.8	4.4
v5 11	2.9	3.4
v5 12	2.8	3.2
v5 13	3.8	4.5
v5 14	4.2	4.9
v5 15	3.6	4.2
v5 16	3.4	4.0
v5 17	3.9	4.6
AVERAGE	4.00	4.67

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remcal14	16.1	18.8	19	0.91	System Zero
remcal15	16.3	19.0	19	0.05	System Span

FTIR TEST DATA SUMMARY  
AMBIENT ROOF AIR SAMPLES  
DATE TESTED: 7/27/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
ambien01	0.4	0.4
ambien02	0.9	1.1
ambien03	1.0	1.1
ambien04	0.5	0.6
ambien05	0.3	0.3
ambien06	0.5	0.6
ambien07	0.3	0.4
AVERAGE	0.55	0.65

FTIR TEST DATA SUMMARY

VENT: 211 RUN: 1 Of 3

DATE TESTED: 7/28/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v1 r101	6.1	7.1
v1 r102	10.8	12.6
v1 r103	7.5	8.8
v1 r104	4.6	5.4
v1 r105	3.9	4.5
v1 r106	4.2	4.9
v1 r107	4.5	5.3
v1 r108	3.7	4.4
v1 r109	3.3	3.8
v1 r110	3.3	3.8
v1 r111	5.4	6.3
v1 r112	4.5	5.3
v1 r113	5.3	6.1
AVERAGE	5.15	6.03

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remzero8	-0.1	-0.1	0	NA	System Zero
remzero9	-0.1	-0.1	0	NA	System Zero
remzer10	0.1	0.1	0	NA	System Zero
local07	16.1	18.8	19	1.09	Local Span
etohj	4.3	5.1	5.2	2.37	Local Mid

FTIR TEST DATA SUMMARY  
 VENT: 211 RUN: 2 Of 3  
 DATE TESTED: 7/28/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v1 r201	6.0	7.0
v1 r202	5.1	6.0
v1 r203	7.4	8.6
v1 r204	5.7	6.7
v1 r205	5.0	5.9
v1 r206	7.1	8.3
v1 r207	5.6	6.5
v1 r208	6.5	7.6
v1 r209	5.6	6.6
v1 r210	6.1	7.1
v1 r211	10.7	12.5
v1 r212	8.0	9.3
v1 r213	7.9	9.2
v1 r214	8.3	9.7
<b>AVERAGE</b>	<b>6.84</b>	<b>7.99</b>

FTIR TEST DATA SUMMARY

VENT: 211 RUN: 3 Of 3

DATE TESTED: 7/28/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v1 r301	7.4	8.7
v1 r302	6.5	7.6
v1 r303	7.2	8.5
v1 r304	6.3	7.3
v1 r305	5.9	6.9
v1 r306	6.3	7.3
v1 r307	5.3	6.2
v1 r308	6.7	7.8
v1 r309	8.0	9.4
v1 r310	7.9	9.3
v1 r311	6.6	7.7
v1 r312	6.0	7.1
AVERAGE	6.68	7.81

FTIR TEST DATA SUMMARY

VENT: 214 RUN: 1 Of 3

DATE TESTED: 7/28/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v2 r101	5.1	6.0
v2 r102	5.3	6.2
v2 r103	6.5	7.6
v2 r104	6.4	7.5
v2 r105	4.8	5.7
v2 r106	5.2	6.1
v2 r107	5.1	6.0
v2 r108	5.7	6.6
v2 r109	4.7	5.5
v2 r110	4.3	5.1
v2 r111	3.7	4.3
v2 r112	3.3	3.8
AVERAGE	5.02	5.87

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remzer12	-0.1	-0.1	0	NA	System Zero

FTIR TEST DATA SUMMARY

VENT: 214 RUN: 2 Of 3

DATE TESTED: 7/28/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v2 r201	3.1	3.6
v2 r202	4.0	4.7
v2 r203	4.3	5.0
v2 r204	5.0	5.8
v2 r205	5.2	6.0
v2 r206	5.2	6.1
v2 r207	4.6	5.4
v2 r208	4.4	5.2
v2 r209	4.4	5.1
v2 r210	3.4	4.0
v2 r211	5.0	5.8
v2 r212	3.9	4.6
v2 r213	5.8	6.7
AVERAGE	4.48	5.24

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remzer13	0.0	0.0	0	NA	System Zero
remzer14	0.2	0.2	0	NA	System Zero
remzer15	0.1	0.1	0	NA	System Zero

FTIR TEST DATA SUMMARY  
 VENT: 214 RUN: 3 Of 3  
 DATE TESTED: 7/28/94

EMISSIONS DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Corrected)
v2 r301	5.4	6.4
v2 r302	5.3	6.2
v2 r303	5.5	6.5
v2 r304	6.0	7.0
v2 r305	6.1	7.1
v2 r306	5.7	6.6
v2 r307	6.2	7.2
v2 r308	5.7	6.6
v2 r309	5.3	6.1
v2 r310	4.9	5.7
v2 r311	4.8	5.6
v2 r312	5.7	6.7
AVERAGE	5.54	6.48

CALIBRATION DATA

File Name	Concentration (ppm) (Calculated)	Concentration (ppm) (Pressure Correction)	Expected (ppm)	% Deviation	Calibration Type
remzer16	-0.3	-0.4	0	NA	System Zero
remcal16	16.3	19.0	19	0.24	System Span
remcal17	16.3	19.1	19	0.38	System Span
remcal18	16.5	19.3	19	1.52	System Span
local08	16.2	19.0	19	0.21	Local Span

Various Test Spectra

LOC1-XY

FTIR GAS PHASE DATA SHEET

X = RUN # (1-8)

Y = SPECTRUM # (1-99)

DATE: 7/26/04

Facility: Anheuser-Busch, Fort Collins, CO

Location: Bottling Line 1

Background Spectral File Name(s)/# of scans: 654.5 Ton  
BKG001 / 200

6:45 AM

WREN'S

Barometer: 35.35"

Cell at atm - 655.5

Cell at vac - 0.5

Data Directory: D/C: AB1/BKG

Pre-Run CTS Spectral File Name(s): 654.0 Ton  
CTS001

Data Directory: D/C: AB1/CTS/ASF  
AIP

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

4R GAIN

Data Directory: \_\_\_\_\_

Pathlength: 320 Atmospheric Pressure: 35.35" (FROM BAROMETER WREN'S)

Calibration Cylinder Concentration: CTS: 100.9 ETDA: 19

CELL: 250 °E  
MANIFOLD: 200 °C

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
LOCAL01	LOCAL CAL 5 MIN FWD	7:28	~ 8 LPM	653.0 Ton, 14.36 ppm
LOCAL02	DIRECT TO CELL AT PRESSURE	7:42		761.3 Ton, 16.96 ppm
BKG002	DIRECT TO CELL	8:01		761.2 Ton
LOCAL <del>02</del> 3	"	8:06		762.6 Ton, 16.42 ppm
CTS002	"	8:14		761.6 Ton

Pen localized  
- BKG use  
654.5 Ton

Indicates  
path is  
30 meters

PATHLENGTH  
IS  
REDUCED

computer  
hung

$AF = \frac{655}{762} = 0.859$

Path factor =  $\frac{16.96}{19} = 0.892$  269

FACTOR = 0.767

ENTROPY

Real Start

700' Sample line

FTIR GAS PHASE DATA SHEET

DATE: 7/26/94

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Bottling Line 1

Background Spectral File Name(s)/# of scans: BKG003 / 100

650.7 Ton 8:40A

Data Directory: C/D: ABS/BKG

Pre-Run CTS Spectral File Name(s): CTS003 3:53

650.5 Ton

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Bad Light  
13,700 cases  
sample 100-1400  
2/26/94

Flow  
Sample  
No Vent/No bypass  
14 LPM  
no Bypass to go to  
12 LPM

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
LOCAL004		9:00		17.27 ppm 650.1 Ton
REM CAL 01	5 MIN FLOW	10:24	5 LPM	remote cal (135 ETOM) O <sub>2</sub> /CO <sub>2</sub> 650.1 Ton 94.6% leak? OK
REM CAL 01	10 MIN FLOW	10:29	5 LPM	remote cal 650.4 Ton 136 ppm ETOM OK
SAMPLE 01	5 MIN	10:39	9 LPM	First stack sample 0.48 ppm ETOM (0.64 ppm)
SAMPLE 02		~10:46		0 ETOM?
SAMPLE 03	~15 min	11:03	9 LPM	NO ETOM weak contaminant
SAMPLE 04	~45 min	11:24		650.1 Ton NO ETOM, weak contaminant

Contaminant is a fluorocarbon

SRW - VENT1

FTIR GAS PHASE DATA SHEET

DATE: 8/26/04  
 Facility: Anheuser-Busch, Fort Collins, CO.  
 Location: Bottling Line 1

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: 35.35" (25.31 m SON BU 3 Barometer)

