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SUMS CALIBRATION TEST REPORT

March 1982

BSR 4491

Prepared by: G. Robertson

Approved by: K. Hsi

Contract NAS 1-16073

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SUMS Calibration Report

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FORWARD

After completion of the Shuttle Upper Atmosphere Mass Spectrometer (SUMS) certification and acceptance tests, instrument calibration was performed on SUMS flight unit number 1, P/N 3290600. Results of the calibration and the as-run test procedures are presented herein.

Section 1 compiles general description and data. These include output data description, engineering data conversion factors, tables and curves and calibration on instrument gauges.

Section 2 presents static calibration results. Instrument sensitive versus external pressure for N_2 and O_2 were determined. Data from each scan of calibration are provided in the data tapes. Typical data plots from N_2 and O_2 are provided. Sensitivity of SUMS at inlet for N_2 and O_2, and ratios of 14/28 for nitrogen and 16/32 for oxygen are presented.

Section 3 presents dynamic calibration data. Nitrogen gas is admitted to the SUMS inlet in a controlled pressure rise from a pressure of approximately 10^{-4} Torr to approximately 25 Torr. During the pressure rise the nitrogen 28 and 14 peaks are recorded. The response of the instrument from this test are compared to the static calibration to determine the time response of the instrument. Corrected ion current vs. time, plots of fraction of static drops and tables of time, pressure, current, fractions and ratios of inlet transducer to Baratron are provided.

Section 4 presents composition changes calibration results. Nitrogen is admitted to the SUMS inlet in a controlled pressure rise. At given pressure points, the gas composition is switched to a nitrogen/oxygen mixture. From this tes, time response to the composition change is determined. Corrected ion current vs. time and tables of time, pressure and current are provided.

The As-Run Procedures for static, dynamic and composition change calibrations are included in Appendix A of this report. Also included is the as-run test procedure for calibration of molecular leaks for O_2 and N_2.

Data printouts and data tapes from each scan of calibration have been forwarded to Mr. Roy Duckett of NASA/LaRC and are not included herein.

SUMS HP9830 DATA TAPE DIRECTORY
(AS OF 3-19-82)

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000 SERIES

TAPE #	BULK FILE #	DATE	TEST PROCEDURE	COMMENTS
001	1	8-28-81	TP3290663	BACKGROUND DATA (BEFORE ARGON)
001	2	8-28-81	TP3290663	DATA AFTER ONE HOUR ARGON
001	3	9-11-81	TP3290640	RUN #1
001	4	9-11-81	TP3290640	RUN #2
002	1	9-22-81	TP3290640	TRIAL RUN #1 (VALVE OPEN)
002	2	9-23-81	TP3290640	TRIAL RUN #2 (VALVE CLOSED)
002	3	9-23-81	TP3290640	1.5 HOUR FILAMENT WARM-UP
002	4	10-1-81		SPECTRA AFTER CHANGING O-RING
003	1	10-1-81		SAME AS ABOVE EXCEPT WITH VALVE CLOSED
003	2	10-7-81		SPECTRA FOLLOWING 62 HOUR BAKEOUT WITH
				VALVE CLOSED
003	3	10-13-81	TP3290640	PRE-ACCEPTANCE TEST FUNCTIONAL
003	4	10-15-81	TP3290641	******* SUMS ACCEPTANCE TEST ******
004	1	10-15-81	TP3290641	ACCEPT. TEST BARATRON PRESS=4.4X10-3 TORR
004	2	10-16-81	TP3290641	*** SUMS ACCEPTANCE TEST (2ND RUN) ***
004	3	10-22-81	TP3290644	EMI TEST @ 7.5 MHZ PER APPENDIX E
004	4	10-22-81	TP3290644	EMI TEST, TEST CABLE DISCONNECTED
005	1	11-10-81	TP3290640	POST BAKEOUT FUNCTIONAL
005	2	11-12-81	TP3290667	LEAK TEST, 1ST PART
005	3	11-13-81	TP3290667	LEAK TEST, 1ST PART
005	4	11-13-81	TP3290667	LEAK TEST, 2ND PART
006	1	11-20-81	TP3290640	SUMS FUNCTIONAL
006	2	11-23-81		UAMS FUNCTIONAL (POST VIBRATION)
006	3	11-23-81	TP3290640	SUMS FUNCTIONAL
006	4	11-30-81	TP3290667	LEAK TEST (BACKGROUND)
007	1	11-30-81	TP3290667	LEAK TEST
007	2	12-23-81	TP3290640	PRE-THERMAL/VACUUM FUNCTIONAL
007	3	1-5-82	TP3290640	THERMAL/VACUUM FUNCTIONAL, COLD (-40F)
007	4	1-6-82	TP3290640	THERMAL/VACUUM FUNCTIONAL, HOT (+90F)
008	1	2-23-82	TP3290648	DYNAMIC CALIBRATION BACKGROUND (BEFORE)
008	2	2-24-82	TP3290648	DYNAMIC CALIBRATION BACKGROUND (AFTER)
008	3	2-25-82	SPECIAL	BACKGROUND (BEFORE), ALL VALVES OPEN
008	4	2-26-82	SPECIAL	BACKGROUND (AFTER), ALL VALVES OPEN
009	1	3-2-82	TP3290648	COMPOSITION CHANGE CAL BCKGRND (BEFORE)
009	2	3-4-82	TP3290648	COMPOSITION CHANGE CAL BCKGRND (AFTER)
009	3			
009	4			

100 SERIES
(STATIC CALIBRATION)

TAPE #	BULK FILE #	DATE	TEST PROCEDURE	COMMENTS
101	1	1-20-82	TP3290648	N2 (RESIDUALS) RANGE VALVE OPEN
101	2	1-20-82	TP3290648	N2 (1 X 10-6 TORR) RANGE VALVE OPEN
101	3	1-20-82	TP3290648	N2 (3 X 10-6 TORR) RANGE VALVE OPEN
101	4	1-20-82	TP3290648	N2 (1 X 10-5 TORR) RANGE VALVE OPEN
101	5	1-20-82	TP3290648	N2 (3 X 10-5 TORR) RANGE VALVE OPEN
101	6	1-20-82	TP3290648	N2 (1 X 10-4 TORR) RANGE VALVE OPEN
102	1	1-20-82	TP3290648	N2 (3 X 10-4 TORR) RANGE VALVE OPEN
102	2	1-20-82	TP3290648	N2 (1 X 10-3 TORR) RANGE VALVE OPEN
102	3	1-20-82	TP3290648	N2 (3 X 10-3 TORR) RANGE VALVE OPEN
102	4	1-20-82	TP3290648	N2 (4.6 X 10-3 TORR) RANGE VALVE OPEN
102	5	1-21-82	TP3290648	N2 (BACKGROUND) PROTECTION VALVE CLOSED
102	6	1-21-82	TP3290648	N2 (BKGND) RANGE,PROT OPEN; INLET CLOSED
103	1	1-21-82	TP3290648	N2 (1 X 10-2 TORR) RANGE VALVE CLOSED
103	2	1-21-82	TP3290648	N2 (0.0300 TORR) RANGE VALVE CLOSED
103	3	1-21-82	TP3290648	N2 (0.100 TORR) RANGE VALVE CLOSED
103	4	1-21-82	TP3290648	N2 (0.300 TORR) RANGE VALVE CLOSED
103	5	1-21-82	TP3290648	N2 (1.00 TORR) RANGE VALVE CLOSED
103	6	1-21-82	TP3290648	N2 (3.00 TORR) RANGE VALVE CLOSED
104	1	1-21-82	TP3290648	N2 (10.00 TORR) RANGE VALVE CLOSED
104	2	1-21-82	TP3290648	N2 (21.00 TORR) RANGE VALVE CLOSED
104	3	1-21-82	TP3290648	N2 (32.72 TORR) RANGE VALVE CLOSED
104	4	1-21-82	TP3290648	N2 (BACKGROUND) ALL VALVES CLOSED
104	5			
104	6			
105	1	1-26-82	TP3290648	O2 (RESIDUALS) RANGE VALVE OPEN
105	2	1-26-82	TP3290648	O2 (1.1 X 10-6 TORR) RANGE VALVE OPEN
105	3	1-26-82	TP3290648	O2 (3.4 X 10-6 TORR) RANGE VALVE OPEN
105	4	1-26-82	TP3290648	O2 (8.6 X 10-5 TORR) RANGE VALVE OPEN
105	5	1-26-82	TP3290648	O2 (4.2 X 10-5 TORR) RANGE VALVE OPEN
105	6	1-26-82	TP3290648	O2 (TORR) RANGE VALVE OPEN
106	1	1-26-82	TP3290648	O2 (9.5 X 10-5 TORR) RANGE VALVE OPEN
106	2	1-26-82	TP3290648	O2 (2.3 X 10-5 TORR) RANGE VALVE OPEN
106	3	1-26-82	TP3290648	O2 (2.97 X 10-4 TORR) RANGE VALVE OPEN
106	4	1-26-82	TP3290648	O2 (1.00 X 10-3 TORR) RANGE VALVE OPEN
106	5	1-26-82	TP3290648	O2 (3.00 X 10-3 TORR) RANGE VALVE OPEN
106	6	1-27-82	TP3290648	O2 (BACKGROUND) RANGE VALVE CLOSED
107	1	1-27-82	TP3290648	O2 (1.0 X 10-2) RANGE VALVE CLOSED
107	2	1-27-82	TP3290648	O2 (3.0 X 10-2 TORR) RANGE VALVE CLOSED
107	3	1-27-82	TP3290648	O2 (1.0 X 10-1 TORR) RANGE VALVE CLOSED
107	4	1-27-82	TP3290648	O2 (3.0 X 10-1 TORR) RANGE VALVE CLOSED
107	5	1-27-82	TP3290648	O2 (1.0 TORR) RANGE VALVE CLOSED
107	6	1-27-82	TP3290648	O2 (3.0 TORR) RANGE VALVE CLOSED

108	1	1-27-82	TP3290648	O2 (10.0 TORR) RANGE VALVE CLOSED
108	2			
108	3			
108	4			
108	5			
108	6			
109	1	2-1-82	TP3290648	O2/EXTRA (5.0 X 10-8 TORR) RANGE OPEN
109	2	2-1-82	TP3290648	O2/EXTRA (9.9 X 10-7 TORR) RANGE OPEN
109	3	2-1-82	TP3290648	O2/EXTRA (3.0 X 10-6 TORR) RANGE OPEN
109	4	2-1-82	TP3290648	O2/EXTRA (1.0 X 10-5 TORR) RANGE OPEN
109	5	2-1-82	TP3290648	O2/EXTRA (3.1 X 10-5 TORR) RANGE OPEN
109	6	2-1-82	TP3290648	O2/EXTRA (1.4 X 10-4 TORR) RANGE OPEN
110	1	2-2-82	TP3290648	N2/O2 (9.7 X 10-8) RANGE VALVE OPEN
110	2	2-2-82	TP3290648	N2/O2 (1.1 X 10-6 TORR) RANGE VALVE OPEN
110	3	2-2-82	TP3290648	N2/O2 (3.2 X 10-6 TORR) RANGE VALVE OPEN
110	4	2-2-82	TP3290648	N2/O2 (1.1 X 10-5 TORR) RANGE VALVE OPEN
110	5	2-2-82	TP3290648	N2/O2 (3.2 X 10-5 TORR) RANGE VALVE OPEN
110	6	2-2-82	TP3290648	N2/O2 (1.4 X 10-4 TORR) RANGE VALVE OPEN
111	1	2-2-82	TP3290648	N2/O2 (3.0 X 10-5 TORR) RANGE VALVE OPEN
111	2	2-2-82	TP3290648	N2/O2 (1.0 X 10-4 TORR) RANGE VALVE OPEN
111	3	2-2-82	TP3290648	N2/O2 (3.0 X 10-4 TORR) RANGE VALVE OPEN
111	4	2-3-82	TP3290648	N2/O2 (1.0 X 10-3 TORR) RANGE VALVE OPEN
111	5	2-3-82	TP3290648	N2/O2 (3.2 X 10-3 TORR) RANGE VALVE OPEN
111	6			
112	1			
112	2			
112	3			
112	4			
112	5			
112	6			
113	1	2-4-82	TP3290648	N2/O2 (5.1 X 10-4 TORR) RANGE VALVE OPEN
113	2	2-4-82	TP3290648	N2/O2 (1.0 X 10-3 TORR) RANGE VALVE OPEN
113	3	2-4-82	TP3290648	N2/O2 (4.0 X 10-3 TORR) RANGE VALVE OPEN
113	4	2-4-82	TP3290648	N2/O2 (BACKGROUND) RANGE VALVE OPEN
113	5	2-4-82	TP3290648	N2/O2 (BACKGROUND) RANGE VALVE CLOSED
113	6			
114	1	2-4-82	TP3290648	N2/O2 (4.2 X 10-3 TORR) RANGE CLOSED
114	2	2-4-82	TP3290648	N2/O2 (1.0 X 10-2 TORR) RANGE CLOSED
114	3	2-4-82	TP3290648	N2/O2 (3.0 X 10-2 TORR) RANGE CLOSED
114	4	2-4-82	TP3290648	N2/O2 (1.0 X 10-1 TORR) RANGE CLOSED
114	5	2-4-82	TP3290648	N2/O2 (3.0 X 10-1 TORR) RANGE CLOSED
114	6	2-4-82	TP3290648	N2/O2 (1.0 TORR) RANGE CLOSED
115	1	2-4-82	TP3290648	N2/O2 3.0 TORR) RANGE VALVE CLOSED
115	2	2-4-82	TP3290648	N2/O2 (10.00 TORR) RANGE VALVE CLOSED
115	3	2-4-82	TP3290648	N2/O2 (30.1 TORR) RANGE VALVE CLOSED
115	4	2-4-82	TP3290648	N2/O2 (BCKGRND) INLET CLOSED, RANGE OPEN
115	5	2-4-82	TP3290648	N2/O2 (BCKGRND) INLET OPEN, RANGE OPEN
115	6			

200 SERIES
(DYNAMIC CALIBRATION)

TAPE #	BULK FILE #	DATE	TEST PROCEDURE	COMMENTS
201	1	2-23-82	TP3290648	RUN #1, NOMINAL PRESSURE PROFILE
201	2	2-23-82	TP3290648	RUN #2, NOMINAL PRESSURE PROFILE
201	3	2-23-82	TP3290648	RUN #3, NOMINAL PRESSURE PROFILE
201	4	2-24-82	TP3290648	RUN #1, +25% P/P PRESSURE PROFILE
202	1	2-24-82	TP3290648	RUN #2, +25% P/P PRESSURE PROFILE
202	2	2-26-82	SPECIAL	NOMINAL PROFILE TO 150 SECONDS THEN HOLD
202	3	2-26-82	SPECIAL	NOMINAL PROFILE TO 630 SECONDS THEN HOLD
202	4	2-26-82	SPECIAL	0.1 X EXP(-0.0132 X T) PROFILE
203	1	3-5-82	EXTRA	NOMINAL PRESSURE PROFILE
203	2	3-5-82	EXTRA	NOMINAL PROFILE TO 155 SECONDS THEN HOLD
203	3	3-5-82	EXTRA	NOMINAL PROFILE TO 635 SECONDS THEN HOLD
203	4			

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300 SERIES
(COMPOSITION CHANGE CALIBRATION)

TAPE #	BULK FILE #	DATE	TEST PROCEDURE	COMMENTS
301	1	3-2-82	TP3290648	RUN TYPE #1, O2 ==> N2
301	2	3-4-82	TP3290648	RUN TYPE #2, O2 ==> N2
301	3	3-4-82	TP3290648	RUN TYPE #3, O2 ==> N2
301	4	3-4-82	TP3290648	RUN TYPE #4, O2 ==> N2
301	5	3-4-82	TP3290648	RUN TYPE #1, N2 ==> N2/O2
301	6	3-4-82	TP3290648	RUN TYPE #2, N2 ==> N2/O2
301	1	3-4-82	TP3290648	RUN TYPE #3, N2 ==> N2/O2
301	2	3-4-82	TP3290648	RUN TYPE #4, N2 ==> N2/O2
301	3			
301	4			
301	5			
301	6			

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OEX/SUMS DATA FORMAT DETAILS

Prepared by:

Greg Robertson
Bendix Aerospace Operations

23 November 1981

Background

The OEX/SUMS instrument is built around a Viking/UAMS instrument. The UAMS data output format is not directly compatible with the Shuttle PCM system. In order to interface UAMS with the PCM, it was necessary to change its serial output format to a parallel format. This is all done within the SUMS instrument.

UAMS Data Format

The SUMS data format is easier to understand if the UAMS format is first understood. The data comes from UAMS serially in 5 second minor frames. (See Figure 1). The first 16 bits form the ID or SYNC word. The next 12 eight bit words are UAMS Housekeeping words. (Not to be confused with SUMS Housekeeping words which will be discussed later). The remainder of the 5 second frame is made up of 432 nine bit science words.

The 432 nine bit science words are of two types; high mass and low mass. There are 360 high mass and 72 low mass science words per 5 second minor frame. Thus there are five times as many high mass words as low mass words. The low mass words follow every fifth high mass word in the UAMS data format. The first high mass word which has a low mass word following it is dependent upon the interlacing frame number which is discussed below.

As mentioned above, the UAMS data comes out in the form of 5 second minor frames. Four of these minor frames constitute a major frame. It is important to note that each 5 second minor frame stands alone as a complete mass spectra. The only difference, format wise, between adjacent 5 second minor frames is the interlacing of the high and low mass science words.

The four different minor frame formats are referred to as frames #1, #2, #3 or #4. Two bits in the first 8 bit UAMS Housekeeping word are used to identify the frame number. (See Table 1 for bit definitions).

The high mass/low mass interlacing is as follows. The first of the 432 science words is always a high mass word. For frame #1, the first low mass word follows the first high mass word, and low mass words follow every fifth high mass word thereafter. For frame #2 the first low mass word follows the second high mass word, and low mass words follow every fifth high mass word thereafter. For frames #3 and #4 the first low mass word follows the third and fourth, respectively, high mass words, and low mass words follow every fifth high mass word thereafter. This interlacing is illustrated below where "H" signifies a 9 bit high mass science word and "L" signifies a 9 bit low mass science word.

frame #1	H L H H H H H L H H H H H L H H ...
frame #2	H H L H H H H H L H H H H H L H ...
frame #3	H H H L H H H H H L H H H H H L ...
frame #4	H H H H L H H H H H L H H H H H ...

Table 1 identifies and describes the format of the 12 eight bit UAMS Housekeeping words. References to the SUMS or PCM data formats will be discussed below.

SUMS Data Format

The SUMS interfaces with the PCM consist of two 8 bit parallel digital ports and 12 analog ports. SUMS is currently using PCM Format 3A. In this format SUMS has continuous use of word slots 47 and 48 for the digital data. The analog data uses word slot 49, the first 12 words deep in each data cycle.

Table 2 lists the SUMS analog channels and their levels. The remainder of the SUMS Data Format discussion will deal only with the SUMS parallel digital data.

The function of the SUMS digital electronics is to convert the UAMS serial data to 16 bit parallel words which the PCM can accept. Since the rate at which the PCM can sample SUMS data is a function of the PCM data cycle width, it was not practical to have a synchronous interface with UAMS. Therefore the interface with UAMS is asynchronous and the PCM oversamples SUMS in order to capture all the UAMS data.

SUMS outputs a 16 bit (2-8 bit) parallel word once every PCM mainframe. This word is synchronous with the PCM clock. Its rate is the same as the PCM mainframe rate. (8 mseconds nominally).

The SUMS 16 bit words are of two types (see Figure 2). The first type is the SUMS Data Word which contains the UAMS digital data. The SUMS Data Words can be recognized by a zero in the MSB. The second type of word is the SUMS Housekeeping word. The SUMS Housekeeping words have a one in the MSB.

The UAMS Data is formatted into 16 bit SUMS Data Words as follows: (refer to Figures 1 and 2). The 16 bit UAMS ID/SYNC word is split into two 8 bit parts. Each 8 bit part is put into the low end of a 16 bit SUMS data word.

Each of the 12 8 bit UAMS Housekeeping words are put into the low end of a 16 bit SUMS Data word. The 432 9 bit science words are also each put into the low end of a 16 SUMS Data word. Therefore it requires a total of 446 16 bit SUMS Data words to output a 5 second frame of UAMS data.

Note again that all SUMS Data words are identified by a zero in the MSB. In addition, the two halves of the UAMS ID/SYNC word have bit 9 set to a one. (See Figure 2). This bit uniquely identifies the two halves of the ID/SYNC word for all SUMS digital data. Bits 10 through 14 of the SUMS Data Word are don't cares.

The ID/SYNC word (in SUMS format) is ØXXXXX1X111Ø1011 for the first half and ØXXXXX1X10010000 for the second half.

At a PCM mainframe rate of 8 milliseconds it takes the PCM 3.57 seconds (which is less than 5 seconds) to collect 446 SUMS words. This illustrates the need for the SUMS Housekeeping words. When the PCM is ready to read a word, SUMS will send it a Data Word if one is available. If not it sends a SUMS Housekeeping word. The SUMS Housekeeping word contains 14 one bit status flags. (See Table 3).

Figure 3 shows a typical SUMS Data Frame.

SHUTTLE OEX-SUMS

FIGURE 1

UAMS DATA FORMAT

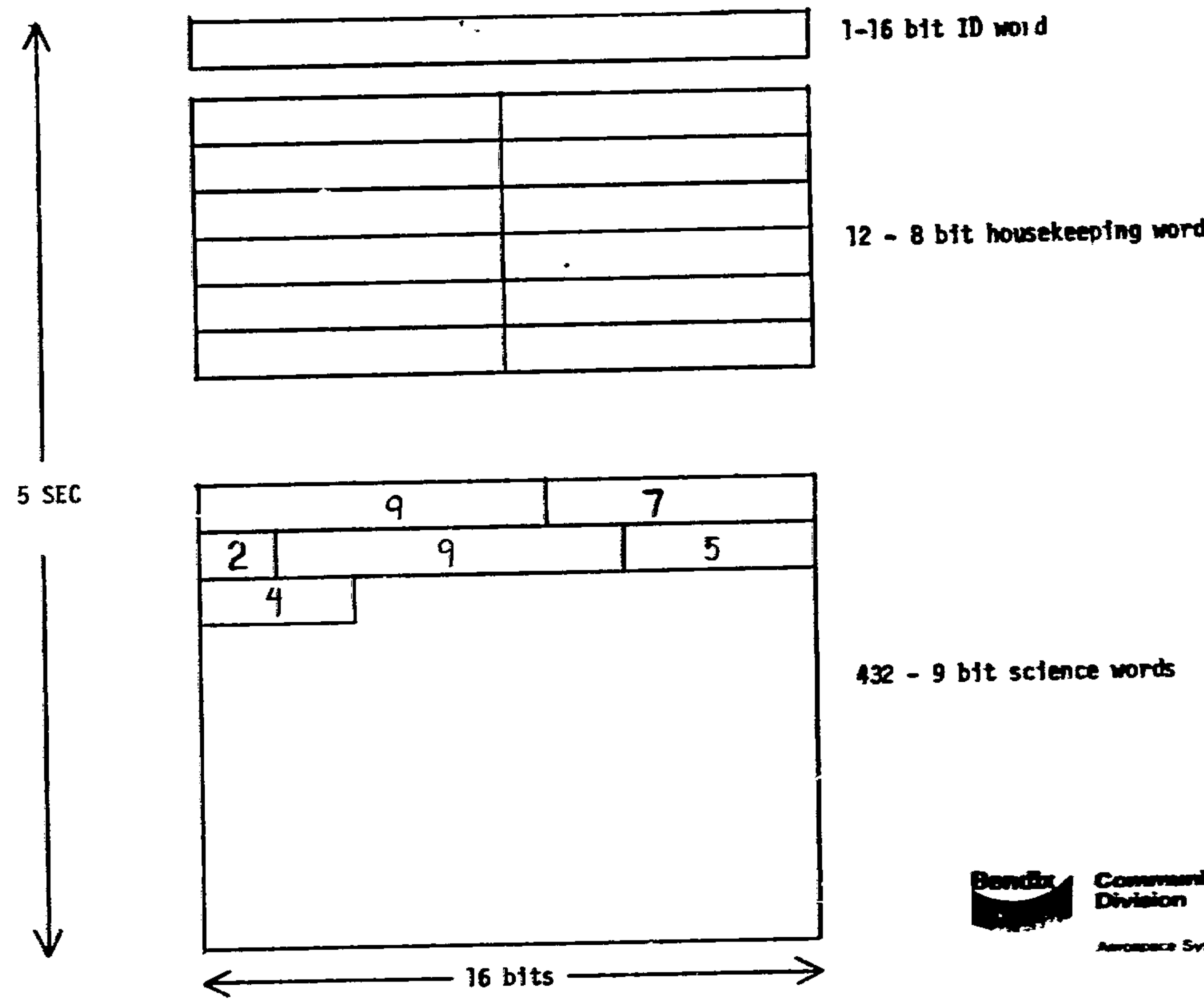

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Table 1

UAMS HOUSEKEEPING WORDS MEASUREMENTS LIST
prepared by: Greg Robertson, Bendix Aerospace
date: 2-9-81
revised: 3-23-82

	Measurement Title	Range**	Digital Limits (Decimal)
1*	Filament No., El. eV, Frame No.	***	—
2	+15 VDC Supply	0-20 VDC	178 - 204
3	-15 VDC Supply	-30 - 0 VDC	120 - 142
4	Ion Pump Voltage	0-5000 VDC	143 - 191
5	Ion Source Temperature	-60-300°F	029 - 120
6	Electrometer Preamp Temp.	-60-190°F	076 - 195
7	+5 VDC Supply	0-10 VDC	115 - 1[illegible]
8	A/D Voltage Reference	0-10 VDC	153 - 174
9	Total Emission Current	0-200 μA	115 - 141
10	Electron Collector Current	0-200 μA	092 - 134
11	Electron Acceleration Voltage	0-100 VDC	178 - 204
12	Ion Acceleration Voltage	0-200 VDC	026 - 046

* This number is the order in which the UAMS HOUSEKEEPING words follow the UAMS ID/Sync word in the PCM data format. That is, once the second half of the UAMS ID word (=Ø29ØH) is seen in the PCM data stream, then the next SUMS Data Word (i.e., the next word with MSB = Ø) will be a 16 bit word of which the lower 8 bits will be a UAMS HOUSEKEEPING word. This word will contain information about the status of the Filament Number, Electron Ionizing Potential and the UAMS Interlacing Frame Number.

The next SUMS Data Word will contain the +15 VDC Supply voltage, and so on. The UAMS Science Data follows the twelth UAMS HOUSEKEEPING word.

** The ranges of all the UAMS HOUSEKEEPING words, with the exception of 1, 5 and 6, are linear and represented by an 8 bit number.

*** The first SUMS Data Word containing a UAMS HOUSEKEEPING word is coded as follows (bit 15 = MSB)

BITS	MEASUREMENT	VALUE
7 and 6	---	---
5 and 4	Filament in use	1Ø = #1; Ø1 = #2
3 and 2	Ionizing Potential	1Ø = 75 eV; Ø1 = 25 eV
1 and 0	Interlacing frame #	ØØ = #1; Ø1 = #2; 1Ø - #3; 11 = #4
15 - 8	---	ØXXX XXXX

FIGURE 2

SUMS DATA FORMAT

Revised: 11-23-81

ID or UAMS HOUSEKEEPING = X
Science = Ø or 1

DATA Word

	MSB															LSB
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	Ø	X	X	X	X	X	1/Ø	X	X	X	X	X	X	X	X	X

ID Word = 1
otherwise = 0

SUMS HOUSEKEEPING WORD

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	1	X	X	X	X	X	Ø	X	X	X	X	X	X	X	X	X

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Bendix Communications Division
Aerospace Systems Operations

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Table 3

SUMS HOUSEKEEPING WORDS BIT ASSIGNMENT
prepared by: G. Robertson, Bendix Aerospace
date: 2-9-81
revised: 3-23-82

BIT NUMBER	FUNCTION	VALUE 0=	VALUE 1=
15	always set to one for SUMS HOUSEKEEPING words		
14	Ion Pump Current	Too High	(O.K.)
13	UAMS Ion Pump Power	(ON)	OFF
12	SUMS Instrument Power	ON	OFF
11	Inlet Pressure	(Too High)	O.K.
10	Internal Pressure	Too Low	(O.K.)
9	always set to zero for non-SUMS ID word		
8	SUMS Program Error	Error Detected	(O.K.)
7	Processor Halt	Halt	(O.K.)
6	SUMS Buffer Overflow	Overflow Detected	(O.K.)
5	Decode	ID word found	Searching for ID word
4	UAMS Reset	Operate Reset	(Release Reset)
3	System Reset	Operate Reset	(Release Reset)
2	Protection Valve Command	Open	(Close)
1	Range Valve Command	Open	(Close)
0	Inlet Valve Command	Open	(Close)

Parenthetical values are "on ground nominal".

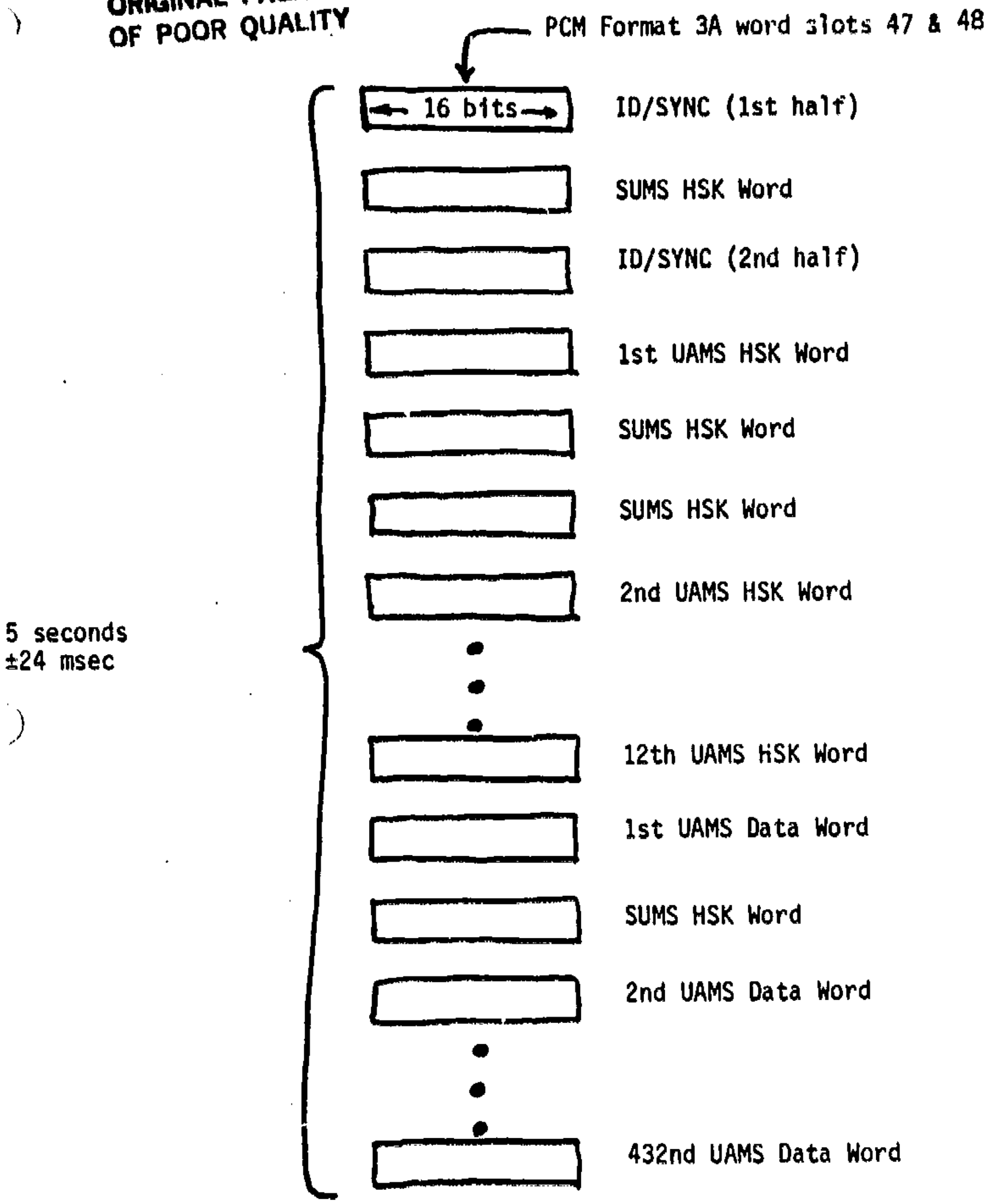
SUMS Ion Pump Power On: SUMS HSK Word = D5FFH*

SUMS Ion Pump & Inst. Power On: SUMS HSK Word = C5DFH**

*This number is constant once everything is initialized (msecs).

**This number is constant once UAMS data is locked on (msecs).

Figure 3 Map of One SUMS Data Frame



Note: The placement of the SUMS HSK words above is typical only. Actual placement is random and will vary from frame to frame.

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Table 4 SUMS PCM DATA TEMPERATURE LOOKUP TABLE

THERMISTOR 8-311-P-10-046 R1=37900 R2=14000 G=5.0560 OFFSET=3.7705

PCM A/D OUTPUT	TEMPERATURE (DEG F)	UNCERTAINTY (+/- DEG F)	PCM A/D OUTPUT	TEMPERATURE (DEG F)	UNCERTAINTY (+/- DEG F)
3	-39.2	3.5			
4	-38.3	3.5	66	-0.9	1.9
5	-37.4	3.4	67	-0.5	1.9
6	-36.5	3.4	68	-0.0	1.9
7	-35.7	3.3	69	0.4	1.9
8	-34.8	3.3	70	0.9	1.9
9	-34.0	3.2	71	1.3	1.9
10	-33.2	3.1	72	1.8	1.9
11	-32.4	3.1	73	2.2	1.9
12	-31.6	3.0	74	2.6	1.9
13	-30.9	3.0	75	3.1	1.8
14	-30.1	3.0	76	3.5	1.8
15	-29.4	2.9	77	4.0	1.8
16	-28.6	2.9	78	4.4	1.8
17	-27.9	2.8	79	4.8	1.8
18	-27.2	2.8	80	5.3	1.8
19	-26.5	2.8	81	5.7	1.8
20	-25.8	2.7	82	6.1	1.8
21	-25.2	2.7	83	6.6	1.8
22	-24.5	2.7	84	7.0	1.8
23	-23.8	2.6	85	7.4	1.8
24	-23.2	2.6	86	7.8	1.8
25	-22.6	2.6	87	8.3	1.8
26	-21.9	2.5	88	8.7	1.8
27	-21.3	2.4	89	9.1	1.8
28	-20.7	2.4	90	9.5	1.8
29	-20.1	2.4	91	9.9	1.8
30	-19.5	2.4	92	10.4	1.8
31	-18.9	2.4	93	10.8	1.8
32	-18.3	2.3	94	11.2	1.8
33	-17.7	2.3	95	11.6	1.8
34	-17.1	2.3	96	12.0	1.8
35	-16.6	2.3	97	12.4	1.8
36	-16.0	2.3	98	12.8	1.8
37	-15.4	2.2	99	13.3	1.8
38	-14.9	2.2	100	13.7	1.8
39	-14.3	2.2	101	14.1	1.7
40	-13.8	2.2	102	14.5	1.7
41	-13.3	2.2	103	14.9	1.7
42	-12.7	2.2	104	15.3	1.7
43	-12.2	2.1	105	15.7	1.7
44	-11.7	2.1	106	16.1	1.8
45	-11.1	2.1	107	16.5	1.8
46	-10.6	2.1	108	16.9	1.7
47	-10.1	2.1	109	17.4	1.7
48	-9.6	2.1	110	17.8	1.7
49	-9.1	2.1	111	18.2	1.7
50	-8.6	2.1	112	18.6	1.7
51	-8.1	2.0	113	19.0	1.7
52	-7.6	2.0	114	19.4	1.7
53	-7.1	2.0	115	19.8	1.7
54	-6.6	2.0	116	20.2	1.7
55	-6.1	2.0	117	20.6	1.7
56	-5.6	2.0	118	21.0	1.7
57	-5.2	2.0	119	21.4	1.7
58	-4.7	2.0	120	21.8	1.7
59	-4.2	2.0	121	22.2	1.7
60	-3.7	1.9	122	22.6	1.7
61	-3.3	1.9	123	23.0	1.7
62	-2.8	1.9	124	23.4	1.7
63	-2.3	1.9	125	23.8	1.7
64	-1.9	1.9	126	24.3	1.7
65	-1.4	1.9	127	24.7	1.7

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PCM A/D OUTPUT	TEMPERATURE (DEG F)	UNCERTAINTY (+/- DEG F)	PCM A/D OUTPUT	TEMPERATURE (DEG F)	UNCERTAINTY (+/- DEG F)
128	25.1	1.7	191	52.3	1.9
129	25.5	1.7	192	52.8	1.9
130	25.9	1.7	193	53.3	1.9
131	26.3	1.7	194	53.8	1.9
132	26.7	1.7	195	54.3	1.9
133	27.1	1.7	196	54.8	2.0
134	27.5	1.7	197	55.3	2.0
135	27.9	1.7	198	55.8	2.0
136	28.3	1.7	199	56.3	2.0
137	28.7	1.7	200	56.8	2.0
138	29.1	1.7	201	57.3	2.0
139	29.5	1.7	202	57.8	2.0
140	29.9	1.7	203	58.4	2.0
141	30.4	1.8	204	58.9	2.0
142	30.8	1.8	205	59.4	2.1
143	31.2	1.8	206	59.9	2.1
144	31.6	1.8	207	60.5	2.1
145	32.0	1.7	208	61.0	2.1
146	32.4	1.7	209	61.5	2.1
147	32.8	1.7	210	62.1	2.1
148	33.3	1.7	211	62.6	2.1
149	33.7	1.7	212	63.2	2.2
150	34.1	1.7	213	63.8	2.2
151	34.5	1.7	214	64.3	2.2
152	34.9	1.7	215	64.9	2.2
153	35.3	1.7	216	65.5	2.2
154	35.8	1.7	217	66.0	2.2
155	36.2	1.7	218	66.6	2.2
156	36.6	1.7	219	67.2	2.3
157	37.0	1.7	220	67.8	2.3
158	37.5	1.7	221	68.4	2.3
159	37.9	1.7	222	69.0	2.3
160	38.3	1.7	223	69.6	2.3
161	38.7	1.7	224	70.2	2.3
162	39.2	1.7	225	70.8	2.4
163	39.6	1.7	226	71.4	2.4
164	40.0	1.7	227	72.1	2.4
165	40.5	1.7	228	72.7	2.4
166	40.9	1.7	229	73.4	2.5
167	41.3	1.8	230	74.0	2.5
168	41.8	1.8	231	74.7	2.5
169	42.2	1.8	232	75.3	2.5
170	42.7	1.8	233	76.0	2.5
171	43.1	1.8	234	76.7	2.6
172	43.5	1.8	235	77.4	2.6
173	44.0	1.8	236	78.1	2.6
174	44.4	1.8	237	78.8	2.7
175	44.9	1.8	238	79.5	2.7
176	45.3	1.8	239	80.2	2.7
177	45.8	1.8	240	80.9	2.7
178	46.2	1.8	241	81.7	2.8
179	46.7	1.8	242	82.4	2.8
180	47.2	1.8	243	83.2	2.9
181	47.6	1.8	244	83.9	2.9
182	48.1	1.8	245	84.7	2.9
183	48.5	1.8	246	85.5	2.9
184	49.0	1.9	247	86.3	3.0
185	49.5	1.9	248	87.1	3.0
186	49.9	1.9	249	87.9	3.1
187	50.4	1.9	250	88.6	3.1
188	50.9	1.9	251	89.6	3.2
189	51.4	1.9	252	90.5	3.2
190	51.9	1.9	253	91.4	3.2

UAMS HOUSE KEEPING MONITORS

1. +15 Volt Supply $-V_{15}$

   $V_{15} = \frac{20 * DIG_{15}}{255}$

   Where DIG_{15} is the digital output for +15 volt supply.

2. -15 Volt Supply V_{-15}

   $V_{-15} = 0.118 * DIG_{-15} - 0.1574 * DIG_{15}$

   Where DIG_{-15} is digital output of -15 Volt supply

   DIG_{15} is digital output of 15 Volt supply

3. Ion Pump Voltage

   $V_{IP} = 19.8 * DIG_{IP}$ volts

4. Ion Source Temperature

   See calibration curve

5. Pre Amp Temperature

   See calibration curve

6. +5 Volt Supply

   $V_5 = \frac{10 * DIG_5}{255}$ Volts

7. A/D Reference Voltage

   $V_{A/D} = \frac{10 * DIG_{A/D}}{255}$ Volts

8. Emission Current

   $I_e = \frac{100 * DIG_e}{126}$ μA

9. Collector Current

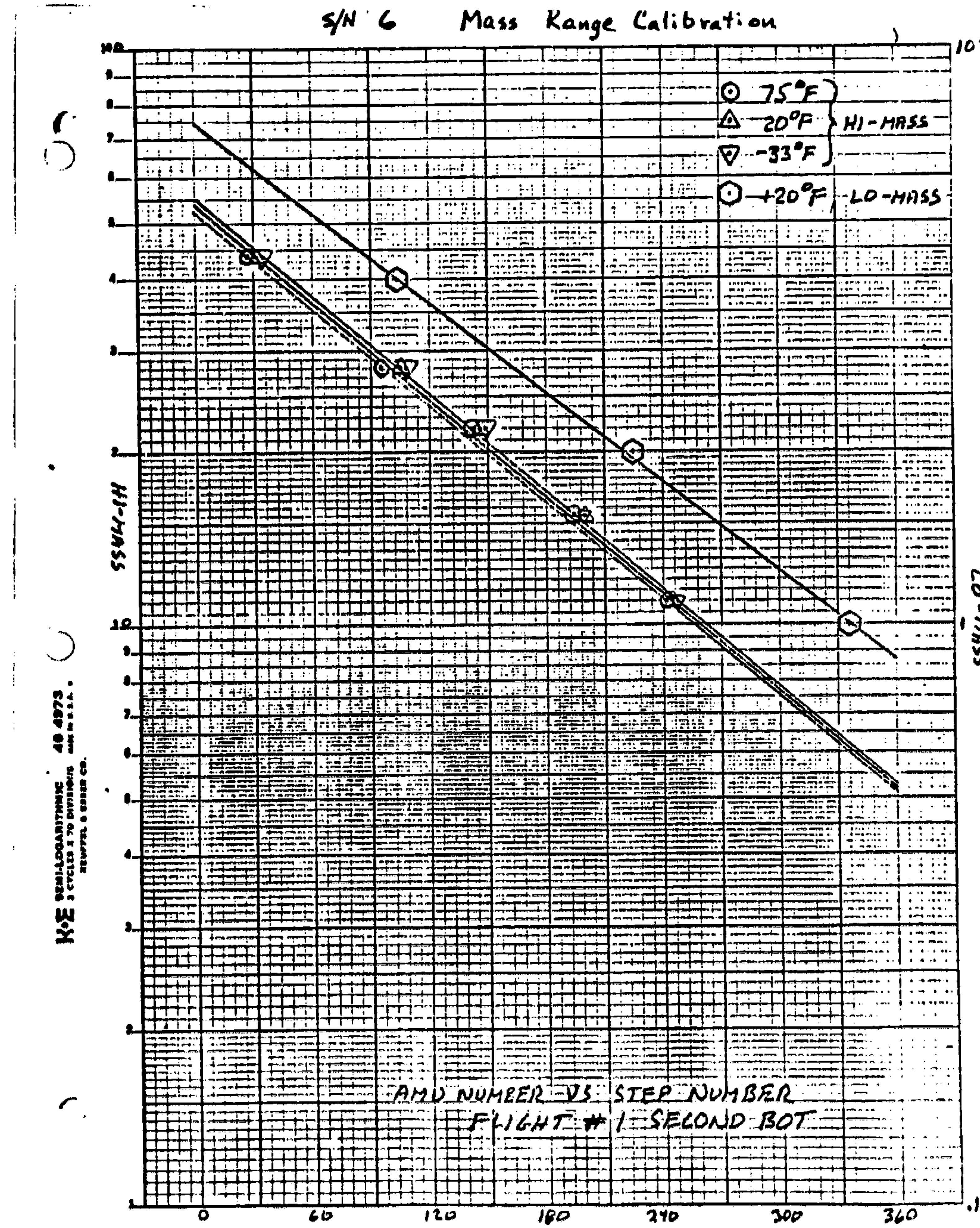
   $I_c \simeq \frac{100 * DIG_c}{126}$

10. Electron Voltage

    $V_{eV} = \frac{75 * DIG_{eV}}{190}$ Near 75 eV

    $V_{eV} = \frac{25 * DIG_{eV}}{70}$ Near 25 eV

11. <u>Ion Accelerator Voltage</u>
Ion accelorator voltage is proportional to digital output
Nominal digital output is <u>39</u> .