Calibration Cylinder Concentration: \_\_\_\_\_  
*clock (data file times) we diff*

see previous page

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V1-R1-01	12:00	12:03	8.8 LPM	650.2 (0.803 ppm) contain
V1-R1-02	-	12:10	-	649.5 (0.735 ppm - but is contain)
V1-R1-03		12:17		± 2.4 ppm 1.8 ppm - real ETOH plus contain
V1-R1-04		12:22		1.91 = 2.54 ppm } real
V1-R1-05		12:29		0.9396
V1-R1-06		12:34		650.7 Ton 2.23 ppm } not contain
V1-R1-07		12:40		new ETOH 2.98 ppm } even more contain
V1-R1-08		12:46		649.4 Ton 3.08

Reset FTIR clock add 9 minutes  
 compared w/ other methods

1<sup>ST</sup> RUN, VENT 1 CONT

FTIR GAS PHASE DATA SHEET

DATE: 7/26/94  
Facility: Anheuser-Busch, Fort Collins, CO.  
Location: Bottling Line 1

Background Spectral File Name(s)/# of scans: BK6-003 / 200

Data Directory: AD: ABI/BK6

Pre-Run CTS Spectral File Name(s): CTS 003

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

See previous page

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V1_R1 09	continuous	12:52		6493 Torr 4.09 ppm More contaminated
10	↓	12:57		4.32 ppm western absorbance 0.1411
11	↓	1:02		6493 Torr 3.94 ppm
12				3.94

Test 2 Run 1

FTIR GAS PHASE DATA SHEET

DATE:

7/26/24

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Bottling Line 1

Background Spectral File Name(s)/# of scans: pk6p03

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): CTS001-1

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): CTS004

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V1-R101	continuous (~1:30)	1:33 ?	8.8 LPM	6.43 ppm <i>contaminant</i>
V1-R102		1:45		4.405 ppm
V1-R103		1:48		6.492 ppm 3.96 ppm <i>contaminant dropping</i>
V1-R104		1:54		5.32 ppm
V1-R105		2:00		4.69 ppm
V1-R106		2:08		5.98 ppm
V1-R107		2:14		6.245 ppm
V1-R108		2:18		4.35 ppm <i>649.0 T6n</i>

Vent 2 Run 1 Conclusion

FTIR GAS PHASE DATA SHEET

DATE: 7/26/94

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Bottling Line 1

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

*Same as earlier pages*

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

*For Cals,  
had to use  
750 PSIG to  
get flow.*

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V2-R109	<i>continuous</i>	2:23	3.3 LPM	6.13 ppm
V2-R110	↓	2:28	↓	6.62 ppm
V2-R111		2:32		6.78 ppm
PERFORMANCE CHECK				
REM CAL 03	Flow 5 minutes	2:43	6-7 LPM	mcomp: 12.7 id ppm LOTS OF CENTAM? 14 ppm ETOM
REM ZERO 0	Flow 5 minutes	2:50		-1.13 ETOM N <sub>2</sub> contains
REM CAL 04	Flow 10 min	3:00		11.62 ppm ETOM

*CO in both  
No ETOM*

RUN 2 VENT 1

3:48 - 4:48

FTIR GAS PHASE DATA SHEET

~~Line down~~  
~~between shifts~~

Line still operating

DATE: 7/26/94  
Facility: Anheuser-Busch, Fort Collins, CO.  
Location: Bottling Line 1

Background Spectral File Name(s)/# of scans: BK6004 / 200 (3:08 pm)

Data Directory: C:\D:\AB\BKG

Pre-Run CTS Spectral File Name(s): CTS001-d

Data Directory: \_\_\_\_\_

see previous sheets

Post-Run CTS Spectral File Name(s): CTS004

Data Directory: \_\_\_\_\_

Pathlength: 37m Atmospheric Pressure: 29.31"

Calibration Cylinder Concentration: 19 ppm ETOM

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
VI-R201	> 5 MIN	3:28	3.0 LPM	650.2 ppm 10.18 ETOM — seems high
VI-R202	↓ continuous	3:36		9.27 ppm ETOM — again seems high
START RUN				
VI-R203		3:49		649.1 ppm (looks more like 5 ppm) 8.97 ETOM
VI-R204		3:55		5.512 ppm
VI-R205		4:02		7.77 ppm
VI-R206		4:06		8.36 ppm
VI-R207		4:10		7.789 ppm

GC being more precise now

Run 2 Vent 1 CONTINUED

FTIR GAS PHASE DATA SHEET

DATE: 7/26/94  
Facility: Anheuser-Busch, Fort Collins, CO.  
Location: Bottling Line 1

ETOH readings  
are "artificially"  
high - contaminant?  
(364 ppm offset)

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): CTS001-2

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): CTS004

Data Directory: \_\_\_\_\_

228  
previous  
sheet

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V1-R208		4:19		7.44 ppm ETOH
V1-R209		4:24		6.57 ppm
V1-R210		4:31		7.11 ppm
V1-R211		4:36		7.09
V1-R212		4:44		6.50

looks like  
2 ppm

ient 2 RUN 2

5:00 - 6:00 PM

FTIR GAS PHASE DATA SHEET

DATE:

7/26/94

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Bottling Line 1

Background Spectral File Name(s)/# of scans:

See earlier sheet

~ 3 ppm

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s):

CT5001/2

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s):

CT5004

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_

Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V1-R201	75 minutes	5:03	80 LPM	650.5 Torr Baseline is off 4.83 ppm look at 1-d ppm
V1-R202	continuous	5:10		4.52 ppm
V1-R203		5:16		648.0 Torr 3.91 ppm
V1-R204		5:21	Y	647.6 Torr 4.25 ppm
V1-R205		5:26		3.69 ppm
V1-R206		5:31		3.78 ppm
V1-R207		5:37		3.72 ppm
V1-R208		5:43		4.22 ppm

V1-R209

5:42

277

5:30 ppm

V1-R210

5:51

3.82 ppm

V1-R211

5:56

3.78 ppm

ENTROPY

GCT FID

Draw a large spike

LINE 1 RUN 3

STRATIFICATION TRAVERSE FOR FID/GC  
FTIR GAS PHASE DATA SHEET

6:56 - 7:56

DATE: 7/26/94  
Facility: Anheuser-Busch, Fort Collins, CO.  
Location: Bottling Line 1

*Virtually no contamination.  
(Finally cleared system)*

Background Spectral File Name(s)/# of scans: BKG005 (200)

Data Directory: 10 AB1/BKG

*FID had to recalibrate - before it assumed the contaminant was present*

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

*see previous*

Post-Run CTS Spectral File Name(s): CT5004

Data Directory: \_\_\_\_\_

Pathlength: 3ft Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
VI-R301	<i>continuous</i>	6:54	8 LPM	2.02 ppm
VI-R302		6:59		1.70
VI-R303		7:04		1.61
VI-R304		7:09		1.68
VI-R305		7:14		1.47
VI-R306		7:19		1.67
VI-R307		7:24		1.24
VI-R308		7:28		1.75
VI-R309		7:32		1.37
VI-R310		7:37		1.89
VI-R311		7:41		1.62
VI-R312		7:45		1.216
VI-R313		7:51		1.18
VI-R314		7:54		1.31

VENT 2 RUN 3

V2-R3 XX

FTIR GAS PHASE DATA SHEET

DATE: 7/26/94

8:03-9:03

Facility: Anheuser-Busch, Fort Collins, CO

Location: Bottling Line 1

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): CTS004

Data Directory: C:\ABI\CTS

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

See previous pages

Filename	Sampling Time	Spectral Time PM	Flow rate to cell	Sampling/Spectral Notes: PPM ETOM
V2-R301	continuous	8:05	3 L/min	0.66
V2-R302		8:09		1.02
V2-R303		8:14		0.77
V2-R304		8:18		1.10
V2-R305		8:25		0.96
V2-R306		8:30		1.27
V2-R307		8:34		1.44
V2-R308		8:39		1.54
V2-R309		8:43		1.16
V2-R310		8:48		1.31
V2-R311		8:52		1.70
V2-R312		8:56		1.71
V2-R313		9:00		1.53
CTS004				651.6 Torr

DAY 2 / VENT 1

FILES

FTIR GAS PHASE DATA SHEET

VI-XX  
~  
file #

DATE: \_\_\_\_\_  
Facility: Anheuser-Busch, Fort Collins, CO  
Location: Remote Vents

Background Spectral File Name(s)/# of scans: BKG-005 / 200

Data Directory: c/D / ABI / BKG

Pre-Run CTS Spectral File Name(s): CTS005

Data Directory: c/D / ABI / CTS

Ambient samples  
are from roof  
(700' sampling system)

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: 32m Atmospheric Pressure: 65.5 Torr (Buckham) / 25.25" (from Sam Bus)  
(vacuum = - 4.8 Torr)

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
LOCAL 06		7:49		Local Cal mcomp = 14.27 ppm = 18.976
* <del>AMBIEN 01</del>	~ 3 minutes	7:57	10 LPM	ETOH = -0.31 (using 1.33 factor)
AMBIEN 01 RENTAL 06		<del>8:05</del> 8:18		ETOH = 14.17 ppm = 18.84 (99% recovery)
AMBIEN 02	~ 10 minutes	8:30		Ambient Air (roof) - 0.13 ppm ETOH Slight Contam (0.006 abs @ 1000 cm <sup>-1</sup> )
AMBIEN 03	~ 10 minutes	8:40		ETOH = -0.46 ppm Some Contam
REPERO 3	15 minutes N <sub>2</sub> flow	8:57		Remili Zero (N <sub>2</sub> ) ETOH = -0.39 See Contaminants! Some CO?!
AMBIEN 04	75 minutes	9:06	9 LPM	-0.08 ppm ETOH Contam = 0.012
AMBIEN 05	✓	9:11		-0.01 ppm ETOH contam
AMBIEN 06	✓	9:18		-0.11 " " "

Remili cal

probe may have seen some vent air

Simultaneous ambient T test w/6/17

\* When first pulled gas into cell from sampling line, saw the contaminants. On 2nd fill of cell, were gone. Sampling System left pulling ambient air overnight to clean out lines

DAY 2 / VENT 1

FTIR GAS PHASE DATA SHEET

9:37 - 10:37 AM

DATE: 2/27/94

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Remote Vents

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

*all previous pages*

*may have some vent air in this spectrum*

*START RUN*

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
ATABIEN 07	continuous	9:23	2 L/min	-0.33 ETOH
V1-01	~5 min ↓	9:28	1 L/min	Spectrum -0.24 ETOH
V1-02	↓	9:32	↓	0.277 ppm ETOH
V1-03		9:33	↓	0.39 ppm ETOH
V1-04		9:43		0.65 ppm ETOH
V1-05		9:47		0.75 ppm ETOH
V1-06		9:52		0.86 ppm ETOH
V1-07		9:57		0.87 ppm ETOH

Jay + Vent 1

Run 9:37-10:37

cont

FTIR GAS PHASE DATA SHEET

DATE: 7/27/94

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Remote Vents

Background Spectral File Name(s)/# of scans: all previous pages

Enter, if any, ETOH

Data Directory: \_\_\_\_\_

Some contamination

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V1-08	<del>continuous</del> ↓	10:05	11 LPM	6.517 ppm 0.72 ppm ETOH
V1-09	↓	10:10	↓	0.66 ppm
V1-10		10:16		0.86 ppm
V1-11		10:20		1.025 ppm
V1-12		10:26		1.09 ppm
V1-13		10:31		1.35 ppm
V1-14		10:36		

DAY 2 / VENT 2

V2-XX

FTIR GAS PHASE DATA SHEET

DATE: 7/27/04  
Facility: Anheuser-Busch, Fort Collins, CO  
Location: Remote Vents

10:42 - 10:42 AM

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

ACP  
pre-mix  
sheets

Look for HF in spectra

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes
V2-01	extensive	10:45	11 LPM	{ 6.503 ppm (01) 02:2 149 ppm 1.85 ppm ETOB
V2-02		10:49		
V2-03		10:58		2.81 ppm
V2-04		11:03		3.02 ppm
V2-05		11:07		3.36 ppm
V2-06		11:12		3.52 ppm
V2-07		11:16		3.74 ppm
V2-08		11:29		3.69 ppm
V2-09		11:26		3.92 ppm
V2-10		11:30		3.82 ppm
V2-11		11:34		4.32 ppm
V2-12		11:38		3.92 ppm
V2-13		11:42		3.65 ppm

# DAY 2 PERFORMANCE CHECK

## FTIR GAS PHASE DATA SHEET

DATE: 7/27/94  
 Facility: Anheuser-Busch, Fort Collins, CO.  
 Location: Remote Vents

(spectra in  
 FBI/DAY 2/VENTD  
 directories)

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

del.  
 previous sheets  
 M. White thinks extra new  
 peaks were from "stretching"  
 the Tuller tube as he moved it  
 to a new site

UNUSUAL  
 SPECTRUM

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
REM CAL 07	11:46 ↓ 11:45	11:44	11 LPM	Remote cal, 19 ppm ETOH 10.54 ppm ETOH (MF) Lots of junk!?
REM CAL 08	8 min	11:54		Still some other peaks (inc MF) 12.83 ppm ETOH
REM CAL 09		11:59		13.08 ppm ETOH
REM CAL 10		12:06		13.42 ppm ETOH
REM ZERO 4	Start Flow at 12:08	12:14		-15 ETOH PEAKS! MF!
REM ZERO 5		12:19		-1.35 ppm ETOH
LOC ZERO 1	Flow > 5 min	12:26		Send Na direct to cell 0.94 ETOH?
BKG-007		12:30		new BKND
CTS006		12:3		new CTS

DAY 2 LOCATION 3

FTIR GAS PHASE DATA SHEET

DATE: 2/27/94  
 Facility: Anheuser-Busch, Fort Collins, CO.  
 Location: Remote Vents

12:39 - 13:39  
 V3-XX

Background Spectral File Name(s)/# of scans: BKG-007

Data Directory: C/D: ABI/BKG

Pre-Run CTS Spectral File Name(s): ~~BKG~~ CTS006

Data Directory: C/D: ABI/CTS

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

*sample in cell at 12:40 - computer problem*

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V3-01	start @ 36	12:46	11 LPM	0.67 ppm ETOH HF present
V3-02		12:50		2.19 ppm ETOH
V3-03		12:54		3.34 ppm ETOH 647.8 Torr
V3-04		12:58		3.47 ppm
V3-05	✓	13:02		3.64 ppm
V3-06		13:07		3.51 ppm
V3-07		13:13		3.66 ppm
V3-08		13:17		4.39 ppm
V3-09		13:22		4.12 ppm
V3-10		13:30		3.5 ppm ETOH
V3-11		13:36		3.53 ppm ETOH

285

check C:\ABI\3AT VENTMADS. ASF (= V3-06 minus AMBIEN3) - HF in plant Vent, also contaminants, CO.

VAY 2 VENT 4

13:48 - 14:48

V4 - XX

FTIR GAS PHASE DATA SHEET

DATE: 7/27/94

Facility: Arheuser-Busch, Fort Collins, CO.

Location: Remote Vents

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

*20 previous sheets*

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V4-01		13:51		4.67 ppm ETOH
V4-02		13:56		3.18 ppm ETOH
V4-03		14:00		3.43 ppm ETOH
V4-04		14:03		2.99 ppm ETOH
V4-05		14:08		2.72 ppm ETOH
V4-06		14:12		3.04 ppm ETOH
V4-07		14:15		3.13 ppm ETOH
V4-08		14:18		3.43 ppm ETOH
V4-09		14:24		3.09 ppm ETOH
V4-10		14:27		3.12 ppm ETOH
V4-11		14:32		2.70 ppm ETOH
V4-12		14:37		2.45 ppm ETOH
V4-13		14:42		2.15 ppm ETOH
V4-14		14:45		1.81 ppm ETOH

7A/2

# PERFORMANCE CHECK

## FTIR GAS PHASE DATA SHEET

DATE: \_\_\_\_\_  
 Facility: Anheuser-Busch, Fort Collins, CO.  
 Location: Remote Vents

directory: c/d: /ABI/DAY2/  
 VENT4/ASF  
 DSF

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

see previous sheets

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
REMZERO6	2:50 → 15 minute purge	3:05	12 LPM	HF! others? -0.68 ETOH
REMCAL11	3:06 →	~3:15		13.39 ppm ETOH
REMCAL12		3:25		13.60 ppm ETOH
REMCAL13		3:29		14.04 ppm ETOH
REMZERO7		3:34		Drier, but still HF etc
BKG008		3:47		
CTS007		3:54		

95% ✓

98%

lines stressed - under tension, 28 being pulled to last location

DAY 2 VENT 5

FTIR GAS PHASE DATA SHEET

VS-XX

DATE: 7/27/94  
 Facility: Anheuser-Busch, Fort Collins, CO.  
 Location: Remote Vents

950' Sample  
~~800' line~~  
~~line~~

Background Spectral File Name(s)/# of scans: BKG 008/009

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): CTS 007

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Lochalite  
 ↑

WRONG  
STACK

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
VS-01	Flow > 10 minutes	4:01		WRONG STACK 3.69 ppm ETOH
REM CAL 14		4:38		First flow through addition 100' section of new line - CONTAM! 13.00 ppm ETOH
REM CAL 15		4:42		Much cleaner! 13.81 ppm ETOH
VS-02	Stack flow 4:44	4:50		5.53 ppm (prob. a good one = 7.4)
VS-03		4:58		3.46 ppm (see it)
BKG-009		5:12		

new  
BKGD

Vent 5

DAY 3

17:20-18:20

FTIR GAS PHASE DATA SHEET

DATE: 7/27/94

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Remote Vents

Vent is over a  
can line

Background Spectral File Name(s)/# of scans: BKG-009

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

off  
earlier  
sheets

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V5-04	Flow: 5:15	5:22	11 L PM	7.75 ppm ETOH
V5-05	↓	5:26	↓	4.48 ppm
V5-06	↓	5:30	↓	3.21 ppm 648.1 Ton
V5-07		5:34		2.97 ppm
V5-08		5:39		2.67 ppm
V5-09		5:43		2.62 ppm (looks OK)
V5-10		5:47		1.97 ppm
V5-11		5:51		1.16 ppm
V5-12		5:56		1.00 ppm
V5-13		6:00		1.82 ppm
V5-14		6:05		1.60 ppm
V5-15		6:09		1.39 ppm
V5-16		6:13		1.46 ppm
V5-17		6:16		1.75 ppm

START  
RUN

looks same  
as pt-  
higher  
conc.