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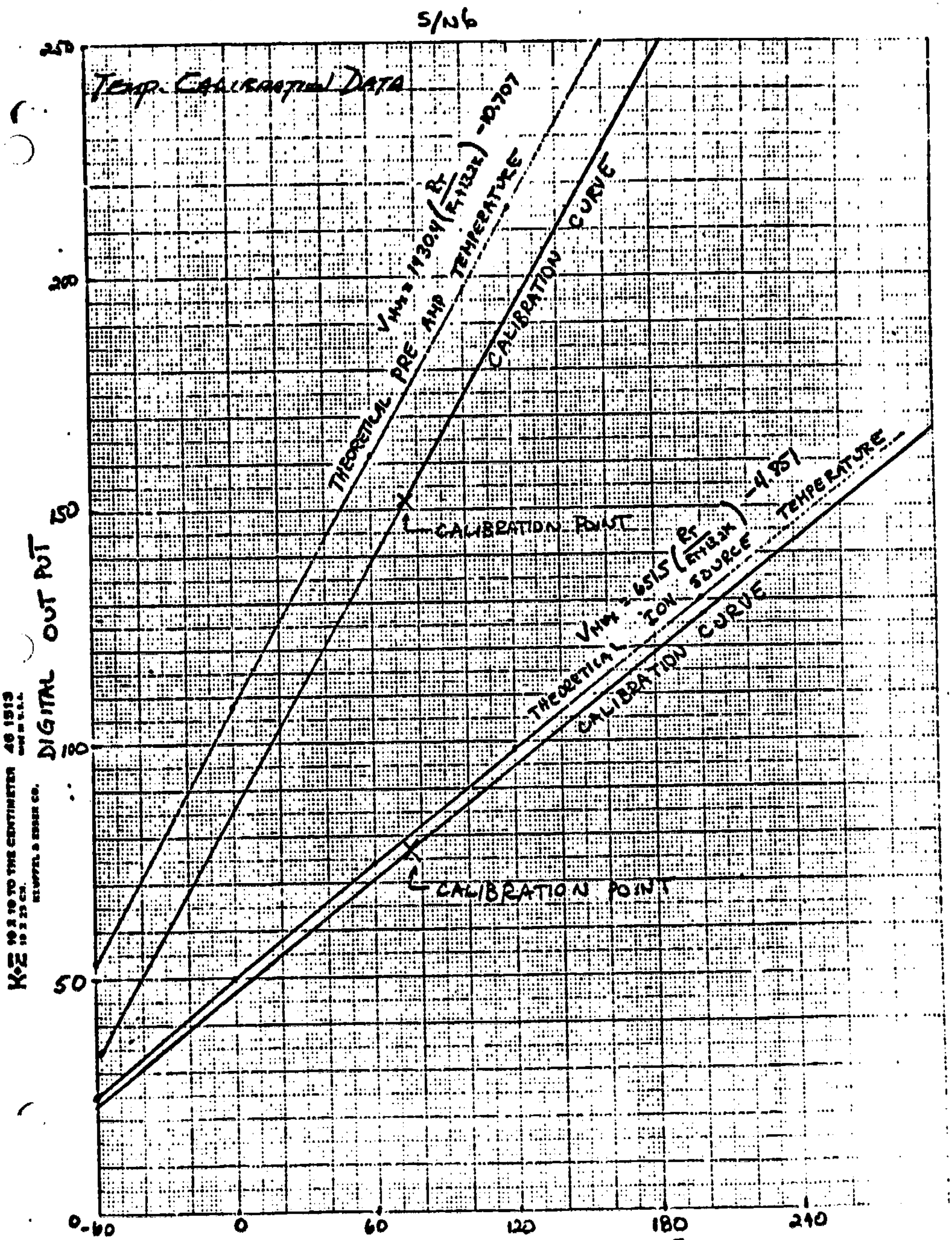

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SCIENCE DATA LOOK UP TABLE

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FILE 5
LIST OF ARRAY 6

ALL VALUES * 1E-15 AMPS

	COL 1	COL 2	COL 3	COL 4
ROW 1	0.00000E+00	2.30000E+01	3.80000E+01	5.30000E+01
ROW 2	4.96000E+02	5.11000E+02	5.26000E+02	5.42000E+02
ROW 3	9.92000E+02	1.02000E+03	1.05000E+03	1.08000E+03
ROW 4	1.98000E+03	2.04000E+03	2.11000E+03	2.17000E+03
ROW 5	3.97000E+03	4.09000E+03	4.21000E+03	4.33000E+03
ROW 6	7.93000E+03	8.18000E+03	8.42000E+03	8.67000E+03
ROW 7	1.59000E+04	1.64000E+04	1.68000E+04	1.73000E+04
ROW 8	3.17000E+04	3.27000E+04	3.37000E+04	3.47000E+04
ROW 9	6.35000E+04	6.54000E+04	6.74000E+04	6.93000E+04
ROW 10	1.27000E+05	1.31000E+05	1.35000E+05	1.39000E+05
ROW 11	2.54000E+05	2.62000E+05	2.70000E+05	2.77000E+05
ROW 12	5.08000E+05	5.23000E+05	5.39000E+05	5.55000E+05
ROW 13	1.02000E+06	1.05000E+06	1.08000E+06	1.11000E+06
ROW 14	2.03000E+06	2.09000E+06	2.16000E+06	2.22000E+06

	COL 5	COL 6	COL 7	COL 8
ROW 1	6.90000E+01	8.40000E+01	9.90000E+01	1.14000E+02
ROW 2	5.57000E+02	5.72000E+02	5.87000E+02	6.03000E+02
ROW 3	1.11000E+03	1.14000E+03	1.17000E+03	1.21000E+03
ROW 4	2.23000E+03	2.29000E+03	2.35000E+03	2.41000E+03
ROW 5	4.46000E+03	4.58000E+03	4.70000E+03	4.82000E+03
ROW 6	8.91000E+03	9.16000E+03	9.40000E+03	9.64000E+03
ROW 7	1.78000E+04	1.83000E+04	1.88000E+04	1.93000E+04
ROW 8	3.56000E+04	3.66000E+04	3.76000E+04	3.86000E+04
ROW 9	7.13000E+04	7.32000E+04	7.52000E+04	7.71000E+04
ROW 10	1.43000E+05	1.46000E+05	1.50000E+05	1.54000E+05
ROW 11	2.85000E+05	2.93000E+05	3.01000E+05	3.09000E+05
ROW 12	5.70000E+05	5.86000E+05	6.02000E+05	6.17000E+05
ROW 13	1.14000E+06	1.17000E+06	1.20000E+06	1.23000E+06
ROW 14	2.28000E+06	2.34000E+06	2.41000E+06	2.47000E+06

	COL 9	COL 10	COL 11	COL 12
ROW 1	1.30000E+02	1.45000E+02	1.60000E+02	1.75000E+02
ROW 2	6.18000E+02	6.33000E+02	6.48000E+02	6.64000E+02
ROW 3	1.24000E+03	1.27000E+03	1.30000E+03	1.33000E+03
ROW 4	2.47000E+03	2.53000E+03	2.59000E+03	2.66000E+03
ROW 5	4.94000E+03	5.07000E+03	5.19000E+03	5.31000E+03
ROW 6	9.89000E+03	1.01000E+04	1.04000E+04	1.06000E+04
ROW 7	1.98000E+04	2.03000E+04	2.08000E+04	2.12000E+04
ROW 8	3.96000E+04	4.05000E+04	4.15000E+04	4.25000E+04
ROW 9	7.91000E+04	8.11000E+04	8.30000E+04	8.50000E+04
ROW 10	1.58000E+05	1.62000E+05	1.66000E+05	1.70000E+05
ROW 11	3.16000E+05	3.24000E+05	3.32000E+05	3.40000E+05
ROW 12	6.33000E+05	6.48000E+05	6.64000E+05	6.80000E+05
ROW 13	1.27000E+06	1.30000E+06	1.33000E+06	1.36000E+06
ROW 14	2.53000E+06	2.59000E+06	2.66000E+06	2.72000E+06

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FILE 5
LIST OF ARRAY 6 ALL VALUES * 1E-15 AMPS

	COL 13	COL 14	COL 15	COL 16
ROW 1	1.91000E+02	2.06000E+02	2.21000E+02	2.37000E+02
ROW 2	6.79000E+02	6.94000E+02	7.10000E+02	7.25000E+02
ROW 3	1.36000E+03	1.39000E+03	1.42000E+03	1.45000E+03
ROW 4	2.72000E+03	2.78000E+03	2.84000E+03	2.90000E+03
ROW 5	5.43000E+03	5.55000E+03	5.68000E+03	5.80000E+03
ROW 6	1.09000E+04	1.11000E+04	1.14000E+04	1.16000E+04
ROW 7	2.17000E+04	2.22000E+04	2.27000E+04	2.32000E+04
ROW 8	4.35000E+04	4.44000E+04	4.54000E+04	4.64000E+04
ROW 9	8.69000E+04	8.89000E+04	9.08000E+04	9.28000E+04
ROW 10	1.74000E+05	1.78000E+05	1.82000E+05	1.86000E+05
ROW 11	3.48000E+05	3.55000E+05	3.63000E+05	3.71000E+05
ROW 12	6.95000E+05	7.11000E+05	7.27000E+05	7.42000E+05
ROW 13	1.39000E+06	1.42000E+06	1.45000E+06	1.48000E+06
ROW 14	2.78000E+06	2.84000E+06	2.91000E+06	2.97000E+06

	COL 17	COL 18	COL 19	COL 20
ROW 1	2.52000E+02	2.67000E+02	2.82000E+02	2.98000E+02
ROW 2	7.40000E+02	7.55000E+02	7.71000E+02	7.86000E+02
ROW 3	1.48000E+03	1.51000E+03	1.54000E+03	1.57000E+03
ROW 4	2.96000E+03	3.02000E+03	3.08000E+03	3.14000E+03
ROW 5	5.92000E+03	6.04000E+03	6.16000E+03	6.29000E+03
ROW 6	1.18000E+04	1.21000E+04	1.23000E+04	1.26000E+04
ROW 7	2.37000E+04	2.42000E+04	2.47000E+04	2.51000E+04
ROW 8	4.74000E+04	4.82000E+04	4.93000E+04	5.03000E+04
ROW 9	9.47000E+04	9.67000E+04	9.86000E+04	1.01000E+05
ROW 10	1.89000E+05	1.93000E+05	1.97000E+05	2.01000E+05
ROW 11	3.79000E+05	3.87000E+05	3.95000E+05	4.02000E+05
ROW 12	7.58000E+05	7.73000E+05	7.89000E+05	8.05000E+05
ROW 13	1.52000E+06	1.55000E+06	1.58000E+06	1.61000E+06
ROW 14	3.03000E+06	3.09000E+06	3.16000E+06	3.22000E+06

	COL 21	COL 22	COL 23	COL 24
ROW 1	3.13000E+02	3.28000E+02	3.43000E+02	3.59000E+02
ROW 2	8.01000E+02	8.16000E+02	8.32000E+02	8.47000E+02
ROW 3	1.60000E+03	1.63000E+03	1.66000E+03	1.69000E+03
ROW 4	3.20000E+03	3.27000E+03	3.33000E+03	3.39000E+03
ROW 5	6.41000E+03	6.53000E+03	6.65000E+03	6.77000E+03
ROW 6	1.28000E+04	1.31000E+04	1.33000E+04	1.35000E+04
ROW 7	2.56000E+04	2.61000E+04	2.66000E+04	2.71000E+04
ROW 8	5.13000E+04	5.22000E+04	5.32000E+04	5.42000F+04
ROW 9	1.03000E+05	1.04000E+05	1.06000E+05	1.08000E+05
ROW 10	2.05000E+05	2.09000E+05	2.13000E+05	2.17000E+05
ROW 11	4.10000E+05	4.18000E+05	4.26000E+05	4.34000E+05
ROW 12	8.20000E+05	8.36000E+05	8.52000E+05	8.67000E+05
ROW 13	1.64000E+06	1.67000E+06	1.70000E+06	1.73000E+06
ROW 14	3.28000E+06	3.34000E+06	3.41000E+06	3.47000E+06

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FILE 5
LIST OF ARRAY S   ALL VALUES * 1E-15 AMPS

	COL 25	COL 26	COL 27	COL 28
ROW 1	3.74000E+02	3.89000E+02	4.04000E+02	4.20000E+02
ROW 2	8.62000E+02	8.77000E+02	8.93000E+02	9.08000E+02
ROW 3	1.72000E+03	1.75000E+03	1.79000E+03	1.82000E+03
ROW 4	3.45000E+03	3.51000E+03	3.57000E+03	3.63000E+03
ROW 5	6.90000E+03	7.02000E+03	7.14000E+03	7.26000E+03
ROW 6	1.38000E+04	1.40000E+04	1.43000E+04	1.45000E+04
ROW 7	2.76000E+04	2.81000E+04	2.86000E+04	2.91000E+04
ROW 8	5.52000E+04	5.62000E+04	5.71000E+04	5.81000E+04
ROW 9	1.10000E+05	1.12000E+05	1.14000E+05	1.16000E+05
ROW 10	2.21000E+05	2.25000E+05	2.29000E+05	2.32000E+05
ROW 11	4.41000E+05	4.49000E+05	4.57000E+05	4.65000E+05
ROW 12	8.83000E+05	8.98000E+05	9.14000E+05	9.30000E+05
ROW 13	1.77000E+06	1.80000E+06	1.83000E+06	1.86000E+06
ROW 14	3.53000E+06	3.59000E+06	3.66000E+06	3.72000E+06

	COL 29	COL 30	COL 31	COL 32
ROW 1	4.35000E+02	4.50000E+02	4.65000E+02	4.81000E+02
ROW 2	9.23000E+02	9.38000E+02	9.54000E+02	9.69000E+02
ROW 3	1.85000E+03	1.88000E+03	1.91000E+03	1.94000E+03
ROW 4	3.69000E+03	3.75000E+03	3.81000E+03	3.88000E+03
ROW 5	7.39000E+03	7.51000E+03	7.63000E+03	7.75000E+03
ROW 6	1.48000E+04	1.50000E+04	1.53000E+04	1.55000E+04
ROW 7	2.95000E+04	3.00000E+04	3.05000E+04	3.10000E+04
ROW 8	5.91000E+04	6.01000E+04	6.10000E+04	6.20000E+04
ROW 9	1.18000E+05	1.20000E+05	1.22000E+05	1.24000E+05
ROW 10	2.36000E+05	2.40000E+05	2.44000E+05	2.48000E+05
ROW 11	4.73000E+05	4.80000E+05	4.88000E+05	4.96000E+05
ROW 12	9.45000E+05	9.61000E+05	9.77000E+05	9.92000E+05
ROW 13	1.89000E+06	1.92000E+06	1.95000E+06	1.98000E+06
ROW 14	3.78000E+06	3.84000E+06	3.91000E+06	3.97000E+06

MKS INSTRUMENTS, INC.

PRECISION VACUUM/PRESSURE/FLOW MEASUREMENT & CONTROL

22-24 THIRD AVENUE BURLINGTON, MASSACHUSETTS 01803 TELEPHONE 617/272-9255 TELEX 94 9375

CALIBRATION RECORD SHEET

The following data was measured on the MKS Baratron Head identified by Type and Serial Number. Calibration is performed using an MKS transfer standard that has been calibrated with a CEC Air Dead-Weight Tester which is traceable to the National Bureau of Standards.

CALIBRATION DATA

PRESSURE STD. mmHg	COMPUTED LINEAR D.C. OUTPUT	ACTUAL D.C. OUTPUT	ERROR (± MV)
.00000	.0000	.0000	0.0
.10521	1.0521	1.0521	0.0
.21043	2.1043	2.1052	+0.9
.31564	3.1564	3.1572	+0.8
.42086	4.2086	4.2095	+0.9
.52607	5.2607	5.2636	+2.9
.63128	6.3128	6.3157	+2.9
.73650	7.3650	7.3680	+3.0
.84171	8.4171	8.4209	+3.8
.94693	9.4693	9.4733	+4.0
1.05214	10.5214	10.5254	+5.0

Head Type 310BHS-1

Ser. No. 19396-1

65503

Data By: BL

Checked By: RE

Date: 5-13-81

Sys. Ck. : 9.67

Indicator Type 170M-6C

Ser. No. 19396-3

NOTES:
1. Temperature regulated units must be operated on regulated heat approximately 2 hours before check or resetting calibration.
2. Bakeable Heads are calibrated at 25°C and Temp. Comp. pot set at 500.
3. MKS DIGITAL READOUTS READ DIRECTLY IN PRESSURE.

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MKS INSTRUMENTS, INC.

PRECISION VACUUM PRESSURE FLOW MEASUREMENT & CONTROL

22-24 THIRD AVENUE BURLINGTON, MASSACHUSETTS 01803 TELEPHONE 617/272-9255 TELEX 94-9375

CALIBRATION RECORD SHEET

The following data was measured on the MKS Baratron Head identified by Type and Serial Number. Calibration is performed using an MKS transfer standard that has been calibrated with a CEC Air Dead-Weight Tester which is traceable to the National Bureau of Standards.

CALIBRATION DATA

PRESSURE STD. mmHg	COMPUTED LINEAR D.C. OUTPUT	ACTUAL D.C. OUTPUT	ERROR (± MV)
.000	.0000	.0000	0.0
10.082	1.0082	1.0082	0.0
20.164	2.0164	2.0164	0.0
30.246	3.0246	3.0246	0.0
40.328	4.0328	4.0328	0.0
50.410	5.0410	5.0401	-0.9
60.491	6.0491	6.0473	-1.8
70.573	7.0573	7.0573	0.0
80.138	8.0138	8.0110	-2.8
90.479	9.0479	9.0551	-2.8
100.819	10.0819	10.0819	0.0

Head Type 310BHS-100

Ser. No. 19396-2 65504

Indicator Type 170M-6C

Ser. No. 19396-3

Data By: BL

Checked By: RK

Date: 5-5-81

Sys. Ck.: 9.8

NOTES: 1. Temperature regulated units must be operated on regulated heat approximately 2 hours before check or resetting calibration.

2. Bakeable Heads are calibrated at 25°C and Temp. Comp. pot set at 500.

3. MKS DIGITAL READOUTS READ DIRECTLY IN PRESSURE.

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66123 2-19-82

STEP NO.	FUNCTION TESTED	Nominal value of Test Inst.	TOLERANCE	Measurement Std. Value FIRST RUN	Measurement Std. Value FINAL RUN	REMARKS
	0-20 mm Hg Abs					FA 160 Spec is
			De rated			0.33% of F.S.
		20.0 mm Hg	to 3%	20.0		= ± 0.06 mm Hg
		15.0	above 10 mm Hg	15.0		
		9.9	± 0.06 mm Hg	9.7		10 mm Hg & Above
		7.4	& below	7.1		FA145 Gauge std
		5.0		5.2		was used Spec
		1.0		1.2		is ± 0.1% of F.S.
						= ± 0.76 mm Hg
						10 mm Hg & below
						McLeod Gauge Std.
						Spec is 3×10^{-4} mm Hg
						= ± 0.0003 mm Hg

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66126

2-19-82

STEP NO.	FUNCTION TESTED	Nominal value of Test Inst.	TOLERANCE	Measurement Std. Value FIRST RUN	FINAL RUN	REMARKS
	0-50 mm Hg Abs.		Derated to			FA160 Spec is
		50 mm Hg Abs	± 1 mm Hg	49.2 mm Hg Abs		±0.33% of F.S.
		49		48.2		= ±0.165 mm Hg
		40		39.1		
		28		27.4		FA145 Std used
		24		23.5		for 10 mm Hg Cup
		20		19.6		to 50 mm Hg Spec is
		10	± 0.165 mm Hg	9.6		±0.1% of F.S. =
						± 0.76 mm Hg
						10 mm & below
						McLeod G. No 100A
						was used Spec is
						3x10⁻⁴ = ±0.0003 mm Hg.

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66125 2-19-82

STEP NO.	FUNCTION TESTED	Nominal value of Test Inst.	TOLERANCE	Measurement Std. Value FIRST RUN	Measurement Std. Value FINAL RUN	REMARKS
	0-200 mmHg Abs.		derated			FA160 Spec
			to			±0.33% of F.S.
		200 mmHg	± 2.0 mmHg	198.0 mmHg		= ± 0.66 mmHg A.
		185		183.0		
		175		173.0		Std Used FA14
		160		158.0		± 0.1% of F.S. =
		83		81.0		± 0.76 mmHg.
		77		75.0		
		50		48.0		

60127

2-19-82

STEP NO.	FUNCTION TESTED	Nominal value of Test Inst.	TOLERANCE	Measurement Std. Value FIRST RUN	Measurement Std. Value FINAL RUN	REMARKS
	0-800 mmHg Abs.					FA160 Spec
		734 mmHg		737.2 mmHg Abs.		is ±0.33% of F.S.
		650	±2.6 mmHg	653.7		= ±2.64 mmHg.
		550		552.0		
		475		476.1		std. used FA145
		350		350.1		is ±0.1% of F.S.
		220		221.0		= ±0.76 mmHg.
		200		201.0		
		150		151.4		
		50		51.0		

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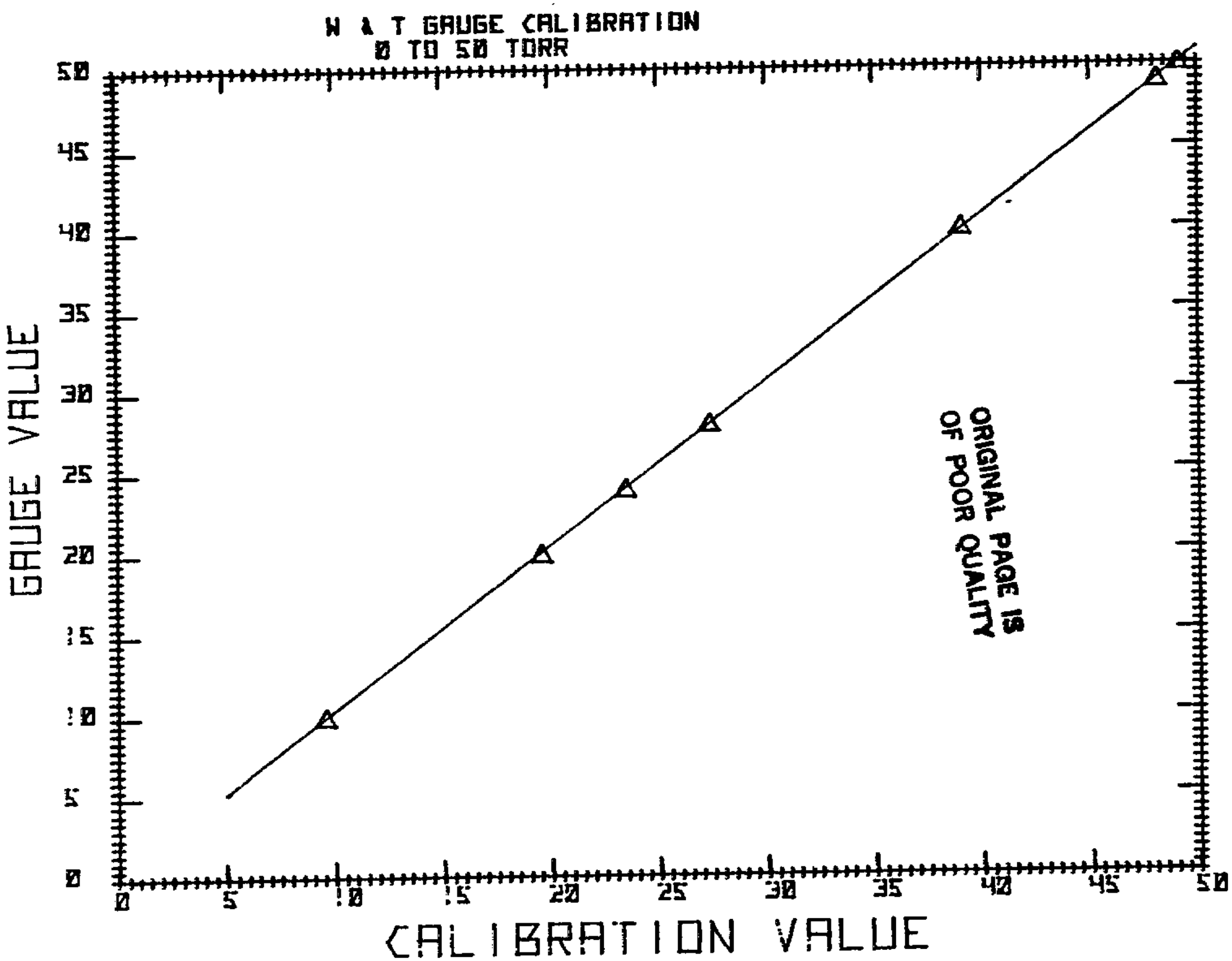

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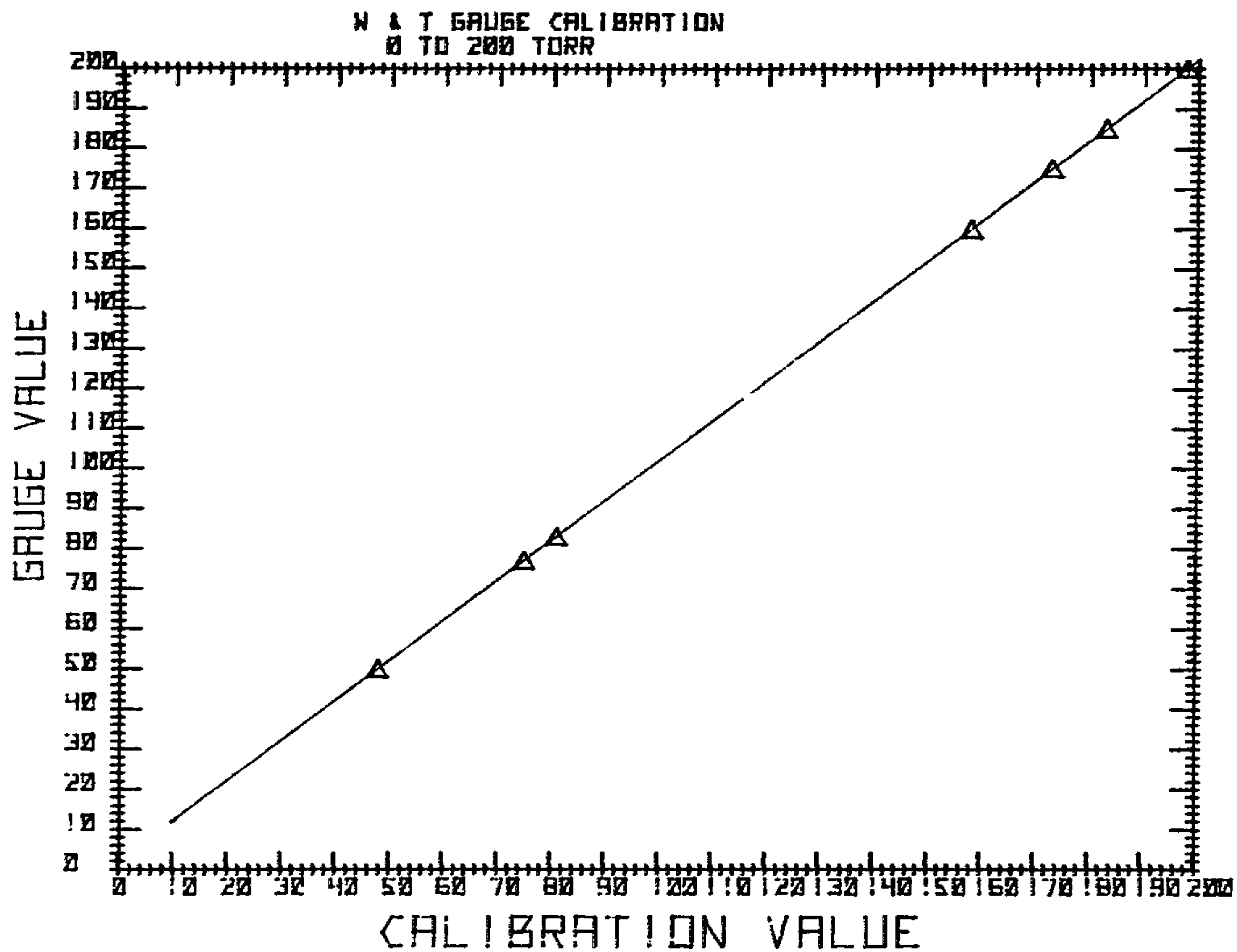

W & T GAUGE CALIBRATION
0 TO 200 TORR
GAUGE VALUE
CALIBRATION VALUE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200

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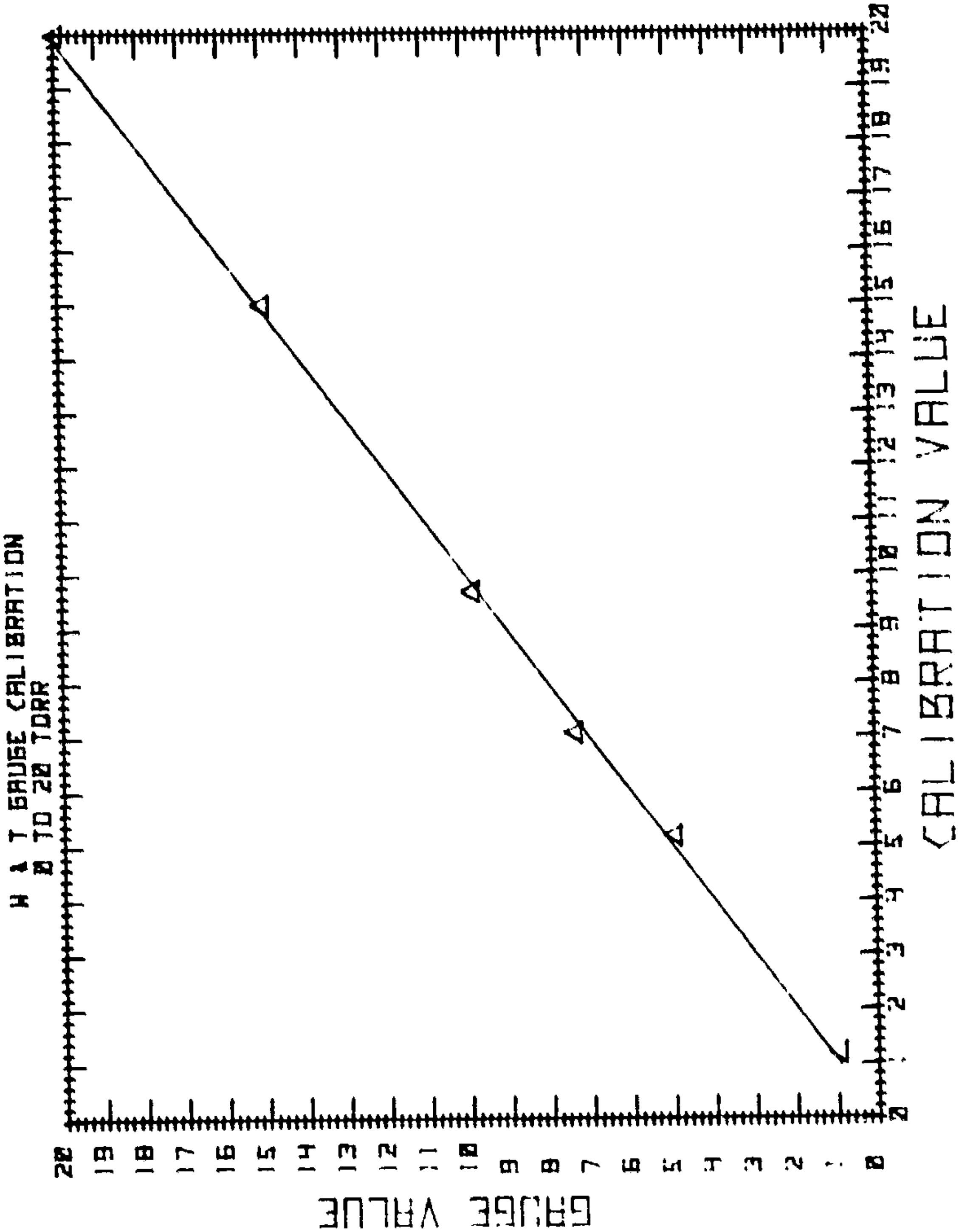

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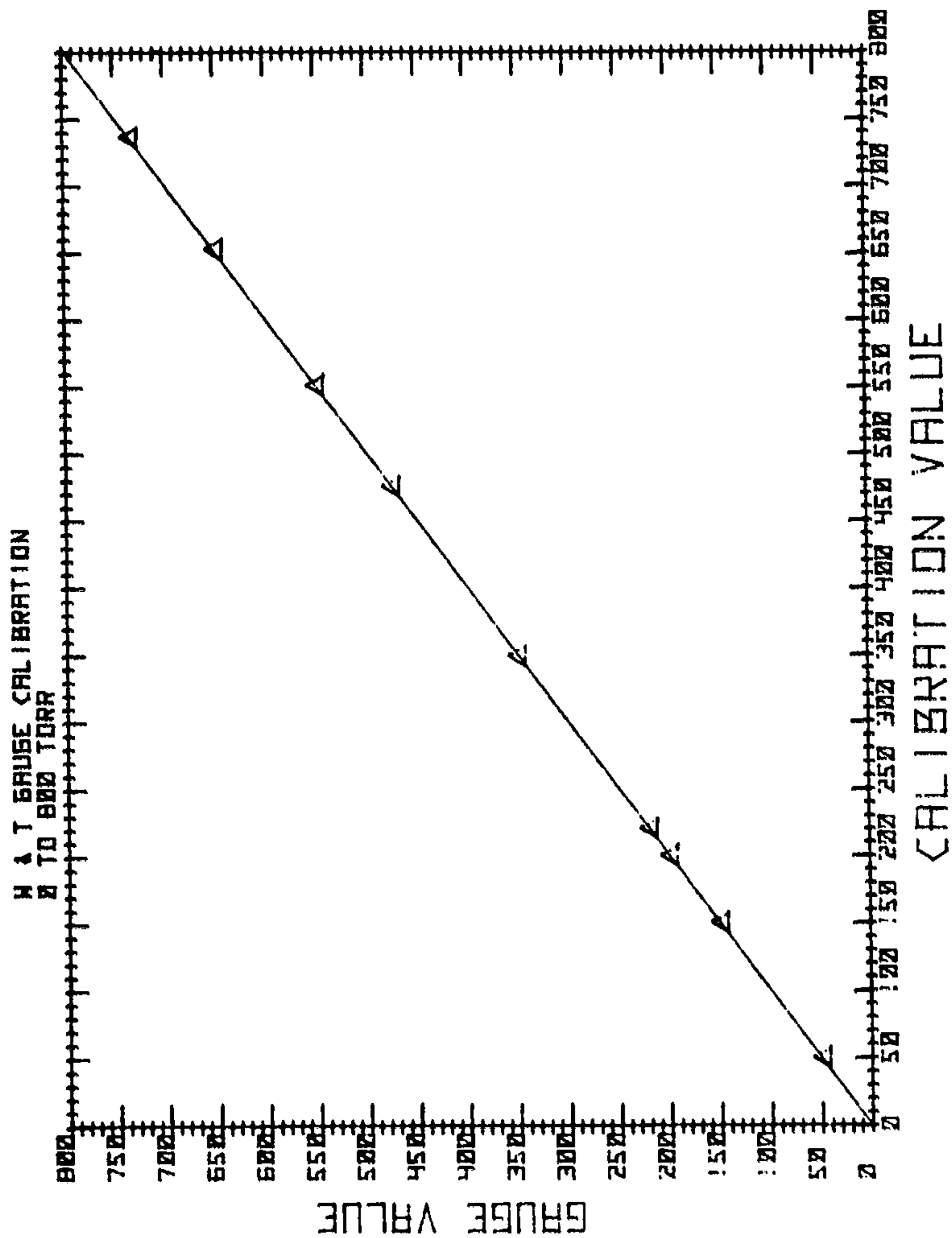

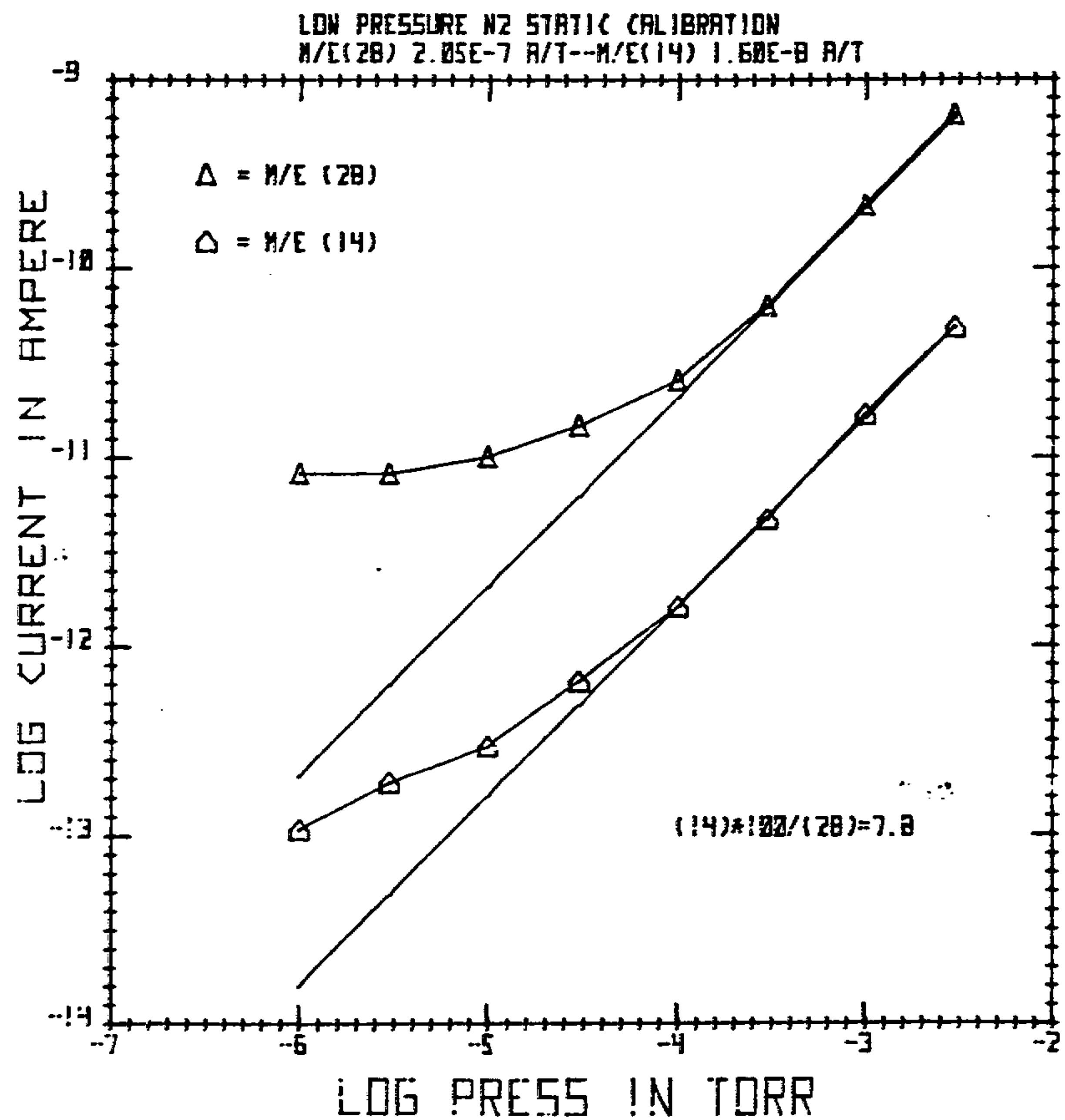

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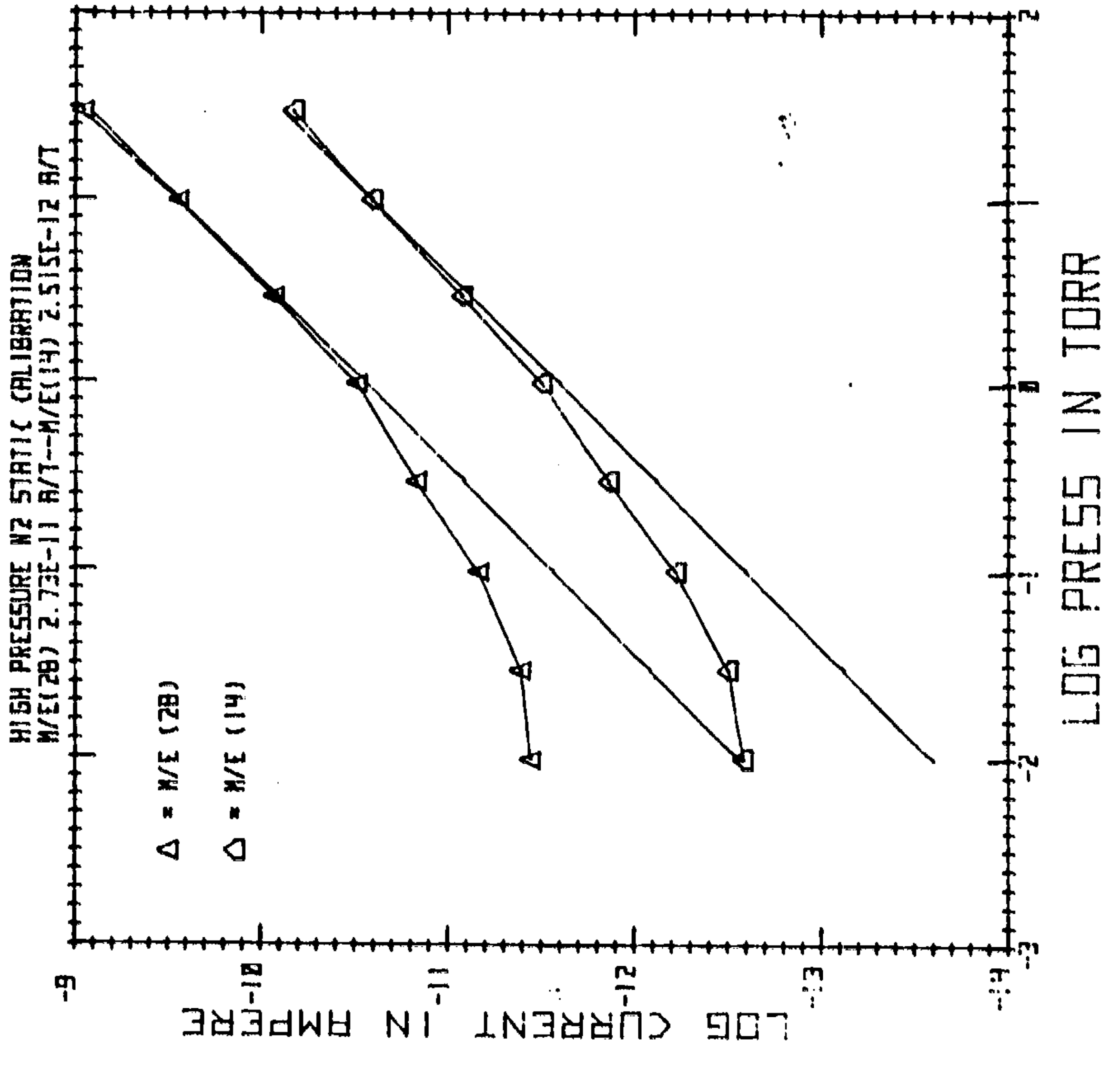