CTS 008

MB EN 07

MB EN 08

6:27

6:31

6:38

289

6:12 (cont'd)

check analysis (MCOM)  
for Baseline

ENTROPY

- Sample line purged with  $N_2$  overnight

FTIR GAS PHASE DATA SHEET

DATE: 7/28/94

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Bottling Line 2

Background Spectral File Name(s)/# of scans: BKG 01 0 / 200

Data Directory: cd: / ABI / BKG

Pre-Run CTS Spectral File Name(s): CTS 009

Data Directory: cd: / ABI / CTS

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: 32 Atmospheric Pressure: 650.1 Torr (vac = 4.9) =

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
LOCAL 07	~5 min	7:41	36 PM	19 ppm ETOH MCOMP = 14.27 = 18.98 ppm
<del>ETOH H</del>				5.8 ppm ETOH cylinder MCOMP = 3.54 = 4.7 - data
<del>BKG 011</del>				
ETOH I		8:10		5.8 ppm cylinder 650.1 Torr 3.07 = 4.08
ETOH J				5.3 ppm cylinder 650.2 Torr 3.19 ppm
ETOH K		8:15		5.3 ppm cylinder 3.23 ppm (= 4.30)
REM ZERO 8	~10 minute $N_2$ flow	8:46		pretty clean - some water peaks. $N_2$ ETOH / MCOMP = -0.18 ppm
BKG 011				650.0 Torr

OK  
poor baseline  
too long each  
note -  
cylinder  
in other  
trunk -  
used 100'  
line to  
get to  
must h.  
Need to repeat  
with shorter  
line.

Baseline is drifting

DAY 3 / VENT 1 RUN 1

VI-R1XY

FTIR GAS PHASE DATA SHEET

DATE: 7/28/94  
 Facility: Anheuser-Busch, Fort Collins, CO.  
 Location: Bottling Line 2

500' Sample Line

Background Spectral File Name(s)/# of scans: BKG-00012

No remote cal-  
 low on gas, gas  
 for cal/zero

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): CTS 009

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

9:31 - 10:31  
 Run

Pathlength: \_\_\_\_\_ Atmospheric Pressure: 25.19"

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
REM ZERO 9	continues	8:56	10 LPM	remote zero ncomp = -0.5% S.M.F. carbon.
REM ZERO 10		9:09		-0.635 ppm
REM ZERO 11		9:29		-0.48 ppm
VI-R101	9:24 start sample	9:34	649.3 Torr	3.69 ppm (looks more like 6-8 ppm)
VI-R102		9:39		6.18 ppm (looks more like 12 ppm)
VI-R103		9:44		3.206 ppm (looks like 9 ppm)
VI-R104		9:48		1.69 ppm ( " " 7 ppm)
VI-R105		9:53		1.17 ppm (is less than others)
VI-R106		9:58		1.6 ppm (looks like ~5.5 ppm)
VI-R107		10:02		1.45 ppm (prob 7 ppm)
VI-R108		10:07		1.19 ppm (~6 ppm)
VI-R109		10:11		1.30 ppm (~6 ppm)
VI-R110		10:15		1.21 ppm
VI-R111		10:20		2.94 ppm (~6.5 ppm)
VI-R112		10:23		2.10 ppm
VI-R113		10:27		2.12 ppm

high conc. →

Very little contamination

VENT2 RUN 1

FTIR GAS PHASE DATA SHEET

10:38 - 11:38

DATE: 7/28/94

Facility: Anheuser-Busch, Fort Collins, CO

Location: Bottling Line 2

Background Spectral File Name(s)/# of scans: BK15-013/100

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

cell  
earlier  
sheets

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V2-R101	Flow START 10:35	10:42	10 LPM	2.68 ppm (looks like 6.3 ppm)
V2-R102		10:46		3.13 ppm
V2-R103		10:51		3.61 ppm (> 6 ppm)
V2-R104		10:55		3.54 ppm (> 6 ppm)
V2-R105		10:00		2.29 ppm (< 6 ppm)
V2-R106		11:05	49.3 LPM	2.54 ppm
V2-R107	✓	11:11		2.96 ppm (< 6 ppm)
V2-R108		11:16		3.41 ppm (= 6)
V2-R109		11:22		3.31 ppm
V2-R110		11:22		3.26 ppm
V2-R111		11:31		2.46 ppm
V2-R112		11:36		2.41 ppm
REMYER-12	11:34 Smith 12:03	11:50		1.15 ppm other organics

contain  
increasing

1.15 ppm EtOH

VENT 1 RUN 2 DAY 3

FTIR GAS PHASE DATA SHEET

RUN 3 of the Day  
12:12 - 1:12

DATE: 7/28/94  
 Facility: Anheuser-Busch, Fort Collins, CO.  
 Location: Bottling Line 2

Background Spectral File Name(s)/# of scans: \_\_\_\_\_  
 Data Directory: \_\_\_\_\_  
 Pre-Run CTS Spectral File Name(s): \_\_\_\_\_  
 Data Directory: \_\_\_\_\_  
 Post-Run CTS Spectral File Name(s): \_\_\_\_\_  
 Data Directory: \_\_\_\_\_

all  
earlier  
sheets

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
VI-R201	start ~ 11:00	12:15	3LPM	4.15 ppm ETOM ( looks like 6.5 ppm)
VI-R202		12:20	647.5 L/min	3.81 ppm
VI-R203		12:23		5.36 ppm (~ 7 ppm)
VI-R204		12:23		4.71 ppm
VI-R205		12:32		4.11 ppm
VI-R206		12:36		5.25 ppm (~ 7 ppm)
VI-R207		12:40		4.43 ppm
VI-R208		12:44		4.81 ppm
VI-R209		12:48		4.36 ppm
VI-R210		12:53		4.62 ppm
VI-R211		12:52	646.6 L/min	7.70 ppm → 210 ppm
VI-R212		1:03		5.82 ppm
VI-R213		1:06		5.08 ppm
VI-R214		1:11		5.05 ppm

Vent 2 Run 2

Qualification Test

FTIR GAS PHASE DATA SHEET

w/ FID

DATE: 7/28/14

Facility: Anheuser-Busch, Fort Collins, CO

Location: Bottling Line 2

Background Spectral File Name(s)/# of scans: BKG014100

V2-R2XX

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

13:21 - 14:21

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

DIRRECTORY  
C/D/AB1/DAY3/VENTA/AS  
AIR  
TEXT

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V2-R201	start 13:19	13:24	3LPM	2.75 ppm ~ 5 ppm
V2-R202		13:29		2.38 ppm
V2-R203		13:33		2.55 ppm
V2-R204		13:33		2.32 ppm
V2-R205		13:42		2.38 ppm
V2-R206		13:45		2.39 ppm
V2-R207		13:50		1.51 ppm
V2-R208		13:54		1.38 ppm
V2-R209		13:58		1.64 ppm
V2-R210		14:02		0.956 ppm (~ 3 ppm)
V2-R211		14:07		2.10 ppm (~ 6 ppm)
V2-R212		14:12		1.44 ppm (~ 3 ppm)
V2-R213		14:13		2.40
<del>V2-R214</del> REMBER 13		14:26		16+ condaminants
REMBER 14		14:30		C, 24
REMBER 15		14:40		

Good  
with  
contaminants

VENT 1 RUN 3

FTIR GAS PHASE DATA SHEET

V1-R3XX

DATE: \_\_\_\_\_  
 Facility: Anheuser-Busch, Fort Collins, CO.  
 Location: Bottling Line 2

Background Spectral File Name(s)/# of scans: BKG-015/200  
 Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_  
 Data Directory: \_\_\_\_\_

2:47-3:47

Post-Run CTS Spectral File Name(s): \_\_\_\_\_  
 Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

DIRECTORY  
 C/D/ABE/DAT3/VENT1/ASF  
 AIF  
 TEST

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
V1-R301	Start 2:46 ↓	2:53	82 L/min	3.40 ppm (≡ 6-7 ppm)
V1-R302		2:57		2.64 ppm
V1-R303		3:02		3.09 ppm
V1-R304		3:06		2.26 ppm
V1-R305		3:10		1.83 ppm 4.6 ppm
V1-R306		3:16		2.00
V1-R307		3:20		1.64
V1-R308		3:30		1.84
V1-R309		3:35	646.4 Torr	3.07 ≡ 6-7 ppm
V1-R310		3:39		3.64
V1-R311		3:42		3.59
V1-R312		2:46		3.03

VENTA RUN 3

LAST RUN

FTIR GAS PHASE DATA SHEET

Adg VA-R3XX

DATE:

7/23/04

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Bottling Line 2

Time 3:54-4:54

Background Spectral File Name(s)/# of scans:

BKG-016

Data Directory:

Directory

Pre-Run CTS Spectral File Name(s):

Data Directory:

c:/a/ABI/DAY3/VENTA/AF  
TECH  
AIF

Post-Run CTS Spectral File Name(s):

CTS010

Data Directory:

BUSCH LIGHT

Pathlength:

Atmospheric Pressure:

Calibration Cylinder Concentration:

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:
VA-R301	Flow 3:54 ↓	15:58	9 LPM 644.5 m	2.64 ppm = ~7 ppm
VA-R302		16:02		2.21 ppm
VA-R303		16:06	↓	2.12
VA-R304		16:10		2.57
VA-R305		16:14		2.77
VA-R306		16:18		2.34
VA-R307		16:22		2.51
VA-R308		16:26		2.23
VA-R309		16:30		2.20
VA-R310		16:40		2.14
VA-R308		16:44		2.12
VA-R311		16:49		2.79
REMZER 16	Flow 15 min	17:05		
REM CAL 16		17:15	13.27 ppm = 17.65 (92.81%)	
REM CAL 12		17:20		13.36 ppm = 17.77 93.8%
REM CAL 18		17:23		13.35 ppm Same

LOCAL P8  
CTS010

17:25

296

14.69 ppm = 19.53 = 102.8%

ENTROPY

# FTIR GAS PHASE DATA SHEET

DATE: \_\_\_\_\_

Facility: Anheuser-Busch, Fort Collins, CO.