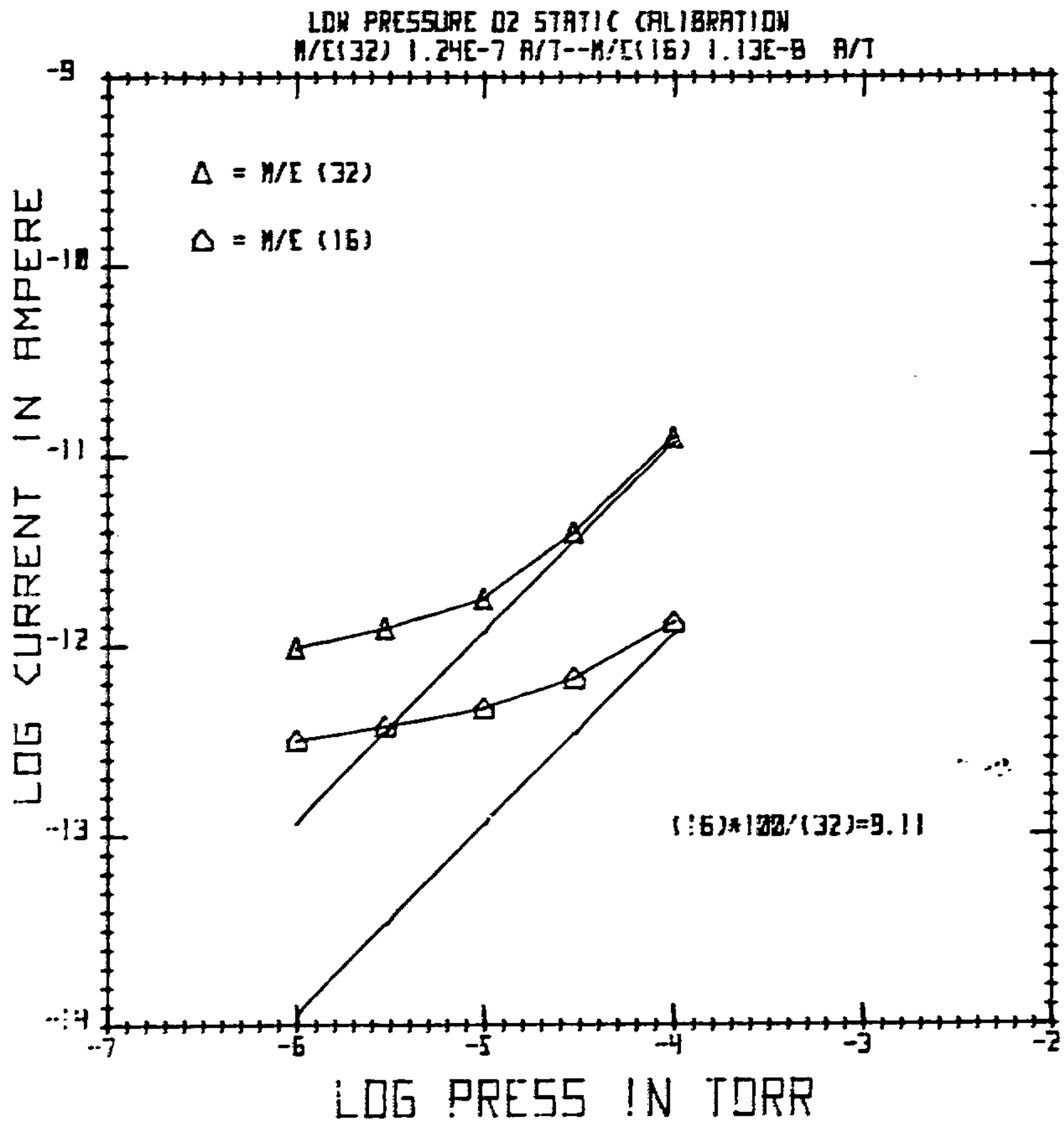

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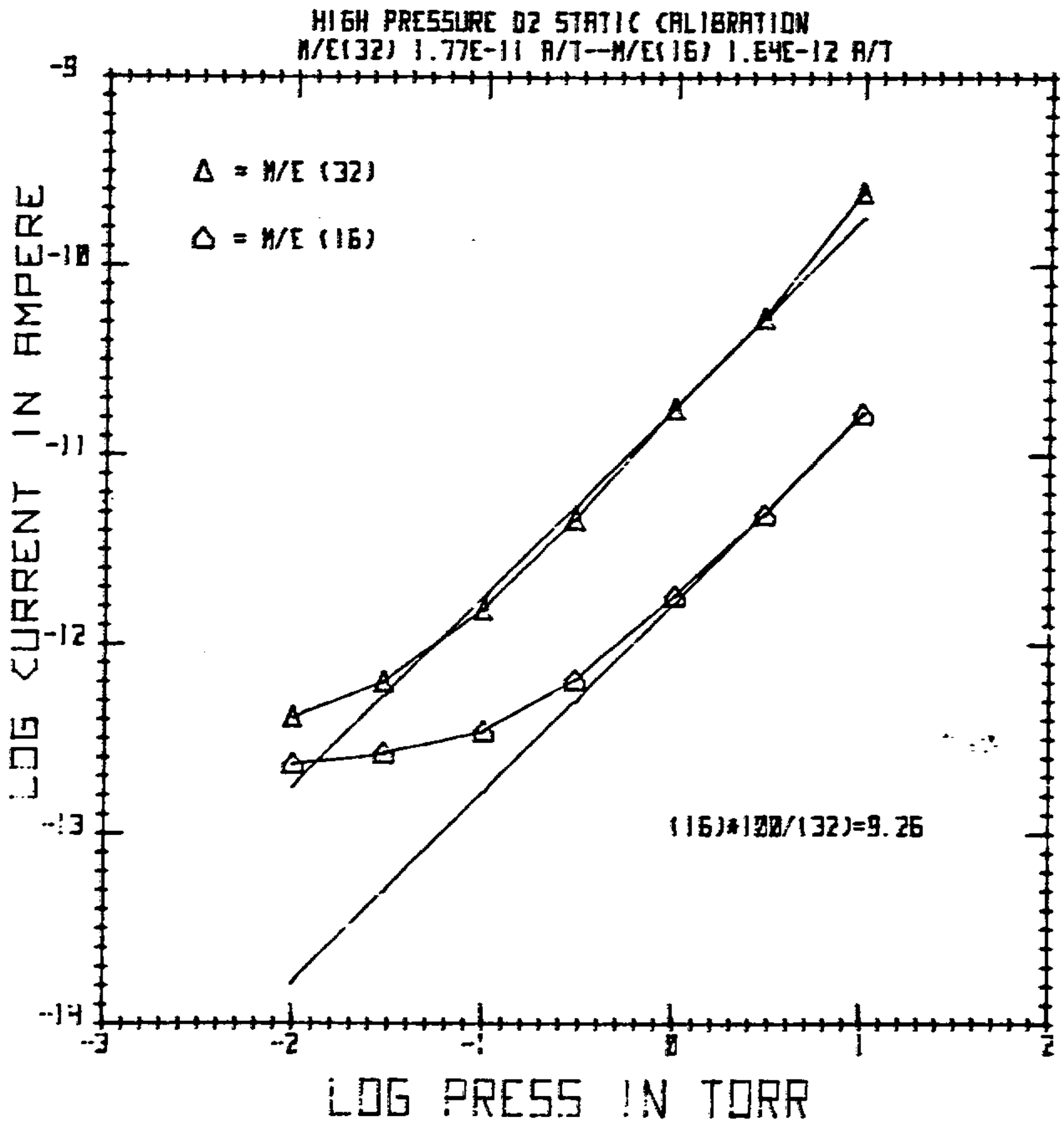

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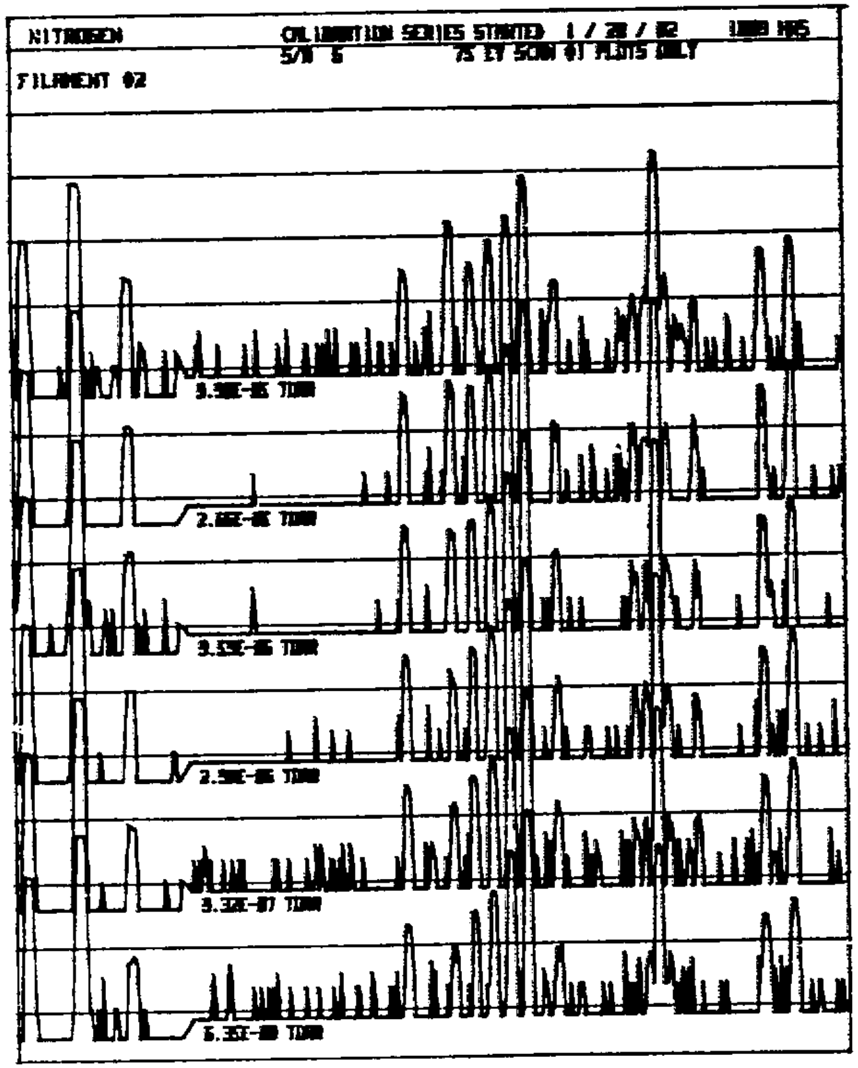
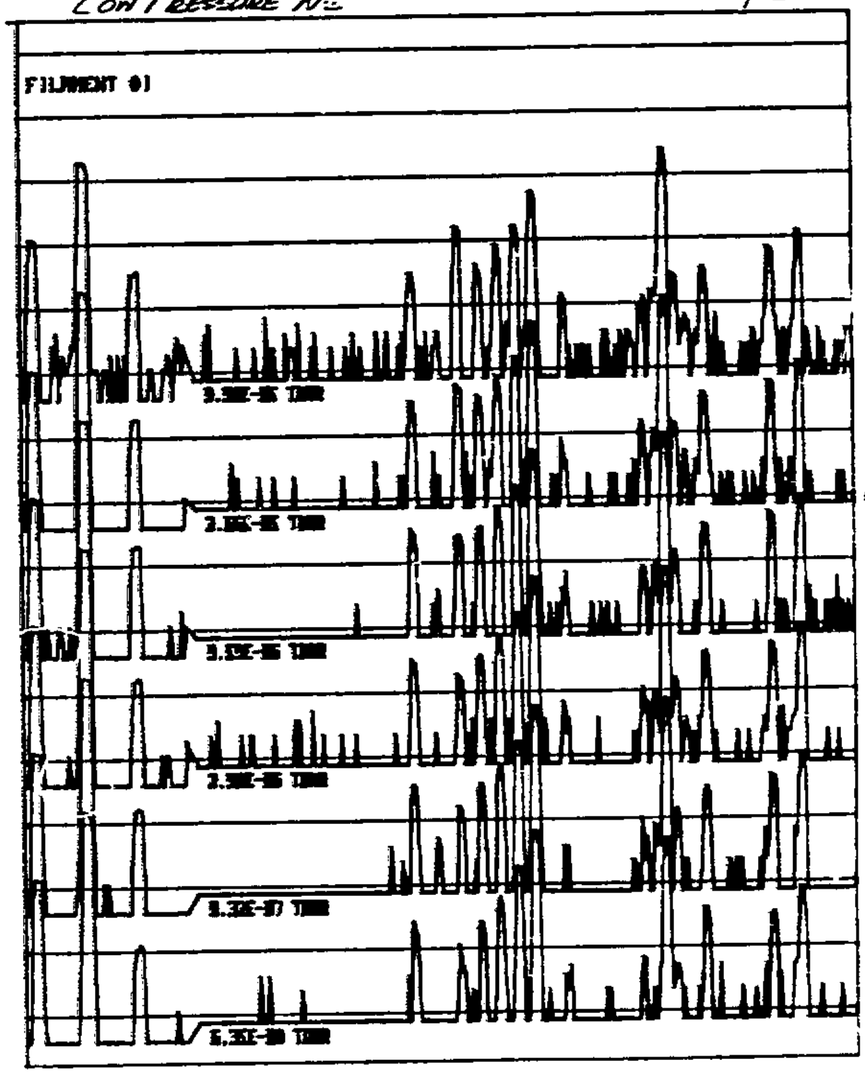
Low Pressure N_2 1 of 2





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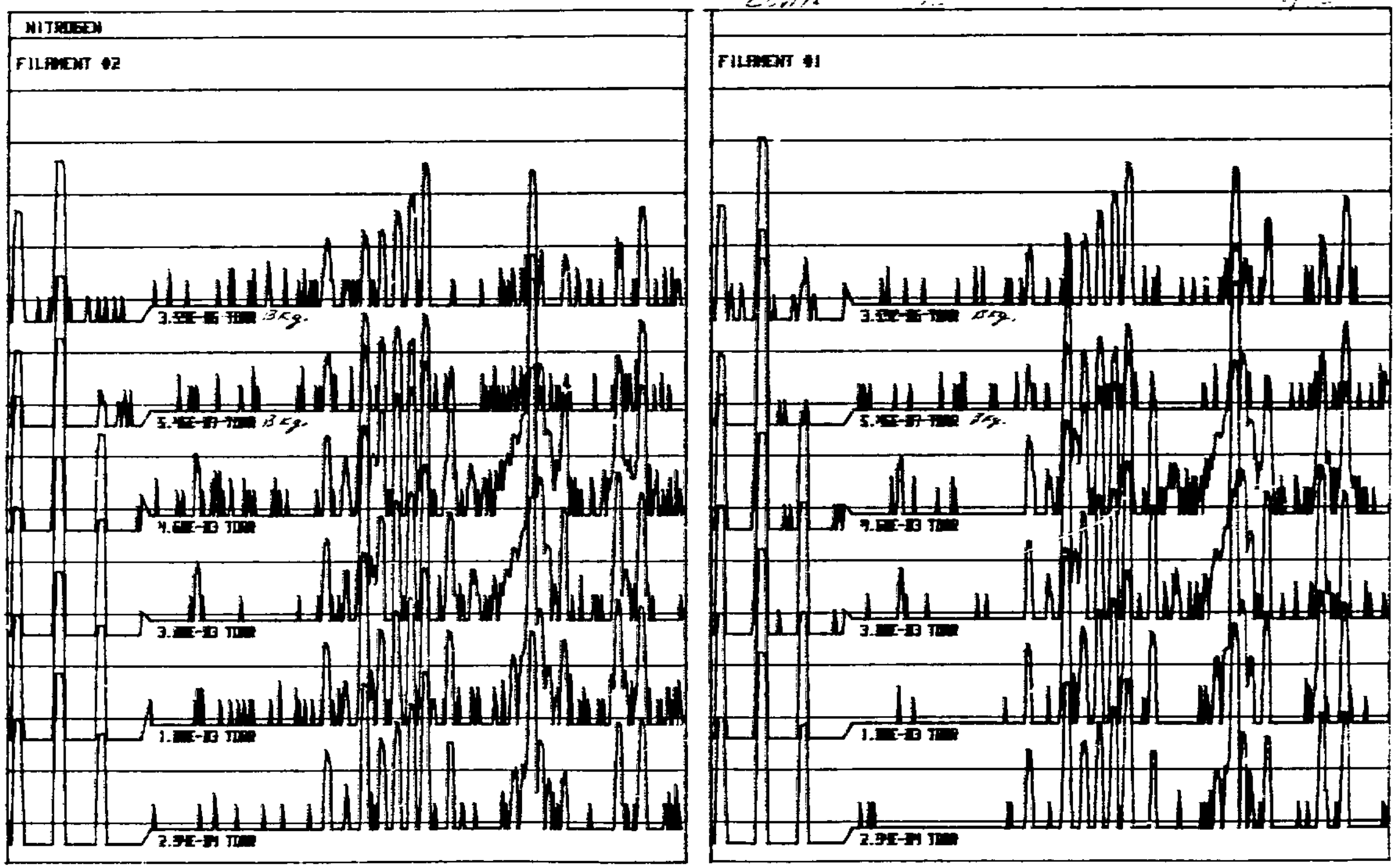
NITROGEN
FILAMENT #2
FILAMENT #1

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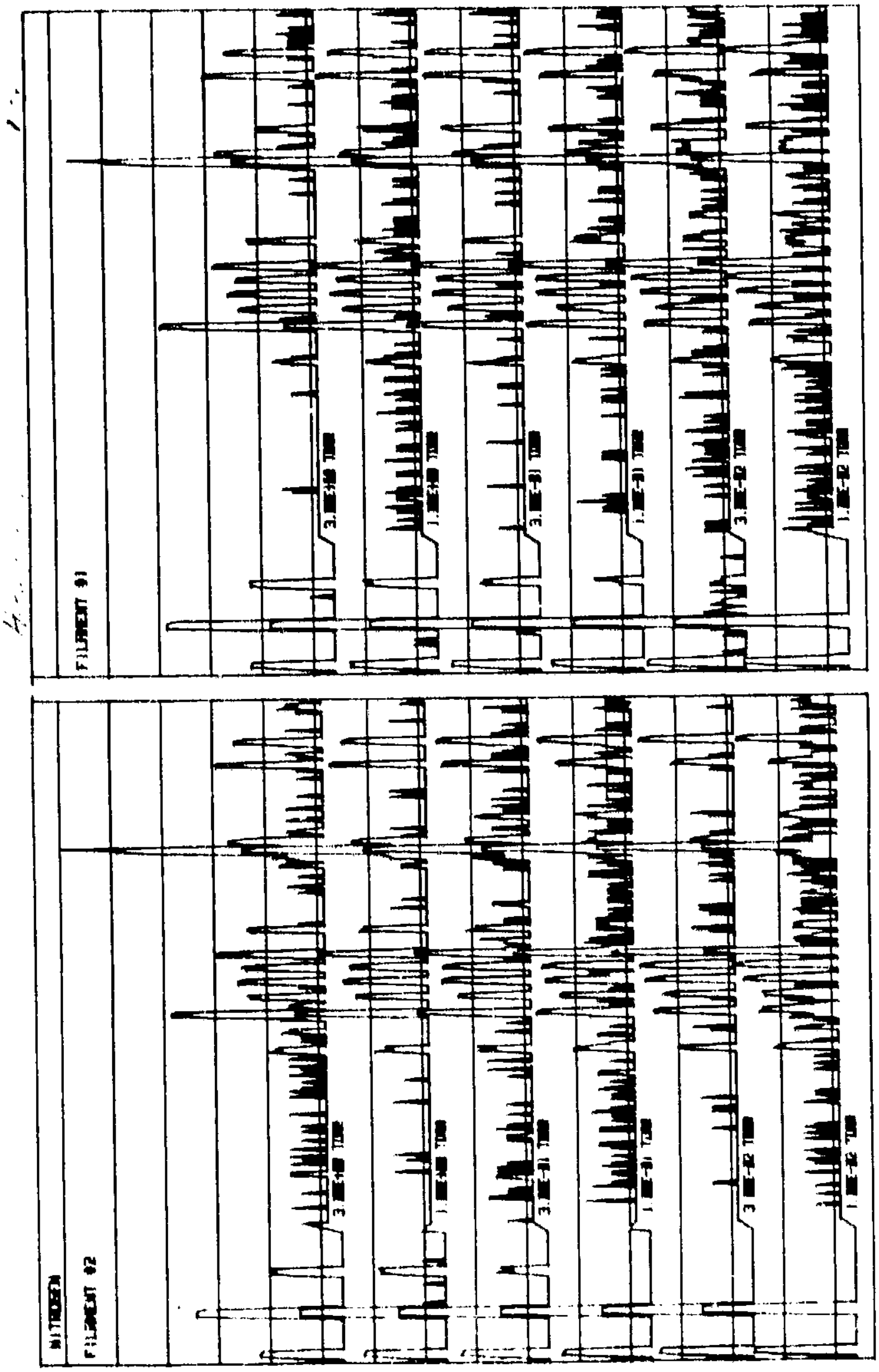

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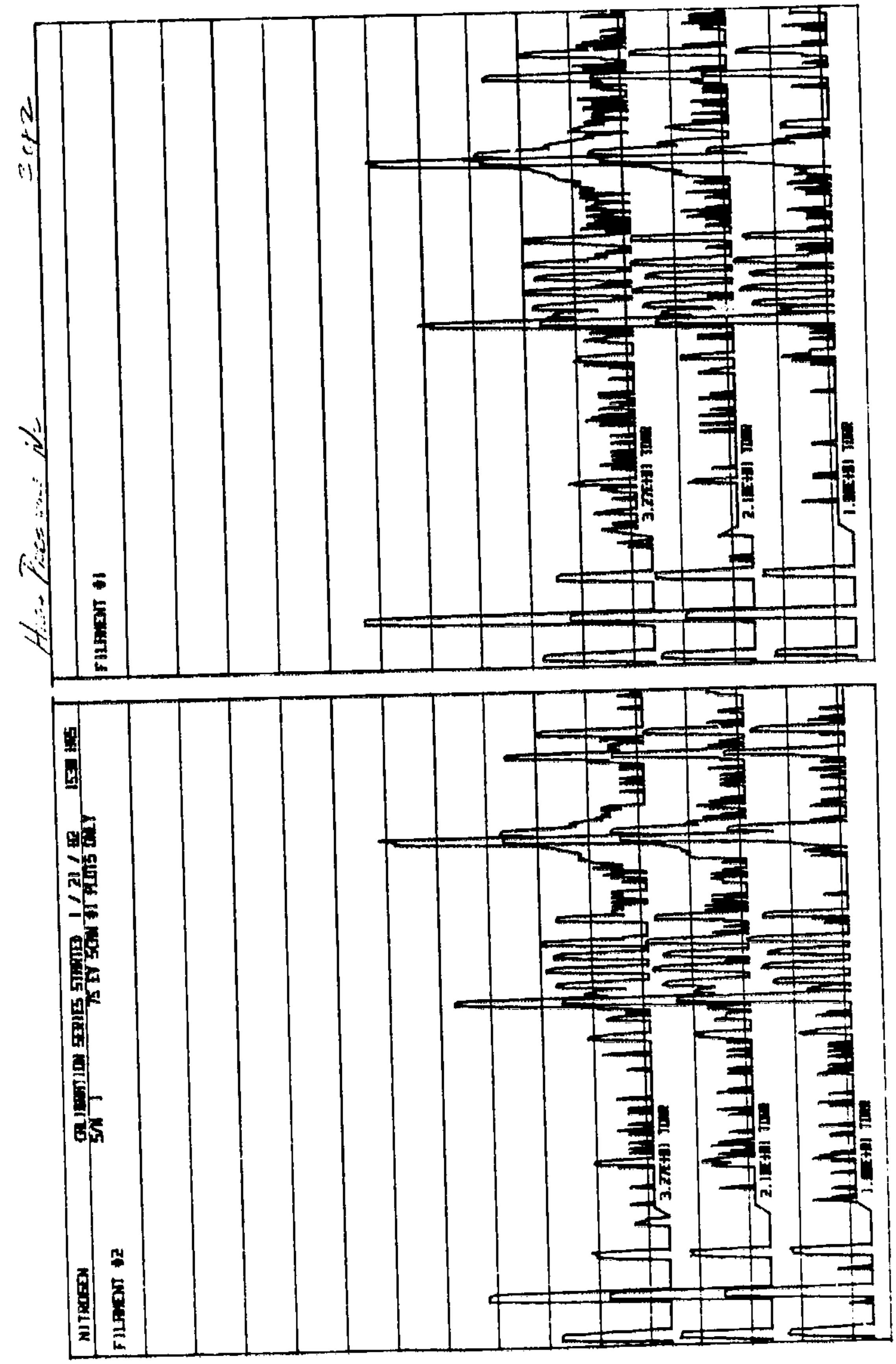

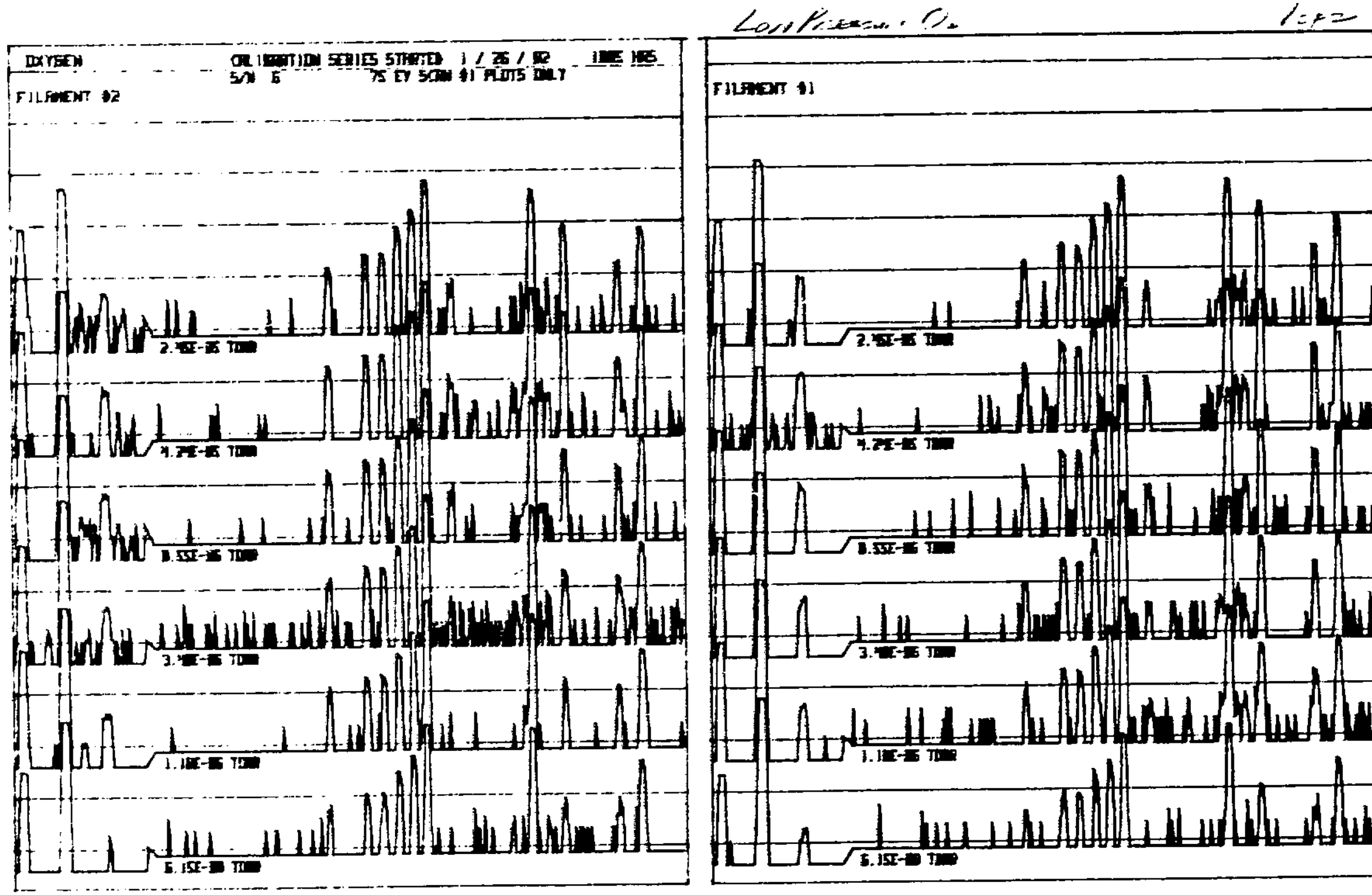
OXYGEN
CALIBRATION SERIES STARTED 1 / 26 / 82
S/N 6
75 EV SCAN #1 PLOTS ONLY
FILAMENT #2
FILAMENT #1

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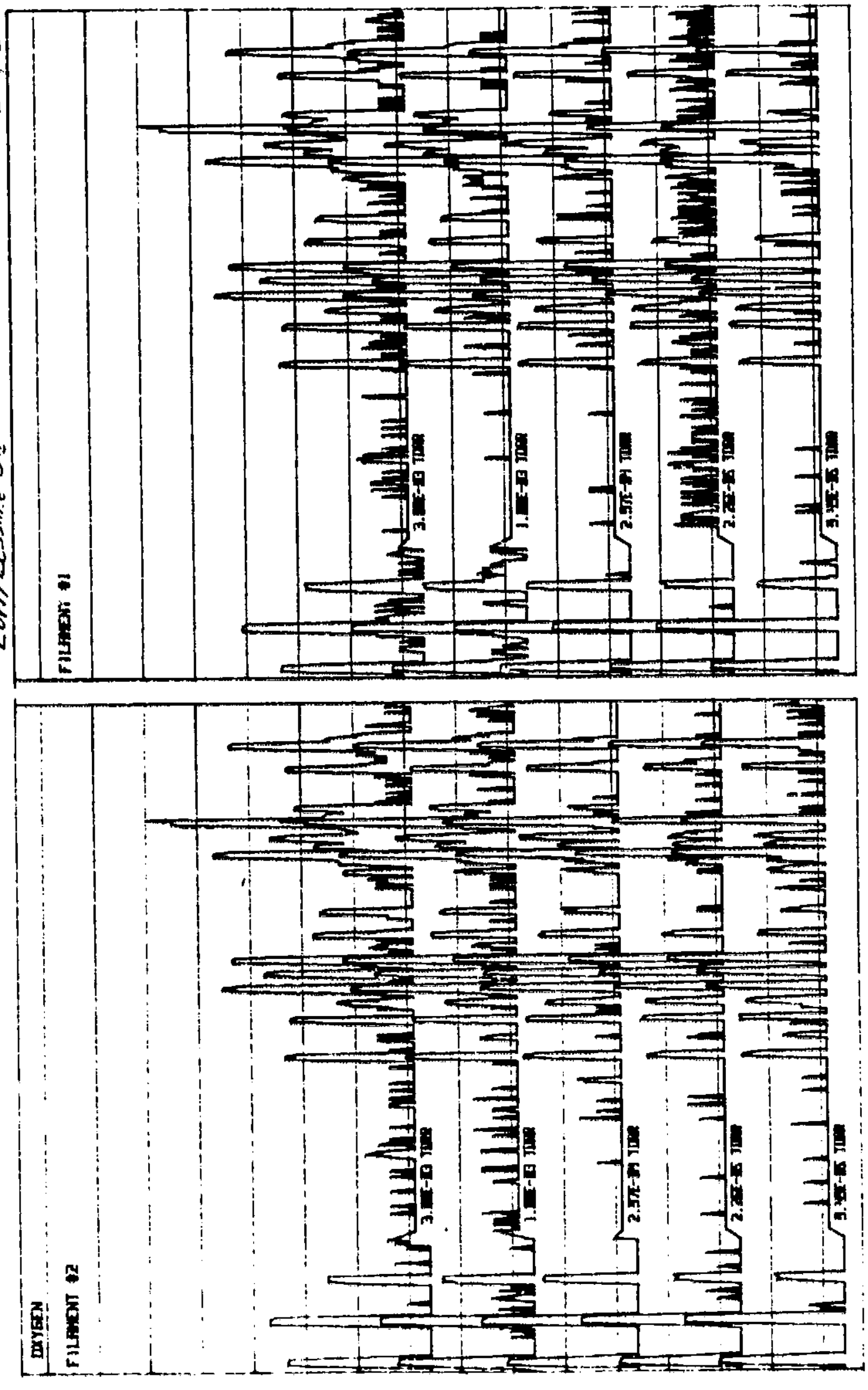
Low Pressure O_2



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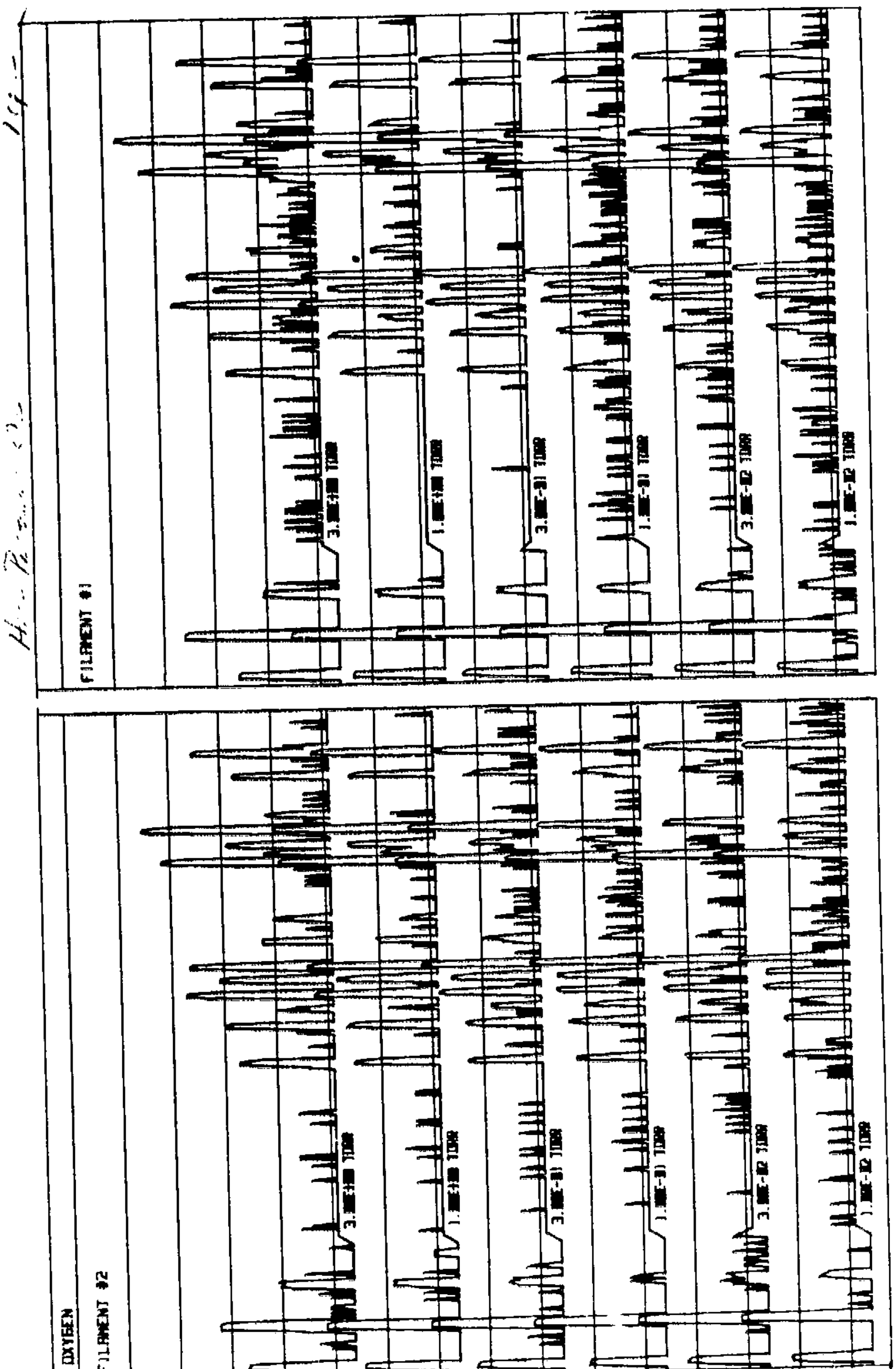

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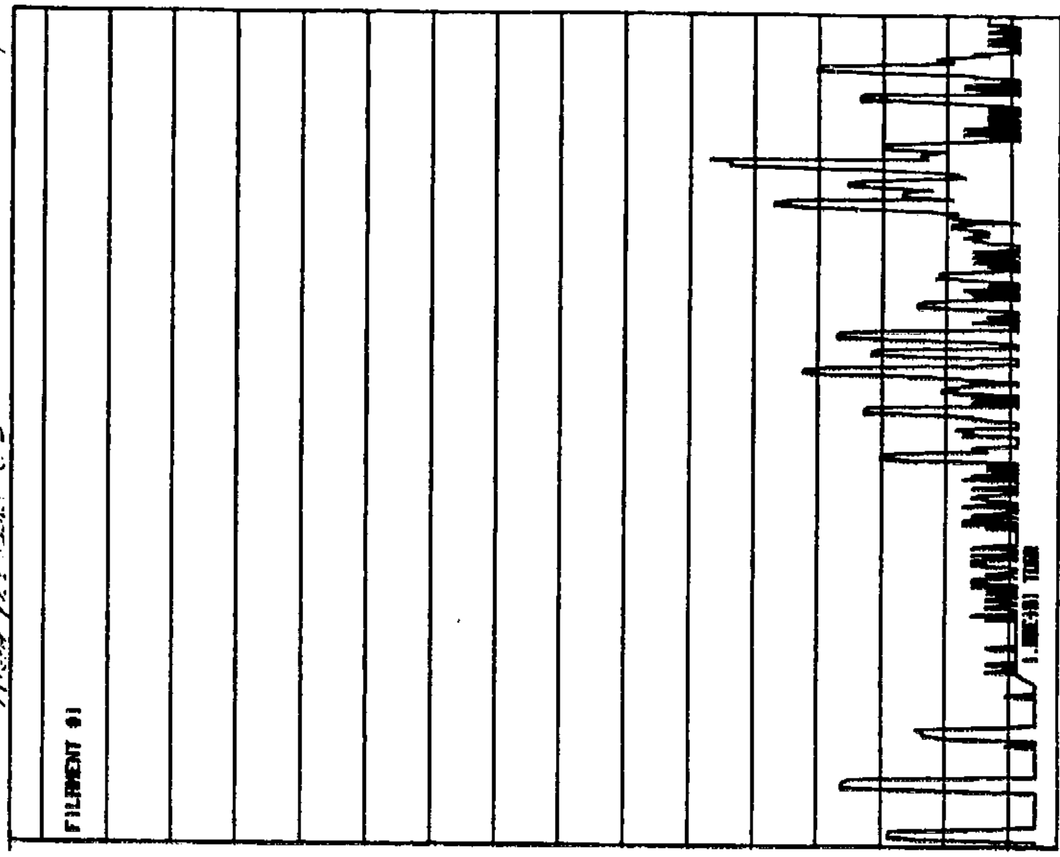
2 of 2

Head Pressure O2



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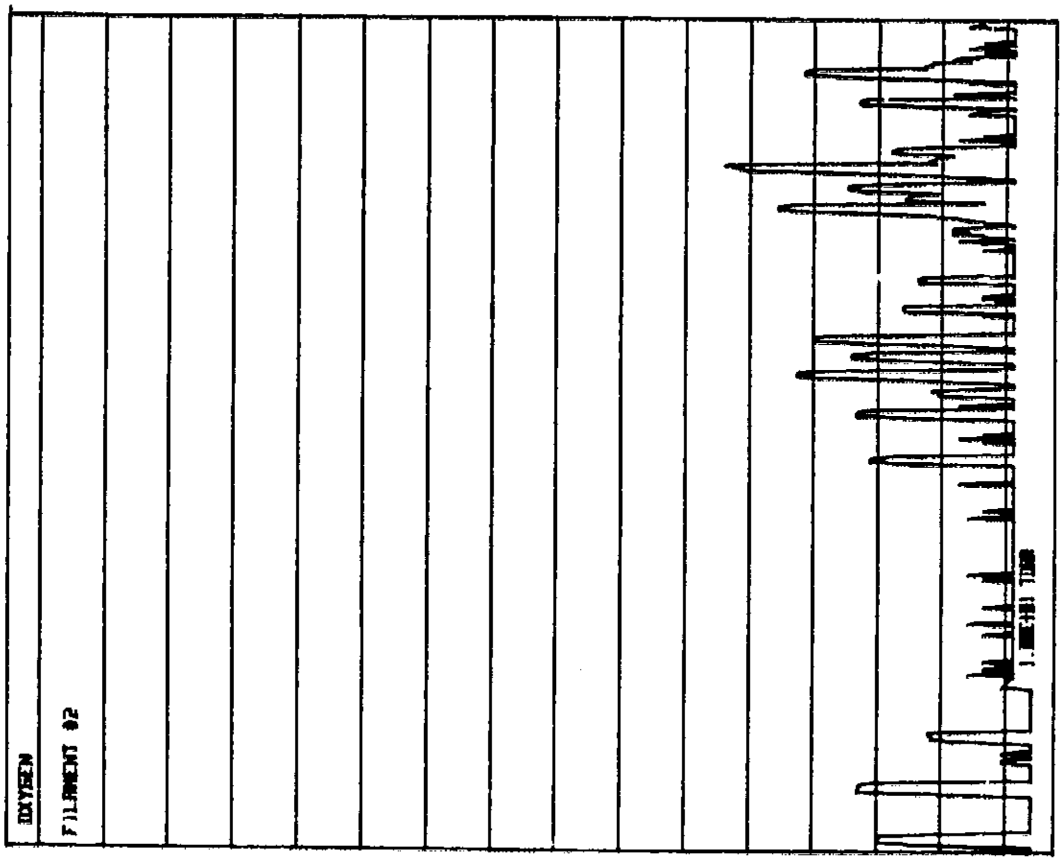
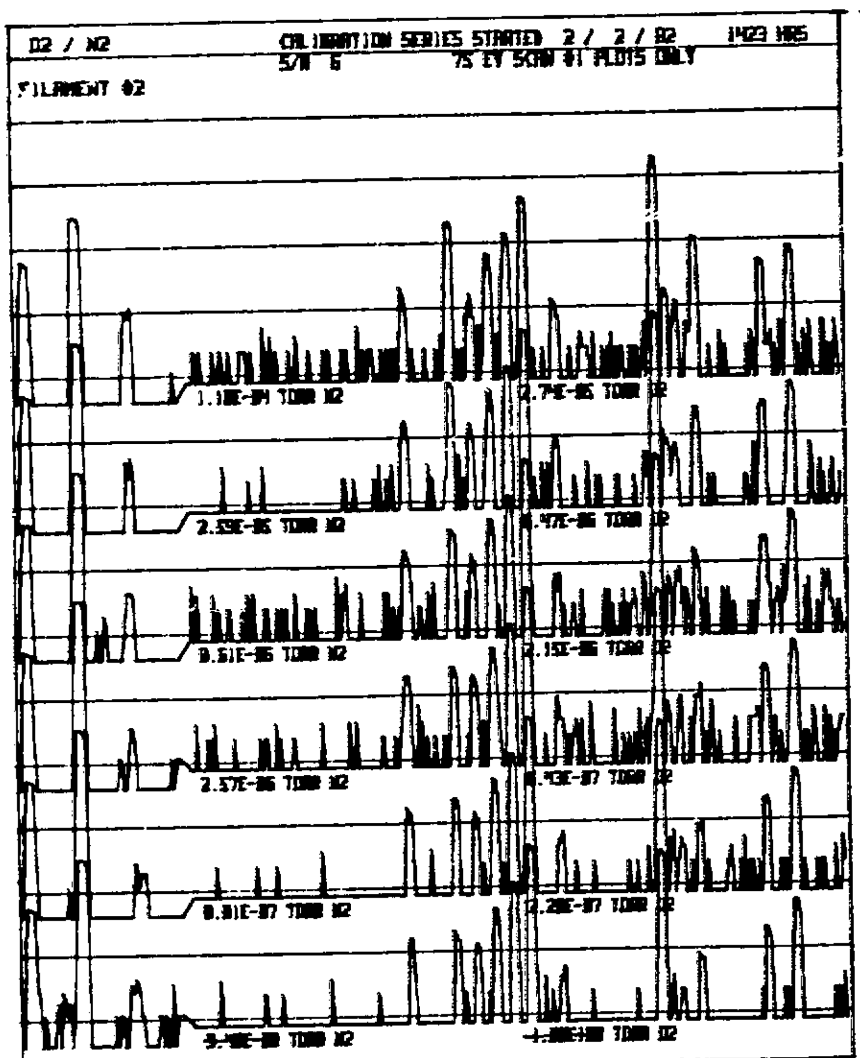
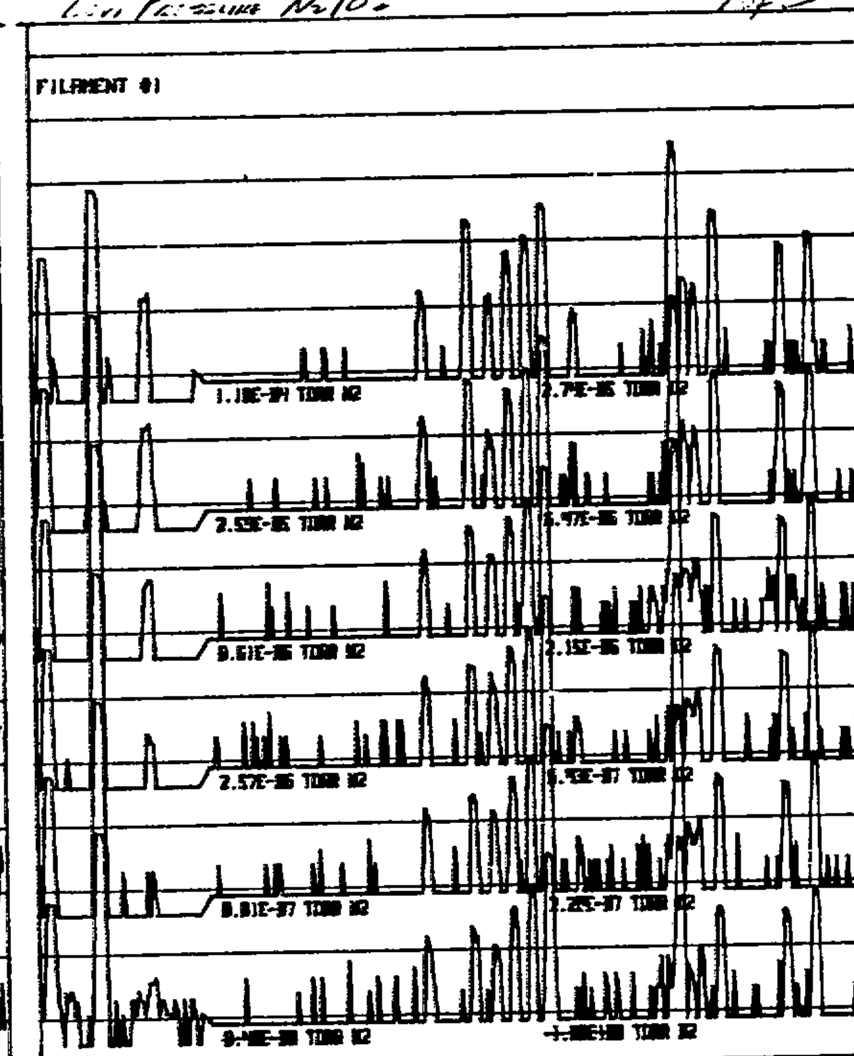
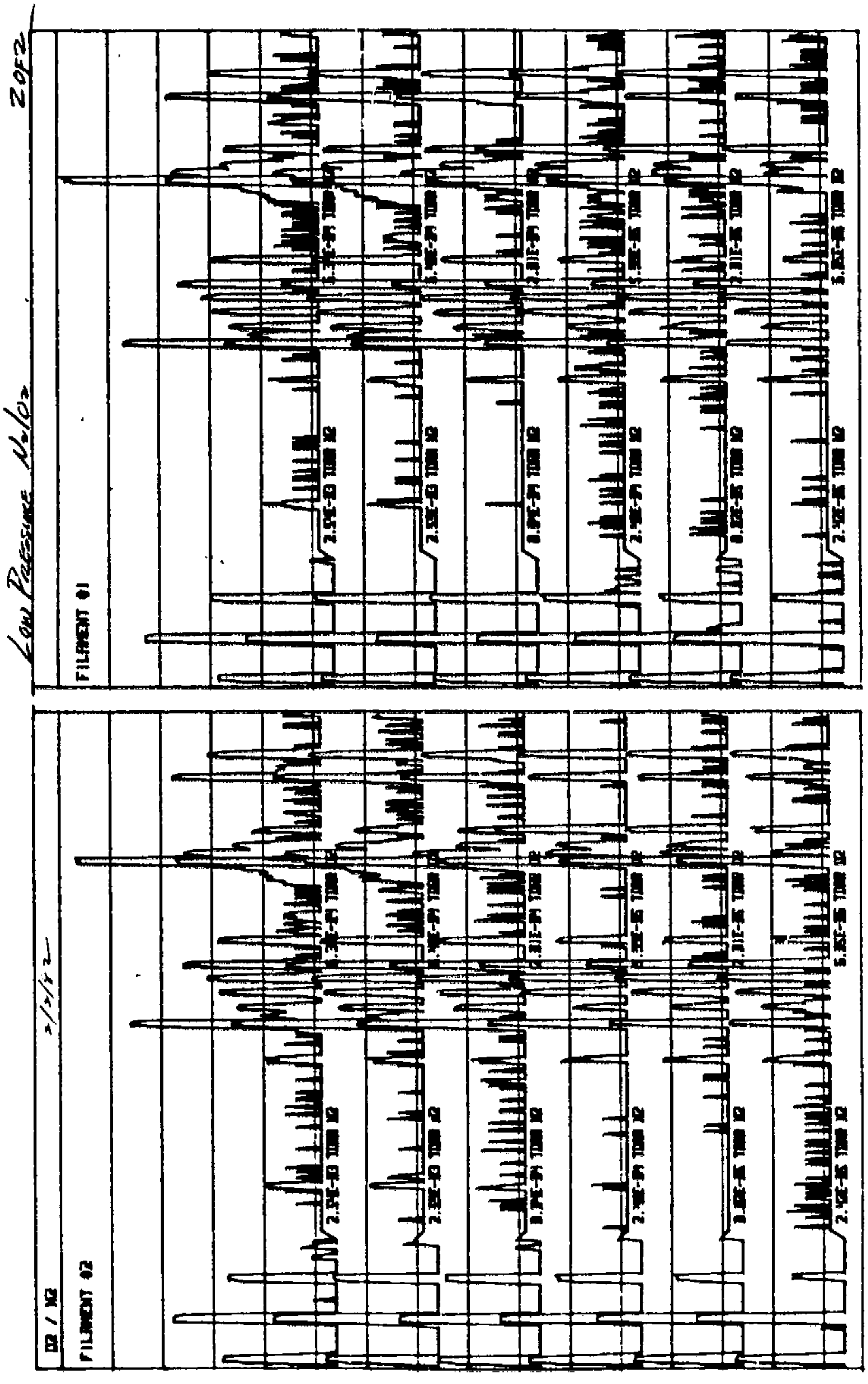