Location: Bottling Line 2

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:

FTIR GAS PHASE DATA SHEET

DATE: \_\_\_\_\_

Facility: Anheuser-Busch Fort Collins, CO

Location: Bottling Line 2

Background Spectral File Name(s)/# of scans: \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pre-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Post-Run CTS Spectral File Name(s): \_\_\_\_\_

Data Directory: \_\_\_\_\_

Pathlength: \_\_\_\_\_ Atmospheric Pressure: \_\_\_\_\_

Calibration Cylinder Concentration: \_\_\_\_\_

Filename	Sampling Time	Spectral Time	Flow rate to cell	Sampling/Spectral Notes:

**APPENDIX D:  
GAS VELOCITY FIELD DATA AND TEST  
RESULTS**



VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-26-94  
 Run: V1-M2-1  
 Time: 1000  
 Personnel: MMW  
 Measurement Location: Roof Vent 1

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.55	74		
A2	0.65	74		
A3	0.60	74	Duct Area (A):	2552 sq. inches
A4	0.60	74	Barometric Pressure (Pbar):	25.30 inches Hg
A5	0.30	74	Static Pressure (Pg):	-0.15 inches H2O
A6	0.40	74	Pitot Tube Coefficient (Cp):	0.84
A7	0.95	74	Percent O2 (%O2):	20.9 % O2
A8	0.95	74	Percent CO2 (%CO2):	0.0 % CO2
B1	0.35	74	Percent Nitrogen (%N2):	79.1 % N2
B2	0.35	74	Percent Moisture (%H2O):	2.5 % H2O
B3	0.35	74		
B4	0.50	74	Root Mean Sq. Delta P (Pavg):	0.51 inches H2O
B5	0.55	75		
B6	0.55	75	Mean Temperature (Ts):	74 Degrees F
B7	0.30	75		
B8	0.55	75		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.975$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.29 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.57 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 44.1 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 38212 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 46893 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-26-94  
 Run: V1-M2-1  
 Time: 1000  
 Personnel: MMW  
 Measurement Location: Roof Vent 1

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.55	74		
A2	0.65	74	Duct Area (A):	2552 sq. inches
A3	0.60	74	Barometric Pressure (Pbar):	25.30 inches Hg
A4	0.60	74	Static Pressure (Pg):	-0.15 inches H2O
A5	0.30	74	Pitot Tube Coefficient (Cp):	0.84
A6	0.40	74	Percent O2 (%O2):	20.9 % O2
A7	0.95	74	Percent CO2 (%CO2):	0.0 % CO2
A8	0.95	74	Percent Nitrogen (%N2):	79.1 % N2
B1	0.35	74	Percent Moisture (%H2O):	2.5 % H2O
B2	0.35	74		
B3	0.35	74	Root Mean Sq. Delta P (Pavg):	0.51 inches H2O
B4	0.50	74		
B5	0.55	75	Mean Temperature (Ts):	74 Degrees F
B6	0.55	75		
B7	0.30	75		
B8	0.55	75		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.975$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.29 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.57 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 44.1 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 38212 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 46893 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-26-94  
 Run: V1-M2-2  
 Time: 1600  
 Personnel: MMW  
 Measurement Location: Roof Vent 1

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.50	81		
A2	0.70	81	Duct Area (A):	2552 sq. inches
A3	0.75	81	Barometric Pressure (Pbar):	25.30 inches Hg
A4	0.35	81	Static Pressure (Pg):	-0.40 inches H2O
A5	0.65	81	Pitot Tube Coefficient (Cp):	0.84
A6	0.50	81	Percent O2 (%O2):	20.9 % O2
A7	0.40	81	Percent CO2 (%CO2):	0.0 % CO2
A8	0.30	81	Percent Nitrogen (%N2):	79.1 % N2
B1	0.40	82	Percent Moisture (%H2O):	3.4 % H2O
B2	0.50	82		
B3	0.45	82	Root Mean Sq. Delta P (Pavg):	0.50 inches H2O
B4	0.55	82		
B5	0.75	82	Mean Temperature (Ts):	82 Degrees F
B6	0.50	82		
B7	0.45	82		
B8	0.35	82		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.966$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.27 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.47 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 44.1 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 37271 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 46893 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-26-94  
 Run: V1-M2-3  
 Time: 1700  
 Personnel: MMW  
 Measurement Location: Roof Vent 1

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.60	80		
A2	0.55	80	Duct Area (A):	2552 sq. inches
A3	0.80	80	Barometric Pressure (Pbar):	25.30 inches Hg
A4	0.35	80	Static Pressure (Pg):	-0.40 inches H2O
A5	0.75	80	Pitot Tube Coefficient (Cp):	0.84
A6	0.50	80	Percent O2 (%O2):	20.9 % O2
A7	0.90	80	Percent CO2 (%CO2):	0.0 % CO2
A8	0.35	80	Percent Nitrogen (%N2):	79.1 % N2
B1	0.50	80	Percent Moisture (%H2O):	2.6 % H2O
B2	0.45	80		
B3	0.45	80	Root Mean Sq. Delta P (Pavg):	0.52 inches H2O
B4	0.60	80		
B5	0.55	80	Mean Temperature (Ts):	80 Degrees F
B6	0.50	80		
B7	0.30	80		
B8	0.30	80		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.974$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.27 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.56 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 44.8 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 38317 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 47637 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-26-94  
 Run: V2-M2-1  
 Time: 1300  
 Personnel: MMW  
 Measurement Location: Roof Vent 2

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)
A1	0.33	81
A2	0.45	81
A3	0.50	81
A4	0.50	81
A5	0.75	81
A6	0.95	80
A7	0.95	80
A8	0.80	80
B1	0.25	81
B2	0.25	80
B3	0.30	80
B4	0.50	81
B5	0.60	81
B6	0.50	81
B7	0.90	81
B8	0.25	81

Duct Area (A): 2552 sq. inches  
 Barometric Pressure (Pbar): 25.30 inches Hg  
 Static Pressure (Pg): -0.40 inches H2O  
 Pitot Tube Coefficient (Cp): 0.84  
 Percent O2 (%O2): 20.9 % O2  
 Percent CO2 (%CO2): 0.0 % CO2  
 Percent Nitrogen (%N2): 79.1 % N2  
 Percent Moisture (%H2O): 1.3 % H2O  
 Root Mean Sq. Delta P (Pavg): 0.52 inches H2O  
 Mean Temperature (Ts): 81 Degrees F

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.987$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.27 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.70 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) X \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 44.7 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 38670 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 47531 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-26-94  
 Run: V2-M2-2  
 Time: 1700  
 Personnel: MMW  
 Measurement Location: Roof Vent 2

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.35	84		
A2	0.40	84	Duct Area (A):	2552 sq. inches
A3	0.55	84	Barometric Pressure (Pbar):	25.30 inches Hg
A4	0.60	84	Static Pressure (Pg):	-0.40 inches H2O
A5	0.85	84	Pitot Tube Coefficient (Cp):	0.84
A6	0.90	84	Percent O2 (%O2):	20.9 % O2
A7	0.50	84	Percent CO2 (%CO2):	0.0 % CO2
A8	0.45	84	Percent Nitrogen (%N2):	79.1 % N2
B1	0.25	84	Percent Moisture (%H2O):	2.7 % H2O
B2	0.30	84		
B3	0.45	84	Root Mean Sq. Delta P (Pavg):	0.53 inches H2O
B4	0.45	84		
B5	0.50	84	Mean Temperature (Ts):	84 Degrees F
B6	0.80	84		
B7	0.90	84		
B8	0.45	84		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.973$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.27 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.55 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 45.4 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 38505 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 48275 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-26-94  
 Run: V2-M2-3  
 Time: 2000  
 Personnel: MMW  
 Measurement Location: Roof Vent 2

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.35	82		
A2	0.45	82	Duct Area (A):	2552 sq. inches
A3	0.45	82	Barometric Pressure (Pbar):	25.30 inches Hg
A4	0.55	82	Static Pressure (Pg):	-0.40 inches H2O
A5	0.70	82	Pitot Tube Coefficient (Cp):	0.84
A6	0.90	82	Percent O2 (%O2):	20.9 % O2
A7	0.80	82	Percent CO2 (%CO2):	0.0 % CO2
A8	0.40	82	Percent Nitrogen (%N2):	79.1 % N2
B1	0.30	82	Percent Moisture (%H2O):	2.2 % H2O
B2	0.35	82		
B3	0.50	82	Root Mean Sq. Delta P (Pavg):	0.54 inches H2O
B4	0.55	82		
B5	0.60	82	Mean Temperature (Ts):	82 Degrees F
B6	0.90	82		
B7	0.75	82		
B8	0.40	82		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.978$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.27 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.60 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 45.7 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 39103 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 48594 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-28-94  
 Run: V1-M2-1  
 Time: 1000  
 Personnel: MMW  
 Measurement Location: Roof Vent 1

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.35	79		
A2	0.50	79	Duct Area (A):	2552 sq. inches
A3	0.55	79	Barometric Pressure (Pbar):	25.20 inches Hg
A4	0.50	79	Static Pressure (Pg):	-0.35 inches H2O
A5	0.75	79	Pitot Tube Coefficient (Cp):	0.84
A6	1.00	79	Percent O2 (%O2):	20.9 % O2
A7	0.80	79	Percent CO2 (%CO2):	0.0 % CO2
A8	0.45	79	Percent Nitrogen (%N2):	79.1 % N2
B1	0.50	79	Percent Moisture (%H2O):	2.0 % H2O
B2	0.55	79		
B3	0.70	79	Root Mean Sq. Delta P (Pavg):	0.60 inches H2O
B4	0.55	79		
B5	0.75	79	Mean Temperature (Ts):	79 Degrees F
B6	0.80	79		
B7	0.60	79		
B8	0.40	79		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.980$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.17 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.62 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 48.1 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 41306 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 51146 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-28-94  
 Run: V1-M2-1  
 Time: 1300  
 Personnel: MMW  
 Measurement Location: Roof Vent #

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)
A1	0.40	86
A2	0.45	86
A3	0.55	86
A4	0.50	86
A5	0.75	86
A6	0.75	86
A7	0.95	86
A8	0.30	86
B1	0.45	86
B2	0.50	86
B3	0.50	86
B4	0.65	86
B5	0.50	86
B6	0.90	86
B7	0.85	86
B8	0.45	86

Duct Area (A): 2552 sq. inches  
 Barometric Pressure (Pbar): 25.20 inches Hg  
 Static Pressure (Pg): -0.30 inches H2O  
 Pitot Tube Coefficient (Cp): 0.84  
 Percent O2 (%O2): 20.9 % O2  
 Percent CO2 (%CO2): 0.0 % CO2  
 Percent Nitrogen (%N2): 79.1 % N2  
 Percent Moisture (%H2O): 2.3 % H2O  
 Root Mean Sq. Delta P (Pavg): 0.58 inches H2O  
 Mean Temperature (Ts): 86 Degrees F

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.977$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.18 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.59 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 47.6 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 40245 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 50615 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-28-94  
 Run: V1-M2-3  
 Time: 1400  
 Personnel: MMW  
 Measurement Location: Roof Vent 1

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.35	85		
A2	0.45	85	Duct Area (A):	2552 sq. inches
A3	0.60	85	Barometric Pressure (Pbar):	25.20 inches Hg
A4	0.55	85	Static Pressure (Pg):	-0.35 inches H2O
A5	0.50	85	Pitot Tube Coefficient (Cp):	0.84
A6	0.45	85	Percent O2 (%O2):	20.9 % O2
A7	0.70	85	Percent CO2 (%CO2):	0.0 % CO2
A8	0.45	85	Percent Nitrogen (%N2):	79.1 % N2
B1	0.30	85	Percent Moisture (%H2O):	2.4 % H2O
B2	0.45	85		
B3	0.50	85	Root Mean Sq. Delta P (Pavg):	0.52 inches H2O
B4	0.50	85		
B5	0.60	85	Mean Temperature (Ts):	85 Degrees F
B6	0.70	85		
B7	1.00	85		
B8	0.45	85		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.976$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.17 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.58 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 45.1 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 38147 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 47956 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-286-94  
 Run: V2-M2-1  
 Time: 1300  
 Personnel: MMW  
 Measurement Location: Roof Vent 2

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)
A1	0.25	79
A2	0.30	79
A3	0.45	79
A4	0.50	79
A5	0.60	79
A6	0.85	79
A7	0.90	79
A8	0.60	79
B1	0.30	79
B2	0.30	79
B3	0.45	79
B4	0.40	79
B5	0.75	79
B6	0.50	79
B7	0.65	79
B8	0.80	79

Duct Area (A): 2552 sq. inches  
 Barometric Pressure (Pbar): 25.20 inches Hg  
 Static Pressure (Pg): -0.45 inches H2O  
 Pitot Tube Coefficient (Cp): 0.84  
 Percent O2 (%O2): 20.9 % O2  
 Percent CO2 (%CO2): 0.0 % CO2  
 Percent Nitrogen (%N2): 79.1 % N2  
 Percent Moisture (%H2O): 2.0 % H2O  
 Root Mean Sq. Delta P (Pavg): 0.52 inches H2O  
 Mean Temperature (Ts): 79 Degrees F

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.980$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.17 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.62 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 44.8 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 38472 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 47637 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-28-94  
 Run: V2-M2-2  
 Time:  
 Personnel: MMW  
 Measurement Location: Roof Vent 2

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.30	89		
A2	0.30	89	Duct Area (A):	2552 sq. inches
A3	0.40	89	Barometric Pressure (Pbar):	25.20 inches Hg
A4	0.35	89	Static Pressure (Pg):	-0.30 inches H2O
A5	0.55	89	Pitot Tube Coefficient (Cp):	0.84
A6	0.65	89	Percent O2 (%O2):	20.9 % O2
A7	0.70	89	Percent CO2 (%CO2):	0.0 % CO2
A8	0.45	89	Percent Nitrogen (%N2):	79.1 % N2
B1	0.30	89	Percent Moisture (%H2O):	2.0 % H2O
B2	0.30	89		
B3	0.40	89	Root Mean Sq. Delta P (Pavg):	0.51 inches H2O
B4	0.65	89		
B5	0.65	89	Mean Temperature (Ts):	89 Degrees F
B6	0.90	89		
B7	0.90	89		
B8	0.65	89		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.980$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.18 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.62 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 44.8 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 37786 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 47637 \text{ ACFM}$$

VOLUMETRIC FLOW RATE DETERMINATION

Company & Plant: Anheuser-Busch Fort Collins, Colorado  
 Date: 7-28-94  
 Run: V2-M2-3  
 Time:  
 Personnel: MMW  
 Measurement Location: Roof Vent 2

TEST DATA

Test Point	Delta P (in H2O)	Temp. (Deg F)		
A1	0.30	88		
A2	0.35	88		
A3	0.45	88	Duct Area (A):	2552 sq. inches
A4	0.60	88	Barometric Pressure (Pbar):	25.20 inches Hg
A5	0.55	88	Static Pressure (Pg):	-0.35 inches H2O
A6	1.00	88	Pitot Tube Coefficient (Cp):	0.84
A7	1.00	88	Percent O2 (%O2):	20.9 % O2
A8	0.50	88	Percent CO2 (%CO2):	0.0 % CO2
B1	0.35	88	Percent Nitrogen (%N2):	79.1 % N2
B2	0.30	88	Percent Moisture (%H2O):	2.3 % H2O
B3	0.55	88		
B4	0.30	88	Root Mean Sq. Delta P (Pavg):	0.54 inches H2O
B5	0.95	88		
B6	0.50	88	Mean Temperature (Ts):	88 Degrees F
B7	0.60	88		
B8	0.75	88		

CALCULATIONS

DRY MOLE FRACTION OF STACK GAS:

$$Mfd = 1 - (\%H2O/100) = 0.977$$

ABSOLUTE STACK GAS PRESSURE:

$$Ps = Pbar + (Pg/13.6) = 25.17 \text{ in. Hg}$$

DRY MOLECULAR WEIGHT OF STACK GAS:

$$Md = 0.44(\%CO2) + 0.32(\%O2) + 0.28(\%N2) = 28.84 \text{ lb/lb-mole}$$

WET MOLECULAR WEIGHT OF STACK GAS:

$$Ms = (Md)(Mfd) + 0.18(\%H2O) = 28.59 \text{ lb/lb-mole}$$

AVERAGE STACK GAS VELOCITY:

$$Vs = 85.49(Cp) \times \text{SQRT}[(Pavg)(Ts + 460)/(Ps)(Ms)] = 46.1 \text{ ft/sec}$$

DRY VOLUMETRIC STACK GAS FLOW RATE:

$$Qsd = 7.353(Mfd)(Vs)(A)(Ps)/(Ts + 460) = 38819 \text{ SCFM}$$

WET VOLUMETRIC STACK GAS FLOW RATE:

$$Qaw = (60/144)(Vs)(A) = 49020 \text{ ACFM}$$













# Sampling and Velocity Traverse Point Determination EPA Method 1

CLIENT Anheuser-Busch  
 PLANT NAME Same  
 CITY, STATE Fort Collins, Colorado  
 SAMPLING LOCATION Roof Vents (All)