Low Pressure N2/O2




2 OF 2
Low Pressure N2/O2
FILAMENT #1
FILAMENT #2

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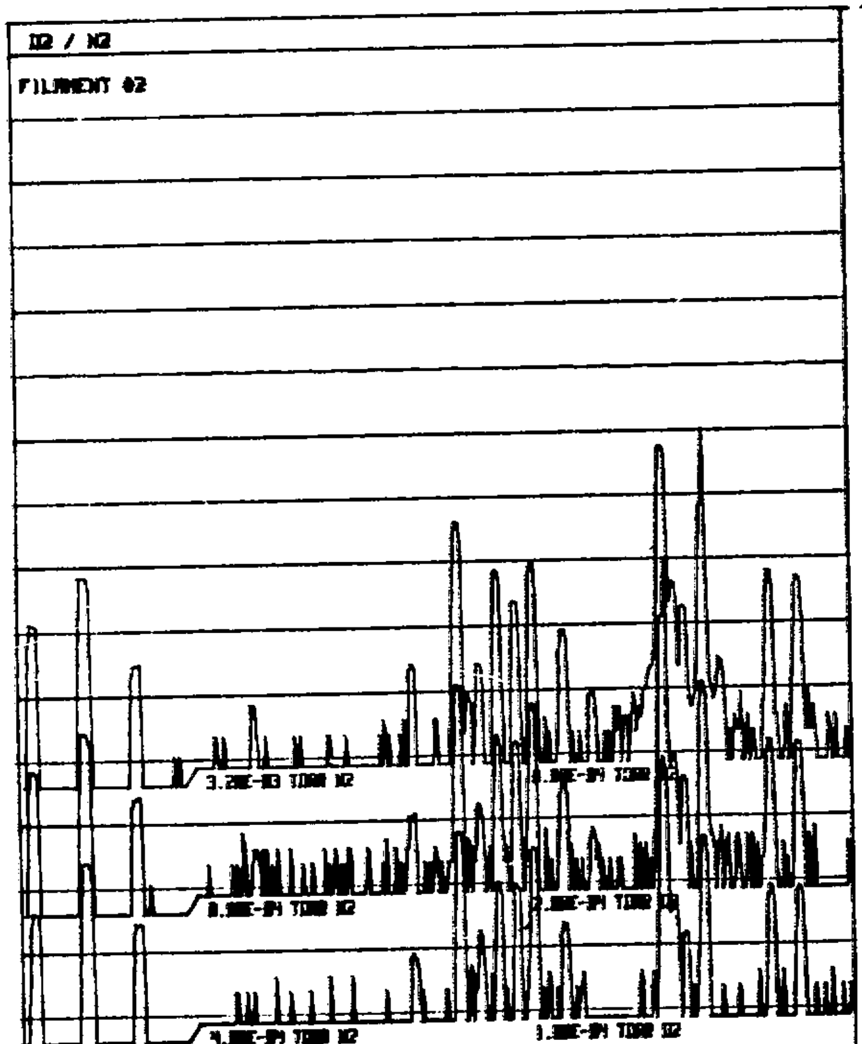
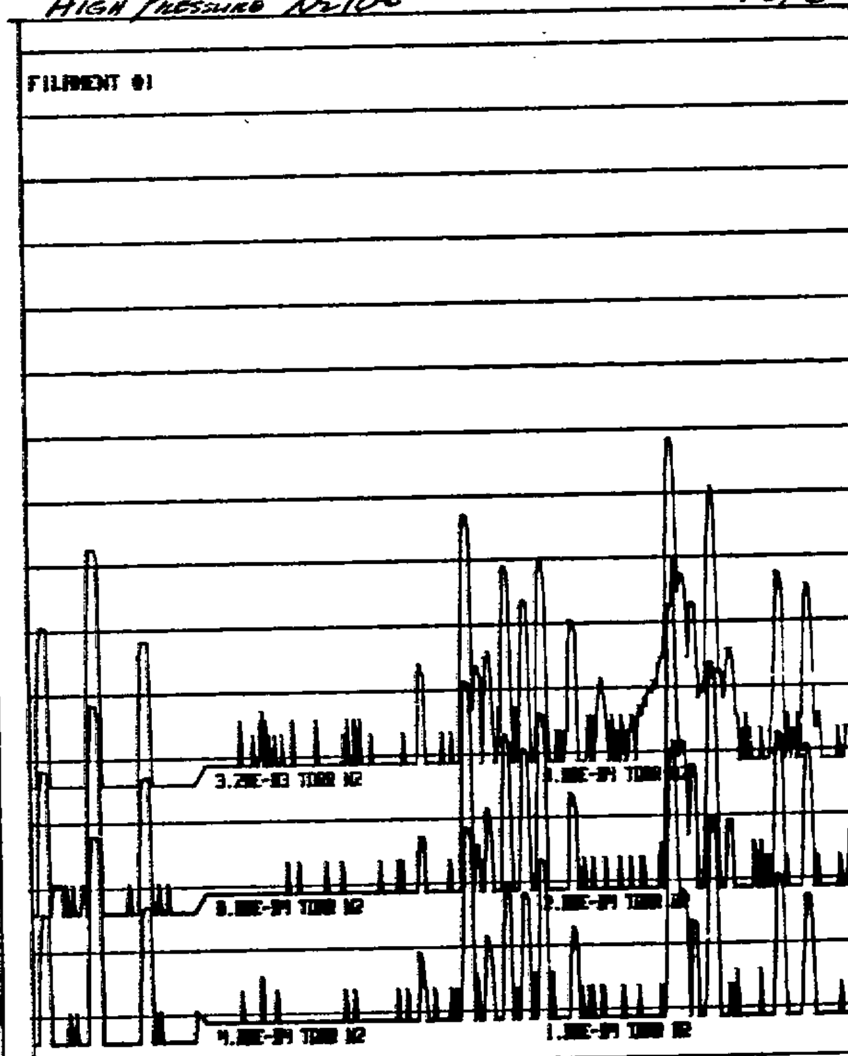
High Pressure N2/Cu 1 of 3





2/4/82
#1

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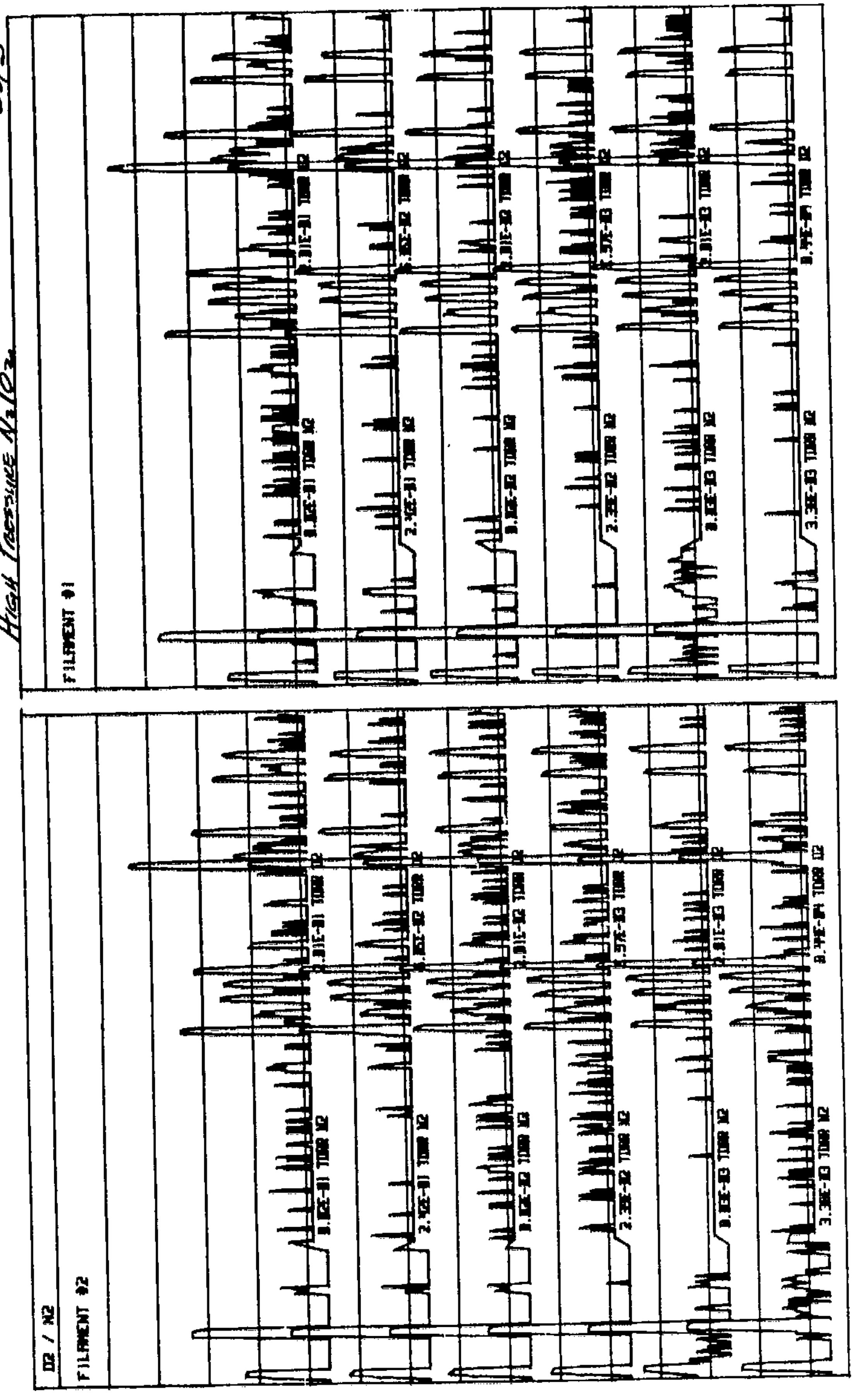
2 of 3

High Pressure N_2/O_2



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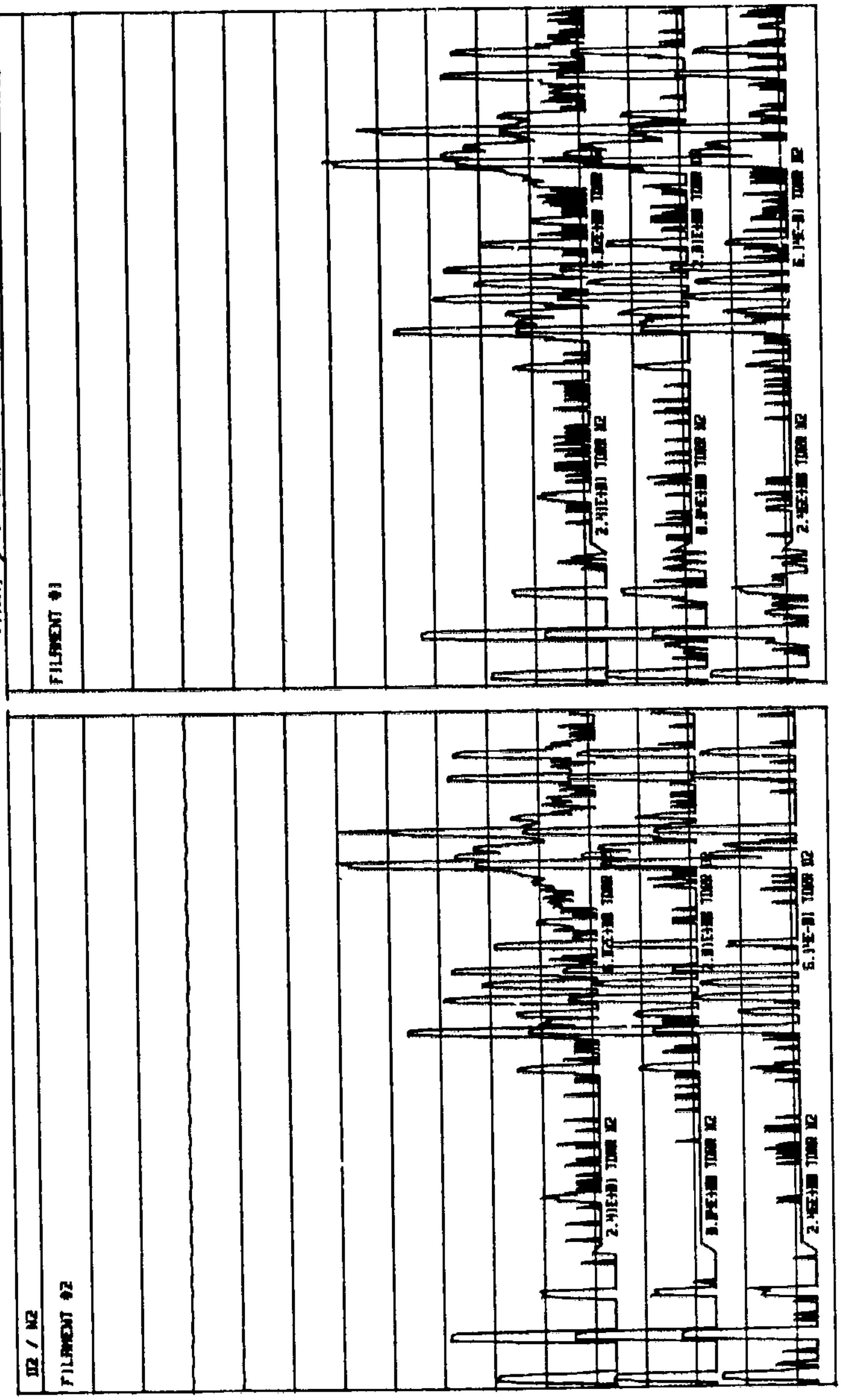
3 of 3

High Pressure N2/O2



2/4/82

SUMS DYNAMIC CALIBRATION
DATA TAPE FORMAT
(200 series)

0	COMMENTS	(72 CHARACTERS)	50	TYPE I	SIZE 50
1	TIME	(SECONDS)	480	TYPE S	SIZE 240
2	INLET P. XDUCER	(VOLTS)	480	TYPE S	SIZE 240
3	BARATRON PRESS.	(TORR)	480	TYPE S	SIZE 240
4	SUMS HSK WORD	(16 BIT DECIMAL)	480	TYPE S	SIZE 240
5	UAMS HSK WORDS	(8 BIT DECIMAL)	2880	TYPE I	SIZE 240,12
6	AMU 28 (6 SAMPLES)	(9 BIT DECIMAL)	1440	TYPE I	SIZE 240,6
7	AMU 14 (6 SAMPLES)	(9 BIT DECIMAL)	1440	TYPE I	SIZE 240,6
8	AMU 28 (2ND HIGHEST)	(9 BIT DECIMAL)	240	TYPE I	SIZE 240
9	AMU 14 (2ND HIGHEST)	(9 BIT DECIMAL)	240	TYPE I	SIZE 240

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DATA COLLECTION TIMING OFFSETS FOR DYNAMIC CALIBRATION

3-23-82

General:

During the SUMS Dynamic Calibration various data is read and stored on tape once every five seconds. One of the values stored is the reading of the HP85 real time clock. This clock is initially set to zero at the beginning of each calibration run. Since the HP85 is a serial machine, timing offsets arise between the time the clock is read, and the time other data is collected. This paper describes these offsets.

Definitions:

Let T_n be the value read from the clock for a given five second group of data. (The "Nth" group)

Note that the clock has an accuracy of ± 1 msec (for the duration of each run) and a resolution of 1 msec. However, due to data tape space restrictions, T_n, as recorded, is rounded off to the nearest 0.1 seconds.

Offset Values:

1) Clock Read = T_n (to 0.1 sec resolution)

2) SUMS HSK Word = T_{n-1} + 1.023 seconds

3) SUMS Inlet Pressure Transducer = T_n + 1.100 seconds - time measured to "TRIGGER" command.

4) Baratron Pressure = T_n + 1.118 seconds

5) Output Next Pressure = T_n + 2.130 seconds

6) Peak Data

For simplicity, assume that the time at which the 9 bit science word for a particular scan step number emerges from SUMS, is the same time as which it was sampled by the UAMS sensor. That is, ignore all delays due to buffering of data by UAMS and SUMS, and the uncertainties introduced due to the asynchronous interface with the PCM. This should introduce an error, conservatively estimated at no greater than 100 msec.

Peak Data continued ...

Given the above, the time offset for a given scan step number (SSN) is:

T_{ssn} (SSN) = -[(226-SSN) * .0135] -.022 seconds

Assuming peak center scan step numbers of:

101 for AMU 28
215 for AMU 14

The offsets will be:

T_{ssn} (101) = -1.7095 seconds (AMU 28)

T_{ssn} (215) = -0.1705 seconds (AMU 14)

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[illegible]

[illegible] #1 [illegible]

Time of 28 AMU Sample, Secs	Ratio of Dynamic Drop To Static Drop	Baratron Pressure at time of 28 AMU Sample, Torr	*Corrected 28 AMU Ion Current Amps	Ratio of Inlet Transducer Pressure to Baratron Pressure
3.411	1.10683	1.6282[illegible]E-04	[illegible].61000E-11	979.867
8.711	1.07943	1.68025E-04	3.70000E-11	1278.82
18.211	1.09246	1.74996E-04	3.90000E-11	920.146
23.411	1.05652	1.80940E-04	3.90000E-11	878.028
28.411	1.04762	1.87165E-04	4.00000E-11	861.785
33.411	1.04969	1.90999E-04	4.09000E-11	842.634
38.411	1.05145	1.95341E-04	4.19000E-11	823.9
43.411	1.04321	2.01583E-04	4.29000E-11	788.823
48.211	1.03224	2.08474E-04	4.39000E-11	772.016
53.311	1.02376	2.14511E-04	4.48000E-11	744.86
58.211	1.03875	2.20852E-04	4.68000E-11	728.876
63.311	1.00923	2.27312E-04	4.68000E-11	702.498
68.411	1.02229	2.33519E-04	4.87000E-11	692.65
73.411	1.02079	2.38665E-04	4.97000E-11	670.435
78.411	1.00258	2.47888E-04	5.07000E-11	640.919
83.311	0.98626	2.56962E-04	5.17000E-11	625.43
88.111	0.982745	2.62869E-04	5.27000E-11	612.509
93.411	0.982026	2.67554E-04	5.36000E-11	605.682
98.211	0.98087	2.72867E-04	5.46000E-11	585.457
103.411	0.960237	2.83835E-04	5.56000E-11	561.08
108.311	0.972111	2.89949E-04	5.75000E-11	564.186
113.211	0.973899	2.94450E-04	5.85000E-11	539.185
118.211	0.985272	3.07967E-04	6.19000E-11	516.47
123.211	1.01363	3.18211E-04	6.58000E-11	506.837
128.211	1.0205	3.25676E-04	6.78000E-11	328.2
133.211	0.992071	3.35009E-04	6.78000E-11	479.135
138.111	1.02135	3.44123E-04	7.17000E-11	466.256
143.211	0.968335	3.52839E-04	6.97000E-11	456.722
148.211	0.981931	3.67423E-04	7.36000E-11	284.628
153.111	0.964935	3.84055E-04	7.56000E-11	421.099
158.211	1.00927	3.86125E-04	7.95000E-11	423.836
163.311	1.00026	3.89602E-04	7.95000E-11	274.425
168.211	0.986526	4.04966E-04	8.15000E-11	390.164
173.211	0.98526	4.24890E-04	8.54000E-11	375.171
178.311	0.961652	4.45006E-04	8.73000E-11	355.382
183.211	0.937078	4.67138E-04	8.93000E-11	340.183
188.211	0.985801	4.84825E-04	9.75000E-11	331.065
193.111	0.928641	5.14667E-04	9.75000E-11	298.08
198.111	0.887394	5.49637E-04	9.95000E-11	294.685
203.111	0.957417	5.55518E-04	1.08500E-10	291.889
208.311	0.954244	5.67639E-04	1.10500E-10	281.556
213.211	0.949807	5.90935E-04	1.14500E-10	268.085
218.111	0.964488	6.27682E-04	1.23500E-10	248.513
223.211	0.931118	6.71236E-04	1.27500E-10	157.238
228.111	0.913222	7.05861E-04	1.31500E-10	224.245

* Corrected for background by subtracting 3.5 E-12 Amps

[illegible]	0.898299	7.61242E-04	1.39500E-10	134.779
238.111	0.852707	8.19190E-04	1.42500E-10	194.639
243.211	0.890825	8.50170E-04	1.54500E-10	188.127
248.111	0.900737	8.84352E-04	1.62500E-10	179.156
253.211	0.894836	9.34000E-04	1.70500E-10	168.84
258.111	0.889272	1.00600E-03	1.82500E-10	153.126
263.011	0.870034	1.09022E-03	1.93500E-10	144.637
268.011	0.86365	1.16639E-03	2.05500E-10	133.57
273.011	0.860306	1.26209E-03	2.21500E-10	82.3734
278.011	0.840329	1.35626E-03	2.32500E-10	115.867
283.011	0.866562	1.46228E-03	2.58500E-10	70.6394
288.111	0.837217	1.60136E-03	2.73500E-10	96.8057
293.011	0.835204	1.74608E-03	2.97500E-10	88.7974
298.011	0.835093	1.88132E-03	3.20500E-10	83.8733
303.111	0.853036	2.01989E-03	3.51500E-10	76.8922
308.211	0.83078	2.21561E-03	3.75500E-10	69.6288
313.211	0.820083	2.42981E-03	4.06500E-10	63.886
318.211	0.791303	2.71022E-03	4.37500E-10	55.654
323.111	0.778875	2.99892E-03	4.76500E-10	52.5984
328.111	0.815549	3.21869E-03	5.35500E-10	48.1868
333.111	0.815283	3.50233E-03	5.82500E-10	44.4628
338.111	0.801541	3.84981E-03	6.29500E-10	39.7333
343.011	0.790576	4.28764E-03	6.91500E-10	35.787
348.011	0.779579	4.74426E-03	7.54500E-10	32.5734
353.011	0.761998	5.35550E-03	8.32500E-10	27.9123
358.011	0.764126	6.03983E-03	9.41500E-10	25.8182
363.011	0.795992	6.62941E-03	1.07650E-09	23.0762
368.011	0.0939665	7.43381E-03	1.42500E-10	20.522
373.111	0.0110205	8.31778E-03	1.87000E-11	18.5035
378.311	3.97761E-03	9.11967E-03	7.40000E-12	17.145
387.911	1.70246E-03	0.0112006	3.89000E-12	18.2152
393.111	8.63274	0.0123852	3.40000E-12	12.5848
398.111	6.88854	0.0138321	3.03000E-12	10.8345
403.111	5.0406	0.0165948	2.66000E-12	8.6997
408.111	4.10607	0.0194527	2.54000E-12	7.977
413.111	3.40597	0.0223433	2.42000E-12	8.70052
418.111	2.81686	0.0256764	2.30000E-12	6.12186
423.111	2.41086	0.0284352	2.18000E-12	5.27038
428.011	2.11866	0.0323569	2.18000E-12	6.31462
433.011	1.82541	0.0375549	2.18000E-12	5.18878
438.111	1.50293	0.042893	2.05000E-12	3.6879
443.011	1.50563	0.0455314	2.18000E-12	4.58108
447.911	1.35519	0.0505858	2.18000E-12	3.94189
453.011	1.24237	0.0582169	2.30000E-12	3.49062
457.911	1.13233	0.0672069	2.42000E-12	2.92235
462.911	1.04125	0.0767097	2.54000E-12	2.71991
468.011	1.04615	0.0838652	2.79000E-12	3.05052
473.211	1.02545	0.092918	3.03000E-12	2.22334
483.111	1.03746	0.106694	3.52000E-12	1.96919
488.011	0.813047	0.145427	3.76000E-12	1.3828
492.911	0.672049	0.198866	4.25000E-12	1.34335
497.911	0.849991	0.20015	5.41000E-12	1.37817
502.811	0.920151	0.209837	6.14000E-12	1.42838
507.811	0.938106	0.231297	6.90000E-12	1.38494
512.811	1.02053	0.24343	7.90000E-12	1.28133
517.811	0.971992	0.268527	8.30000E-12	1.32095
522.911	0.929114	0.307996	9.10000E-12	1.13739
528.011	0.870098	0.372256	1.03000E-11	1.02955
533.011	0.849943	0.436581	1.18000E-11	1.07177
537.911	0.896957	0.483816	1.38000E-11	1.03756
542.811	0.890335	0.558054	1.58000E-11	0.983321
547.911	0.908422	0.630023	1.82000E-11	1.07177
552.911	0.928412	0.701136	2.07000E-11	1.00205
557.811	0.900595	0.806594	2.31000E-11	0.993237

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562.011	0.909422	0.885212	2.50000E-11	1.00002
567.911	0.967179	0.949399	2.92000E-11	1.00736
572.911	0.850643	1.1534	3.12000E-11	0.997941
577.011	0.860427	1.35226	3.70000E-11	0.982891
582.811	0.92482	1.42472	4.19000E-11	1.02581
588.011	0.929596	1.54983	4.50000E-11	1.03167
592.911	0.908732	1.71797	4.97000E-11	1.00309
597.811	0.872414	1.96808	5.46000E-11	0.959044
602.811	0.94475	2.25676	6.78000E-11	0.972675
607.811	0.930969	2.48608	7.36000E-11	1.00265
612.811	0.960959	2.72919	8.34000E-11	0.991241
617.711	0.941819	2.98165	8.93000E-11	1.0195
622.711	0.949972	3.2275	9.75000E-11	1.00244
627.811	0.955505	3.50501	1.06500E-10	1.01998
632.811	0.946391	3.73813	1.12500E-10	1.01797
637.711	0.975188	3.98246	1.23500E-10	1.00589
642.711	0.982433	4.20916	1.31500E-10	1.01159
647.711	0.986525	4.44671	1.39500E-10	1.0209
652.811	0.965534	4.64109	1.42500E-10	1.0239
657.911	0.981284	4.82297	1.50500E-10	1.02031
662.811	0.997216	4.99819	1.58500E-10	1.03057
667.911	0.995686	5.1322	1.62500E-10	1.01954
672.811	0.996497	5.25425	1.66500E-10	1.02583
677.711	1.00141	5.35406	1.70500E-10	1.01986
682.711	1.02786	5.46102	1.78500E-10	1.02841
687.811	0.992379	5.52956	1.74500E-10	1.0336
692.711	1.04066	5.6054	1.85500E-10	1.01939
697.811	1.00961	5.68435	1.82500E-10	1.02477
702.711	1.03608	5.75157	1.89500E-10	1.03325
707.811	1.01903	5.8478	1.89500E-10	1.01741
712.711	1.00259	5.94371	1.89500E-10	1.02971
717.711	1.01312	6.00607	1.93500E-10	1.03069
722.711	1.02016	6.08791	1.97500E-10	1.02999
727.811	1.00556	6.17634	1.97500E-10	1.02617
732.811	1.01114	6.26661	2.01500E-10	1.02822
737.811	1.00003	6.33627	2.01500E-10	1.01899
742.811	1.02265	6.44209	2.09500E-10	1.02846
747.811	1.007[illegible]4	6.53809	2.09500E-10	1.02251
752.811	1.01327	6.62591	2.13500E-10	1.02602
757.811	1.00141	6.70437	2.13500E-10	1.02319
762.811	1.004	6.81234	2.17500E-10	1.02331
767.811	1.00631	6.9217	2.21500E-10	1.03291
772.711	1.01406	6.99286	2.25500E-10	1.02361
777.611	0.99855	7.10149	2.25500E-10	1.02484
782.711	1.01501	7.20313	2.32500E-10	1.02545
787.711	1.00231	7.29442	2.32500E-10	1.02174
792.611	1.00531	7.39776	2.36500E-10	1.02437
797.711	1.006	7.51325	2.40500E-10	1.02139
802.611	1.03738	7.5935	2.50500E-10	1.01619
807.711	1.021	7.71528	2.50500E-10	1.02373
812.811	1.03702	7.83872	2.58500E-10	1.0202
817.711	1.02541	7.92745	2.58500E-10	1.02032
822.611	1.01167	8.03516	2.58500E-10	1.01978
827.811	0.971873	8.62304	2.66500E-10	1.02436
832.811	1.00953	9.267	2.97500E-10	1.02325
837.711	1.01899	9.18098	2.97500E-10	1.03415
842.711	1.04376	8.96307	2.97500E-10	1.03948
847.811	1.06582	8.77755	2.97500E-10	1.02266
852.711	1.03419	8.80275	2.89500E-10	1.01921
857.711	0.994801	8.89846	2.81500E-10	1.01872
862.611	1.0151	8.96828	2.89500E-10	1.0233
867.611	1.01201	8.99567	2.89500E-10	1.01797
872.611	1.03438	9.04434	2.97500E-10	1.01823
877.711	0.999444	9.10883	2.89500E-10	1.01516
882.611	1.00623	9.29735	2.97500E-10	1.01209

887.611	1.00752	9.52513	3.05500E-10	1.0215
892.511	1.02151	9.62011	3.12500E-10	1.01592
897.611	1.00967	9.73288	3.12500E-10	1.015
902.611	1.02229	9.85885	3.20500E-10	1.01134
907.711	1.00807	9.9979	3.20500E-10	1.01447
912.711	1.01944	10.1321	3.28500E-10	1.01593
917.611	1.00189	10.3107	3.28500E-10	1.01457
922.511	1.00521	10.5269	3.36500E-10	1.01092
927.511	1.01144	10.7107	3.44500E-10	1.01635
932.611	1.01515	10.8884	3.51500E-10	1.01261
937.511	0.999273	11.0615	3.51500E-10	1.01415
942.611	1.00791	11.2162	3.59500E-10	1.01413
947.511	1.0161	11.3734	3.67500E-10	1.01411
952.611	1.00144	11.5399	3.67500E-10	1.00907
957.511	1.00911	11.7015	3.75500E-10	1.0133
962.611	0.994247	11.8765	3.75500E-10	1.01185
967.511	1.00196	12.0361	3.83500E-10	1.01337
972.611	0.987346	12.2143	3.83500E-10	1.01316
977.511	0.993192	12.3957	3.91500E-10	1.0147
982.611	0.997456	12.5634	3.98500E-10	1.01203
987.511	1.00399	12.7321	4.06500E-10	1.01346
992.511	0.991108	12.8977	4.06500E-10	1.01514
997.511	0.996924	13.0748	4.14500E-10	1.01145
1002.51	1.00213	13.2579	4.22500E-10	1.01497
1007.51	0.987194	13.4585	4.22500E-10	1.0142
1012.51	0.991833	13.6492	4.30500E-10	1.01393
1017.51	0.992953	13.8555	4.37500E-10	1.01181
1022.41	0.998462	14.031	4.45500E-10	1.01189
1027.51	0.984084	14.236	4.45500E-10	1.01277
1032.61	0.986108	14.4619	4.53500E-10	1.01477
1037.61	0.990849	14.6466	4.61500E-10	1.01289
1042.61	0.994855	14.8405	4.69500E-10	1.01374
1047.51	0.980752	15.0539	4.69500E-10	1.01231
1052.51	0.981847	15.2613	4.76500E-10	1.01231
1057.61	0.98403	15.4831	4.84500E-10	1.01387
1062.61	0.985731	15.7116	4.92500E-10	1.01177
1067.61	0.97361	15.9072	4.92500E-10	1.01149
1072.51	1.01194	16.1436	5.19500E-10	1.01298
1077.51	0.998641	16.3587	5.19500E-10	1.01123
1082.51	0.984202	16.5987	5.19500E-10	1.00996
1087.41	1.00113	16.8206	5.35500E-10	1.0104
1092.41	0.986966	17.062	5.35500E-10	1.01279
1097.51	0.971989	17.3249	5.35500E-10	1.0119
1102.41	0.988287	17.5483	5.51500E-10	1.0112
1107.51	0.975046	17.7866	5.51500E-10	1.01276
1112.41	0.987547	18.0391	5.66500E-10	1.01195
1117.41	0.974165	18.2869	5.66500E-10	1.0103
1122.51	0.960809	18.5411	5.66500E-10	1.01266
1127.41	0.973243	18.8212	5.82500E-10	1.01226
1132.31	0.961771	19.0457	5.82500E-10	1.01157
1137.41	0.974557	19.3121	5.98500E-10	1.01247
1142.41	0.959718	19.6107	5.98500E-10	1.01095
1147.31	0.970665	19.8755	6.13500E-10	1.01045
1152.41	0.957727	20.144	6.13500E-10	1.01088
1157.41	0.968089	20.4481	6.29500E-10	1.01204
1162.41	0.955215	20.7237	6.29500E-10	1.01067
1167.51	0.964457	21.0142	6.44500E-10	1.00951
1172.41	0.950672	21.3189	6.44500E-10	1.0098

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Time of 28 AMU Sample, Secs	Ratio of Dynamic Drop To Static Drop	Baratron Pressure at time of 18 AMU Sample, Torr	*Corrected 28 AMU Ion Current Amps	Ratio of Inlet Transducer Pressure to Baratron Pressure
3.011	1.13836	1.51145E-04	3.51000E-11	1403.48
8.211	1.1048	1.55737E-04	3.51000E-11	1386.47
13.211	1.10904	1.59562E-04	3.61000E-11	1330.47
18.011	1.09493	1.65647E-04	3.70000E-11	1285.62
23.111	1.05698	1.71594E-04	3.70000E-11	1242.99
27.911	1.05434	1.76674E-04	3.80000E-11	1211.8
33.211	1.05713	1.80844E-04	3.90000E-11	1190.58
38.211	1.05566	1.85739E-04	4.00000E-11	1143.6
43.011	1.04748	1.91401E-04	4.09000E-11	1124.08
48.011	1.01945	1.96665E-04	4.09000E-11	1080.51
53.211	1.02807	2.04551E-04	4.29000E-11	1041.18
58.011	1.02061	2.10850E-04	4.39000E-11	1015.88
63.111	1.01297	2.16795E-04	4.48000E-11	1232.41
68.011	1.00851	2.22615E-04	4.58000E-11	963.225
73.111	0.996138	2.30301E-04	4.68000E-11	1149.52
78.111	0.999746	2.38786E-04	4.87000E-11	897.975
83.111	1.00198	2.43146E-04	4.97000E-11	888.797
88.011	0.976063	2.49602E-04	4.97000E-11	846.243
93.111	0.976365	2.59566E-04	5.17000E-11	826.301
98.011	0.988718	2.65743E-04	5.36000E-11	806.378
103.111	0.974264	2.74717E-04	5.46000E-11	772.29
108.111	0.963905	2.82755E-04	5.56000E-11	764.146
113.111	0.973965	2.89397E-04	5.75000E-11	733.963
118.011	0.967482	2.96403E-04	5.85000E-11	732.726
122.911	1.0292	3.04346E-04	6.39000E-11	689.064
128.111	1.01482	3.17837E-04	6.58000E-11	847.1
133.011	1.02935	3.22874E-04	6.78000E-11	667.075
137.911	1.03126	3.31309E-04	6.97000E-11	801.149
142.911	1.07751	3.43930E-04	7.56000E-11	775.32
147.911	0.991286	3.54560E-04	7.17000E-11	603.553
153.111	1.0137	3.65579E-04	7.56000E-11	729.725
158.011	1.00521	3.78419E-04	7.76000E-11	701.833
162.911	0.990758	3.93341E-04	7.95000E-11	540.392
167.811	0.97901	4.08075E-04	8.15000E-11	521.968
173.111	0.965659	4.23362E-04	8.34000E-11	629.487
178.011	0.994789	4.40038E-04	8.93000E-11	480.76
182.911	0.991231	4.60904E-04	9.32000E-11	459.036
187.911	0.972804	4.79209E-04	9.51000E-11	446.405
192.911	0.971956	5.01818E-04	9.95000E-11	416.155
198.011	0.949618	5.29108E-04	1.02500E-10	404.088
203.011	0.928664	5.51604E-04	1.04500E-10	285.801
208.011	0.947934	5.81760E-04	1.12500E-10	454.887
213.011	0.930956	6.13432E-04	1.16500E-10	341.984
218.011	0.940067	6.43988E-04	1.23500E-10	331.654
222.911	0.908541	6.87916E-04	1.27500E-10	295.7

* Corrected for background by subtracting 3.5 E-12 Amps

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228.011	0.902762	7.35759E-04	1.35500E-10	368.974
233.011	0.93432	7.47634E-04	1.42500E-10	356.113
238.011	0.919187	7.80764E-04	1.46500E-10	337.451
243.011	0.913351	8.29202E-04	1.54500E-10	252.086
248.011	0.890512	8.94506E-04	1.62500E-10	231.497
253.011	0.866576	9.64467E-04	1.70500E-10	217.465
257.911	0.879048	1.03443E-03	1.85500E-10	200.349
262.911	0.869469	1.11348E-03	1.97500E-10	188.567
268.011	0.874786	1.19637E-03	2.13500E-10	173.364
273.011	0.860327	1.28485E-03	2.25500E-10	163.741
277.911	0.837819	1.40713E-03	2.40500E-10	142.743
282.811	0.848387	1.53983E-03	2.66500E-10	138.966
287.911	0.855588	1.61281E-03	2.81500E-10	129.635
292.711	0.865145	1.73098E-03	3.05500E-10	149.814
298.011	0.851813	1.89043E-03	3.28500E-10	137.012
302.911	0.838005	2.05612E-03	3.51500E-10	100.545
307.811	0.808332	2.27714E-03	3.75500E-10	111.153
312.811	0.812702	2.50013E-03	4.14500E-10	84.3616
317.911	0.819608	2.71232E-03	4.53500E-10	93.9758
322.911	0.812943	2.96972E-03	4.92500E-10	70.6279
327.811	0.830572	3.25490E-03	5.51500E-10	77.3598
332.911	0.811104	3.61707E-03	5.98500E-10	57.8914
337.911	0.805686	3.92127E-03	6.44500E-10	65.4534
342.911	0.795741	4.35837E-03	7.07500E-10	58.4999
347.811	0.797546	4.82792E-03	7.85500E-10	53.3438
352.711	0.777778	5.44222E-03	8.63500E-10	45.6745
357.811	0.781965	6.10265E-03	9.73500E-10	43.0979
362.711	0.823466	6.58681E-03	1.10650E-09	31.069
367.711	0.805813	7.46110E-03	1.22650E-09	33.5274
372.911	0.0970646	8.20658E-03	1.62500E-10	32.6034
377.811	0.010759	9.43115E-03	2.07000E-11	19.7098
382.711	3.45991E-03	0.0111926	7.90000E-12	19.0201
387.711	2.30649E-03	0.0114978	5.41000E-12	18.7542
392.811	11.2468	0.0118831	4.25000E-12	22.1492
397.711	8.78475	0.01303	3.64000E-12	19.2184
402.811	6.23398	0.0164951	3.27000E-12	13.8527
407.711	4.61933	0.0198101	2.91000E-12	10.8202
412.711	4.13791	0.0212029	2.79000E-12	11.9471
417.811	3.42388	0.0244307	2.66000E-12	10.1916
422.911	2.76443	0.0288935	2.54000E-12	8.53244
427.811	2.34406	0.0324652	2.42000E-12	8.14499
432.811	2.12146	0.0358718	2.42000E-12	6.90509
437.811	1.84454	0.0412571	2.42000E-12	6.19034
442.711	1.52088	0.0475559	2.30000E-12	5.13802
447.711	1.40898	0.054011	2.42000E-12	4.8904
452.811	1.33593	0.0597888	2.54000E-12	4.1562
457.811	1.16497	0.0685628	2.54000E-12	4.46846
462.811	1.12384	0.0780673	2.79000E-12	3.19194
468.011	1.03069	0.0887845	2.91000E-12	3.49105
477.711	1.07785	0.102696	3.52000E-12	3.05708
482.711	1.05833	0.111722	3.76000E-12	2.74632
487.811	0.91674	0.133437	3.89000E-12	2.13248
492.811	0.886032	0.157227	4.43000E-12	1.99803
497.811	0.939755	0.173001	5.17000E-12	2.03884
502.811	0.871645	0.204197	5.66000E-12	1.66396
507.811	0.853777	0.235358	6.39000E-12	1.55482
512.811	0.900095	0.258533	7.40000E-12	1.56537
517.811	0.87131	0.299556	8.30000E-12	1.48302
522.811	0.85537	0.341902	9.30000E-12	1.36378
527.711	0.886629	0.383049	1.08000E-11	1.29833
532.611	0.926694	0.43775	1.29000E-11	1.16713
537.711	0.904386	0.497227	1.43000E-11	1.20987
542.611	0.920577	0.556801	1.63000E-11	1.21258
547.611	0.908271	0.630128	1.82000E-11	1.09319