NO. OF PORTS AVAILABLE 2  
 NO. OF PORTS USED 2  
 PORT INSIDE DIAMETER 2"

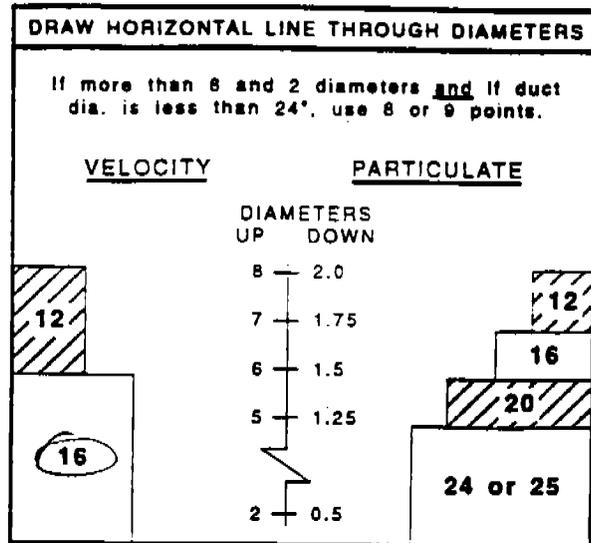
DISTANCE FROM FAR WALL TO OUTSIDE OF PORT 57"  
 NIPPLE LENGTH AND/OR WALL THICKNESS 0  
 DEPTH OF STACK OR DUCT 57"  
 STACK OR DUCT WIDTH (IF RECTANGULAR) -

EQUIVALENT DIAMETER:  
 $D_e = \frac{2 \times \text{DEPTH} \times \text{WIDTH}}{\text{DEPTH} + \text{WIDTH}} = \frac{2 ( ) ( )}{( ) + ( )} = \underline{\hspace{2cm}}$

DISTANCE FROM PORTS TO FLOW DISTURBANCES

	UPSTREAM	DOWNSTREAM
	<u>88</u>	<u>40</u>
DIAMETERS	<u>1.5</u>	<u>0.7</u>

STACK/DUCT AREA =  $\left(\frac{57}{2}\right)^2 \pi = 2551.75 \text{ IN}^2$



PITOT USED  TYPE 'S'  STANDARD

POINT	% OF DUCT DEPTH	DISTANCE FROM INSIDE WALL (in)	DISTANCE FROM OUTSIDE OF PORT
1	3.2	1.92	1 7/8
2	10.5	5.98	6
3	19.4	11.05	11
4	32.3	18.41	18 3/8
5	47.7	28.54	38 5/8
6	60.6	45.94	46
7	79.5	51.02	51
8	96.8	55.18	55 1/8
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

LOCATION OF POINTS IN CIRCULAR STACKS OR DUCTS

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.8	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.8	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	18.9	14.8	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			98.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.6	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.6
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

LOCATION OF POINTS IN RECTANGULAR STACKS OR DUCTS

	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.8	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	46.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										96.5	87.6
12											95.8













**APPENDIX E:  
SAMPLING AND ANALYTICAL  
PROCEDURES**



#### **Sampling Point Determination - EPA Method 1**

The number and locations of the sampling or traverse points was determined according to the procedures outlined in EPA Method 1. The source did not meet EPA Method 1 straight-run criteria, but had straightening vanes. The maximum number of traverse points was used.

#### **Flue Gas Velocity and Volumetric Flow Rate - EPA Method 2**

The flue gas velocity and volumetric flow rate was determined according to the procedures outlined in EPA Method 2. Velocity measurements were made using Type-S pitot tubes conforming to the geometric specifications outlined in EPA Method 2. Accordingly, each was been assigned a coefficient of 0.84. Differential pressures were measured with Magnehelic gauges of appropriate range. Effluent gas temperatures were measured with chromel-alumel thermocouples equipped with hand-held digital readouts. A cyclonic flow check was performed by Entropy to compensate for cyclonic air flow. The duct static pressures were recorded and appropriate adjustments were made to the recorded velocities.

#### **Flue Gas Composition - EPA Method 3**

Since the vents exhaust from an occupied room, ambient levels of O<sub>2</sub> (20.9%) and CO<sub>2</sub> (0.0%) were assumed. The absence of CO<sub>2</sub> was confirmed by Fyrite analysis onsite.

#### **Flue Gas Moisture Content - EPA Method 4**

The vent gas moisture content was measured using wet-bulb/dry bulb measurements and psychrometric relationships.

### **Ethanol and Speciation - EPA Method 18 Direct Interface**

Samples were withdrawn from the source using the direct interface procedure outlined in EPA Method 18. Figure 4-1 is a schematic of the EPA Method 18 sampling train that was used.

Sample Collection. The sampling procedure consisted of withdrawing a gas sample from the source at a constant rate and pumping the sample to an on-site gas chromatograph (GC) for analysis. All transfer lines, connections, and pumps were constructed of Type 316 stainless steel or Teflon and were maintained at ambient temperature. Condensation of volatile organics or water in the sample line was not anticipated given the moisture and organic content of the effluent.

Calibration. The GC was calibrated before testing using gaseous standards according to the procedures outlined in EPA Method 18.7.2. Three gaseous ethanol standards was prepared, bracketing the expected ethanol concentrations. A calibration curve was prepared using two injections for each standard. The duplicate injections were within  $\pm 5\%$  of the mean. The mean value for each standard was  $\pm 10\%$  of the value predicted from the calibration curve.

Performance Check. The mid-range calibration gas was introduced at the sampling probe and analyzed to ensure the integrity of the sampling system. The response to the performance check was  $\pm 10\%$  of the predicted value for the standard. This procedure was performed before the first run and after each subsequent run. A post-test calibration was performed to ensure that instrument drift did not vary greater than 5% from the mean of the pre-test and post-test calibrations.

Sample Analysis. Direct interface GC analysis is a semi-continuous method. One reading is recorded for approximately every 15 minutes of sample time.

### **M25A THC**

Continuous emissions monitoring (CEM) was conducted for total hydrocarbons (THC) emissions. The sampling and analytical procedures for THC were in accordance with EPA Method 25A.

The extractive monitor requires that the effluent gas sample be filtered to eliminate any particulate matter before being transported and injected into the analyzer. All components of the sampling system which contacted the sample were constructed of heated Type 316 stainless steel or Teflon. The output from the monitor was connected to a computerized data acquisition system (DAS). The sample collection system consisted of a heated probe with a heated glass mat particulate filter, heated sample lines, heated 3-way valve, and a heated pump. The configuration of the sampling system allows for the injection of calibration gases directly to the analyzer or through the sampling system. A Thomas Model 2107CA 18-TFE pump was used to move the effluent sample through the system. All pretest and posttest calibration procedures were performed as outlined in EPA Method 25A. The operation of the analyzer and the DAS are described below.

Rafisch Model RS-55 TGO Analyzer. This analyzer automatically and continuously monitors the TGO concentrations in a flowing gas mixture. The theory of operation is based on the principle of flame ionization detection. In the flame ionization detector, hydrogen is mixed with the sample gas and is burned in a small jet. The ionization current in the hydrogen flame is measured. In a pure hydrogen flame, very few ions are produced, but if an organic component or hydrocarbon is burned in the flame, the ion current is greatly increased. The current provides a quantitative measure of the amount of hydrocarbons in the flame. The current is converted to a voltage output. The hydrogen flame ionization detector is extremely sensitive and is capable of detecting hydrocarbon levels in the low parts per million range and is insensitive to inorganic gases such as nitrogen, carbon dioxide, and water vapor.

Data Acquisition System. The DAS uses a Compaq portable computer with a 20MB hard disk and an internal 12-bit analog-to-digital converter with a 16 channel multiplexer. In addition to providing an instantaneous display of analyzer responses, the DAS compiles the analyzer data collected once each second and averages them, calculates emission rates, and documents analyzer calibrations. The DAS integrates the real-time measurements and provides printouts of 1-minute, 15-minute, and 60-minute averaged emissions.

### **Ethanol and VOC Speciation - FTIR**

Extractive monitoring was conducted to detect volatile organic and inorganic emissions. The analytical procedures for extractive FTIR monitoring was in accordance with the Draft EPA document "Protocol for Applying Fourier Transform Infrared (FTIR) Spectrometry in Emission Testing."

Sample Collection. Equipment and procedures developed by Entropy for use in EPA-sponsored screening tests using extractive FTIR monitoring were used to measure the concentration of gaseous organic and inorganic species. The sample collection system consisted of an unheated probe, sample lines, a 3-way valve, and a pump. The configuration of the sampling system allows for the injection of calibration gases directly to the analyzer or through the sampling system. The probe was connected to the sample pump in the FTIR truck using 3/8-in O.D. Teflon® sample line. All components of the sample system are constructed of Type 316 stainless steel or Teflon. All pre-test and post-test calibration procedures are performed as outlined in the Draft EPA Protocol.