552.811	0.904419	0.719736	2.07000E-11	1.0873
557.811	0.926892	0.801106	2.36000E-11	1.12141
562.911	0.935043	0.874409	2.60000E-11	1.22981
572.611	0.936508	1.07787	3.21000E-11	1.07411
577.711	0.970612	1.19875	3.70000E-11	1.13492
582.611	0.925394	1.35927	4.00000E-11	0.997277
587.611	0.880872	1.66251	4.39000E-11	0.99757
592.811	0.873299	1.88472	5.27000E-11	1.07249
597.611	0.923	1.99309	5.85000E-11	1.06203
602.511	0.959145	2.22289	6.78000E-11	0.993476
607.511	0.922656	2.50848	7.36000E-11	1.02574
612.611	0.951483	2.75637	8.34000E-11	1.03138
617.611	0.953666	3.00726	9.12000E-11	1.04962
622.511	0.963245	3.24832	9.95000E-11	1.02935
627.511	0.990748	3.50729	1.10500E-10	1.03237
632.611	1.0447	3.71745	1.23500E-10	1.05514
637.511	1.00815	3.85224	1.23500E-10	1.03614
642.611	1.00674	4.1075	1.31500E-10	1.0315
647.611	1.00568	4.362	1.39500E-10	1.02827
652.511	0.980916	4.56831	1.42500E-10	1.0455
657.511	0.99547	4.75424	1.50500E-10	1.04017
662.511	0.985965	4.92765	1.54500E-10	1.03882
667.711	1.00425	5.08843	1.62500E-10	1.04036
672.611	1.00441	5.21285	1.66500E-10	1.0411
677.511	1.03345	5.30977	1.74500E-10	1.04363
682.511	1.01596	5.40121	1.74500E-10	1.03658
687.511	1.04523	5.49065	1.82500E-10	1.04913
692.611	1.02908	5.57681	1.82500E-10	1.04416
697.611	1.03387	5.64222	1.85500E-10	1.05422
702.611	1.02008	5.71846	1.85500E-10	1.03355
707.711	1.02522	5.81252	1.89500E-10	1.04987
712.511	1.03459	5.88146	1.93500E-10	1.04482
717.411	1.01938	5.96922	1.93500E-10	1.03716
722.411	1.02423	6.06372	1.97500E-10	1.03977
727.511	1.03099	6.14597	2.01500E-10	1.04551
732.511	1.01821	6.22314	2.01500E-10	1.03942
737.611	1.02353	6.31368	2.05500E-10	1.04166
742.611	1.02949	6.39932	2.09500E-10	1.04546
747.611	1.03499	6.48682	2.13500E-10	1.0383
752.611	1.03821	6.58784	2.17500E-10	1.03796
757.611	1.02188	6.69315	2.17500E-10	1.03821
762.511	1.00952	6.77506	2.17500E-10	1.04594
767.511	1.01714	6.84803	2.21500E-10	1.039
772.411	1.0207	6.94732	2.25500E-10	1.03904
777.511	1.01826	7.05667	2.28500E-10	1.0382
782.411	1.00256	7.16718	2.28500E-10	1.03643
787.411	1.02057	7.2872	2.36500E-10	1.03418
792.411	1.02446	7.38232	2.40500E-10	1.04056
797.511	1.05551	7.46302	2.50500E-10	1.03292
802.611	0.998595	7.57353	2.40500E-10	1.03878
807.511	1.02537	7.68244	2.50500E-10	1.03843
812.411	1.01084	7.79283	2.50500E-10	1.03016
817.511	1.02805	7.90713	2.58500E-10	1.03675
822.311	1.01419	8.01519	2.58500E-10	1.03495
827.511	1.0173	8.23792	2.66500E-10	1.03812
832.511	1.02765	8.36914	2.73500E-10	1.04292
837.511	1.03348	8.32199	2.73500E-10	1.0322
842.411	1.02204	8.41511	2.73500E-10	1.03212
847.511	1.03829	8.52573	2.81500E-10	1.03776
852.411	1.02845	8.6073	2.81500E-10	1.03235
857.311	1.02233	8.65881	2.81500E-10	1.03136
862.311	1.01451	8.72555	2.81500E-10	1.02898
867.411	1.00423	8.81487	2.81500E-10	1.02859
872.511	1.01873	8.93634	2.89500E-10	1.03093
877.511	1.032	9.06523	2.97500E-10	1.02928

882.411	1.01863	9.18421	2.97500E-10	1.03344
887.411	1.0311	9.31711	3.05500E-10	1.02896
892.511	1.0152	9.46306	3.05500E-10	1.03073
897.511	1.02328	9.60344	3.12500E-10	1.02684
902.511	1.00755	9.75339	3.12500E-10	1.02661
907.411	1.0178	9.90231	3.20500E-10	1.02351
912.311	1.00296	10.0488	3.20500E-10	1.0286
917.511	1.01057	10.2221	3.28500E-10	1.02696
922.411	1.01986	10.3858	3.36500E-10	1.02684
927.411	1.00247	10.5556	3.36500E-10	1.02498
932.411	1.01018	10.7241	3.44500E-10	1.02509
937.411	1.01613	10.8779	3.51500E-10	1.03108
942.311	1.00155	11.0363	3.51500E-10	1.02436
947.311	1.00759	11.2198	3.59500E-10	1.02194
952.411	1.01444	11.392	3.67500E-10	1.02288
957.311	1.00126	11.542	3.67500E-10	1.02282
962.311	0.986849	11.7106	3.67500E-10	1.02139
967.311	0.993678	11.8833	3.75500E-10	1.02067
972.411	1.00036	12.0553	3.83500E-10	1.02403
977.311	1.00721	12.2231	3.91500E-10	1.02314
982.411	0.99308	12.3971	3.91500E-10	1.02227
987.411	0.997456	12.5634	3.98500E-10	1.02174
992.411	1.0041	12.7307	4.06500E-10	1.02523
997.311	1.01058	12.8981	4.14500E-10	1.02436
1002.21	0.997252	13.0705	4.14500E-10	1.02305
1007.21	1.00248	13.2532	4.22500E-10	1.02094
1012.31	1.00644	13.451	4.30500E-10	1.02138
1017.41	0.99023	13.6713	4.30500E-10	1.02346
1022.31	0.991186	13.8802	4.37500E-10	1.02195
1027.31	0.995737	14.0694	4.45500E-10	1.02308
1032.21	0.99993	14.262	4.53500E-10	1.02076
1037.31	0.986136	14.4615	4.53500E-10	1.02174
1042.41	0.989734	14.6631	4.61500E-10	1.02228
1047.31	0.993329	14.8633	4.69500E-10	1.0228
1052.31	0.979626	15.0712	4.69500E-10	1.01966
1057.31	0.980774	15.278	4.76500E-10	1.02001
1062.21	1.02465	15.4831	5.04500E-10	1.02041
1067.31	0.985537	15.7147	4.92500E-10	1.01784
1072.31	0.970347	15.9607	4.92500E-10	1.01935
1077.31	1.00892	16.1919	5.19500E-10	1.01924
1082.31	0.995174	16.4157	5.19500E-10	1.02113
1087.31	0.98134	16.6471	5.19500E-10	1.02039
1092.31	0.998075	16.8721	5.35500E-10	1.01968
1097.31	0.98494	17.0971	5.35500E-10	1.01898
1102.31	1.00111	17.3234	5.51500E-10	1.02124
1107.31	0.98623	17.5849	5.51500E-10	1.01883
1112.31	0.997227	17.864	5.66500E-10	1.01738
1117.21	0.984191	18.1006	5.66500E-10	1.01889
1122.31	0.970884	18.3487	5.66500E-10	1.02003
1127.31	0.985421	18.5886	5.82500E-10	1.02158
1132.31	0.972943	18.827	5.82500E-10	1.02017
1137.21	0.985225	19.103	5.98500E-10	1.01643
1142.21	0.969637	19.4101	5.98500E-10	1.01702
1147.31	0.980706	19.672	6.13500E-10	1.01998
1152.31	0.967991	19.9304	6.13500E-10	1.01765
1157.21	0.979204	20.216	6.29500E-10	1.01708
1162.11	0.964547	20.5232	6.29500E-10	1.01689
1167.21	0.974286	20.8022	6.44500E-10	1.01911

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[illegible]

2-23-82 RUN #3 [illegible]

Time of 28 AMU Sample, Secs	Ratio of Dynamic Drop To Static Drop	Baratron Pressure at time of 28 AMU Sample, Torr	*Corrected 28 AMU Ion Current Amps	Ratio of Inlet Transducer Pressure to Baratron Pressure
2.911	1.17893	1.50102E-04	3.61000E-11	2491.48
8.211	1.14033	1.55183E-04	3.61000E-11	2404.85
13.211	1.09398	1.61758E-04	3.61000E-11	2282.24
18.011	1.08442	1.67252E-04	3.70000E-11	2263.23
23.011	1.0886	1.71113E-04	3.80000E-11	2170.27
28.011	1.08642	1.75969E-04	3.90000E-11	2150.64
33.211	1.08967	1.79942E-04	4.00000E-11	2069.9
38.111	1.09056	1.83840E-04	4.09000E-11	2068.77
43.111	1.08477	1.89341E-04	4.19000E-11	1932.19
48.111	1.06757	1.96983E-04	4.29000E-11	1930.22
53.111	1.06799	2.01495E-04	4.39000E-11	1832.6
57.911	1.06866	2.10084E-04	4.58000E-11	1778.62
63.111	1.05833	2.16766E-04	4.68000E-11	1479.58
68.111	1.05372	2.22367E-04	4.78000E-11	1690.13
73.111	1.04384	2.28699E-04	4.87000E-11	1395.37
78.111	1.05103	2.36462E-04	5.07000E-11	1583.22
83.111	1.04068	2.43523E-04	5.17000E-11	1314.91
88.111	1.01097	2.50679E-04	5.17000E-11	1495.47
93.111	1.00406	2.57288E-04	5.27000E-11	1247.98
98.011	1.01669	2.63252E-04	5.46000E-11	1429.72
103.111	1.01164	2.69411E-04	5.56000E-11	1191.01
108.011	0.993123	2.79372E-04	5.66000E-11	1323.3
112.911	0.986971	2.90550E-04	5.85000E-11	1289.66
117.911	1.08583	2.97051E-04	6.58000E-11	1268.58
123.111	1.05291	3.06338E-04	6.58000E-11	1036.88
128.011	1.08413	3.15150E-04	6.97000E-11	1203.56
133.111	1.0668	3.20271E-04	6.97000E-11	1000.92
138.011	1.03475	3.30192E-04	6.97000E-11	1130.26
142.911	1.08266	3.42294E-04	7.56000E-11	1085.13
148.111	1.02172	3.53113E-04	7.36000E-11	1067.77
153.011	1.02133	3.62848E-04	7.56000E-11	875.67
157.911	1.01151	3.76060E-04	7.76000E-11	997.508
163.011	1.0152	3.93526E-04	8.15000E-11	928.832
168.011	0.994547	4.11065E-04	8.34000E-11	920.962
173.011	0.999106	4.19002E-04	8.54000E-11	890.566
177.811	1.00802	4.34259E-04	8.93000E-11	854.751
182.811	0.972571	4.59667E-04	9.12000E-11	679.516
187.811	0.964757	4.83206E-04	9.51000E-11	779.93
193.111	0.983358	5.00984E-04	1.00500E-10	630.753
197.911	0.975493	5.25124E-04	1.04500E-10	707.681
202.811	0.969021	5.48866E-04	1.08500E-10	673.005
207.811	0.971865	5.77523E-04	1.14500E-10	639.949
212.811	0.990223	6.11369E-04	1.23500E-10	599.321
218.011	0.963022	6.48998E-04	1.27500E-10	488.905

* Corrected for background by subtracting 3.5 E-12 Amps

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222.911	0.938168	6.87092E-04	1.31500E-10	531.057
228.011	0.938861	7.28354E-04	1.39500E-10	439.100
233.011	0.912705	7.65339E-04	1.42500E-10	410.342
238.011	0.911904	8.09016E-04	1.50500E-10	359.412
243.011	0.901204	8.62136E-04	1.58500E-10	418.859
247.911	0.905364	9.22535E-04	1.70500E-10	403.917
252.811	0.916625	9.75900E-04	1.82500E-10	419.924
257.911	0.882049	1.05314E-03	1.89500E-10	345.079
262.811	0.892046	1.12926E-03	2.05500E-10	279.128
267.811	0.877742	1.21468E-03	2.17500E-10	254.943
273.011	0.874503	1.30326E-03	2.32500E-10	285.215
278.011	0.868637	1.41364E-03	2.50500E-10	213.919
283.011	0.846908	1.54252E-03	2.66500E-10	208.011
288.011	0.86945	1.63220E-03	2.89500E-10	220.959
293.011	0.854896	1.79187E-03	3.12500E-10	172.612
297.911	0.844633	1.95293E-03	3.36500E-10	159.391
302.811	0.861181	2.09186E-03	3.67500E-10	151.048
307.811	0.836315	2.29473E-03	3.91500E-10	153.196
312.811	0.841659	2.50730E-03	4.30500E-10	128.359
318.011	0.857752	2.63742E-03	4.61500E-10	118.138
322.911	0.826251	2.92189E-03	4.92500E-10	103.274
327.811	0.823935	3.28112E-03	5.51500E-10	109.915
332.811	0.815524	3.59747E-03	5.98500E-10	86.1194
337.911	0.804824	4.02292E-03	6.60500E-10	75.204
342.911	0.794961	4.46131E-03	7.23500E-10	70.3544
347.911	0.802515	4.89576E-03	8.01500E-10	62.022
352.911	0.788816	5.46550E-03	8.79500E-10	56.6735
357.811	0.794803	6.09659E-03	9.88500E-10	49.4367
362.711	0.820254	6.79189E-03	1.13650E-09	46.0774
367.711	0.829363	7.48566E-03	1.26650E-09	40.4941
372.911	0.0629722	0.0129609	1.66500E-10	16.9993
377.911	8.08632E-03	0.013094	2.16000E-11	82.0465
382.911	0.0131984	3.19408E-03	8.60000E-12	274.032
387.811	0.0322225	8.97557E-04	5.90000E-12	807.748
392.711	48.6334	3.02610E-03	4.68000E-12	56.3379
397.811	11.2856	0.0108392	3.89000E-12	23.4036
402.911	6.33792	0.0168696	3.40000E-12	21.5149
407.911	5.11202	0.018639	3.03000E-12	19.0539
412.811	4.38066	0.0208894	2.91000E-12	17.1103
417.711	3.74317	0.0234389	2.79000E-12	15.1001
422.611	3.06263	0.0273124	2.66000E-12	12.5143
427.611	2.48573	0.0321331	2.54000E-12	9.44149
432.811	2.16663	0.0368655	2.54000E-12	9.55543
437.811	1.92	0.0416011	2.54000E-12	8.63049
442.911	1.6736	0.0477258	2.54000E-12	7.23894
447.711	1.55331	0.0538511	2.66000E-12	6.8132
452.711	1.42071	0.0588773	2.66000E-12	6.02969
457.711	1.31835	0.0694118	2.91000E-12	4.86607
462.811	1.19848	0.0795032	3.03000E-12	4.68233
468.011	1.20044	0.0825166	3.15000E-12	5.1688
477.611	1.18264	0.0967878	3.64000E-12	4.25065
482.611	1.08743	0.115961	4.01000E-12	3.22193
487.811	0.930947	0.143561	4.25000E-12	2.8146
492.711	0.961416	0.160926	4.92000E-12	2.55268
497.611	0.98169	0.181307	5.66000E-12	2.47895
502.711	0.92743	0.20819	6.14000E-12	2.19743
507.811	0.920207	0.235796	6.90000E-12	2.14575
512.811	0.927623	0.267811	7.90000E-12	1.88728
517.811	0.92982	0.297616	8.80000E-12	1.92233
522.811	0.930753	0.337861	1.00000E-11	1.59354
527.711	0.891567	0.387982	1.10000E-11	1.60374
532.611	0.990763	0.422138	1.33000E-11	1.4666
537.611	0.97471	0.477484	1.48000E-11	1.45481
542.711	0.961732	0.549323	1.68000E-11	1.39551

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547.711	0.944792	0.622412	1.87000E-11	1.26733
552.611	0.939019	0.709507	2.12000E-11	1.21714
557.711	0.938645	0.807399	2.41000E-11	1.10502
562.911	0.960022	0.884413	2.70000E-11	1.32722
572.711	0.922447	1.16248	3.41000E-11	1.15292
577.611	1.00767	1.27637	4.09000E-11	1.22982
582.511	1.05074	1.36637	4.39000E-11	1.21451
587.511	1.01072	1.41378	4.58000E-11	1.11372
592.711	0.86747	1.73279	4.78000E-11	0.999626
597.611	0.864907	2.0906	5.75000E-11	1.08419
602.711	0.960963	2.28086	6.97000E-11	1.0959
607.711	0.997136	2.44726	7.76000E-11	1.09127
612.611	0.991588	2.64489	8.34000E-11	1.06839
617.711	0.970342	2.95558	9.12000E-11	1.04763
622.611	0.974141	3.24427	1.00500E-10	1.06742
627.511	0.982319	3.47336	1.08500E-10	1.0607
632.611	1.03929	3.73681	1.23500E-10	1.05389
637.711	1.00654	3.98338	1.27500E-10	1.07738
642.711	1.01589	4.19432	1.35500E-10	1.06805
647.711	0.9991	4.39074	1.39500E-10	1.06259
652.611	0.997809	4.61703	1.46500E-10	1.06125
657.611	1.01224	4.79971	1.54500E-10	1.07107
662.511	1.00277	4.97046	1.58500E-10	1.06737
667.611	1.02536	5.10631	1.66500E-10	1.06755
672.611	1.0235	5.23852	1.70500E-10	1.0661
677.611	1.02781	5.3389	1.74500E-10	1.06878
682.411	1.03487	5.42405	1.78500E-10	1.062
687.411	1.041	5.51294	1.82500E-10	1.06465
692.711	1.04162	5.6002	1.85500E-10	1.06895
697.611	1.05195	5.6648	1.89500E-10	1.06875
702.511	1.03774	5.74237	1.89500E-10	1.05695
707.511	1.04233	5.83776	1.93500E-10	1.06378
712.411	1.0514	5.90702	1.97500E-10	1.05906
717.511	1.03672	5.99066	1.97500E-10	1.06169
722.511	1.02395	6.06542	1.97500E-10	1.06028
727.611	1.02843	6.1613	2.01500E-10	1.06215
732.611	1.03134	6.26584	2.05500E-10	1.06145
737.511	1.04118	6.32748	2.09500E-10	1.0579
742.411	1.02682	6.41597	2.09500E-10	1.05643
747.511	1.03127	6.51025	2.13500E-10	1.05424
752.411	1.03667	6.59765	2.17500E-10	1.05912
757.311	1.03906	6.70355	2.21500E-10	1.05465
762.511	1.02529	6.79354	2.21500E-10	1.05563
767.511	1.02969	6.88669	2.25500E-10	1.05708
772.611	1.0288	6.98434	2.28500E-10	1.04967
777.611	1.03188	7.08541	2.32500E-10	1.04958
782.611	1.01732	7.18681	2.32500E-10	1.05045
787.511	1.02181	7.27835	2.36500E-10	1.053
792.411	1.02432	7.38333	2.40500E-10	1.04879
797.411	1.0506	7.49796	2.50500E-10	1.05135
802.411	1.03751	7.59249	2.50500E-10	1.05078
807.411	1.02328	7.69811	2.50500E-10	1.04384
812.411	1.04163	7.80404	2.58500E-10	1.04997
817.511	1.02683	7.9165	2.58500E-10	1.05556
822.411	1.04448	8.02358	2.66500E-10	1.04183
827.611	0.951767	8.8052	2.66500E-10	1.09628
832.511	1.08063	9.32653	3.20500E-10	1.08613
837.511	1.10882	8.66407	3.05500E-10	1.06343
842.411	1.06598	8.54028	2.89500E-10	1.0491
847.611	1.03186	8.57886	2.81500E-10	1.04688
852.511	1.02187	8.66274	2.81500E-10	1.03992
857.511	1.041	8.74516	2.89500E-10	1.04745
862.511	1.03363	8.80751	2.89500E-10	1.04271
867.411	1.02284	8.90045	2.89500E-10	1.04355

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872.511	1.03322	9.01089	2.97500E-10	1.04139
877.411	1.0252	9.12523	2.97500E-10	1.03495
882.411	1.01227	9.2419	2.97500E-10	1.03868
887.411	1.02568	9.36632	3.05500E-10	1.0422
892.411	1.03491	9.49551	3.12500E-10	1.03806
897.511	1.01978	9.63635	3.12500E-10	1.03454
902.411	1.00556	9.77268	3.12500E-10	1.03722
907.411	1.01666	9.91337	3.20500E-10	1.03608
912.311	1.02729	10.0557	3.28500E-10	1.03477
917.411	1.01206	10.207	3.28500E-10	1.03423
922.311	1.02139	10.3601	3.36500E-10	1.03518
927.411	1.03077	10.5099	3.44500E-10	1.0365
932.411	1.01564	10.6665	3.44500E-10	1.03451
937.511	1.01972	10.8396	3.51500E-10	1.0341
942.411	1.00546	10.9934	3.51500E-10	1.03472
947.311	1.01423	11.1464	3.59500E-10	1.03003
952.311	1.02221	11.3055	3.67500E-10	1.03473
957.311	1.00788	11.4662	3.67500E-10	1.03425
962.411	1.01451	11.6392	3.75500E-10	1.02747
967.311	0.99932	11.8162	3.75500E-10	1.0302
972.411	1.00494	12.0004	3.83500E-10	1.02835
977.411	1.01098	12.1775	3.91500E-10	1.03114
982.311	0.997481	12.3424	3.91500E-10	1.02736
987.211	1.00278	12.4966	3.98500E-10	1.03166
992.311	1.00853	12.6748	4.06500E-10	1.02867
997.411	1.01267	12.8715	4.14500E-10	1.02965
1002.41	1.01706	13.0632	4.22500E-10	1.02741
1007.31	1.00297	13.2468	4.22500E-10	1.02954
1012.41	1.00748	13.4372	4.30500E-10	1.02721
1017.41	1.01019	13.619	4.37500E-10	1.0298
1022.41	0.995933	13.8132	4.37500E-10	1.02539
1027.31	0.99889	14.025	4.45500E-10	1.02561
1032.31	1.00175	14.236	4.53500E-10	1.02589
1037.21	1.00616	14.4237	4.61500E-10	1.02554
1042.31	0.992401	14.6237	4.61500E-10	1.02734
1047.31	0.994051	14.8525	4.69500E-10	1.0267
1052.21	0.995652	15.0497	4.76500E-10	1.02601
1057.31	0.998221	15.263	4.84500E-10	1.02613
1062.21	0.982647	15.5049	4.84500E-10	1.02173
1067.21	1.00944	15.7164	5.04500E-10	1.02696
1072.21	1.02539	15.9319	5.19500E-10	1.024
1077.21	1.01098	16.159	5.19500E-10	1.02578
1082.11	0.997525	16.377	5.19500E-10	1.02528
1087.11	1.01328	16.6189	5.35500E-10	1.02657
1092.11	0.999627	16.8459	5.35500E-10	1.02583
1097.11	1.01291	17.1216	5.51500E-10	1.02214
1102.11	0.998736	17.3647	5.51500E-10	1.02288
1107.21	0.985188	17.6035	5.51500E-10	1.01871
1112.21	0.997629	17.8568	5.66500E-10	1.02153
1117.21	0.985924	18.0688	5.66500E-10	1.02197
1122.31	0.999847	18.3204	5.82500E-10	1.02258
1127.21	0.983997	18.6155	5.82500E-10	1.02394
1132.11	0.996571	18.8855	5.98500E-10	1.02272
1137.11	0.984091	19.125	5.98500E-10	1.02131
1142.21	0.994287	19.4033	6.13500E-10	1.02107
1147.21	0.979844	19.6893	6.13500E-10	1.02231
1152.11	0.991857	19.9581	6.29500E-10	1.01982
1157.11	0.977135	20.2588	6.29500E-10	1.0222
1162.21	0.987324	20.5275	6.44500E-10	1.02001
1167.11	0.973682	20.8151	6.44500E-10	1.01869

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SURS. DYNAMIC CALIBRATION +25% CASE

2-22-82 RUN #1 TAPE 201

Time of 28 AMU Sample, Secs	Ratio of Dynamic Drop To Static Drop	Baratron Pressure at time of 28 AMU Sample, Torr	*Corrected 28 AMU Ion Current Amps	Ratio of Inlet Transducer Pressure to Baratron Pressure
3.411	0.749997	9.41180E-06	1.44000E-12	35064.4
8.711	0.704304	1.00224E-05	1.44000E-12	34903.5
18.511	0.636265	1.20957E-05	1.57000E-12	30194.3
23.211	0.594599	1.29433E-05	1.57000E-12	24155.5
28.311	0.598404	1.38440E-05	1.69000E-12	26604.8
33.411	0.537958	1.64930E-05	1.81000E-12	19610.7
38.411	0.553336	1.70977E-05	1.93000E-12	27370.4
43.311	0.555477	1.70318E-05	1.93000E-12	17613.4
48.311	0.526825	1.79581E-05	1.93000E-12	29492.1
53.311	0.652042	1.54116E-05	2.05000E-12	20129.6
58.411	0.574561	1.85990E-05	2.18000E-12	17917.5
63.311	0.643944	1.75085E-05	2.30000E-12	23057.5
68.211	0.615075	1.83303E-05	2.30000E-12	15528.5
73.211	0.67765	1.92418E-05	2.66000E-12	22645.7
78.211	0.655618	2.08604E-05	2.79000E-12	14356.5
83.211	0.586426	2.53279E-05	3.03000E-12	16052.7
88.311	0.694415	2.40010E-05	3.40000E-12	15592.1
93.211	0.756497	2.35865E-05	3.64000E-12	16984.3
98.211	0.816199	2.33627E-05	3.89000E-12	13202.3
103.111	0.757174	2.59608E-05	4.01000E-12	13685.2
108.411	0.725824	2.87030E-05	4.25000E-12	12766.7
113.311	0.747027	2.78883E-05	4.25000E-12	15157.3
118.111	0.847419	2.70718E-05	4.68000E-12	12639.5
123.111	0.811408	2.97232E-05	4.92000E-12	11167.7
128.411	0.860316	3.08254E-05	5.41000E-12	11599
133.311	0.881755	3.28000E-05	5.90000E-12	11599
138.111	0.90888	3.31155E-05	6.14000E-12	11322.8
143.111	0.894365	3.50232E-05	6.39000E-12	8813.5
148.111	0.888029	3.80883E-05	6.90000E-12	9607.31
153.311	0.878836	4.12756E-05	7.40000E-12	8766.12
158.311	0.879567	4.40279E-05	7.90000E-12	7252.8
163.211	0.886873	4.58761E-05	8.30000E-12	8043.33
168.211	0.852777	4.94348E-05	8.60000E-12	6223.28
173.111	0.912951	5.15458E-05	9.60000E-12	6483.09
178.211	0.931542	5.26220E-05	1.00000E-11	6830.33
183.311	0.876692	5.87100E-05	1.05000E-11	6067.77
188.311	0.853256	6.49185E-05	1.13000E-11	4795.58
193.211	0.862988	6.81626E-05	1.20000E-11	5562.12
198.111	0.929935	7.01082E-05	1.33000E-11	4491.73
203.111	0.92654	7.56557E-05	1.43000E-11	4081.34
208.111	0.894871	8.10720E-05	1.48000E-11	4600.35
213.311	0.887772	8.72419E-05	1.58000E-11	4090.85
218.311	0.892979	9.49674E-05	1.73000E-11	3337.76
223.311	0.878894	1.01509E-04	1.82000E-11	3562.26
228.311	0.852839	1.10358E-04	1.92000E-11	2828.26

* Corrected for background by subtracting 3.5 E-12 Amps

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
238.111	0.829830	1.37501E-04	2.26000E-11	2341.72
243.211	0.815915	1.44791E-04	2.41000E-11	2136.85
248.011	0.812541	1.56602E-04	2.60000E-11	2001.64
253.011	0.786501	1.71897E-04	2.75000E-11	2076.69
258.311	0.810078	1.88790E-04	3.12000E-11	1667.17
263.211	0.764445	2.12119E-04	3.31000E-11	1380.6
268.111	0.744152	2.37704E-04	3.61000E-11	1455.21
273.111	0.780042	2.50406E-04	4.00000E-11	1435.66
278.211	0.770905	2.79147E-04	4.39000E-11	1094.65
283.111	0.759287	3.08597E-04	4.79000E-11	1173.5
288.111	0.751648	3.30646E-04	5.07000E-11	960.247
293.111	0.727827	3.74469E-04	5.56000E-11	999.67
298.011	0.727073	4.20343E-04	6.39000E-11	739.119
303.111	0.751506	4.67688E-04	7.17000E-11	756.661
308.011	0.739822	5.26756E-04	7.95000E-11	677.318
313.011	0.736032	5.81416E-04	8.73000E-11	624.917
318.211	0.701598	6.64449E-04	9.51000E-11	443.673
323.111	0.705698	7.53669E-04	1.08500E-10	417.594
328.011	0.731293	8.27837E-04	1.23500E-10	424.466
333.111	0.71147	9.33581E-04	1.35500E-10	387.028
338.011	0.694662	1.06202E-03	1.50500E-10	276.989
343.111	0.690919	1.20967E-03	1.70500E-10	260.337
348.011	0.720652	1.31621E-03	1.93500E-10	231.439
353.011	0.694373	1.53545E-03	2.17500E-10	222.341
358.011	0.660127	1.78590E-03	2.40500E-10	172.556
362.911	0.681449	2.02495E-03	2.81500E-10	171.211
368.211	0.656843	2.39186E-03	3.20500E-10	125.513
373.111	0.656388	2.74452E-03	3.67500E-10	128.512
378.011	0.6639	3.17863E-03	4.30500E-10	108.69
383.111	0.695726	3.66030E-03	5.19500E-10	84.2113
388.011	0.706836	4.15064E-03	5.98500E-10	71.568
393.111	0.676304	4.90338E-03	6.76500E-10	70.937
398.111	0.694533	5.76279E-03	8.16500E-10	60.2187
403.011	0.696872	6.73527E-03	9.57500E-10	51.8027
408.111	0.707841	7.87052E-03	1.13650E-09	38.0592
413.311	0.0836	8.59015E-03	1.46500E-10	44.1458
422.911	19.4914	0.0114548	7.10000E-12	29.9872
428.111	12.0413	0.0128488	4.92000E-12	24.9807
433.111	7.23826	0.0152926	3.52000E-12	17.7208
438.011	4.86669	0.0195786	3.03000E-12	15.3134
442.911	3.753	0.0222882	2.66000E-12	13.7379
447.911	2.86908	0.0265244	2.42000E-12	12.5163
452.911	2.26736	0.0318991	2.30000E-12	11.1939
458.011	1.81203	0.0378324	2.18000E-12	8.86209
462.911	1.45305	0.0443653	2.05000E-12	7.01908
468.011	1.34753	0.0508733	2.18000E-12	6.7069
473.111	1.15703	0.0592491	2.18000E-12	6.07796
478.011	1.06375	0.0679923	2.30000E-12	5.01482
482.911	0.9087	0.0795939	2.30000E-12	4.47413
488.111	0.931282	0.085768	2.54000E-12	4.38811
493.011	0.863796	0.10157	2.79000E-12	3.08655
498.011	0.770137	0.128622	3.15000E-12	2.79598
503.011	0.753759	0.146853	3.52000E-12	2.68675
508.011	0.707115	0.178331	4.01000E-12	2.16048
513.011	0.742211	0.208454	4.92000E-12	1.99028
518.011	0.786483	0.226308	5.66000E-12	2.06209
522.911	0.797875	0.251848	6.39000E-12	1.79044
528.011	0.780128	0.29829	7.40000E-12	1.63926
533.011	0.755639	0.357896	8.60000E-12	1.51549
537.911	0.723787	0.434472	1.00000E-11	1.32347
542.811	0.73573	0.512903	1.20000E-11	1.30301
547.911	0.787847	0.590735	1.48000E-11	1.24461
552.811	0.794313	0.700736	1.77000E-11	1.13314
557.911	0.791492	0.822425	2.07000E-11	1.15335

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563.111	0.851753	0.889766	2.41000E-11	1.29301
568.011	0.869552	0.994511	2.75000E-11	1.03291
573.011	0.738426	1.32868	3.12000E-11	0.936888
578.011	0.773309	1.58593	3.90000E-11	1.11179
583.011	0.89183	1.6502	4.68000E-11	1.14985
587.911	0.916418	1.73975	5.07000E-11	1.12005
592.811	0.90656	1.89295	5.46000E-11	1.04021
597.711	0.77159	2.34344	5.75000E-11	0.91577
602.911	0.784177	3.03166	7.56000E-11	1.00925
608.011	0.851444	3.44217	9.32000E-11	1.04776
612.911	0.896546	3.80566	1.08500E-10	1.02497
618.011	0.903381	4.29901	1.23500E-10	1.03521
622.911	0.907579	4.69491	1.35500E-10	1.0306
627.811	0.898402	5.1279	1.46500E-10	1.03102
632.811	0.921143	5.54752	1.62500E-10	1.03353
637.811	0.916695	5.98609	1.74500E-10	1.02349
642.711	0.930634	6.40329	1.89500E-10	1.03705
647.811	0.935527	6.77316	2.01500E-10	1.03291
652.911	0.957843	7.14065	2.17500E-10	1.03813
657.811	0.955472	7.42166	2.25500E-10	1.03577
662.811	0.955625	7.65082	2.32500E-10	1.04057
667.911	0.999751	7.87932	2.50500E-10	1.03843
673.111	0.966404	8.1512	2.50500E-10	1.05008
682.711	0.984489	8.257	2.58500E-10	1.04417
687.911	0.987435	8.23237	2.58500E-10	1.04176
692.911	0.984462	8.25723	2.58500E-10	1.04405
697.911	0.979436	8.2996	2.58500E-10	1.04381
702.911	0.970673	8.37453	2.58500E-10	1.03738
707.811	0.988202	8.48055	2.66500E-10	1.0365
712.711	0.972651	8.61614	2.66500E-10	1.035
717.911	0.977796	8.79593	2.73500E-10	1.0325
722.911	0.959663	8.96213	2.73500E-10	1.03249
727.911	0.968931	9.13604	2.81500E-10	1.03999
732.911	0.975977	9.32785	2.89500E-10	1.03677
737.911	0.984769	9.50004	2.97500E-10	1.03156
742.911	0.994833	9.65681	3.05500E-10	1.03672
747.811	0.979829	9.80468	3.05500E-10	1.03387
752.811	0.98806	9.94579	3.12500E-10	1.03466
757.711	1.00005	10.0781	3.20500E-10	1.03406
762.711	0.986233	10.2193	3.20500E-10	1.03182
767.811	0.994798	10.3842	3.28500E-10	1.0336
772.811	0.981443	10.5255	3.28500E-10	1.02953
777.811	0.99173	10.67	3.36500E-10	1.03119
782.811	0.978877	10.8101	3.36500E-10	1.033
787.711	0.989164	10.952	3.44500E-10	1.03373
792.811	0.99543	11.1042	3.51500E-10	1.03472
797.811	0.982503	11.2503	3.51500E-10	1.03071
802.811	0.991512	11.4018	3.59500E-10	1.031
807.711	0.978197	11.557	3.59500E-10	1.03084
812.611	0.984361	11.7402	3.67500E-10	1.0303
817.711	0.990394	11.9227	3.75500E-10	1.02863
822.711	0.979175	12.0593	3.75500E-10	1.02884
827.611	0.987387	12.2138	3.83500E-10	1.02897
832.711	0.994789	12.3758	3.91500E-10	1.02448
837.611	0.982296	12.5332	3.91500E-10	1.02847
842.811	0.984364	12.7305	3.98500E-10	1.03137
847.711	0.991039	12.8986	4.06500E-10	1.0276
852.711	0.99888	13.0492	4.14500E-10	1.0271
857.611	0.984136	13.2447	4.14500E-10	1.02631
862.711	0.98751	13.4542	4.22500E-10	1.02713
867.611	0.991463	13.6543	4.30500E-10	1.02487
872.711	0.980205	13.8111	4.30500E-10	1.02746
877.611	0.982402	14.0043	4.37500E-10	1.02634
882.711	0.98601	14.2082	4.45500E-10	1.02618

887.611	0.973289	14.3939	4.45500E-10	1.02483
892.611	0.993243	14.6113	4.61500E-10	1.02623
897.611	0.980804	14.7966	4.61500E-10	1.02505
902.711	0.985209	14.9858	4.69500E-10	1.02574
907.611	0.986294	15.1925	4.76500E-10	1.02486
912.611	0.98934	15.4	4.84500E-10	1.02368
917.611	0.976707	15.5992	4.84500E-10	1.02599
922.611	1.00256	15.8242	5.04500E-10	1.02559
927.511	1.01835	16.0421	5.19500E-10	1.02147
932.611	1.00371	16.276	5.19500E-10	1.0234
937.711	1.02067	16.4985	5.35500E-10	1.02053
942.611	1.00771	16.7107	5.35500E-10	1.02254
947.611	0.993769	16.9452	5.35500E-10	1.0215
952.711	1.00965	17.177	5.51500E-10	1.02375
957.611	0.996613	17.4017	5.51500E-10	1.01944
962.611	1.00946	17.6475	5.66500E-10	1.01999
967.711	0.995143	17.9014	5.66500E-10	1.02132
972.711	0.98194	18.1421	5.66500E-10	1.02255
977.711	0.996459	18.3827	5.82500E-10	1.02126
982.611	1.01022	18.6302	5.98500E-10	1.02388
987.611	0.996107	18.8943	5.98500E-10	1.02202
992.611	1.00765	19.1459	6.13500E-10	1.02244
997.511	0.994056	19.4078	6.13500E-10	1.02196
1002.61	1.00551	19.6871	6.29500E-10	1.02174
1007.51	0.992384	19.9475	6.29500E-10	1.02195
1012.71	0.978638	20.2277	6.29500E-10	1.02109
1017.61	0.989285	20.4868	6.44500E-10	1.01935
1022.51	1.00038	20.7625	6.60500E-10	1.01954
1027.51	0.985623	21.0734	6.60500E-10	1.01818
1032.51	0.995735	21.3647	6.76500E-10	1.0198
1037.51	1.00423	21.6515	6.91500E-10	1.01879
1042.51	0.991129	21.9399	6.91500E-10	1.01777
1047.61	0.977377	22.2486	6.91500E-10	1.01989
1052.51	0.986644	22.5496	7.07500E-10	1.01919
1057.41	0.996084	22.841	7.23500E-10	1.01985
1062.51	0.98211	23.166	7.23500E-10	1.01919
1067.61	0.988741	23.4877	7.38500E-10	1.01758
1072.61	0.996615	23.807	7.54500E-10	1.01863
1077.61	0.982895	24.1393	7.54500E-10	1.01686
1082.51	0.989471	24.4556	7.69500E-10	1.01623
1087.51	0.996717	24.7826	7.85500E-10	1.01906
1092.41	0.984294	25.0954	7.85500E-10	1.01853
1097.51	0.989902	25.4615	8.01500E-10	1.01568
1102.41	0.994396	25.8208	8.16500E-10	1.01727
1107.51	1.00042	26.1682	8.32500E-10	1.01625
1112.41	0.987419	26.5128	8.32500E-10	1.01879
1117.41	0.992456	26.8852	8.48500E-10	1.01661
1122.51	0.978897	27.2576	8.48500E-10	1.01732
1127.51	0.982914	27.6261	8.63500E-10	1.01648
1132.41	0.987581	28.005	8.79500E-10	1.01685
1137.41	0.990978	28.385	8.94500E-10	1.01622
1142.41	0.994963	28.777	9.10500E-10	1.0156
1147.61	0.981205	29.1805	9.10500E-10	1.01664
1152.51	0.985319	29.5693	9.26500E-10	1.01546
1157.51	0.987519	29.9811	9.41500E-10	1.01627
1162.41	0.991104	30.3803	9.57500E-10	1.01529
1167.51	0.977555	30.8014	9.57500E-10	1.01549
1172.51	0.980438	31.224	9.73500E-10	1.01527

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SUMS DYNAMIC CALIBRATION +25% CASE

2-23-82 RUN #2 TAPE 202

Time of 28 AMU Sample, Secs	Ratio of Dynamic Drop To Static Drop	Baratron Pressure at time of 28 AMU Sample, Torr	*Corrected 28 AMU Ion Current Amps	Ratio of Inlet Transducer Pressure to Baratron Pressure
3.311	0.907712	1.57150E-05	2.91000E-12	26383.4
8.611	1.32122	1.07966E-05	2.91000E-12	23837.6
18.111	0.802018	1.62580E-05	2.66000E-12	14768.9
23.211	0.884314	1.47450E-05	2.66000E-12	27449.4
28.111	1.13119	1.15269E-05	2.66000E-12	15640.1
33.111	0.910648	1.43186E-05	2.66000E-12	14590.5
38.111	0.885546	1.54441E-05	2.79000E-12	13419.6
43.211	0.880537	1.62000E-05	2.91000E-12	16774.5
48.011	0.917424	1.68310E-05	3.15000E-12	15266.8
53.211	0.885182	1.81086E-05	3.27000E-12	14689.1
58.111	0.914986	1.82152E-05	3.40000E-12	12213.4
63.211	0.956223	1.86600E-05	3.64000E-12	10979.7
68.211	0.900422	2.04697E-05	3.76000E-12	12698.5
73.211	0.9313	2.11069E-05	4.01000E-12	13127.9
78.111	0.998597	2.08626E-05	4.25000E-12	12879.1
83.211	1.00261	2.16590E-05	4.43000E-12	12131.6
88.211	0.959604	2.39069E-05	4.68000E-12	10451.9
93.211	1.01221	2.50372E-05	5.17000E-12	11466.2
98.011	1.08576	2.55535E-05	5.66000E-12	9568.65
103.011	1.02848	2.69767E-05	5.66000E-12	10870
108.011	1.09455	2.64232E-05	5.90000E-12	9568.65
113.211	1.07991	2.78708E-05	6.14000E-12	9990.8
118.111	1.12469	2.78507E-05	6.39000E-12	7548.6
123.211	1.07828	3.00040E-05	6.60000E-12	8599.68
128.111	1.0759	3.14373E-05	6.90000E-12	6967.94
133.011	1.09833	3.16880E-05	7.10000E-12	8387.33
138.111	1.11578	3.33890E-05	7.60000E-12	7831.41
143.211	1.03886	3.58610E-05	7.60000E-12	7266.04
148.111	1.02487	3.87422E-05	8.10000E-12	5341.51
153.011	1.01849	4.13914E-05	8.60000E-12	6409.19
158.211	1.04231	4.27968E-05	9.10000E-12	5020.77
163.111	1.05992	4.43981E-05	9.60000E-12	5907.6
168.211	1.03188	4.75050E-05	1.00000E-11	5489.89
173.111	1.03962	5.09235E-05	1.08000E-11	5127.35
178.011	1.05795	5.32847E-05	1.15000E-11	5060.51
183.011	1.04413	5.63371E-05	1.20000E-11	3623.32
188.111	1.01116	6.25370E-05	1.29000E-11	3298.93
193.211	0.990324	6.83080E-05	1.38000E-11	3800.69
198.211	0.979131	7.40953E-05	1.48000E-11	2797.93
203.111	0.959139	8.07505E-05	1.58000E-11	3189.55
207.911	0.982502	8.38196E-05	1.68000E-11	3326.18
213.211	0.974726	8.90144E-05	1.77000E-11	2775.78
218.111	0.956201	9.84287E-05	1.92000E-11	2739.41
222.911	0.97417	1.01645E-04	2.02000E-11	2578.26
228.011	0.987257	1.07249E-04	2.16000E-11	2477.2
233.111	0.963434	1.14989E-04	2.26000E-11	2227.45

*Corrected for background by subtracting 3.5 E-12 Amps

238.011	0.922215	1.28101E-04	2.41000E-11	1983.56
243.011	0.8797	1.42651E-04	2.56000E-11	1805.63
247.911	0.869624	1.55014E-04	2.75000E-11	1681.61
252.911	0.876578	1.68883E-04	3.02000E-11	1518.14
258.011	0.857024	1.89191E-04	3.31000E-11	1072.52
263.111	0.81728	2.10526E-04	3.51000E-11	1230.19
268.011	0.822505	2.26472E-04	3.80000E-11	926.682
273.011	0.811233	2.53185E-04	4.19000E-11	974.013
278.111	0.806185	2.78484E-04	4.58000E-11	978.221
283.011	0.853255	2.85527E-04	4.97000E-11	915.599
288.011	0.815747	3.16683E-04	5.27000E-11	789.281
292.911	0.756844	3.66589E-04	5.66000E-11	680.906
297.911	0.801565	4.14630E-04	6.78000E-11	622.993
303.111	0.756799	4.76724E-04	7.36000E-11	514.58
308.011	0.743561	5.37292E-04	8.15000E-11	493.402
312.911	0.785237	5.81815E-04	9.32000E-11	433.273
317.911	0.738175	6.67385E-04	1.00500E-10	300.607
322.911	0.807097	7.31865E-04	1.20500E-10	365.303
328.011	0.80691	7.74559E-04	1.27500E-10	266.682
333.111	0.775328	8.81979E-04	1.39500E-10	280.01
337.911	0.719035	1.02602E-03	1.50500E-10	244.532
343.011	0.694023	1.20426E-03	1.70500E-10	163.766
348.011	0.711243	1.36119E-03	1.97500E-10	154.402
353.011	0.769482	1.43654E-03	2.25500E-10	164.086
357.911	0.798473	1.53786E-03	2.50500E-10	133.554
363.011	0.761113	1.76148E-03	2.73500E-10	140.17
367.911	0.719287	2.08199E-03	3.05500E-10	118.615
372.811	0.682145	2.47561E-03	3.44500E-10	99.0016
377.911	0.63783	3.06262E-03	3.98500E-10	62.403
383.011	0.675208	3.66263E-03	5.04500E-10	69.6847
387.911	0.670719	4.25721E-03	5.82500E-10	45.4934
392.911	0.692773	5.00616E-03	7.07500E-10	51.0506
397.811	0.718855	5.78602E-03	8.48500E-10	42.0489
402.811	0.716383	6.76396E-03	9.88500E-10	37.8355
407.811	0.741392	7.91105E-03	1.19650E-09	30.4545
413.011	0.0839185	8.79120E-03	1.50500E-10	31.5108
418.011	61.3081	0.0103611	2.02000E-11	21.2736
422.911	19.5305	0.013042	8.10000E-12	20.2299
427.811	13.504	0.0137392	5.90000E-12	15.3249
432.911	9.53981	0.0154269	4.68000E-12	15.9178
437.811	6.20952	0.0196999	3.89000E-12	11.5475
442.811	4.55289	0.0243124	3.52000E-12	10.7009
447.911	3.91907	0.0262988	3.27000E-12	9.88289
452.811	3.11503	0.0305881	3.03000E-12	7.74282
457.911	2.42856	0.0376804	2.91000E-12	6.61111
462.811	2.02409	0.0433457	2.79000E-12	5.82978
467.711	1.65433	0.0530339	2.79000E-12	4.35509
472.711	1.44967	0.0631242	2.91000E-12	5.08473
477.711	1.41118	0.0675198	3.03000E-12	4.51511
482.711	1.2246	0.0778072	3.03000E-12	3.17605
488.011	1.20622	0.0852495	3.27000E-12	3.20195
492.811	1.17079	0.094544	3.52000E-12	2.9808
497.811	0.951705	0.124239	3.76000E-12	2.25128
502.811	0.853709	0.147709	4.01000E-12	2.14991
507.711	0.973907	0.159009	4.92000E-12	1.92162
512.711	0.90097	0.188825	5.41000E-12	1.76632
517.911	0.810464	0.228236	6.14000E-12	1.42383
522.811	0.818623	0.272739	7.10000E-12	1.54831
527.711	0.874272	0.298541	8.30000E-12	1.34035
532.811	0.854813	0.353161	9.60000E-12	1.25006
537.711	0.800116	0.432327	1.10000E-11	0.993863
542.711	0.818253	0.511136	1.33000E-11	1.11201
547.711	0.853517	0.582127	1.58000E-11	1.09088
552.811	0.843157	0.697438	1.87000E-11	1.06139
557.711	0.854434	0.813367	2.21000E-11	0.988843

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562.811	0.919564	0.875449	2.56000E-11	1.12421
567.811	0.798178	1.11102	2.82000E-11	0.789580
572.811	0.761501	1.44947	3.51000E-11	1.04591
577.611	0.85378	1.61699	4.39000E-11	0.961378
582.911	0.891526	1.85887	5.27000E-11	1.08658
587.811	0.931195	1.9418	5.75000E-11	1.02166
592.711	0.927161	2.22174	6.58000E-11	0.971797
597.811	0.894157	2.65277	7.56000E-11	0.967478
602.711	0.882795	3.04208	8.54000E-11	0.996348
607.711	0.920617	3.43209	1.00500E-10	1.00518
612.811	0.913751	3.87166	1.12500E-10	1.01778
617.811	0.950938	4.21629	1.27500E-10	1.00475
622.711	0.942014	4.65287	1.39500E-10	0.99518
627.811	0.92259	5.1298	1.50500E-10	1.01742
632.611	0.927439	5.50986	1.62500E-10	1.00826
637.811	0.943318	5.95049	1.78500E-10	1.01981
642.811	0.938216	6.35154	1.89500E-10	1.0149
647.811	0.95741	6.74973	2.05500E-10	1.02063
652.711	0.963317	7.10007	2.17500E-10	1.02262
657.711	0.959731	7.38873	2.25500E-10	1.02382
662.811	0.973317	7.64099	2.36500E-10	1.02726
667.811	1.00101	7.8694	2.50500E-10	1.02621
672.811	0.978928	8.04692	2.50500E-10	1.03128
678.011	0.996773	8.15524	2.58500E-10	1.03996
687.611	1.01715	8.23916	2.66500E-10	1.03379
692.711	1.00948	8.30173	2.66500E-10	1.03307
697.711	0.994537	8.42653	2.66500E-10	1.028
702.611	0.97787	8.57016	2.66500E-10	1.02357
707.711	0.986124	8.72165	2.73500E-10	1.02407
712.711	0.999046	8.86065	2.81500E-10	1.02237
717.711	0.98545	8.9829	2.81500E-10	1.02637
722.711	0.998875	9.11402	2.89500E-10	1.02246
727.611	1.01026	9.26026	2.97500E-10	1.02843
732.611	0.994801	9.40423	2.97500E-10	1.02687
737.611	0.982354	9.52339	2.97500E-10	1.02557
742.611	0.992717	9.67739	3.05500E-10	1.02086
747.611	1.00009	9.82613	3.12500E-10	1.02994
752.711	0.987373	9.95271	3.12500E-10	1.02058
757.611	0.998208	10.0967	3.20500E-10	1.02344
762.511	0.988739	10.1934	3.20500E-10	1.02167
767.611	0.996804	10.3633	3.28500E-10	1.02058
772.511	1.00514	10.5276	3.36500E-10	1.02731
777.611	0.994741	10.6377	3.36500E-10	1.01972
782.611	1.00265	10.8046	3.44500E-10	1.02415
787.711	0.98737	10.9719	3.44500E-10	1.02044
792.711	0.997514	11.081	3.51500E-10	1.0228
797.611	0.985376	11.2175	3.51500E-10	1.01939
802.511	0.991443	11.4026	3.59500E-10	1.02129
807.511	0.998074	11.5789	3.67500E-10	1.02432
812.511	0.988529	11.6907	3.67500E-10	1.02303
817.511	0.992959	11.8919	3.75500E-10	1.01668
822.711	0.977894	12.0751	3.75500E-10	1.02116
827.611	0.988828	12.196	3.83500E-10	1.02196
832.511	0.996868	12.35	3.91500E-10	1.02192
837.611	0.980388	12.5576	3.91500E-10	1.01796
842.611	1.0034	12.7396	4.06500E-10	1.02025
847.511	0.993272	12.8696	4.06500E-10	1.02065
852.511	0.997832	13.0629	4.14500E-10	1.02009
857.411	0.985118	13.2315	4.14500E-10	1.01885
862.511	0.988171	13.4452	4.22500E-10	1.01981
867.511	0.992153	13.6448	4.30500E-10	1.02195
872.611	0.997221	13.7962	4.37500E-10	1.02082
877.611	0.982367	14.0048	4.37500E-10	1.01742
882.611	0.985656	14.2133	4.45500E-10	1.01908
887.611	0.992125	14.3742	4.53500E-10	1.01669

892.611	0.97737	14.5912	4.53500E-10	1.02164
897.611	0.981216	14.7904	4.61500E-10	1.02002
902.511	0.980354	14.9684	4.69500E-10	1.01739
907.411	0.985982	15.1973	4.76500E-10	1.01509
912.511	0.988994	15.4054	4.84500E-10	1.01853
917.411	0.992217	15.6089	4.92500E-10	1.01947
922.511	1.00319	15.8142	5.04500E-10	1.01671
927.411	0.990848	16.0113	5.04500E-10	1.01758
932.411	1.00485	16.2576	5.19500E-10	1.01854
937.511	0.989939	16.5025	5.19500E-10	1.01873
942.511	1.00848	16.6979	5.35500E-10	1.01633
947.411	0.993898	16.943	5.35500E-10	1.01472
952.411	1.00968	17.1764	5.51500E-10	1.01776
957.511	0.996836	17.3978	5.51500E-10	1.01411
962.411	0.98469	17.6124	5.51500E-10	1.01714
967.511	0.996256	17.8814	5.66500E-10	1.01667
972.411	0.982222	18.1369	5.66500E-10	1.0163
977.511	0.997234	18.3684	5.82500E-10	1.01407
982.511	0.982514	18.6436	5.82500E-10	1.01569
987.411	0.996951	18.8783	5.98500E-10	1.01447
992.511	0.984235	19.1222	5.98500E-10	1.01593
997.411	0.994553	19.3981	6.13500E-10	1.01485
1002.51	1.00451	19.7067	6.29500E-10	1.01322
1007.41	0.992066	19.9539	6.29500E-10	1.01619
1012.51	0.978923	20.2218	6.29500E-10	1.01656
1017.51	0.989875	20.4746	6.44500E-10	1.01477
1022.51	1.00037	20.7627	6.60500E-10	1.01382
1027.51	0.985422	21.0777	6.60500E-10	1.0133
1032.51	0.996108	21.3567	6.76500E-10	1.01532
1037.51	0.983449	21.6316	6.76500E-10	1.01525
1042.51	0.99126	21.937	6.91500E-10	1.01611
1047.51	0.977839	22.2381	6.91500E-10	1.01561
1052.51	0.98812	22.5159	7.07500E-10	1.01427
1057.41	0.996486	22.8318	7.23500E-10	1.0116
1062.31	0.982861	23.1483	7.23500E-10	1.01388
1067.41	0.988257	23.4992	7.38500E-10	1.01498
1072.41	0.997075	23.796	7.54500E-10	1.01336
1077.31	0.983698	24.1196	7.54500E-10	1.01409
1082.41	0.988804	24.4721	7.69500E-10	1.0117
1087.31	0.99687	24.7788	7.85500E-10	1.01491
1092.41	0.984541	25.0891	7.85500E-10	1.01313
1097.41	0.990828	25.4377	8.01500E-10	1.01396
1102.41	0.993822	25.8357	8.16500E-10	1.01362
1107.41	0.980662	26.1824	8.16500E-10	1.01259
1112.31	0.987638	26.5069	8.32500E-10	1.01258
1117.31	0.992148	26.8773	8.48500E-10	1.01146
1122.41	0.978904	27.2574	8.48500E-10	1.01226
1127.31	0.982533	27.6368	8.63500E-10	1.0128
1132.41	0.987359	28.0113	8.79500E-10	1.0129
1137.41	0.973938	28.3973	8.79500E-10	1.01154
1142.41	0.976926	28.7933	8.94500E-10	1.01171
1147.41	0.981639	29.1676	9.10500E-10	1.01161
1152.31	0.985413	29.5665	9.26500E-10	1.0113
1157.31	0.987371	29.9856	9.41500E-10	1.01301
1162.41	0.974549	30.3801	9.41500E-10	1.01203
1167.31	0.977739	30.7956	9.57500E-10	1.01124

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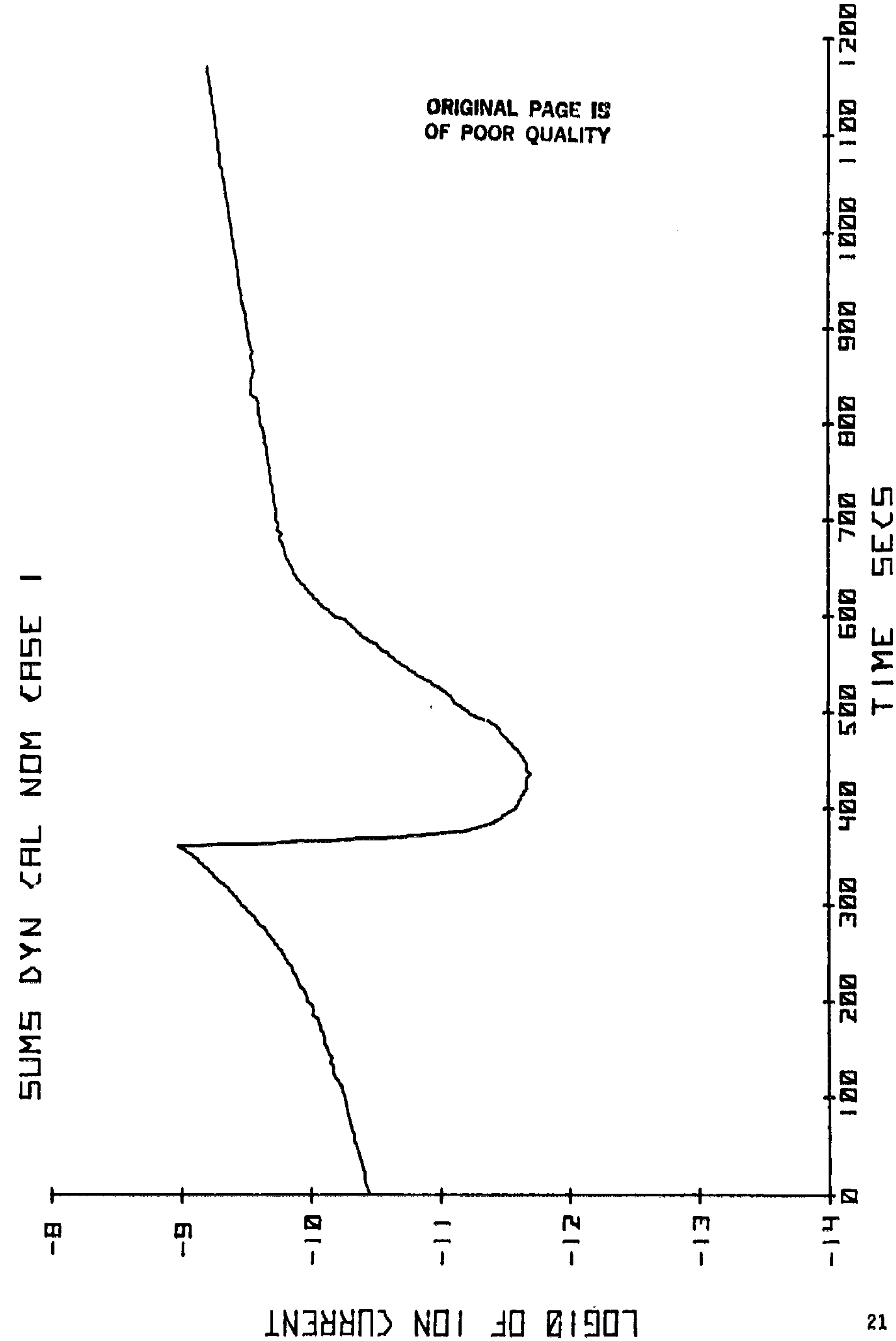
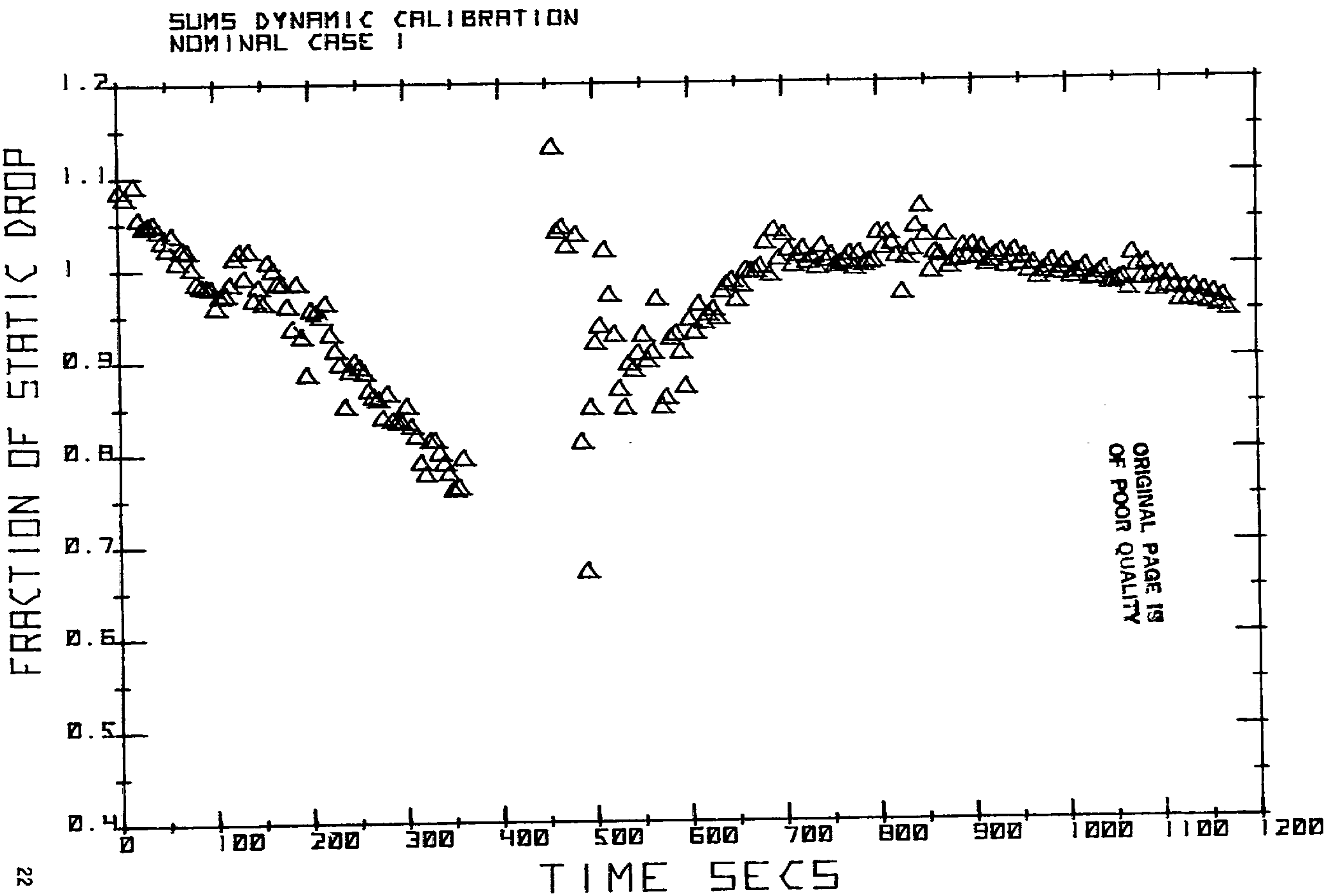
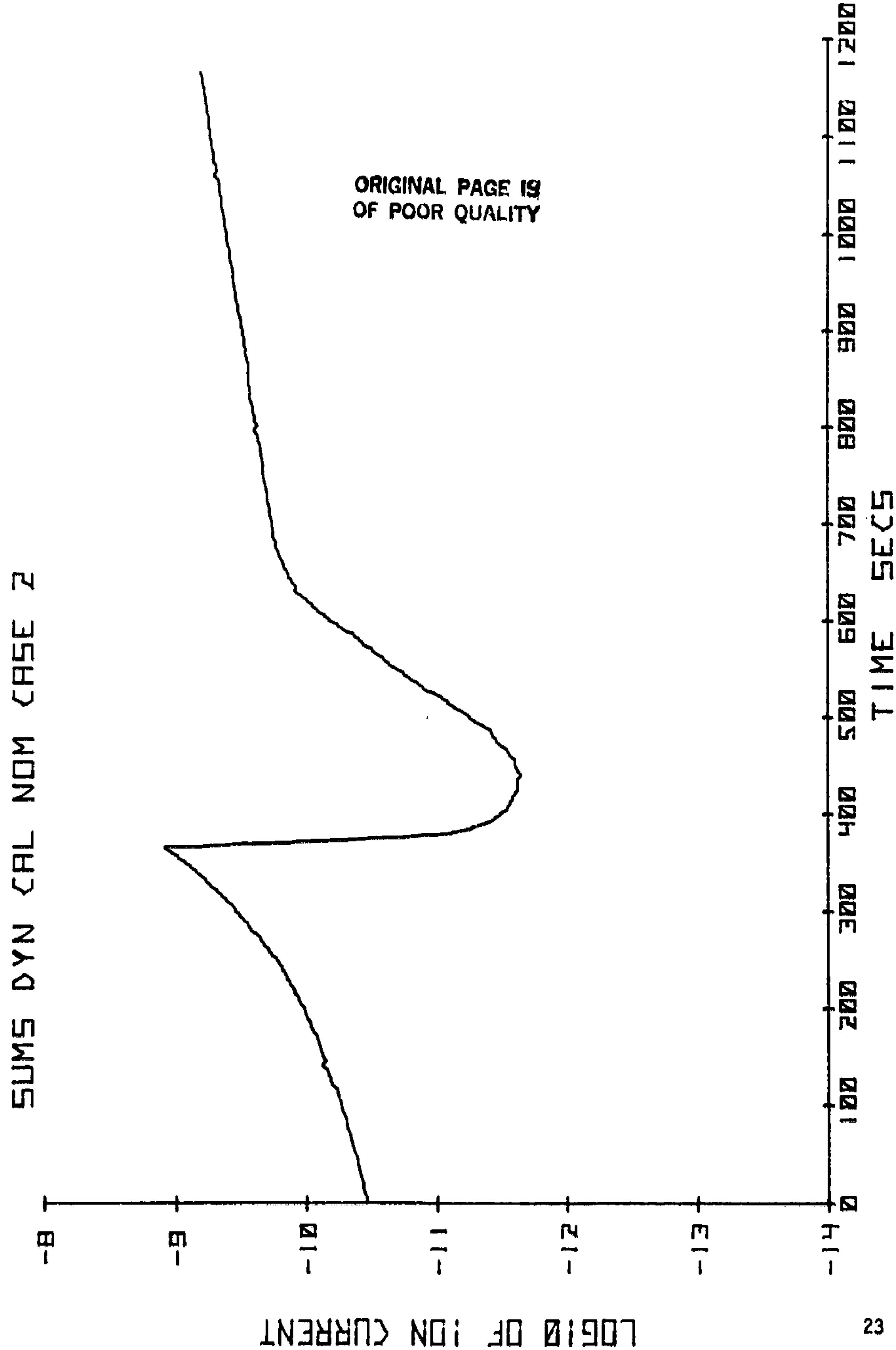
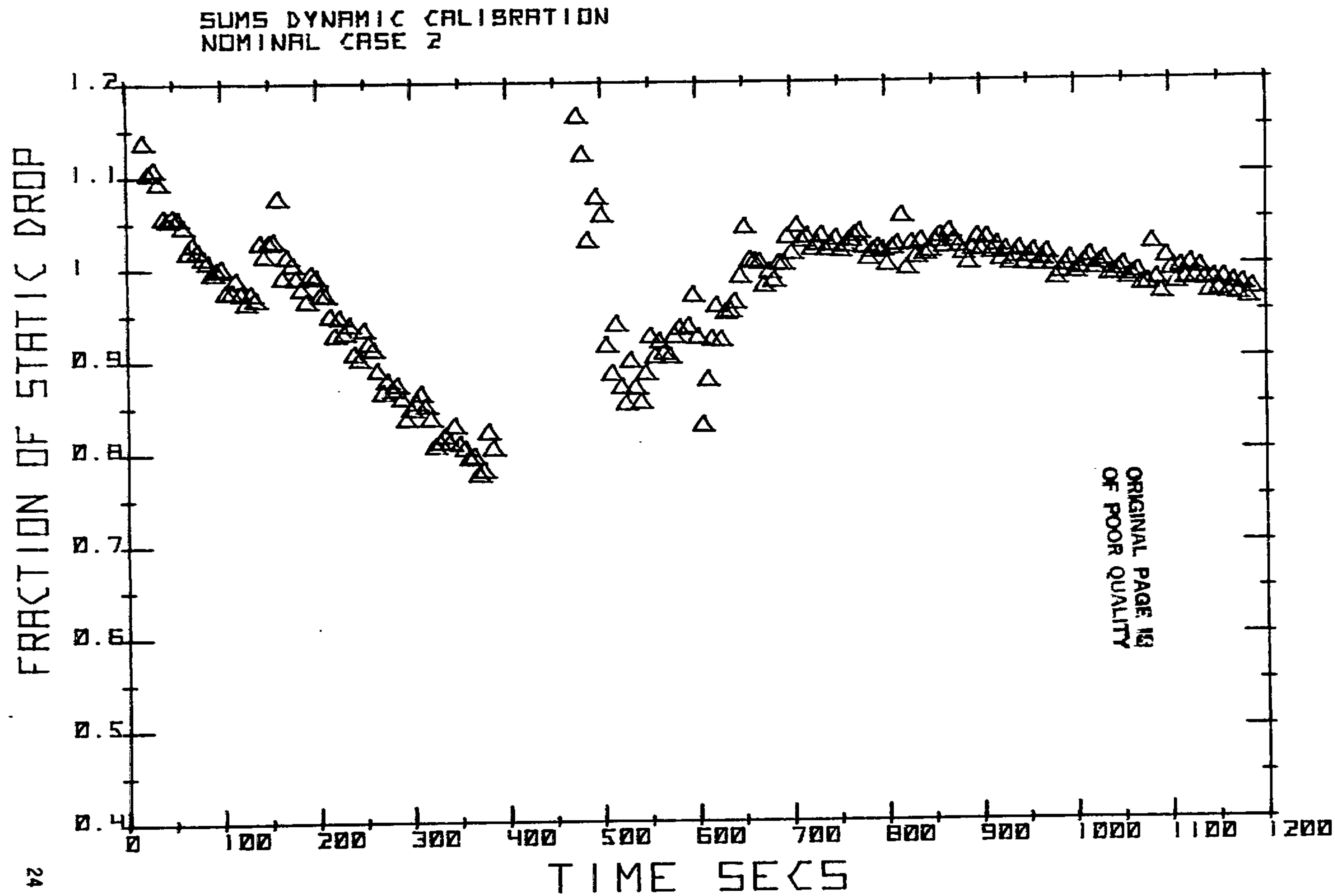

SUMS DYN CAL NOM CASE 1
LOG10 OF ION CURRENT
-8
-9
-10
-11
-12
-13
-14
TIME SECS
0
100
200
300
400
500
600
700
800
900
1000
1100
1200


SUMS DYNAMIC CALIBRATION
NOMINAL CASE 1
FRACTION OF STATIC DROP
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
TIME SECS


SUMS DYN CAL NOM CASE 2
LOG10 OF ION CURRENT
-8
-9
-10
-11
-12
-13
-14
TIME SECS
0
100
200
300
400
500
600
700
800
900
1000
1100
1200



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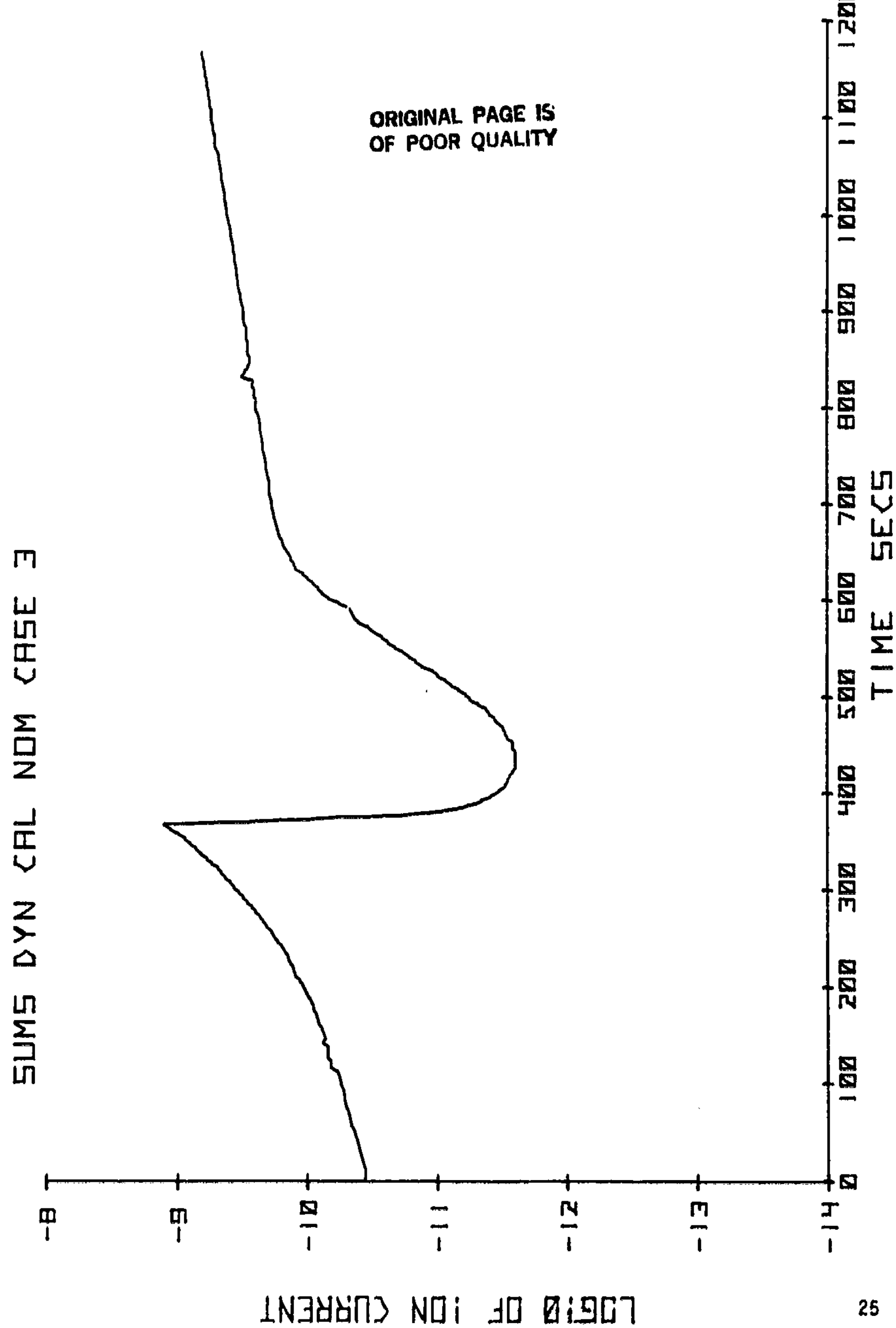
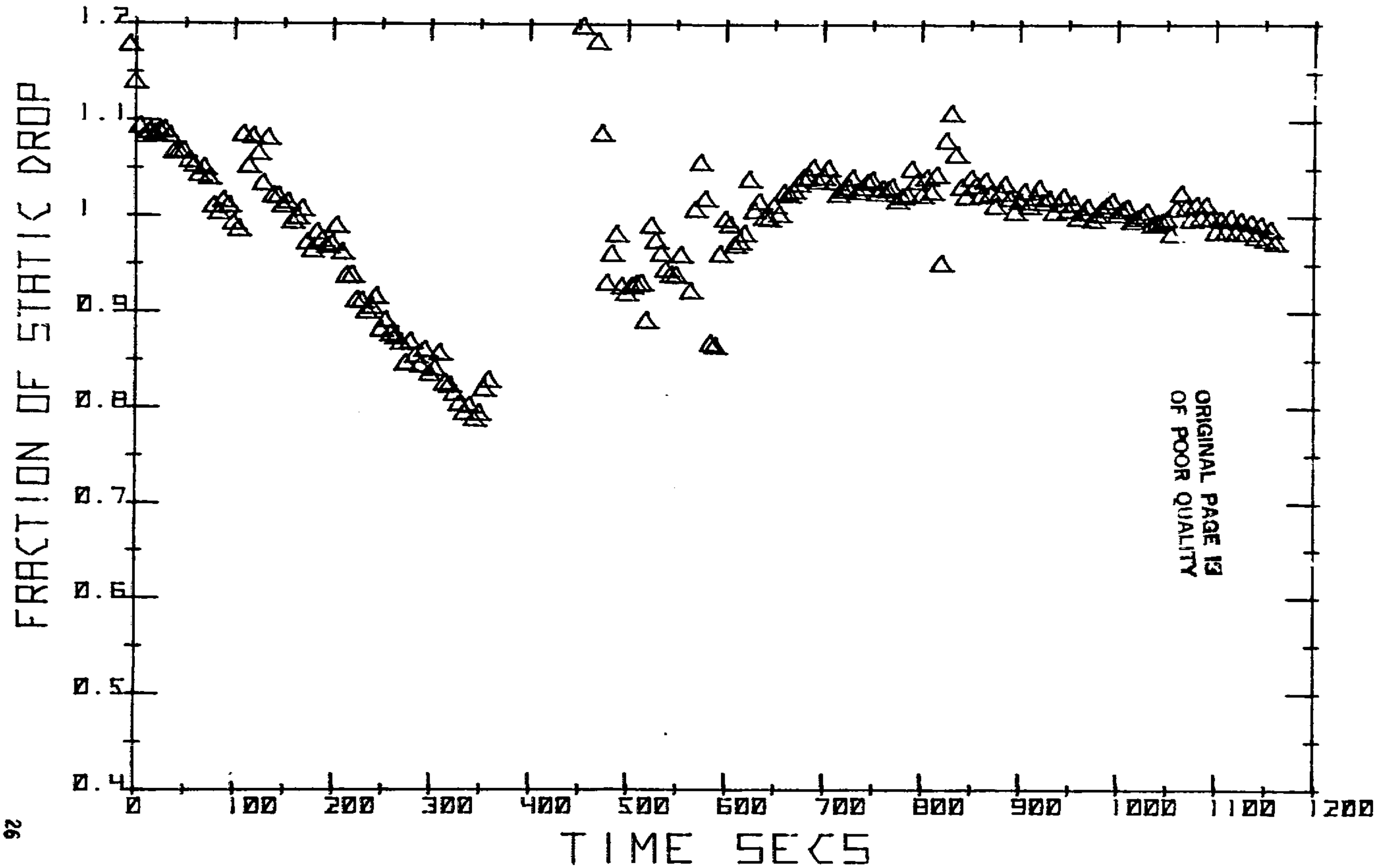
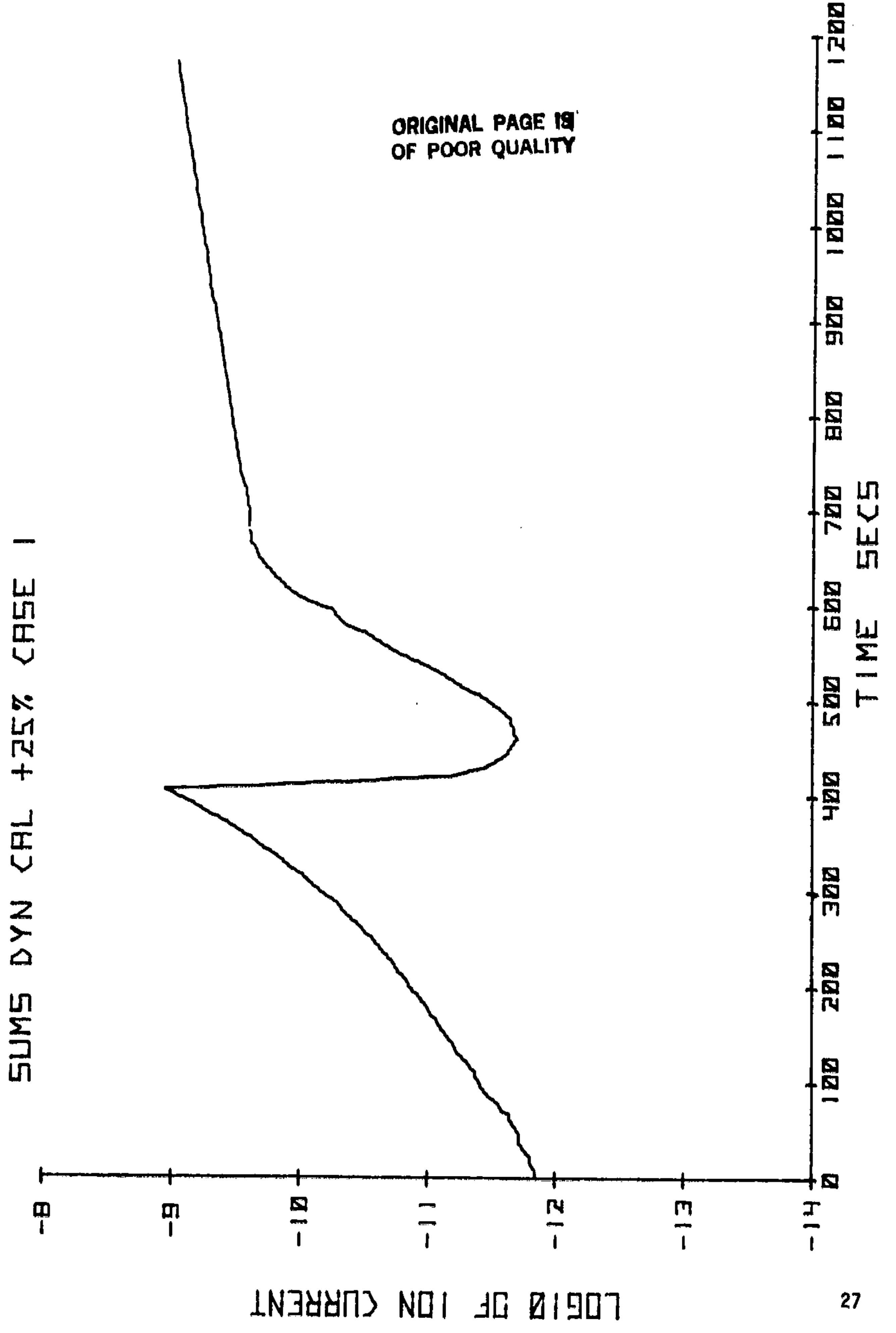
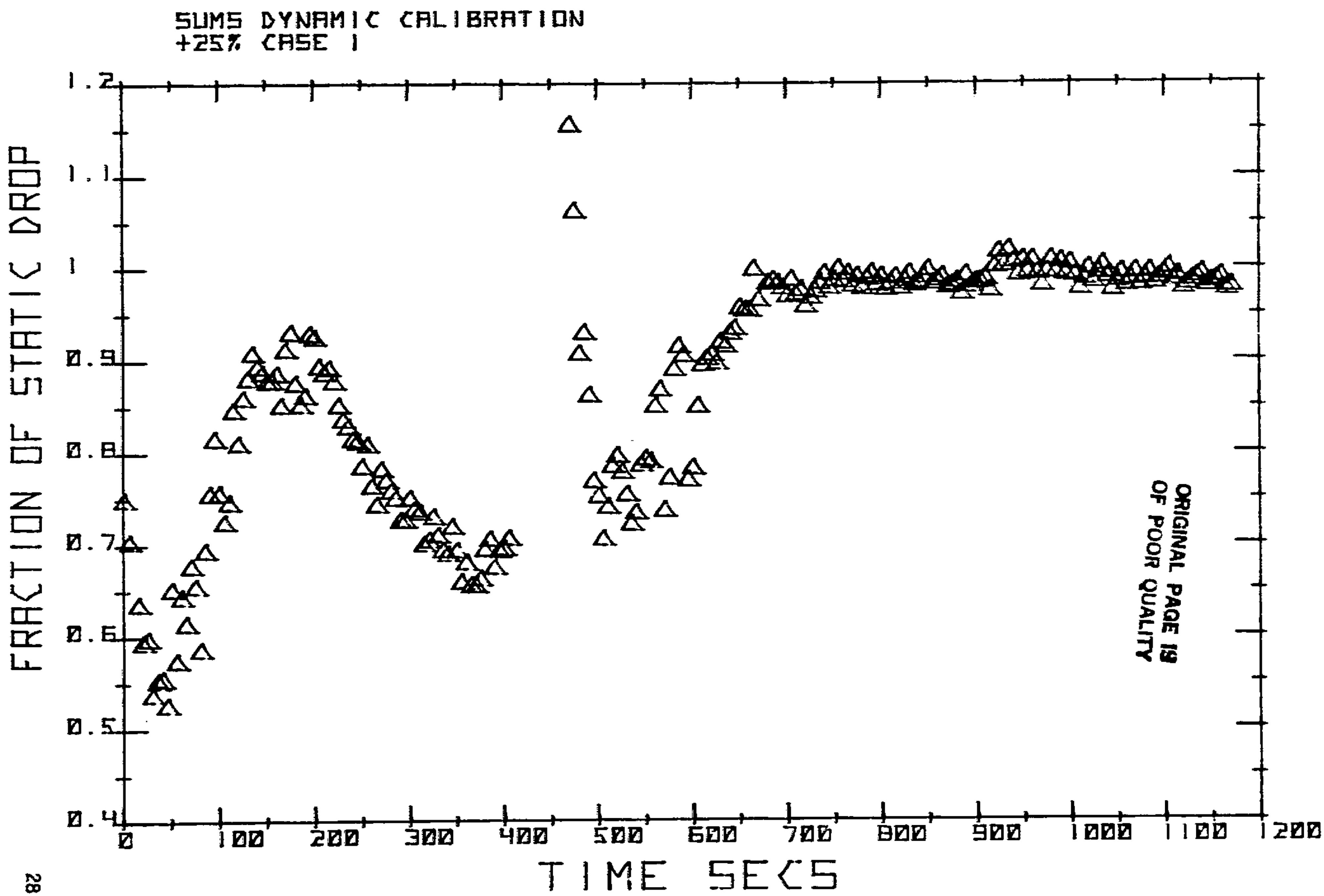


SUMS DYNAMIC CALIBRATION
NOMINAL CASE 3




SUMS DYN CAL +25% CASE 1
LOG10 OF ION CURRENT
TIME SECS
-8
-9
-10
-11
-12
-13
-14
0
100
200
300
400
500
600
700
800
900
1000
1100
1200



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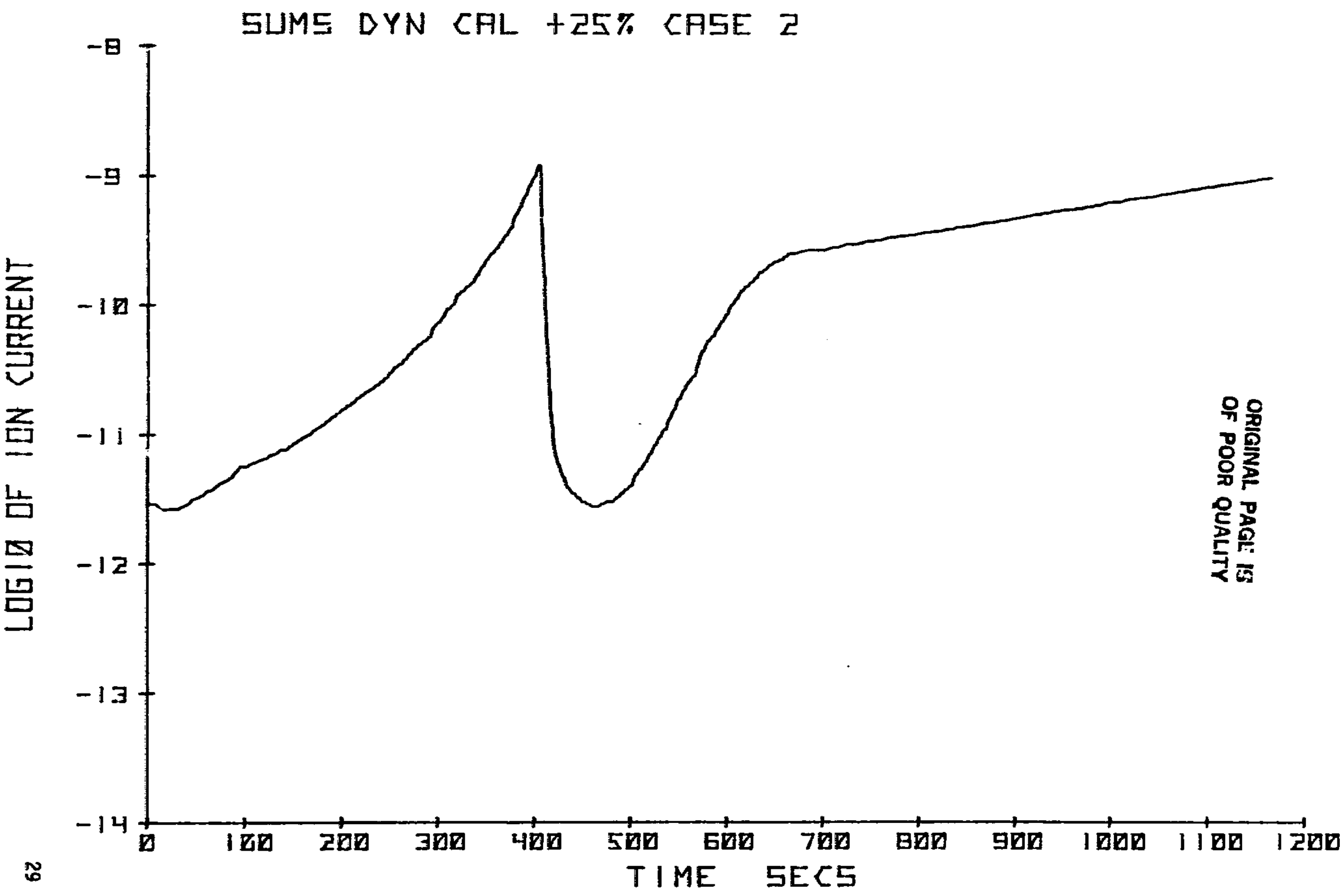
SUMS DYN CAL +25% CASE 2
-8
-9
-10
-11
-12
-13
-14
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
TIME SECS
LOG10 OF ION CURRENT
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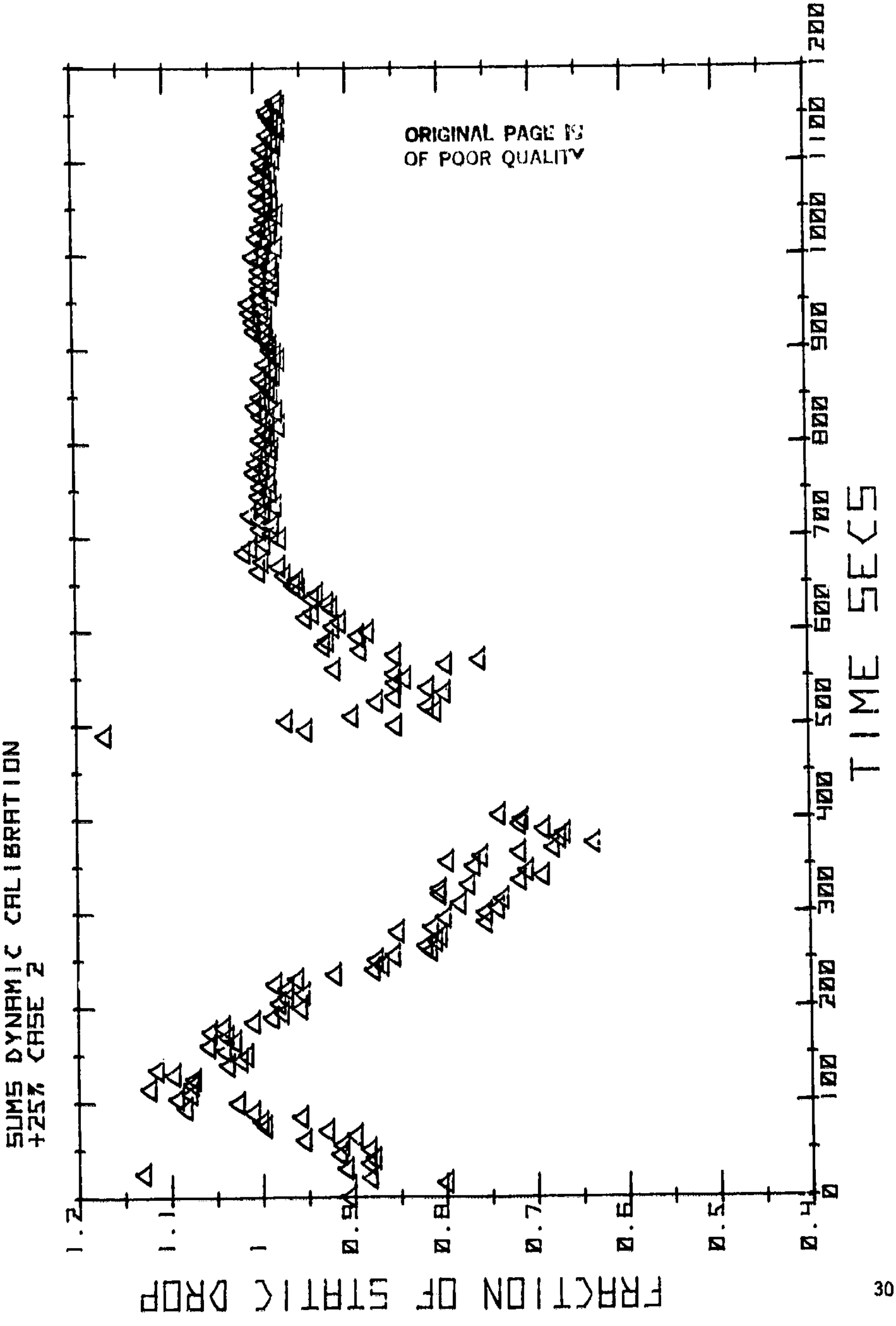

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SUMS COMPOSITION CHANGE CALIBRATION
DATA TAPE FORMAT
(300 SERIES)

0	COMMENTS	(72 CHARACTERS)	50	TYPE I	SIZE 50
1	TIME	(SECONDS)	240	TYPE S	SIZE 120
2	INLET P. XDUCER	(VOLTS)	240	TYPE S	SIZE 120
3	BARATRON PRESS.	(TORR)	240	TYPE S	SIZE 120
4	UAMS HSK WORDS (2)	(16 BIT DECIMAL)	240	TYPE I	SIZE 120,2
5	AMU 32 (6 SAMPLES)	(9 BIT DECIMAL)	720	TYPE I	SIZE 120,6
6	AMU 32 (2ND HIGHEST)	(9 BIT DECIMAL)	120	TYPE I	SIZE 120
7	AMU 28 (6 SAMPLES)	(9 BIT DECIMAL)	720	TYPE I	SIZE 120,6
8	AMU 28 (2ND HIGHEST)	(9 BIT DECIMAL)	120	TYPE I	SIZE 120
9	AMU 16 (6 SAMPLES)	(9 BIT DECIMAL)	720	TYPE I	SIZE 120,6
10	AMU 16 (2ND HIGHEST)	(9 BIT DECIMAL)	120	TYPE I	SIZE 120
11	AMU 14 (6 SAMPLES)	(9 BIT DECIMAL)	720	TYPE I	SIZE 120,6
12	AMU 14 (2ND HIGHEST)	(9 BIT DECIMAL)	120	TYPE I	SIZE 120

DATA COLLECTION TIMING OFFSETS FOR COMPOSITION CHANGE CALIBRATION

3-23-82

General:

During the SUMS Composition Change Calibration various data is read and stored on tape once every five seconds. One of the values stored is the reading of the HP85 real time clock. This clock is initially set to zero at the beginning of each calibration run. Since the HP85 is a serial machine, timing offsets arise between the time the clock is read, and the time other data is collected. This paper describes these offsets.