During a sampling run, flue gas continuously flows through the heated system to the sample manifold in the FTIR truck, and a portion of the gas stream is diverted to the inlet of the FTIR absorption cell. The cell is filled with effluent sample to ambient pressure and the spectrum recorded. The cell is then evacuated to prepare for a subsequent sample. The process of filling the cell, collecting the spectrum and evacuating the cell took approximately 5 minutes. The heated manifold in the FTIR truck includes a secondary particulate filter and valves that allow the operator to send sample gas directly to the absorption cell or through a gas conditioning system. The extractive system can deliver three types of samples to the absorption cell, but in this study all sample was sent directly to the FTIR cell as unconditioned, or "hot/wet" effluent. This sample is thought to be most representative of the actual effluent composition.

KVB/Analect RFX-40 FTIR Spectrometer System. The FTIR equipment consisted of a medium-resolution interferometer, a heated infrared absorption cell, a liquid nitrogen cooled mercury cadmium telluride (MCT) broad band infrared detector, and a computer. The interferometer, detector, and computer were purchased from KVB/Analect, Inc., and comprise the Model RFX-40 system. The nominal spectral

resolution of the system was one wavenumber ( $1 \text{ cm}^{-1}$ ). Effluent samples were contained in a model 5-22H infrared absorption cell manufactured by Infrared Analysis, Inc. The inside walls and mirror housing of the cell were Teflon® coated. Cell temperature was maintained at  $240^\circ \text{ F}$  using heated jackets and temperature controllers. The absorption path length of the cell was set at 18 meters.

The theory of operation is based on the principle of absorption of infrared radiation by gaseous organic and inorganic molecules. Effluent gas is transported to a heated gas cell which is optically coupled to the FTIR spectrometer. The spectrometer transmits infrared radiation through the gas cell to an infrared-sensitive detector, and monitors the total infrared intensity as a function of wavelength over the entire mid-infrared region (approximately 2.2-20 mm). Different species absorb infrared radiation in distinct patterns called spectra, where the intensity of absorbance is directly proportional to the concentration. By examination of the FTIR spectra, species can be identified and quantified.

The quantification was performed on a personal computer using a mathematical analysis of the effluent spectrum. In this analysis the effluent spectrum is compared to carefully prepared, quantitative reference spectra of the effluent constituents, in this case ethanol and water. The FTIR spectrometer system is very sensitive and capable of detecting numerous organic and inorganic species at levels in the low parts per million range, though the detection limit varies from compound to compound. The FTIR measurement is insensitive to gases such as nitrogen and oxygen (homonuclear diatomics). Some common effluent constituents, such as carbon dioxide and water vapor, can interfere with the analysis for some pollutants if present at high concentration.



**APPENDIX F:  
CALIBRATION GASES**





# Scott Specialty Gases, Inc.

6141 ROAD, P.O. BOX 310, PLUMSTEADVILLE, PA 18949-0310

(215) 766-8861 FAX: (215) 766-0320

## CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

### Customer

Entropy  
Cem Division  
8724 Glenwood Avenue  
Raleigh, NC 27612

### Assay Laboratory

Scott Specialty Gases, Inc.  
6141 Easton Road  
P.O. Box 310  
Plumsteadville, PA 18949-0310

Purchase Order 21691

Scott Project # 01-58591-002

### ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number ALM045404

Certification Date

07-12-94

Expiration Date

07-12-97

Cylinder Pressure 2000 psig+

Previous Certification Dates

None

### ANALYZED CYLINDER

#### Components

Propane  
Balance Gas: Air

#### Certified Concentration

4.99 ppm

#### Analytical Uncertainty\*

±1% NIST Traceable

\*Do not use when cylinder is less than 150 psig.

\*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

### REFERENCE STANDARD

Type

NTRM1666

Expiration Date

03-05-95

Cylinder Number

ALM017367

Concentration

9.62 ppm C<sub>3</sub>H<sub>8</sub> in N<sub>2</sub>

### INSTRUMENTATION

Instrument/Model/Serial #

C3H8: Varian/VA3300/7945

Last Date Calibrated

07-12-94

Analytical Principle

FID

### ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date: 07-12-94      Response Units: Area Z1=000000 R1=094997 T1=049217 R2=094781 Z2=000000 T2=049248 Z3=000000 T3=048994 R3=094669 Avg. Conc. of Cust. Cyl. 4.99 ppm		Concentration = A + Bx + Cx <sup>2</sup> + Dx <sup>3</sup> + Ex <sup>4</sup> r = 1.00000      NTRM1666 Constants:      A = 3.2113E-03 B = 1.0185E-04      C = 0.0000E+00 D = 0.0000E+00      E = 0.0000E+00

#### Special Notes:

Check this box if certified concentration has been corrected for analytical interferences.

*Robert K. Kufrovich*  
Analyst Robert K. Kufrovich



# Scott Specialty Gases, Inc.

6141 ROAD, P.O. BOX 310, PLUMSTEADVILLE, PA 18949-0310

(215) 766-8861 FAX: (215) 766-0320

## CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

**Customer**  
Entropy  
Cem Division  
8724 Glenwood Avenue  
Raleigh, NC 27612

**Assay Laboratory**  
Scott Specialty Gases, Inc.  
6141 Easton Road  
P.O. Box 310  
Plumsteadville, PA 18949-0310

**Purchase Order** 21691  
**Scott Project #** 01-58591-001

### ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

<b>Cylinder Number</b>	ALM045251	<b>Certification Date</b>	07-12-94	<b>Expiration Date</b>	07-12-97
<b>Cylinder Pressure</b>	2000 psig+	<b>Previous Certification Dates</b>	None		

### ANALYZED CYLINDER

#### Components

Propane  
Balance Gas: Air

#### Certified Concentration

3.01 ppm

#### Analytical Uncertainty\*

±1% NIST Traceable

\*Do not use when cylinder is less than 150 psig.

\*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

### REFERENCE STANDARD

<b>Type</b>	Expiration Date	<b>Cylinder Number</b>	<b>Concentration</b>
NTRM1666	03-05-95	ALM017367	9.62 ppm C <sub>3</sub> H <sub>8</sub> in N <sub>2</sub>

### INSTRUMENTATION

<b>Instrument/Model/Serial #</b>	<b>Last Date Calibrated</b>	<b>Analytical Principle</b>
C3H8: Varian/VA3300/7945	07-12-94	FID

### ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
Propane	Date: 07-12-94    Response Units: Area Z1=000000 R1=094997 T1=029774 R2=094781 Z2=000000 T2=029526 Z3=000000 T3=029575 R3=094669 Avg. Conc. of Cust. Cyl. 3.01 ppm		Concentration = A+Bx+Cx <sup>2</sup> +Dx <sup>3</sup> +Ex <sup>4</sup> r=1.00000    NTRM1666 Constants:    A=-3.2113E-03 B=1.0185E-04    C=0.0000E+00 D=0.0000E+00    E=0.0000E+00

#### Special Notes:

Check this box if certified concentration has been corrected for analytical interferences.

*Robert K. Kalrovich*  
Analyst Robert K. Kalrovich



# Scott Specialty Gases, Inc.

6141 ROAD, P.O. BOX 310, PLUMSTEADVILLE, PA 18949-0310

(215) 766-8861 FAX: (215) 766-0320

## CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

**Customer**  
Entropy  
Cem Division  
8724 Glenwood Avenue  
Raleigh, NC 27612

**Assay Laboratory**  
Scott Specialty Gases, Inc.  
6141 Easton Road  
P.O. Box 310  
Plumsteadville, PA 18949-0310

**Purchase Order** 21691  
**Scott Project #** 01-58591-003

### ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

**Cylinder Number** ALM045403  
**Cylinder Pressure** 2000 psig+

**Certification Date** 07-12-94  
**Previous Certification Dates** None

**Expiration Date** 07-12-97

### ANALYZED CYLINDER

#### Components

Propane  
Balance Gas: Air

**Certified Concentration**  
8.46 ppm

**Analytical Uncertainty\***  
±1% NIST Traceable

\*Do not use when cylinder is less than 150 psig.

\*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

### REFERENCE STANDARD

**Type** NTRM1666  
**Expiration Date** 03-05-95

**Cylinder Number** ALM017367

**Concentration** 9.62 ppm C<sub>3</sub>H<sub>8</sub> in N<sub>2</sub>

### INSTRUMENTATION

**Instrument/Model/Serial #**  
C3H8: Varian/VA3300/7945

**Last Date Calibrated**  
07-12-94

**Analytical Principle**  
FID

### ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

#### Components

Propane

#### First Triad Analysis

Date: 07-12-94 Response Units: Area  
Z1=000000 R1=094997 T1=083525  
R2=094781 Z2=000000 T2=083439  
Z3=000000 T3=083261 R3=094669  
Avg. Conc. of Cust. Cyl. 8.46 ppm

#### Second Triad Analysis

#### Calibration Curve

Concentration = A+Bx+Cx<sup>2</sup>+Dx<sup>3</sup>+Ex<sup>4</sup>  
r=1.00000 NTRM1666  
Constants: A=3.2113E-03  
B=1.0185E-04 C=0.0000E+00  
D=0.0000E+00 E=0.0000E+00

#### Special Notes:

Check this box if certified concentration has been corrected for analytical interferences.

Analyst Robert K. Kufrovich