Definitions:

Let T_n be the value read from the clock for a given five second group of data. (The "Nth" group)

Note that the clock has an accuracy of ± 1 msec (for the duration of each run) and a resolution of 1 msec. However, due to data tape space restrictions, T_n, as recorded, is rounded off to the nearest 0.1 seconds.

Offset Values:

1) Clock Read = T_n (to 0.1 sec resolution)

2) SUMS Inlet Pressure Transducer = T_n + .052 seconds
   - time measured to "TRIGGER" command.

3) Baratron Pressure = T_n + .1oz seconds

4) Peak Data

For simplicity, assume that the time at which the 9 bit science word for a particular scan step number emerges from SUMS, is the same time as which it was sampled by the UAMS sensor. That is, ignore all delays due to buffering of data by UAMS and SUMS, and the uncertainties introduced due to the asynchronous interface with the PCM. This should introduce an error, conservatively estimated at no greater than 100 msec.

Given the above, the time offset for a given scan step number (SSN) is:

$$T_{ssn}\ (SSN) = -[(222-SSN) * .0135] -.977 \text{ seconds}$$

Peak Data continued ...

Assuming peak center scan step numbers of:

80 for AMU 32
101 for AMU 28
194 for AMU 16
215 for AMU 14

The offsets will be:

T_{ssn} (80) = -2.8940 second, (AMU 32)

T_{ssn} (101) = -2.6105 second, (AMU 28)

T_{ssn} (194) = -1.3550 second, (AMU 16)

T_{ssn} (215) = -1.0715 second, (AMU 14)

NOTE:

Tables of Corrected Time, Pressure and Current of 28 and 32 Peaks

&

Corrected Ion Current vs. Time

To be supplied at a later date under seperate cover.

G. Robertson
3/23/82

RELIABILITY		REVISIONS			
APPD	PREDICTION	LTR	DESCRIPTION	DATE	CONFIG MGT APPV'D
		–	STD RELEASE – ER-1973-62	1/18/82	C. MILLER

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SUMS Calibration Procedure
(Static, Dynamic and Composition Change)

As-Run

SUMS S/N 1

UAMS S/N 6

Date 1/19/82 (start)

T/C. G. Robertson

DRAWING AND PART APPLICATION

PART NO.	NEXT ASSY	END ITEM NO.	SERIAL NO.
TP3290648	1	3290600	1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.

MATERIAL:

DRAWING CLASS
A ☐ B ☐ C ☐

CONTR NO.		
DRAWN	Robertson	1-12-82
CHECKED	[illegible]	1/13-82
STRESS/WT		
DSGN SUPV	[illegible]	
PROJ ENGR	[illegible]	1-18-82
QUAL CONT		
SYS SPT		
DSGN APPL	G. Robertson	1-18-82
MFG		
CUSTOMER		

THE BENDIX COMMUNICATIONS DIVISION
AEROSPACE SYSTEMS OPERATIONS – ANN ARBOR, MICHIGAN

TITLE
SUMS Calibration Procedure

SIZE	CODE IDENT NO.	DRAWING NUMBER	REV
A	07038	TP3290648	~~A~~ B

SCALE	WEIGHT	SHEET 1 OF ~~56~~ 63

BxA 3418-1

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1.0 PURPOSE

The purpose of this test is to determine the instrument sensitivity to specific gases, the dynamic response of the inlet system and to determine the time reqponse to gas composition changes at selected pressures.

2.0 SCOPE

This procedure specifies the test methods, test equipment and data to be recorded to effect the calibration of the SUMS instrument.

3.0 APPLICABLE DOCUMENTS

3290635	Performance and Design Requirements Specification
TP2374339	Calibration Station Molecular Leak Test Procedure
BSR 4400	Test Plan for SUMS.

4.0 PARTICIPANTS REQUIRED

Bendix Engineering Representative
Quality Engineering Representative (optional)
NASA Representative.

5.0 EQUIPMENT REQUIRED

Item	Manufacturer	Part Number or Model	Qty	Serial No.	Calib. Due Date
UAMS Test Set (Small)	BxA	2373400	1	N/A	N/A
Calibration Stand	BxA	N/A	1	N/A	N/A
Nitrogen	Matheson	Research Purity	AR	N/A	N/A
Oxygen	Matheson	Research Purity	AR	N/A	N/A
Test Gas	Union Carbide	80% N_2, 20% O_2	1	T144124 (5-20-81)	N/A
MKS Baratron Pressure Meter	MKS Inst.	210	1	17020C	N/A
Pressure Gauge 0.1-20 mm Hg	Wallace & Tiernan	FA160	1	66123	N/A
Pressure Gauge 0-50 mm Hg	Wallace & Tiernam	FA160	1	66126	N/A
Pressure Gauge 0-200 mm Hg	Wallace & Tiernan	FA160	1	66125	N/A
Pressure Gauge 0-800 mm Hg	Wallace & Tiernan	FA160	1	66124	N/A

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Item	Manufacturer	Part Number or Model	Qty	Serial No.	Calib. Due Date
Ion Gauge Controller (Plenum chamber)	Varian	971-1008	1	66130	11-26-81
Ion Gauge Controller (Calibration chamber)	Varian	971-1008	1	66131	11-26-81
Ion Gauge (Plenum chamber)	Varian	971-5008	1	---	---
Ion Gauge (Calibration chamber)	Varian	971-5008	1	---	---
Ion Pump Controller (Calibration station)	Varian	921-0066	1	66141	N/A
Ion Pump Controller (Gas manifold system)	Varian	921-0062	1	---	N/A
Calculator	HP	9830A	1	N/A	N/A
Printer	HP	9866A	1	N/A	N/A
Calculator Plotter	HP	9862A	1	N/A	N/A
Cassette Memory	HP	9865A	1	N/A	N/A
SUMS GSE Interface Unit	BxA	N/A	1	N/A	N/A
1 Torr Baratron Head	MKS	310BHS-1	1	---	N/A
100 Torr Baratron Head	MKS	310BHS-100	1	---	N/A
Servo Valve	MKS	245	1	---	N/A
Servo Valve Controller	MKS	244A	1	---	N/A
Range Multiplier	MKS	170M-6C	1	---	N/A
Digital Readout Unit	MKS	170M-270	1	---	N/A
Head Selector	MKS	170M-34C	1	---	N/A
Data Logger	Fluke	2240C	1	---	---

Equivalent items may be sutstituted. These and any additional items must be listed below prior to testing.

DVM	Fluke	8022A	1	52445	4-16-82
Chart Recorder	HP	299A	1	16266	N/A
Flow Meters	Union-Carbide	201-4336	2	—	—

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE	WEIGHT	SHEET 3	

BxA 3418-2

6.0 PROCEDURE

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WARNING

Never turn on SUMS instrument power without first verifying sensor pressure is less than 3×10^{-4} Torr. Higher pressures will reduce filament life and may cause burnout.

NOTES:

1. The analysis of data required in this TP is not a constraint upon continuation of testing.
2. During this test it is required that the molecular leaks be calibrated per TP2374339.
3. To insure that valid data is taken during this test; the printer, strip chart recorder, oscilloscope, and DVM may be used at any time at the direction of the test conductor.

6.1 STATIC CALIBRATION

6.1.1 Test Set-Up

6.1.1.1 Verify that the SUMS instrument is mounted onto the calibration station, via the inlet simulator and that equipment is connected in accordance with Figure 1. ✓

6.1.1.2 Verify or connect thermocouples to each of the following four areas. Also record channels on the Fluke data logger which will record these temperatures.

Vacuum station near inlet simulator.
Channel number 11

SUMS inlet system tube near inlet simulator.
Channel number 12

Calibration panel large leak.
Channel number 13

Calibration panel variable volume
Channel number 14

variation

Vacuum station near 50/10 1/sec orifice. 15

6.1.1.3 Turn on Fluke data logger and verify all thermocouples are giving valid readings. ✓

≈ 75.0°F

THE BENDIX COMMUNICATIONS DIVISION
AEROSPACE SYSTEMS OPERATIONS
ANN ARBOR, MICHIGAN

SIZE	CODE IDENT NO.	DRAWING NUMBER	REV
A	07038	TP3290648	—

SCALE | WEIGHT | SHEET 4

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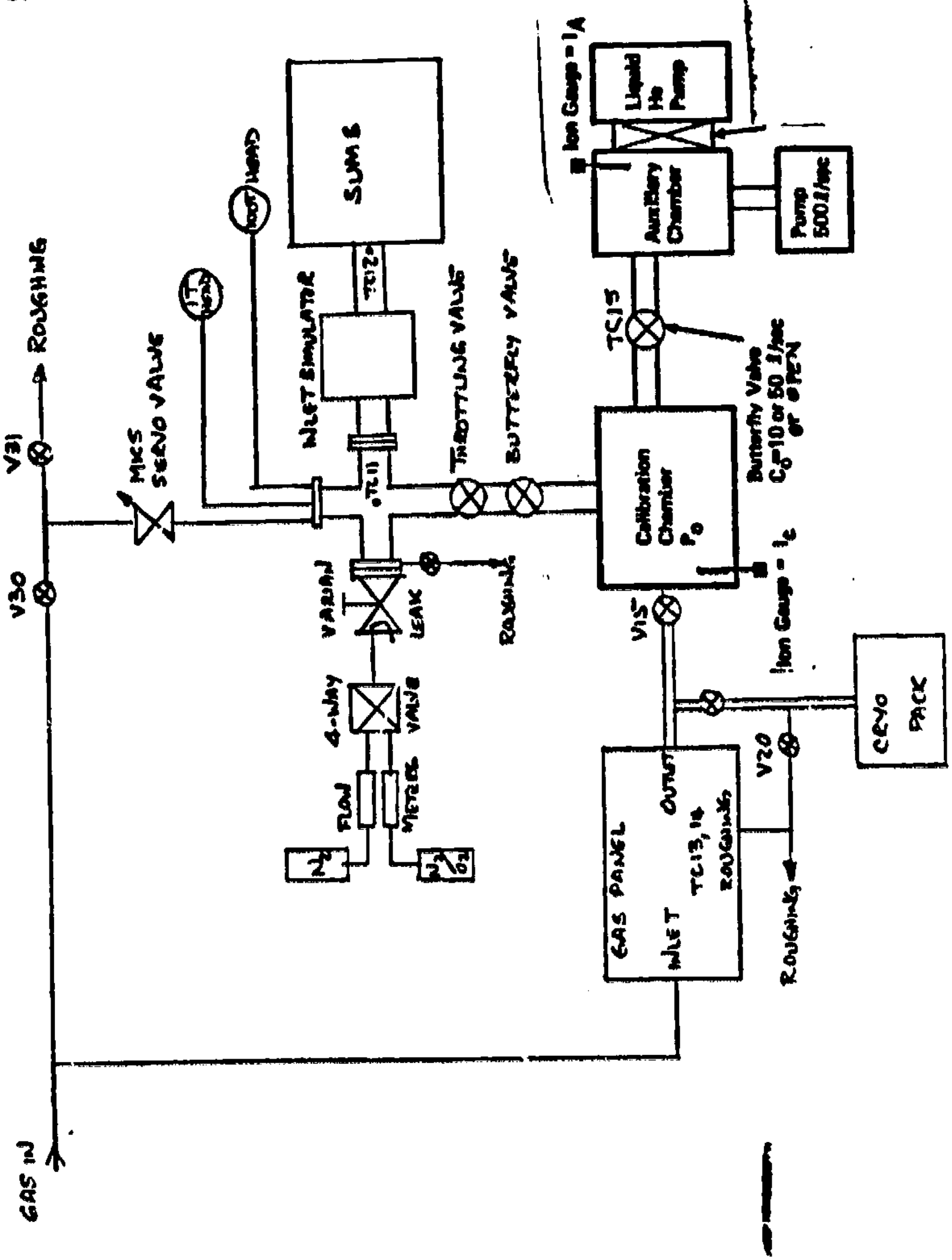


Figure 1 - Calibration System Gas Schematic

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP-3290648	REV —
	SCALE		WEIGHT	SHEET 5

BxA 341B-2

6.1.1.4 Verify or perform interconnection of SUMS and GSE in accordance with Figure 2. ✓

6.1.1.5 Verify or turn ON the power for each Ion Gauge Controller. ✓

6.1.2 <u>SUMS and Inlet Simulator Pump Down</u>

6.1.2.1 Verify that the calibration chamber pressure is $\leq 1 \times 10^{-6}$ torr. Record reading. ✓ Torr
~~8.5×10^{-8}~~
4×10^{-8}

Verify or perform the following:

6.1.2.2 Using the cryopump and Ion Pump, pump down the inlet simulator to $\leq 1 \times 10^{-6}$. Record reading from calibration chamber pressure gauge. ✓ Torr
~~8.5×10^{-8}~~
4×10^{-8}

PRESSURE DROPPED WHEN INLET TO MKS VALVE WAS EVACUATED (V34 CLOSED, V51 OPEN)

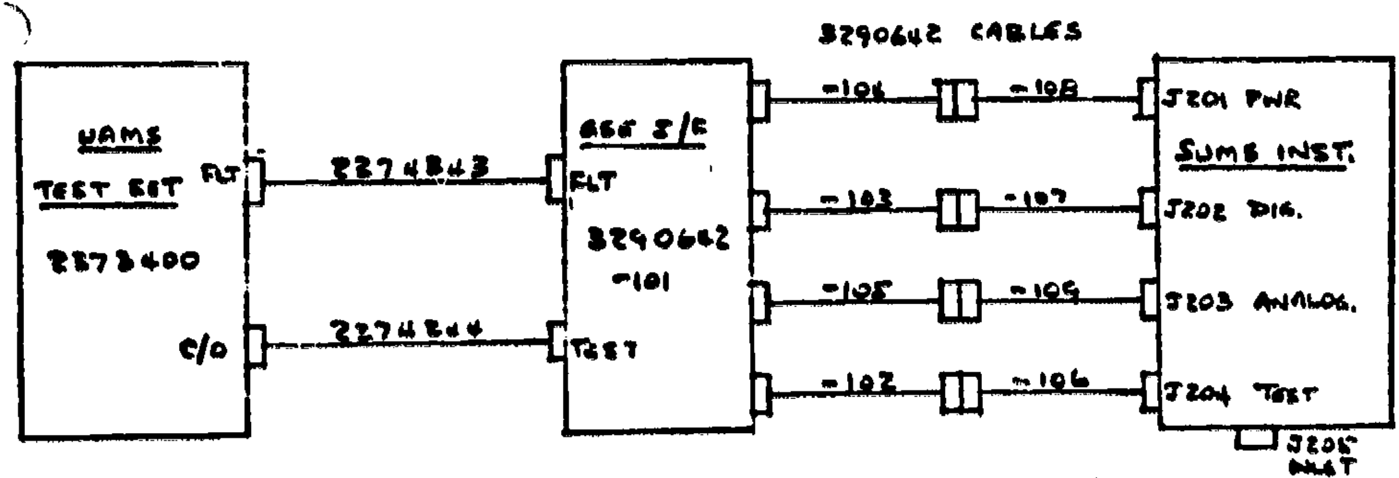
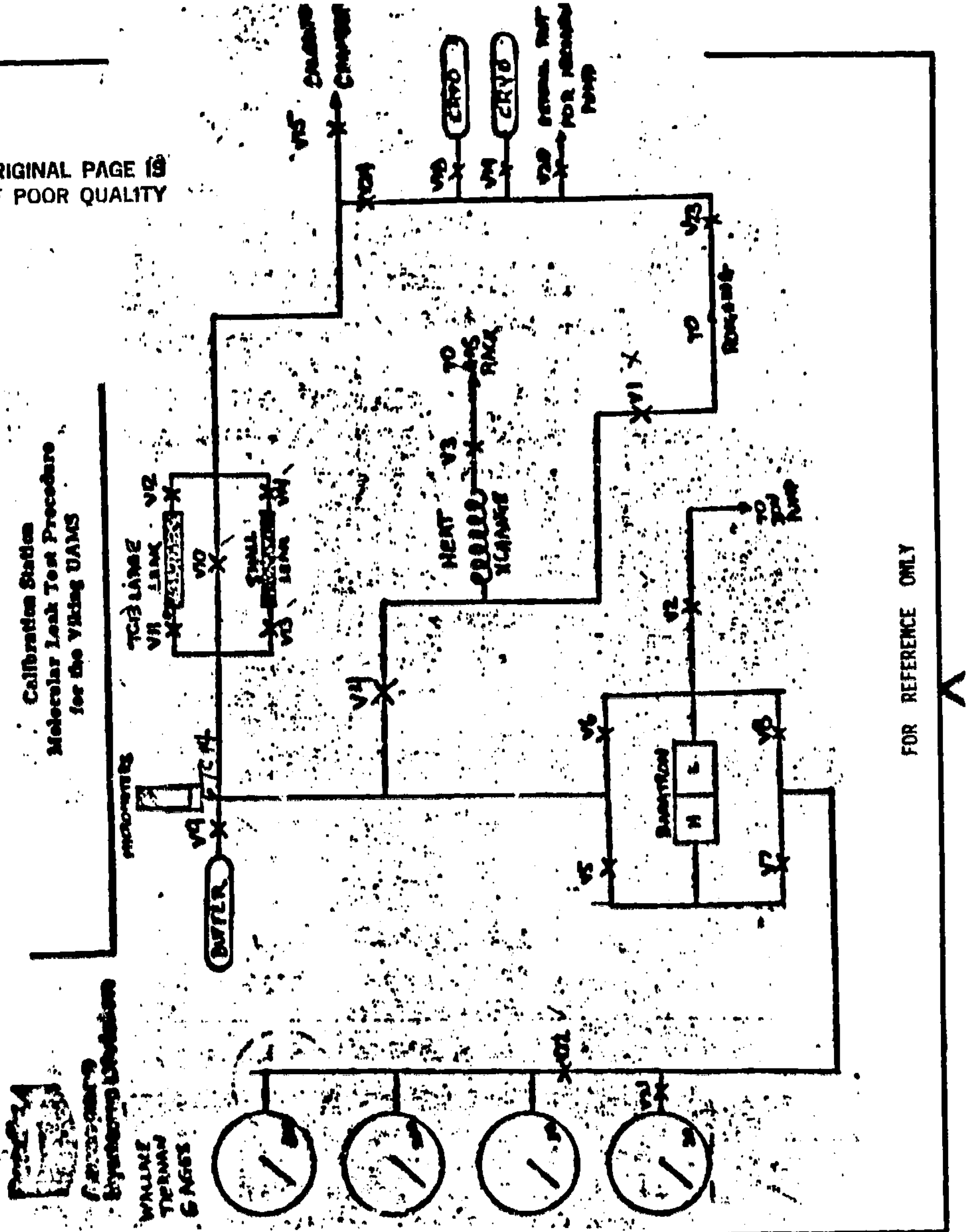


Figure 2 - Test Configuration



THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648		REV —
	SCALE		WEIGHT	SHEET 7	

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6.1.2.3 Pump down liquid helium pump. ✓

6.1.2.4 Close off liquid helium pump. ✓

6.1.2.5 Adjust the zero, span and full scale settings on the MKS baratrons and the MKS control valve. ✓

6.1.3 Initial Test Equipment Adjustments

6.1.3.1 Set the clock source switch on the upper panel of the UAMS test set to "CLK EXT". ✓

6.1.3.2 Set the power configuration switch on the lower panel of the UAMS test set to "SUMS" ✓

6.1.3.3 Move the "Instrument" and "Test Set" power switches on the lower panel of the UAMS test set to the ON position. ✓

6.1.3.4 Set the two power supplies in the lower panel of the UAMS test set to 28.0 V. This voltage may be measured at the terminals on the front of each supply.

Instrument 28.2 V
Ion Pump 28.2 V

6.1.3.5 Verify that the inlet system is connected to the SUMS electronics package. ✓

6.1.3.6 Verify that the valve control select switch on the GSE I/F is in the "GSE" position and that all valve switches are in the "CLOSED" position. ✓

WARNING

Never operate the valves unless the SUMS instrument is connected to a vacuum station. Exposure of the mass sensor to pressures in excess of 1 x 10^{-5} Torr may cause instrument contamination and/or filament damage.

6.1.3.7 Turn on the GSE I/F unit power. ✓

6.1.3.8 On the UAMS test set upper panel, push the number of frames switch until "CNT" lights. Push the "RESET" button. Push the START/DECODE switch to begin sending shift and enable pulses. ✓

6.1.3.9 Record the GSE I/F hour meter readings.

Power A 4396.8 hrs
Power B 6391.4 hrs

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE	WEIGHT	SHEET 8	

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6.1.3.10 Connect the test set to the calculator using the special HP cable. ✓

6.1.3.11 Verify the Plotter and Cassette Memory are connected to the calculator. ✓

6.1.3.12 Turn ON the Calculator, Printer, Plotter and Cassette Memory. ✓

6.1.4 Calibration, General Instructions

6.1.4.1 When a new gas is let into the gas-inlet system the system first must be evacuated per paragraph 6.6 of TP2374339. ✓

6.1.4.2 Whenever a gas is changed set the emission current of the plenum ionization gauge below the orifice plate so that its reading agrees with that of the ionization gauge in the calibration chamber. This can be done when equilibrium is achieved anywhere in the indicated range of 10^{-5} torr ± 50% with both pumps shut off, the butterfly valve in the open position and the inlet valves closed. ✓

NOTE: Nowhere in this procedure is pressure to be determined from ionization gauge readings. This step of the procedure is performed only to permit determination of the pressure ratio across the calibrated orifice so that small corrections can be made to the more accurate pressure determinations of this section. However, ionization gauge readings may be used as a tool to achieve approximate pressure settings.

6.1.4.3 Chamber pressure is calculated according to the equation

$$Pc = \frac{P_G S_L}{So\,(1 - \frac{Ip}{Ic})} \; \frac{T_c}{T_s}$$

where: Pc = chamber pressure, Torr

P_G = Gauge Pressure of upstream gas, Torr

S_L = Leak conductance in liters/sec. as determined per TP2374339

Ip = I-gauge reading in the plenum below orifice plate

Ic = Chamber I-gauge reading

So = Orifice conductance in liters/sec.

Tc = Chamber temperature in °K or °R

Ts = Displacement meter temperature in same units as Tc.

Values of So in liters/sec. are tabulated below:

		Small Orifice			Large Orifice		
Gas	AMU	-40°F	+77°F	+100°F	-40°F	+77°F	+100°F
N_2	28	8.842	10.00	10.21	44.17	49.95	51.01
O_2	32	8.271	9.354	9.551	41.32	46.72	47.71

At any other temperature, T(°F), the conductance can be calculated from the equation

variation

$$S_T = S_{77}\left(\frac{T + 459.4}{536.4}\right)^{\frac{1}{2}}$$

where

S_T = Orifice conductance at temperature T.

S_{77} = Orifice conductance at 77°F (25°C)

6.1.4.4 Calibration chamber pressure stabilization. Before taking any science data with the instrument, the pressure in the calibration chamber as determined by its ionization gauge must have been stable for at least 8 minutes.

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6.1.5 Nitrogen Gas Calibration

The SUMS instrument will be calibrated over a pressure range from 1×10^{-6} torr to 20 torr. In order to achieve this dynamic range, the SUMS instrument and the calibration are operated in several configurations. For those pressures at the inlet of 1×10^{-3} torr and below the range valve on the SUMS instrument is open. Above 1×10^{-3} torr the range valve is closed. In order to protect the SUMS instrument the instrument should never be exposed to an inlet pressure greater than 1.2×10^{-3} with the range valve open. The calibration system operates as a dynamic flow through system up to 10^{-2} torr. For pressures up to and including 10^{-5} torr the system is pumped through the 50 l/s orifice and the pressures are determined by the known calibrated leak and corrections calculated from the ion gauge readings. Above 10^{-5} torr to 3×10^{-4} torr, the system is pumped by the 10 l/s orifice. From 10^{-3} torr to 10^{-2} torr the calibrated leak is no longer used, and the gas is admitted via the MKS valve into the inlet plenum which has been partially isolated via the throttling valve. The pressure is measured via the 1 torr baratron head. The ion pump is still operating. From 3×10^{-2} torr to 20 torr the pressure is set staticly using the MKS valve. The ion pump is off and the pressure is read using the 1 torr and 100 torr baratrons as appropriate.

5.14×10^{-6} @ 43.5 Torr
5.17×10^{-6} @ 442 Torr

6.1.5.1 CALIBRATE THE LARGE VIKING INLET LEAK FOR NITROGEN PER TP2374339. RECORD VALUE HERE. 5.16×10^{-6} LITERS/SEC (ave of 40 Torr & 400 Torr run.)

6.1.5.2 CLOSE VALVE V30. ✓

6.1.5.3 VERIFY OR EVACUATE THE GAS INLET SYSTEM PER PARAGRAPH 6.6 OF TP2374339. VERIFY THROTTLING VALVE AT SUMS PLENUM IS OPEN. ✓

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6.1.5.4 VERIFY THAT VALVE V1 IS NOW CLOSED. ✓

6.1.5.5 VERIFY THAT THE REGULATOR AND VALVES ON THE NITROGEN TANK HAVE BEEN PROPERLY FLUSHED WITH NITROGEN AND THAT THE GAS SUPPLY LINE BETWEEN THE BLACK VALVE AND THE CALIBRATION STAND INLET IS NOW EVACUATED. ✓

6.1.5.6 ADJUST ION GAUGES PER PARAGRAPH 6.1.4.2 ✓

Variation

6.1.5.7 PUMP THE CALIBRATION CHAMBER DOWN TO A PRESSURE <= 2 X 10-8 TORR. RECORD THE PRESSURE. 6.7×10^{-8} TORR w/ 50 l/sec ✓

6.1.5.8 TURN ON THE "SUMS ION PUMP POWER". ✓

6.1.5.9 OPEN THE SUMS INLET, RANGE AND PROTECTION VALVES. ✓

6.1.5.10 VERIFY THE INSTRUMENT SENSOR INTERNAL PRESSURE IS LESS THAN OR EQUAL TO 1 X 10-5 TORR. ✓

6.1.5.11 TURN ON THE "SUMS INSTRUMENT POWER". ✓

6.1.5.12 VERIFY THAT THE NITROGEN STATIC CALIBRATION TAPE IS INSERTED IN THE HP9830 CALCULATOR. ✓

Valve positions prior to taking of residual data.

OPEN: V2, V5, V6, V7, V8, V11, V12, V21, V22, V31

CLOSED: V1, V3, V4, V9, V10, V13, V14, V30

large orifice used (50 lit./sec)

6.1.5.13 WAIT 30 MINUTES MINIMUM FOR THE INSTRUMENT ION SOURCE TEMPERATURE TO STABILIZE. ✓ power on at 8:10 Hrs 1-20-82

6.1.5.14 RECORD THE CALIBRATION CHAMBER AND THE GAS INLET SYSTEM TEMPERATURES USING THE FLUKE DATA LOGGER.

T12 CALIBRATION CHAMBER 76.8 DEG F
T13 GAS INLET SYSTEM 77.5 DEG F

T11 77.3
T14 77.5
T15 83.3

6.1.5.15 VERIFY THE SPECIAL CONDITIONS OF TABLE 6.1.5.1 HAVE BEEN SET. ✓

6.1.5.16 ON THE HP9830 TYPE LOAD 0, EXECUTE, FOLLOWED BY RUN, EXECUTE. THE PROGRAM IS INTERACTIVE. BE CERTAIN TO COMPLY WITH ALL CALCULATOR REQUESTS THROUGHOUT THE TEST. ✓

6.1.5.17 VERIFY THAT THE CHAMBER PRESSURE AS READ ON THE ION GAUGE HAS BEEN STABLE FOR AT LEAST 8 MINUTES. ✓

6.1.5.18 FILL IN THE REQUESTED DATA IN TABLE 6.1.5.1 AND TABLE 6.1.5.6 AS THE FOLLOWING STEPS ARE PERFORMED:

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PRESS (TORR)	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
RESIDUALS	✓	✓	✓

BE CERTAIN NOT TO PROCEED UNTIL THE HP9830 HAS TAKEN DATA FOR BOTH FILAMENTS.

6.1.5.19 VERIFY THAT VALVES V6, V7, V8, V11, V12, V21 AND V22 ARE OPEN. ✓

6.1.5.20 CLOSE VALVE V10 AND REMOVE THE KNOB. ✓ (already closed)

6.1.5.21 VERIFY OR CLOSE VALVES V2, V4, V9, V13 AND V14. ✓

6.1.5.22 CLOSE VALVE V3. ✓

6.1.5.23 OPEN BLACK VALVE AT NITROGEN TANK. ✓

6.1.5.24 OPEN VALVE V4. ✓

6.1.5.25 TAKING DATA FOR A GIVEN PRESSURE POINT IS A FOUR STEP PROCESS. THESES STEPS ARE: 1) SET THE PRESSURE; 2) WATCH THE CALIBRATION CHAMBER ION GAUGE AND DO NOT PROCEED UNTIL THE PRESSURE IS STABLE FOR AT LEAST 8 MINUTES; 3) RECORD INSTRUMENT ION PUMP CURRENT MONITOR VOLTAGE (AS READ FROM UAMS TEST SET) IN TABLE 6.1.5.6; 4) LET THE HP9830 CALCULATOR TAKE DATA FOR BOTH FILAMENTS.

SETTING A PRESSURE IS ACCOMPLISHED BY SLOWLY OPENING VALVE V3 UNTIL THE DESIRED PRESSURE IS REACHED ON THE WALLACE & TIERNAN GAUGES. THEN CLOSE VALVES V3 AND V4 AND ALLOW AT LEAST 8 MINUTES AFTER THE PRESSURE ON THE ION GAUGE HAS STABILIZED.

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FILL IN THE REQUESTED DATA IN TABLE 6.1.5.1 AS THE FOLLOWING STEPS ARE PERFORMED:

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
1X10-6	✓	✓	✓	✓
3X10-6	✓	✓	✓	✓
1X10-5	✓	✓	✓	✓

valve V21 closed

WHEN ALL DATA HAS BEEN TAKEN FOR THE ABOVE THREE PRESSURE POINTS PROCEED TO THE NEXT STEP.

6.1.5.26 VERIFY THAT THE CRYO PUMP IS STILL COLD. ✓

6.1.5.27 REDUCE THE PRESSURE UPSTREAM OF THE LARGE VIKING LEAK BY OPENING VALVES V4 AND V1. WHEN THE PRESSURE ON THE WALLACE & TIERNAN GUAGES HAS BEEN REDUCED TO LESS THAN 40 TORR CLOSE VALVE V1 AND PROCEED. ✓

6.1.5.28 SWITCH IN THE SMALL ORIFICE (10 LITERS/SEC) AND VERIFY THE SPECIAL CONDITIONS OF TABLE 6.1.5.2 ✓

6.1.5.29 CONTINUE FOR THE NEXT THREE PRESSURE POINTS AS LISTED IN TABLE 6.1.5.2, SETTING THE PRESSURE AGAIN BY FIRST OPENING VALVE V4, SLOWLY OPENING VALVE V3 TO OBTAIN THE DESIRED PRESSURE, THEN CLOSING BOTH V3 AND V4. BE SURE TO STABILIZE THE PRESSURE PER PARAGRAPH 6.1.4.4. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.5.2 AS THE FOLLOWING STEPS ARE PERFORMED:

variation.

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-5	✓	✓	✓	✓
1X10-4	✓	✓	✓	✓
3X10-4	✓	✓	✓	✓

open V21, V1, V4 and pump down inletsystem.

6.1.5.30 CLOSE OFF THE VIKING INLET LEAK BY CLOSING VALVES V11 AND V12 AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.5.3. ✓

6.1.5.31 CONTINUE FOR THE NEXT PRESSURE POINT AS LISTED IN TABLE 6.1.5.3. THE PRESSURE IS NOW SET BY USING THE MKS SERVO VALVE AND ITS CONTROLLER. THE VALVE INPUT CONTROL IS SET UNTIL THE MKS DIGITAL READOUT SHOWS THE DESIRED PRESSURE. BE SURE TO WAIT AT LEAST 8 MINUTES FOR THE PRESSURE TO STABILIZE. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.5.3 AS THE FOLLOWING STEPS ARE PERFORMED:

variation

After reaching the desired pressure, "freeze" the servo valve.

Baratron heads were re-zeroed at this point when chamber pressure was 4x10⁻⁸ Torr and throttling valve was open.

variation

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
1X10-3	✓	✓	✓	✓

6.1.5.32 CLOSE THE SUMS RANGE VALVE AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.5.4. ✓ ← do not do at this time.

6.1.5.33 CONTINUE FOR THE NEXT TWO PRESSURE POINTS AS LISTED IN TABLE 6.1.5.4. THE PRESSURE IS AGAIN SET WITH THE MKS SERVO VALVE AND ITS CONTROLLER. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.5.4 AS THE FOLLOWING STEPS ARE PERFORMED: ← servo valve controller left in loop this time.

variation

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-3	✓	✓	✓	✓
1X10-2	✓	✓	✓	✓

range valve closed when pressure was raised to 4.8x10⁻³ Torr. Range valve was then manually reopened and pressure was reduced to 4.60x10⁻³ and data was taken.

6.1.5.34 CLOSE THE MKS INLET VALVE AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.5.5. ✓

6.1.5.35 CONTINUE FOR THE NEXT SEVEN PRESSURE POINTS AS LISTED IN TABLE 6.1.5.5. THE PRESSURES ARE NOW SET STATICLY BY MANUALLY OPENING THE MKS VALVE UNTIL THE DESIRED PRESSURE IS OBTAINED AND THEN CLOSING THE VALVE. BE SURE TO WAIT 8 MINUTES FOR THE PRESSURE TO STABILIZE. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.5.5 AS THE FOLLOWING STEPS ARE PERFORMED:

variation

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-2	✓	✓	✓	✓
1X10-1	✓	✓	✓	✓
3X10-1	✓	✓	✓	✓
1	✓	✓	✓	✓
3	✓	✓	✓	✓
10	✓	✓	✓	✓
20	✓	✓	✓	✓
32.72	✓	✓	✓	✓

← ion pump (cal. chamber) left on

← 10 liter/sec orifice used

← ion pump off but MKS valve left slightly open to stabilize pressure

6.1.5.36 CLOSE OFF NITROGEN SUPPLY. ✓

6.1.5.37 USING THE CYROPUMP, REDUCE THE CALIBRATION CHAMBER PRESSURE TO 50 MICRONS OR LESS. ✓

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6.1.5.38 TURN ON THE MAIN ION PUMP AND REDUCE PRESSURE TO 1 X 10-6 TORR OR LESS. ✓

6.1.5.39 OPEN THE SUMS RANGE VALVE. ✓

6.1.5.40 TURN THE SUMS INSTRUMENT POWER OFF. ✓

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END OF NITROGEN CALIBRATION

6.1.6 OXYGEN GAS CALIBRATION

THE OXYGEN CALIBRATION IS SIMILAR TO THE NITROGEN CALIBRATION EXCEPT THE ION SOURCE PRESSURE SHOULD NOT EXCEED 2 X 10-5 TORR. THIS PRESSURE IS INDICATED WHEN THE ION PUMP CURRENT MONITOR AS READ ON THE UAMS TEST SET EXCEEDS ABOUT 7 MV.

6.1.6.1 CALIBRATE THE LARGE VIKING INLET LEAK FOR OXYGEN PER TP2374339. RECORD VALUE HERE. 4.86×10^{-6} (ave.) LITERS/SEC

4.85×10^{-6} @ 43.85 Torr @ 75.2 °F
4.87×10^{-6} @ 445.0 Torr @ 75.3 °F

6.1.5.2 CLOSE VALVE V30. ✓

6.1.6.3 VERIFY OR EVACUATE THE GAS INLET SYSTEM PER PARAGRAPH 6.6 OF TP2374339. VERIFY THROTTLING VALVE AT SUMS PLENUM IS OPEN. ✓

6.1.6.4 VERIFY THAT VALVE V1 IS NOW CLOSED. ✓

6.1.6.5 VERIFY THAT THE REGULATOR AND VALVES ON THE OXYGEN TANK HAVE BEEN PROPERLY FLUSHED WITH OXYGEN AND THAT THE GAS SUPPLY LINE BETWEEN THE BLACK VALVE AND THE CALIBRATION STAND INLET IS NOW EVACUATED. ✓

6.1.6.6 ADJUST ION GUAGES PER PARAGRAPH 6.1.4.2 ✓ no adjustment necessary

variation
6.1.6.7 PUMP THE CALIBRATION CHAMBER DOWN TO A PRESSURE <= 2 X ~~10-8~~ TORR. RECORD THE PRESSURE. 6.4×10^{-8} TORR

w/ 50 liter/sec ! set up per table 6.1.6.1

6.1.6.8 TURN ON THE "SUMS ION PUMP POWER". ✓

6.1.6.9 OPEN THE SUMS INLET, RANGE AND PROTECTION VALVES. ✓

6.1.6.10 VERIFY THE INSTRUMENT SENSOR INTERNAL PRESSURE IS LESS THAN OR EQUAL TO 1 X 10-5 TORR. ✓

6.1.6.11 TURN ON THE "SUMS INSTRUMENT POWER". ✓

6.1.6.12 VERIFY THAT THE OXYGEN STATIC CALIBRATION TAPE IS INSERTED IN THE HP9830 CALCULATOR. ✓

6.1.6.13 WAIT 30 MINUTES MINIMUM FOR THE INSTRUMENT ION SOURCE TEMPERATURE TO STABILIZE. ✓

6.1.6.14 RECORD THE CALIBRATION CHAMBER AND THE GAS INLET SYSTEM TEMPERATURES USING THE FLUKE DATA LOGGER.

T12 CALIBRATION CHAMBER 75.3 DEG F
T13 GAS INLET SYSTEM 76.4 DEG F

T11 76.2
T14 75.9
T15 82.4

6.1.6.15 VERIFY THE SPECIAL CONDITIONS OF TABLE 6.1.6.1 HAVE BEEN SET. ✓

6.1.6.16 ON THE HP9830 TYPE LOAD 0, EXECUTE, FOLLOWED BY RUN, EXECUTE. THE PROGRAM IS INTERACTIVE. BE CERTAIN TO COMPLY WITH ALL CALCULATOR REQUESTS THROUGHOUT THE TEST. ✓

6.1.6.17 VERIFY THAT THE CHAMBER PRESSURE AS READ ON THE ION GUAGE HAS BEEN STABLE FOR AT LEAST 8 MINUTES. ✓

6.1.6.18 FILL IN THE REQUESTED DATA IN TABLE 6.1.6.1 AND TABLE 6.1.6.5 AS THE FOLLOWING STEPS ARE PERFORMED:

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PRESS (TORR)	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
RESIDUALS	✓	✓	✓

BE CERTAIN NOT TO PROCEED UNTIL THE HP9830 HAS TAKEN DATA FOR BOTH FILAMENTS.

6.1.6.19 VERIFY THAT VALVES V6, V7, V8, V11, V12, V21 AND V22 ARE OPEN. ✓

6.1.6.20 CLOSE VALVE V10 AND REMOVE THE KNOB. ✓ (already closed)

6.1.6.21 VERIFY OR CLOSE VALVES V2, V4, V9, V13 AND V14. ✓ (all already closed)

6.1.6.22 CLOSE VALVE V3. ✓

6.1.6.23 OPEN BLACK VALVE AT OXYGEN TANK. ✓

6.1.6.24 OPEN VALVE V4. ✓

6.1.6.25 TAKING DATA FOR A GIVEN PRESSURE POINT IS A FOUR STEP PROCESS. THESES STEPS ARE: 1) SET THE PRESSURE; 2) WATCH THE CALIBRATION CHAMBER ION GUAGE AND DO NOT PROCEED UNTIL THE PRESSURE IS STABLE FOR AT LEAST 8 MINUTES; 3) RECORD INSTRUMENT ION PUMP CURRENT MONITOR VOLTAGE (AS READ FROM UAMS TEST SET) IN TABLE 6.1.6.5; 4) LET THE HP9830 CALCULATOR TAKE DATA FOR BOTH FILAMENTS.

SETTING A PRESSURE IS ACCOMPLISHED BY SLOWLY OPENING VALVE V3 UNTIL THE DESIRED PRESSURE IS REACHED ON THE WALLACE & TIERNAN GUAGES. THEN CLOSE VALVES V3 AND V4 AND ALLOW AT LEAST 8 MINUTES AFTER THE PRESSURE ON THE ION GUAGE HAS STABILIZED.

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FILL IN THE REQUESTED DATA IN TABLE 6.1.6.1 AS THE FOLLOWING STEPS ARE PERFORMED:

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
1X10-6	✓	✓	✓	✓
3X10-6	✓	✓	✓	✓
1X10-5	✓	✓	✓	✓
5×10^{-5}	✓	✓	✓	✓

variation

same w/T pressure as at 1×10^{-5}, but with small (10 l/s) orifice in.

WHEN ALL DATA HAS BEEN TAKEN FOR THE ABOVE THREE PRESSURE POINTS PROCEED TO THE NEXT STEP.

6.1.6.26 VERIFY THAT THE CRYO PUMP IS STILL COLD. ✓

6.1.6.27 REDUCE THE PRESSURE UPSTREAM OF THE LARGE VIKING LEAK BY OPENING VALVES V4 AND V1. WHEN THE PRESSURE ON THE WALLACE & TIERNAN GUAGES HAS BEEN REDUCED TO LESS THAN 40 TORR CLOSE VALVE V1 AND PROCEED. ✓

6.1.6.28 SWITCH IN THE SMALL ORIFICE (10 LITERS/SEC) AND VERIFY THE SPECIAL CONDITIONS OF TABLE 6.1.6.2 ✓

6.1.6.29 CONTINUE FOR THE NEXT TWO PRESSURE POINTS AS LISTED IN TABLE 6.1.6.2, SETTING THE PRESSURE AGAIN BY FIRST OPENING VALVE V4, SLOWLY OPENING VALVE V3 TO OBTAIN THE DESIRED PRESSURE, THEN CLOSING BOTH V3 AND V4. BE SURE TO STABILIZE THE PRESSURE PER PARAGRAPH 6.1.4.4. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 7MV. RECORD DATA IN TABLE 6.1.6.2 AS THE FOLLOWING STEPS ARE PERFORMED:

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-5	✓	✓	✓	✓
1X10-4	✓	✓	✓	✓
2×10^{-5}	✓	✓	✓	✓

variation

6.1.6.30 CLOSE OFF THE VIKING INLET LEAK BY CLOSING VALVES V11 AND V12 AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.6.3 ✓

variation

Do not do until data at 3×10^{-4} is taken

6.1.6.31 CONTINUE FOR THE NEXT FOUR PRESSURE POINTS AS LISTED IN TABLE 6.1.6.3. THE PRESSURE IS NOW SET BY USING THE MKS SERVO VALVE AND ITS CONTROLLER. THE VALVE INPUT CONTROL IS SET UNTIL THE MKS DIGITAL READOUT SHOWS THE DESIRED PRESSURE. BE SURE TO WAIT AT LEAST 8 MINUTES FOR THE PRESSURE TO STABILIZE. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 7MV. RECORD DATA IN TABLE 6.1.6.3 AS THE FOLLOWING STEPS ARE PERFORMED:

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variation

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-4	✓	✓	✓	✓
1X10-3	✓	✓	✓	✓
3X10-3	✓	✓	✓	✓
1X10-2	✓	✓	✓	✓

use Viking leak still. Note: Cal. station ion pump is pulling 135mA.

variation

variation

6.1.6.32 CLOSE THE MKS INLET VALVE AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.6.4. ✓

still use active control until noted in table

6.1.6.33 CONTINUE FOR THE NEXT FIVE PRESSURE POINTS AS LISTED IN TABLE 6.1.6.4. THE PRESSURES ARE NOW SET STATICLY BY MANUALLY OPENING THE MKS VALVE UNTIL THE DESIRED PRESSURE IS OBTAINED AND THEN CLOSING THE VALVE. BE SURE TO WAIT 8 MINUTES FOR THE PRESSURE TO STABILIZE. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 7MV. RECORD DATA IN TABLE 6.1.6.4 AS THE FOLLOWING STEPS ARE PERFORMED:

variation

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-2	✓	✓	✓	✓
1X10-1	✓	✓	✓	✓
3X10-1	✓	✓	✓	✓
1	✓	✓	✓	✓
3	✓	✓	✓	✓
10	✓	✓	✓	✓

6.1.6.34 CLOSE OFF OXYGEN SUPPLY. ✓

6.1.6.35 USING THE CYROPUMP, REDUCE THE CALIBRATION CHAMBER PRESSURE TO 50 MICRONS OR LESS. ✓

6.1.6.36 TURN ON THE MAIN ION PUMP AND REDUCE PRESSURE TO 1 X 10-6 TORR OR LESS. ✓

6.1.6.37 OPEN THE SUMS RANGE VALVE. ✓

6.1.6.38 TURN THE SUMS INSTRUMENT POWER OFF. ✓

END OF OXYGEN CALIBRATION

date 2-2-82

6.1.7 OXYGEN/NITROGEN MIXTURE GAS CALIBRATION

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THE O2/N2 MIXTURE CALIBRATION IS SIMILAR TO THE NITROGEN CALIBRATION. THE ION SOURCE PRESSURE SHOULD NOT EXCEED 1 X 10-4 TORR. THIS PRESSURE IS INDICATED WHEN THE ION PUMP CURRENT MONITOR AS READ ON THE UAMS TEST SET EXCEEDS ABOUT 7 MV.

variation

6.1.7.1 CALIBRATE THE LARGE VIKING INLET LEAK FOR N2/O2 PER TP2374339. RECORD VALUE HERE. 5.65×10^{-6} LITERS/SEC @ T = 76.6°F (ave) 5.63×10^{-6} @ 76.8°F @ 40 Torr 5.66×10^{-6} @ 76.4°F @ 400 Torr

6.1.7.2 CLOSE VALVE V38. ✓

Conductances above were measured using N_2 after baking Viking leak. Correction of this value to N_2/O_2 not required since correction factor appears in both numerator and denominator of HP9830 calculations.

6.1.7.3 VERIFY OR EVACUATE THE GAS INLET SYSTEM PER PARAGRAPH 6.6 OF TP2374339. VERIFY THROTTLING VALVE AT SUMS PLENUM IS OPEN ✓

6.1.7.4 VERIFY THAT VALVE V1 IS NOW CLOSED. ✓

6.1.7.5 VERIFY THAT THE REGULATOR AND VALVES ON THE N2/O2 TANK HAVE BEEN PROPERLY FLUSHED WITH N2/O2 AND THAT THE GAS SUPPLY LINE BETWEEN THE BLACK VALVE AND THE CALIBRATION STAND INLET IS NOW EVACUATED. ✓

6.1.7.6 ADJUST ION GAUGES PER PARAGRAPH 6.1.4.2. ✓

variation

6.1.7.7 PUMP THE CALIBRATION CHAMBER DOWN TO A PRESSURE <= 2 X 10-8 TORR. RECORD THE PRESSURE. 9.7×10^{-8} TORR (50 l/s orifice)

6.1.7.8 TURN ON THE "SUMS ION PUMP POWER". ✓

6.1.7.9 OPEN THE SUMS INLET, RANGE AND PROTECTION VALVES. ✓

6.1.7.10 VERIFY THE INSTRUMENT SENSOR INTERNAL PRESSURE IS LESS THAN OR EQUAL TO 1 X 10-5 TORR. ✓

6.1.7.11 TURN ON THE "SUMS INSTRUMENT POWER". ✓

6.1.7.12 VERIFY THAT THE N2/O2 STATIC CALIBRATION TAPE IS INSERTED IN THE HP9830 CALCULATOR. ✓

6.1.7.13 WAIT 30 MINUTES MINIMUM FOR THE INSTRUMENT ION SOURCE TEMPERATURE TO STABILIZE. ✓

6.1.7.14 RECORD THE CALIBRATION CHAMBER AND THE GAS INLET SYSTEM TEMPERATURES USING THE FLUKE DATA LOGGER.

variation

T12 CALIBRATION CHAMBER 72.8 DEG F   T11 = 73.9 °F
T13 GAS INLET SYSTEM 75.5 DEG F   T14 = 75.3 °F
T15 = 79.8 °F

6.1.7.15 VERIFY THE SPECIAL CONDITIONS OF TABLE 6.1.7.1 HAVE BEEN SET. ✓

6.1.7.16 ON THE HP9830 TYPE LOAD 0, EXECUTE, FOLLOWED BY RUN, EXECUTE. THE PROGRAM IS INTERACTIVE. BE CERTAIN TO COMPLY WITH ALL CALCULATOR REQUESTS THROUGHOUT THE TEST. ✓

6.1.7.17 VERIFY THAT THE CHAMBER PRESSURE AS READ ON THE ION GAUGE HAS BEEN STABLE FOR AT LEAST 8 MINUTES. ✓

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6.1.7.18 FILL IN THE REQUESTED DATA IN TABLE 6.1.7.1 AND TABLE 6.1.7.6 AS THE FOLLOWING STEPS ARE PERFORMED:

PRESS (TORR)	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
RESIDUALS	✓	✓	✓

BE CERTAIN NOT TO PROCEED UNTIL THE HP9830 HAS TAKEN DATA FOR BOTH FILAMENTS.

6.1.7.19 VERIFY THAT VALVES V6, V7, V8, V11, V12, V21 AND V22 ARE OPEN. ✓ (already were)

6.1.7.20 CLOSE VALVE V10 AND REMOVE THE KNOB. ✓ (was)

6.1.7.21 VERIFY OR CLOSE VALVES V2, V4, V9, V13 AND V14. ✓ (were)

6.1.7.22 CLOSE VALVE V3. ✓ (was

6.1.7.23 OPEN BLACK VALVE AT N2/O2 TANK. ✓

6.1.7.24 OPEN VALVE V4. ✓

6.1.7.25 TAKING DATA FOR A GIVEN PRESSURE POINT IS A FOUR STEP PROCESS. THESES STEPS ARE: 1) SET THE PRESSURE; 2) WATCH THE CALIBRATION CHAMBER ION GAUGE AND DO NOT PROCEED UNTIL THE PRESSURE IS STABLE FOR AT LEAST 8 MINUTES; 3) RECORD INSTRUMENT ION PUMP CURRENT MONITOR VOLTAGE (AS READ FROM UAMS TEST SET) IN TABLE 6.1.7.6; 4) LET THE HP9830 CALCULATOR TAKE DATA FOR BOTH FILAMENTS.

SETTING A PRESSURE IS ACCOMPLISHED BY SLOWLY OPENING VALVE V3 UNTIL THE DESIRED PRESSURE IS REACHED ON THE WALLACE & TIERNAN GAUGES. THEN CLOSE VALVES V7 AND V4 AND ALLOW AT LEAST 8 MINUTES AFTER THE PRESSURE ON THE ION GAUGE HAS STABILIZED.

FILL IN THE REQUESTED DATA IN TABLE 6.1.7.1 AS THE FOLLOWING STEPS ARE PERFORMED:

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variation

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
1X10-6	✓	✓	✓	✓
3X10-6	✓	✓	✓	✓
1X10-5	✓	✓	✓	✓
3x10-5	✓	✓	✓	✓

(large orifice still)

WHEN ALL DATA HAS BEEN TAKEN FOR THE ABOVE THREE PRESSURE POINTS PROCEED TO THE NEXT STEP.

6.1.7.26 VERIFY THAT THE CRYO PUMP IS STILL COLD. ✓

6.1.7.27 REDUCE THE PRESSURE UPSTREAM OF THE LARGE VIKING LEAK BY OPENING VALVES V4 AND V1. WHEN THE PRESSURE ON THE WALLACE & TIERNAN GUAGES HAS BEEN REDUCED TO LESS THAN 40 TORR CLOSE VALVE V1 AND PROCEED. ✓ do not do until running the special point below.

6.1.7.28 SWITCH IN THE SMALL ORIFICE (10 LITERS/SEC) AND VERIFY THE SPECIAL CONDITIONS OF TABLE 6.1.7.2 ✓

6.1.7.29 CONTINUE FOR THE NEXT THREE PRESSURE POINTS AS LISTED IN TABLE 6.1.7.2, SETTING THE PRESSURE AGAIN BY FIRST OPENING VALVE V4, SLOWLY OPENING VALVE V3 TO OBTAIN THE DESIRED PRESSURE, THEN CLOSING BOTH V3 AND V4. BE SURE TO STABILIZE THE PRESSURE PER PARAGRAPH 6.1.4.4. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.7.2 AS THE FOLLOWING STEPS ARE PERFORMED:

variation

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
1.5x10-4	✓	✓	✓	✓
3X10-5	✓	✓	✓	✓
1X10-4	✓	✓	✓	✓
3X10-4	✓	✓	✓	✓

6.1.7.30 CLOSE OFF THE VIKING INLET LEAK BY CLOSING VALVES V11 AND V12 AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.7.3. ✓ V15 also closed this time

6.1.7.31 CONTINUE FOR THE NEXT PRESSURE POINT AS LISTED IN TABLE 6.1.7.3. THE PRESSURE IS NOW SET BY USING THE MKS SERVO VALVE AND ITS CONTROLLER. THE VALVE INPUT CONTROL IS SET UNTIL THE MKS DIGITAL READOUT SHOWS THE DESIRED PRESSURE. BE SURE TO WAIT AT LEAST 8 MINUTES FOR THE PRESSURE TO STABILIZE. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.7.3 AS THE FOLLOWING STEPS ARE PERFORMED:

Date 2-3-82

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PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
variation 1X10-3	✓	✓	✓	✓
5x10-3	✓	✓	✓	✓

6.1.7.32 CLOSE THE SUMS RANGE VALVE AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.7.4. ____

6.1.7.33 CONTINUE FOR THE NEXT TWO PRESSURE POINTS AS LISTED IN TABLE 6.1.7.4. THE PRESSURE IS AGAIN SET WITH THE MKS SERVO VALVE AND ITS CONTROLLER. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.7.4 AS THE FOLLOWING STEPS ARE PERFORMED:

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-3	____	____	____	____
1X10-2	____	____	____	____

6.1.7.34 CLOSE THE MKS INLET VALVE AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.7.5. ____

6.1.7.35 CONTINUE FOR THE NEXT SEVEN PRESSURE POINTS AS LISTED IN TABLE 6.1.7.5. THE PRESSURES ARE NOW SET STATICLY BY MANUALLY OPENING THE MKS VALVE UNTIL THE DESIRED PRESSURE IS OBTAINED AND THEN CLOSING THE VALVE. BE SURE TO WAIT 8 MINUTES FOR THE PRESSURE TO STABILIZE. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.7.5 AS THE FOLLOWING STEPS ARE PERFORMED:

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-2	____	____	____	____
1X10-1	____	____	____	____
3X10-1	____	____	____	____
1	____	____	____	____
3	____	____	____	____
10	____	____	____	____
20	____	____	____	____

Test stopped at this point. It was determined that the large chamber of the calibration station was somehow absorbing the O_2 from the test gas. Large chamber was valved off and test was continued. Go to page 21A for continuation of test.

6.1.7.36 CLOSE OFF N2/O2 SUPPLY. ____

6.1.7.37 USING THE CYROPUMP, REDUCE THE CALIBRATION CHAMBER PRESSURE TO 50 MICRONS OR LESS. ____

6.1.7.38 TURN ON THE MAIN ION PUMP AND REDUCE PRESSURE TO 1 X 10-6 TORR OR LESS. ____

6.1.7.39 OPEN THE SUMS RANGE VALVE. ___

6.1.7.40 TURN THE SUMS INSTRUMENT POWER OFF. ___

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END OF NITROGEN/OXYGEN MIXTURE CALIBRATION

END OF SUMS STATIC CALIBRATION

TABLE 6.1.5.1

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NITROGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM PRESSURE
RESIDUALS THROUGH 1 X 10-5 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
2. INLET THROTTLING VALVE OPEN ✓
3. CALIBRATION ION PUMP ON ✓
4. MKS SERVO VALVE CLOSED ✓
5. VALVE V30 CLOSED ✓
6. LARGE ORIFICE (50 LITERS/SEC) SET IN CALIBRATION CHAMBER (OUT) ✓
7. LARGE VIKING LEAK USED AS GAS INLET ✓
8. RECORD LARGE LEAK VALUE FROM TP2374339 5.16×10^{-6} (ave) LITERS/SEC ✓
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	NOMINAL WALLACE TIERNAN PRESSURE (TORR)	CALIBRATION CHAMBER ION GUAGE PRESSURE (TORR)	PLENUM CHAMBER ION GUAGE PRESSURE (TORR)	WALLACE TIERNAN PRESSURE (TORR)	*** CALCULATED CHAMBER PRESSURE +/- 20% OF NOMINAL (TORR)	BARITRON READING 1 TORR HEAD (TORR)
RESIDUALS	101 1	0	6.35×10^{-8}	2.1×10^{-8}	0	—— (6.35×10^{-8})	0.000*
1 X 10-6	101 2	7.4	9.35×10^{-7}	1.9×10^{-7}	7.26	9.32×10^{-7}	-3×10^{-5} **
3 X 10-6	101 3	22	2.7×10^{-6}	5.0×10^{-7}	23.7	2.98×10^{-6}	-6×10^{-5} **
1 X 10-5	101 4	74	8.7×10^{-6}	1.55×10^{-6}	77.0	9.59×10^{-6}	-6.5×10^{-5} **

* noise in last place
** MKS readout drifts increasingly negative with time (both heads)
*** as calculated by HP9830 program (corrected)

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TABLE 6.1.5.2

NITROGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM PRESSURE
3 X 10-5 THROUGH 3 X 10-4 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
2. INLET THROTTLING VALVE OPEN ✓
3. CALIBRATION ION PUMP ON ✓
4. MKS SERVO VALVE CLOSED ✓
5. VALVE V30 CLOSED ✓
* 6. SMALL ORIFICE (10 LITERS/SEC) SET IN CALIBRATION CHAMBER (IN) ✓
7. LARGE VIKING LEAK USED AS GAS INLET ✓
8. RECORD LARGE LEAK VALUE FROM TP2374339 5.16×10^{-6} LITERS/SEC ✓ (ave)
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓

* CHANGE FROM PREVIOUS RUN

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	NOMINAL WALLACE TIERNAN PRESSURE (TORR)	CALIBRATION CHAMBER ION GUAGE PRESSURE (TORR)	PLENUM CHAMBER ION GUAGE PRESSURE (TORR)	WALLACE TIERNAN PRESSURE (TORR)	CALCULATED* CHAMBER PRESSURE +/- 20% OF NOMINAL (TORR)	BARITRON READING 1 TORR HEAD (TORR)
3 X 10-5	101 5	40	2.1×10^{-5}	10.2×10^{-7}	49.[illegible]5	2.66×10^{-5}	-6×10^{-5}
1 X 10-4	101 6	160	8.0×10^{-5}	3.6×10^{-6}	184.5	9.9×10^{-5}	9.9×10^{-5} **
3 X 10-4	102 1	400	2.5×10^{-4}	11.3×10^{-6}	548	2.94×10^{-4}	2.95×10^{-4} ***

* as calculated by HP9850 program (corrected)
** MKS baratrons rezeroed at this point. 1 Torr head set to 9.8×10^{-5}.
100 Torr head set to zero.
*** noise in the third digit.

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TABLE 6.1.5.3

NITROGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED AT PRESSURE OF 1 X 10-3 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
* 2. INLET THROTTLING VALVE NEARLY CLOSED ✓
3. CALIBRATION ION PUMP ON ✓
* 4. MKS VALVE USED TO SET PRESSURE ✓
* 5. VALVE V31 CLOSED AND V30 OPEN ✓
* 6. ORIFICE BUTTERFLY VALVE OPEN ✓
* 7. VIKING INLET LEAK CLOSED ✓
* 8. ION GAUGES OFF AND NOT USED ✓
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓
* 11. PRIMARY MEASUREMENT MADE WITH BARATRON ✓

* CHANGES REQUIRED FROM PREVIOUS RUN

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)
1 X 10-3	102 2	$1.00 \times 10^{-3} \pm 1\%$

← by the end of data taking, pressure had built up to 1.03×10^{-3}. Turning servo valve controller back on (after) brought pressure back to 1.00×10^{-3}.

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TABLE 6.1.5.4

NITROGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM 3 X 10-3 TO 1 X 10-2 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
2. INLET THROTTLING VALVE NEARLY CLOSED ✓
3. CALIBRATION ION PUMP ON ✓
4. MKS VALVE USED TO SET PRESSURE ✓
5. VALVE V31 CLOSED AND V30 OPEN ✓
6. ORIFICE BUTTERFLY VALVE OPEN ✓
7. VIKING INLET LEAK CLOSED ✓
8. ION GUAGES OFF AND NOT USED ✓ ← see variation TP 6.1.5.32
• 9. SUMS RANGE VALVE CLOSED (leave open) ✓
10. SUMS INSTRUMENT ION PUMP ON ✓
11. PRIMARY MEASUREMENT MADE WITH BARATRON ✓

• CHANGES REQUIRED FROM PREVIOUS RUN

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	
3 X 10-3	102 3	$3.00 \times 10^{-3} \pm 1\%$	← range valve open
1 X 10-2	103 1	$1.00 \times 10^{-2} \pm 1/2\%$	← range valve closed
4.6×10^{-3}	102 4	$4.60 \times 10^{-3} \pm 1/2\%$	← range valve open

TABLE 6.1.5.5

NITROGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM 3 X 10-2 TO 20 TORR

1. LIQUID HELIUM PUMP VALVED OFF
• 2. CALIBRATION CHAMBER ION PUMP OFF
• 3. INLET THROTTLING VALVE OPEN
• 4. MKS VALVE CLOSED AFTER USE
5. VALVE V31 CLOSED AND V30 OPEN
6. ORIFICE BUTTERFLY VALVE OPEN
7. VIKING INLET LEAK CLOSED
8. ION GUAGES OFF AND NOT USED
9. SUMS RANGE VALVE CLOSED
10. SUMS INSTRUMENT ION PUMP ON
11. PRIMARY MEASUREMENT MADE WITH BARATRON

see variation P 6.1.5.35

• CHANGES REQUIRED FROM PREVIOUS RUN —— NOTE THIS IS A COMPLETELY STATIC CALIBRATION.

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	100 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)
3 X 10-2	103 2	.0300±1%	.0305
1 X 10-1	103 3	.100 ±½%	.1002
3 X 10-1	103 4	.300 ±½%	.300
1	103 5	1.002	1.002
3	103 6	N/A	3.001
10	104 1	N/A	10.00
20	104 2	N/A	21.00
32.72	104 3	N/A	32.72

THE BENDIX COMMUNICATIONS DIVISION
AEROSPACE SYSTEMS OPERATIONS
ANN ARBOR, MICHIGAN

SIZE	CODE IDENT NO.	DRAWING NUMBER	REV
A	07038	TP3290648	—
SCALE	WEIGHT	SHEET 28	

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TABLE 6.1.5.6

NITROGEN CALIBRATION RUN

ION PUMP CURRENT MONITOR CALIBRATION

NOMINAL CALIBRATION PRESSURE (TORR)	CALCULATED* CALIBRATION PRESSURE (TORR)	ION PUMP CURRENT MONITOR (MV)
RESIDUALS	(6.85×10^{-8})	2.1 mV
1 X 10-6	9.32×10^{-7}	2.3
3 X 10-6	2.98×10^{-6}	2.5
1 X 10-5	9.59×10^{-6}	2.5
3 X 10-5	2.66×10^{-5}	2.5
1 X 10-4	9.9×10^{-5}	2.7
3 X 10-4	2.94×10^{-4}	3.5
1 X 10-3	1.00×10^{-3}	6.3
3 X 10-3	3.00×10^{-3}	14.4 (range valve open)
1 X 10-2	1.00×10^{-2}	2.1 (range valve closed)
3 X 10-2	3.00×10^{-2}	2.1
1 X 10-1	1.00×10^{-1}	2.1
3 X 10-1	3.00×10^{-1}	2.3
1	1.002	2.8
3	3.001	4.1
10	10.00	8.3
20	21.00	14.5
4.6×10^{-3}	4.60×10^{-3}	21.2 (range valve open)
32.72	32.72	21.1 (inlet pressure transducer 3.07 V * 10.78 = 33.1 Torr)

Variation

* as calculated by HP9830 (pressure external to sums inlet)

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE	WEIGHT	SHEET 29	

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TABLE 6.1.6.1

OXYGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM PRESSURE
RESIDUALS THROUGH 1 X 10-5 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
2. INLET THROTTLING VALVE OPEN ✓
3. CALIBRATION ION PUMP ON ✓
4. MKS SERVO VALVE CLOSED ✓
5. VALVE V30 CLOSED ✓
6. LARGE ORIFICE (50 LITERS/SEC) SET IN CALIBRATION CHAMBER (OUT) ✓
7. LARGE VIKING LEAK USED AS GAS INLET ✓
8. RECORD LARGE LEAK VALUE FROM TP2374339 4.86×10^{-6} LITERS/SEC ✓
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	NOMINAL WALLACE TIERNAN PRESSURE (TORR)	CALIBRATION CHAMBER ION GUAGE PRESSURE (TORR)	PLENUM CHAMBER ION GUAGE PRESSURE (TORR)	WALLACE TIERNAN PRESSURE (TORR)	CALCULATED CHAMBER * PRESSURE +/- 20% OF NOMINAL (TORR)	BARITRON READING 1 TORR HEAD (TORR)
RESIDUALS	105 1	0	~~[illegible]~~ 6.15×10^{-8}	2.35×10^{-8}	0	(6.4×10^{-8})	$0.000 \pm 0.005 \times 10^{-3}$
1 X 10-6	105 2	7.4	1.09×10^{-6} ~~[illegible]~~	1.50×10^{-7} ~~[illegible]~~	9.86 ~~[illegible]~~	1.1×10^{-6}	"
3 X 10-6	105 3	22	2.90×10^{-6}	4.0×10^{-7}	28.35	3.4×10^{-6}	-0.015×10^{-3}
1 X 10-5	105 4	74	3.2×10^{-6} **	1.35×10^{-6}	82.7	8.55×10^{-6}	$0.000 \pm 0.005 \times 10^{-3}$

* as calculated by HP9830 program

** value is not accurate. when pressure was first set on W&T guage, chamber ion guage read 8.6×10^{-6}. over a period of minutes it decreased to 2.9×10^{-6} and lower. Ion guage was turned off at this point.

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE	WEIGHT	SHEET 30	

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TABLE 6.1.6.2

OXYGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM PRESSURE
3 X 10-5 THROUGH 1 X 10-4 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
2. INLET THROTTLING VALVE OPEN ✓
3. CALIBRATION ION PUMP ON ✓
4. MKS SERVO VALVE CLOSED ✓
5. VALVE V38 CLOSED ✓
* 6. SMALL ORIFICE (10 LITERS/SEC) SET IN CALIBRATION CHAMBER (IN) ✓
7. LARGE VIKING LEAK USED AS GAS INLET ✓
8. RECORD LARGE LEAK VALUE FROM TP2374339 4.86×10^{-6} LITERS/SEC ✓
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓

* CHANGE FROM PREVIOUS RUN.

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	NOMINAL WALLACE TIERMAN PRESSURE (TORR)	CALIBRATION CHAMBER ION GUAGE PRESSURE (TORR)	PLENUM CHAMBER ION GUAGE PRESSURE (TORR)	WALLACE TIERMAN PRESSURE (TORR)	CALCULATED CHAMBER PRESSURE +/- 20% OF NOMINAL (TORR)	BARITRON READING 1 TORR HEAD (TORR)
3 X 10-5	105 6	40	4.6×10^{-6}	7.4×10^{-7}	39.85	\# 2.06×10^{-5} 2.45×10^{-5}	0.020×10^{-3}
1 X 10-4	106 1	160	6.65×10^{-5} **	3.25×10^{-6}	174.8	9.49×10^{-5}	0.080×10^{-3}
5×10^{-5}	105 5	74	off	1.45×10^{-6}	82.2	$\times 10^{-5}$ 4.24	0.032×10^{-3}
	106 2	160	1.65×10^{-5}	3.35×10^{-6}	174.0	2.26×10^{-5}	0.010×10^{-3} ± 0.005

extra data point taken with large orifice in.

** ion guages working properly again at this point.
\# 2.06 is uncorrected. 2.45 corrected, but ion guages are not working properly so correction is not valid probably.

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE	WEIGHT	SHEET 31	

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TABLE 6.1.6.3

OXYGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT RUN FROM PRESSURE
3 X 10-4 THROUGH 1 X 10-2 TORR

1. LIQUID HELIUM PUMP VALVED OFF
* 2. INLET THROTTLING VALVE NEARLY CLOSED
3. CALIBRATION ION PUMP ON (active)
* 4. MKS VALVE USED TO SET PRESSURE
* 5. VALVE V31 CLOSED AND V38 OPEN
* 6. ORIFICE BUTTERFLY VALVE OPEN
* 7. VIKING INLET LEAK CLOSED
* 8. ION GAUGES OFF AND NOT USED
* 9. SUMS RANGE VALVE CLOSED — variation as noted below
10. SUMS INSTRUMENT ION PUMP ON
* 11. PRIMARY MEASUREMENT MADE WITH BARATRON

* CHANGES REQUIRED FROM PREVIOUS RUN

	NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	cal chamber	plenum chamber	w/T	calculated
range valve open	3 X 10-4	106 3	0.292×10^{-3}	2.35×10^{-4}	1.20×10^{-5}	547	2.97×10^{-4}
range valve open	1 X 10-3	106 4	1.00×10^{-3} ± 1%				
range valve open	3 X 10-3	106 5	3.00×10^{-3} ± 1%				
range valve closed	1 X 10-2	107 1	1.00×10^{-2} ± ½%				

MKS servo valve with active control.

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TABLE 6.1.6.4

OXYGEN CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM 3 X 10-2 TO 3 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
* 2. CALIBRATION CHAMBER ION PUMP OFF ✓ still used until noted
* 3. THROTTLING VALVE OPEN ✓
* 4. MKS SERVO VALVE CLOSED AFTER USE ✓
5. VALVE V31 CLOSED AND V30 OPEN ✓
6. ORIFICE BUTTERFLY VALVE OPEN ✓ 10 l/sec used
7. VIKING INLET LEAK CLOSED ✓
8. ION GUAGES OFF AND NOT USED ✓
9. SUMS RANGE VALVE CLOSED ✓
10. SUMS INSTRUMENT ION PUMP ON ✓
11. PRIMARY MEASUREMENT MADE WITH BARATRON ✓

* CHANGES REQUIRED FROM PREVIOUS RUN --- NOTE THIS IS A COMPLETELY STATIC CALIBTION

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	100 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)
3 X 10-2	107 2	3.00×10^{-2} ± 1/2%	.0299
1 X 10-1	107 3	1.00×10^{-1} ±0.2%	.
3 X 10-1	107 4	3.00×10^{-1} ±0.2%	.299
1	107 5	N/A	1.0005 ±.0005
3	107 6	N/A	3.004 ±.003
10	108 1	N/A	10.005

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TABLE 6.1.6.5

OXYGEN CALIBRATION RUN

ION PUMP CURRENT MONITOR CALIBRATION

NOMINAL CALIBRATION PRESSURE (TORR)	CALCULATED * CALIBRATION PRESSURE (TORR)	ION PUMP CURRENT MONITOR (MV)		SUMS Inlet Pressure (Volts) GSE channel #9
RESIDUALS	6.4×10^{-8}	2.0 mV	range valve open	
1 X 10-6	1.1×10^{-6}	2.1 mV	"	
3 X 10-6	3.4×10^{-6}	2.2	"	
1 X 10-5	8.55×10^{-6}	2.2	"	
3 X 10-5		2.3	"	0.14
1 X 10-4	9.49×10^{-5}	2.5	"	0.13
3 X 10-4	2.97×10^{-4}	[redacted] 3.1	"	[redacted] 0.11
** 1 X 10-3	1.00×10^{-3}	4.9	"	0.35
3 X 10-3	3.00×10^{-3}	9.9	"	0.24
1 X 10-2	1.00×10^{-2}	2.1	range valve closed	0.45
3 X 10-2	3.00×10^{-2}	2.1	"	0.46
1 X 10-1	1.00×10^{-1}	2.1	"	0.33
3 X 10-1	3.00×10^{-1}	2.1	"	0.26
1	1.000	2.4	"	0.31
3	3.003	3.2	"	0.48
5×10^{-5}	4.24×10^{-5}	2.3		
	2.26×10^{-5}	2.4		0.15
10	[redacted] 10.005	[redacted] 7.1	range closed	[redacted] 1.39

** as read with Baratron; set using active servo valve.
* as calculated by HP9830 program

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE	WEIGHT	SHEET 34	

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TABLE 6.1.7.1

N2/O2 CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM PRESSURE RESIDUALS THROUGH 1 X 10-5 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
2. INLET THROTTLING VALVE OPEN ✓
3. CALIBRATION ION PUMP ON ✓
4. MKS SERVO VALVE CLOSED ✓
5. VALVE V30 CLOSED ✓
6. LARGE ORIFICE (50 LITERS/SEC) SET IN CALIBRATION CHAMBER (OUT) ✓
7. LARGE VIKING LEAK USED AS GAS INLET ✓
8. RECORD LARGE LEAK VALUE FROM TP2374339 5.65×10^{-6} LITERS/SEC (ave) ✓
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	NOMINAL WALLACE TIERMAN PRESSURE (TORR)	CALIBRATION CHAMBER ION GUAGE PRESSURE (TORR)	PLENUM CHAMBER ION GUAGE PRESSURE (TORR)	WALLACE TIERMAN PRESSURE (TORR)	CALCULATED CHAMBER PRESSURE +/- 20% OF NOMINAL (TORR)	BARITRON READING 1 TORR HEAD (TORR)
RESIDUALS	110 1	0	9.7×10^{-8}	2.35×10^{-8}	0	—	0.005×10^{-3}
1 X 10-6	110 2	7.4	1.05×10^{-6}	1.85×10^{-7}	7.52	1.10×10^{-6}	0.010×10^{-3}
3 X 10-6	110 3	22	2.7×10^{-6}	4.75×10^{-7}	21.95	3.21×10^{-6}	0.015×10^{-3}
1 X 10-5	110 4	74	9.05×10^{-6}	1.55×10^{-6}	74.0	1.08×10^{-5}	0.015×10^{-3}
3×10^{-5}	110 5	220	2.5×10^{-5}	4.6×10^{-6}	219	3.24×10^{-5}	0.040×10^{-3}

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE	WEIGHT	SHEET 35	

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TABLE 6.1.7.2

N2/O2 CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM PRESSURE
3 X 10-5 THROUGH 3 X 10-4 TORR

1. LIQUID HELIUM PUMP VALVED OFF ✓
2. INLET THROTTLING VALVE OPEN ✓
3. CALIBRATION ION PUMP ON ✓
4. MKS SERVO VALVE CLOSED ✓
5. VALVE V30 CLOSED ✓
* 6. SMALL ORIFICE (10 LITERS/SEC) SET IN CALIBRATION CHAMBER (IN) ✓
7. LARGE VIKING LEAK USED AS GAS INLET ✓
8. RECORD LARGE LEAK VALUE FROM TP2374339 5.65×10^{-6} LITERS/SEC (ave) ✓
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓

* CHANGE FROM PREVIOUS RUN

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	NOMINAL WALLACE TIERNAN PRESSURE (TORR)	CALIBRATION CHAMBER ION GUAGE PRESSURE (TORR)	PLENUM CHAMBER ION GUAGE PRESSURE (TORR)	WALLACE TIERNAN PRESSURE (TORR)	CALCULATED CHAMBER PRESSURE +/- 20% OF NOMINAL (TORR)	BARITRON READING 1 TORR HEAD (TORR)
3 X 10-5	111 / 1	40	2.3×10^{-5}	9.75×10^{-7}	48.1	3.03×10^{-5}	0.043×10^{-3}
1 X 10-4	111 / 2	160	7.65×10^{-5}	3.0×10^{-6}	159.8	1.00×10^{-4}	0.105×10^{-3}
3 X 10-4	111 / 3	400	2.4×10^{-4}	9.25×10^{-6}	478	3.00×10^{-4}	0.299×10^{-3}
1.5×10^{-4}	110 / 6	220	1.06×10^{-4}	4.4×10^{-6}	218	1.37×10^{-4}	0.140×10^{-3}

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TABLE 6.1.7.3

N2/O2 CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED AT PRESSURE OF 1 X 10-3 TORR

Variation

1. LIQUID HELIUM PUMP VALVED OFF ✓
* 2. INLET THROTTLING VALVE ~~NEARLY CLOSED~~ OPEN ✓
3. CALIBRATION ION PUMP ~~ON~~ OFF ✓
* 4. MKS VALVE USED TO SET PRESSURE ✓
* 5. VALVE V31 CLOSED AND V30 OPEN ✓
* 6. ORIFICE BUTTERFLY VALVE OPEN ✓
* 7. VIKING INLET LEAK CLOSED ✓
* 8. ION GUAGES OFF AND NOT USED ✓
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓
* 11. PRIMARY MEASUREMENT MADE WITH BARATRON ✓

MKS valve not used in feedback mode. Totally closed after setting pressure and Cryo pump put on back side of valve.

* CHANGES REQUIRED FROM PREVIOUS RUN

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	100 Torr Baratron
1 X 10-3	111 4	1.01×10^{-3} ± ½%	noise
5×10^{-3}			~~.0024~~
3×10^{-3}	111 5	3.24×10^{-3}	.0024
3×10^{-3}	111 6	3.17×10^{-3}	.0020

last reading of ion guages before turning them off $I_c = 1.02 \times 10^{-3}$ $I_p = 9.8 \times 10^{-4}$

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE		WEIGHT	SHEET 37

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TABLE 6.1.7.4

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N2/O2 CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM 3 X 10-3 TO 1 X 10-2 TORR

1. LIQUID HELIUM PUMP VALVED OFF ——
2. INLET THROTTLING VALVE NEARLY CLOSED ——
3. CALIBRATION ION PUMP ON ——
4. MKS VALVE USED TO SET PRESSURE ——
5. VALVE V31 CLOSED AND V30 OPEN ——
6. ORIFICE BUTTERFLY VALVE OPEN ——
7. VIKING INLET LEAK CLOSED ——
8. ION GUAGES OFF AND NOT USED ——
* 9. SUMS RANGE VALVE CLOSED ——
10. SUMS INSTRUMENT ION PUMP ON ——
11. PRIMARY MEASUREMENT MADE WITH BARATRON ——

* CHANGES REQUIRED FROM PREVIOUS RUN

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	100 Torr Baratron
3 X 10-3			
1 X 10-2			

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
	SCALE		WEIGHT	SHEET 38

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TABLE 6.1.7.5

N2/O2 CALIBRATION RUN

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SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM 3 X 10-2 TO 20 TORR

1. LIQUID HELIUM PUMP VALVED OFF ——
* 2. CALIBRATION CHAMBER ION PUMP OFF ——
* 3. INLET THROTTLING VALVE OPEN ——
* 4. MKS VALVE CLOSED AFTER USE ——
5. VALVE V31 CLOSED AND V30 OPEN ——
6. ORIFICE BUTTERFLY VALVE OPEN ——
7. VIKING INLET LEAK CLOSED ——
8. ION GAUGES OFF AND NOT USED ——
9. SUMS RANGE VALVE CLOSED ——
10. SUMS INSTRUMENT ION PUMP ON ——
11. PRIMARY MEASUREMENT MADE WITH BARATRON ——

* CHANGES REQUIRED FROM PREVIOUS RUN —— NOTE THIS IS A COMPLETELY STATIC CALIBRATION

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	100 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)
3 X 10-2			
1 X 10-1			
3 X 10-1			
1			
3			
10			
20			

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TABLE 6.1.7.6

N2/O2 CALIBRATION RUN

ION PUMP CURRENT MONITOR CALIBRATION

NOMINAL CALIBRATION PRESSURE (TORR)	CALCULATED CALIBRATION PRESSURE (TORR)	ION PUMP CURRENT MONITOR (MV)	range Valve	SUMS Inlet Pressure GSE Channel #9 (Volts)
RESIDUALS	9.7×10^{-8}	2.1	open	0.10
1 X 10-6	1.10×10^{-6} *	2.1	open	0.09
3 X 10-6	3.21×10^{-6} *	2.2	open	0.08
1 X 10-5	1.08×10^{-5} *	2.2	open	0.10
3 X 10-5	3.03×10^{-5} *	2.3	open	0.08 (small orifice)
1 X 10-4	1.00×10^{-4} *	2.5	open	0.09
3 X 10-4	3.00×10^{-4} *	3.2	open	0.07
1 X 10-3	1.01×10^{-3} *	6.5	open	0.11
3 X 10-3				
1 X 10-2				
3 X 10-2				
1 X 10-1				
3 X 10-1				
1				
3				
10				
20				
3×10^{-5}	3.27×10^{-5} *	2.3	open	0.15 (large orifice)
1.5×10^{-4}	1.37×10^{-4} *	2.7	open	0.09 (small orifice)
3×10^{-3}	3.24×10^{-3}	15.8	open	0.10

* calculated by HP9830

THE BENDIX COMMUNICATIONS DIVISION
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ANN ARBOR, MICHIGAN

SIZE	CODE IDENT NO.	DRAWING NUMBER	REV
A	07038	TP3290648	—
SCALE	WEIGHT	SHEET 40	

FILL IN THE REQUESTED DATA IN TABLE 6.1.7.1 AS THE FOLLOWING STEPS ARE PERFORMED:

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PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
1X10-6	___	___	___	___
3X10-6	___	___	___	___
1X10-5	___	___	___	___

WHEN ALL DATA HAS BEEN TAKEN FOR THE ABOVE THREE PRESSURE POINTS PROCEED TO THE NEXT STEP.

6.1.7.26 VERIFY THAT THE CRYO PUMP IS STILL COLD. ___

6.1.7.27 REDUCE THE PRESSURE UPSTREAM OF THE LARGE VIKING LEAK BY OPENING VALVES V4 AND V1. WHEN THE PRESSURE ON THE WALLACE & TIERNAN GUAGES HAS BEEN REDUCED TO LESS THAN 40 TORR CLOSE VALVE V1 AND PROCEED. ___

6.1.7.28 SWITCH IN THE SMALL ORIFICE (10 LITERS/SEC) AND VERIFY THE SPECIAL CONDITIONS OF TABLE 6.1.7.2. ___

6.1.7.29 CONTINUE FOR THE NEXT THREE PRESSURE POINTS AS LISTED IN TABLE 6.1.7.2, SETTING THE PRESSURE AGAIN BY FIRST OPENING VALVE V4, SLOWLY OPENING VALVE V3 TO OBTAIN THE DESIRED PRESSURE, THEN CLOSING BOTH V3 AND V4. BE SURE TO STABILIZE THE PRESSURE PER PARAGRAPH 6.1.4.4. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.7.2 AS THE FOLLOWING STEPS ARE PERFORMED.

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-5	___	___	___	___
1X10-4	___	___	___	___
3X10-4	___	___	___	___

Restart from here on 2-4-82. Throttling Valve closed for all remaining pressures

6.1.7.30 CLOSE OFF THE VIKING INLET LEAK BY CLOSING VALVES V11 AND V12 AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.7.3A ✓

6.1.7.31 CONTINUE FOR THE NEXT PRESSURE POINT AS LISTED IN TABLE 6.1.7.3A THE PRESSURE IS NOW SET BY USING THE MKS SERVO VALVE AND ITS CONTROLLER. THE VALVE INPUT CONTROL IS SET UNTIL THE MKS DIGITAL READOUT SHOWS THE DESIRED PRESSURE. BE SURE TO WAIT AT LEAST 8 MINUTES FOR THE PRESSURE TO STABILIZE. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.7.3A AS THE FOLLOWING STEPS ARE PERFORMED.

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
5×10^{-4}	✓	✓	✓	✓
1X10-3	✓	✓	✓	✓
4×10^{-3}	✓	✓	✓	✓

variation

MKS Valve used in closed loop servo mode.

6.1.7.32 CLOSE THE SUMS RANGE VALVE AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.7.4.A ✓

6.1.7.33 CONTINUE FOR THE NEXT TWO PRESSURE POINTS AS LISTED IN TABLE 6.1.7.4.A THE PRESSURE IS AGAIN SET WITH THE MKS SERVO VALVE AND ITS CONTROLLER. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.7.4A AS THE FOLLOWING STEPS ARE PERFORMED:

SUMS Range Valve Closed Automatically at 6.1×10^{-3} Torr.

PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
4X10-3	✓	✓	✓	✓
1X10-2	✓	✓	✓	✓

variation

MKS Valve closed after setting pressure.

6.1.7.34 CLOSE THE MKS INLET VALVE AND SET THE SPECIAL CONDITIONS LISTED IN TABLE 6.1.7.5.A ✓

6.1.7.35 CONTINUE FOR THE NEXT SEVEN PRESSURE POINTS AS LISTED IN TABLE 6.1.7.5.A THE PRESSURES ARE NOW SET STATICLY BY MANUALLY OPENING THE MKS VALVE UNTIL THE DESIRED PRESSURE IS OBTAINED AND THEN CLOSING THE VALVE. BE SURE TO WAIT 8 MINUTES FOR THE PRESSURE TO STABILIZE. MONITOR THE ION PUMP CURRENT AND TURN THE INSTRUMENT POWER OFF IF THE MONITOR EXCEEDS 50MV. RECORD DATA IN TABLE 6.1.7.5A AS THE FOLLOWING STEPS ARE PERFORMED:

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PRESS (TORR)	SET PRESS POINT	CHAMBER PRESS STABILIZED	RECORD ION PUMP	DATA TAKEN
3X10-2	✓	✓	✓	✓
1X10-1	✓	✓	✓	✓
3X10-1	✓	✓	✓	✓
1	✓	✓	✓	✓
3	✓	✓	✓	✓
10	✓	✓	✓	✓
30 ~~20~~	✓	✓	✓	✓

variation

System automatically closes valves at 48.1 Torr.

6.1.7.36 CLOSE OFF N2/O2 SUPPLY. ✓

6.1.7.37 USING THE CYROPUMP, REDUCE THE CALIBRATION CHAMBER PRESSURE TO 50 MICRONS OR LESS. ✓

6.1.7.38 TURN ON THE MAIN ION PUMP AND REDUCE PRESSURE TO 1 X 10-6 TORR OR LESS. ✓

6.1.7.39 OPEN THE SUMS RANGE VALVE. ✓

6.1.7.40 TURN THE SUMS INSTRUMENT POWER OFF. ✓

END OF NITROGEN/OXYGEN MIXTURE CALIBRATION

END OF SUMS STATIC CALIBRATION

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THE BENDIX CORPORATION Aerospace Systems Operations ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV —
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2-4-82

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TABLE 6.1.7.3 A

N2/O2 CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED AT PRESSURE OF 1 X 10-3 TORR

variation

1. LIQUID HELIUM PUMP VALVED OFF ✓
* 2. INLET THROTTLING VALVE ~~NEARLY CLOSED~~ ALL THE WAY ✓
3. CALIBRATION ION PUMP ON (OUT OF THE PICTURE) ✓
* 4. MKS VALVE USED TO SET PRESSURE ✓ (closed loop servo mode)
* 5. VALVE V31 CLOSED AND V30 OPEN ✓
* 6. ORIFICE BUTTERFLY VALVE OPEN ✓
* 7. VIKING INLET LEAK CLOSED ✓
* 8. ION GAUGES OFF AND NOT USED ✓
9. SUMS RANGE VALVE OPEN ✓
10. SUMS INSTRUMENT ION PUMP ON ✓
* 11. PRIMARY MEASUREMENT MADE WITH BARATRON ✓

* CHANGES REQUIRED FROM PREVIOUS RUN

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	100 Torr Baratron
1 X 10-3	113 2	1.00×10^{-3}	
5×10^{-4}	113 1	5.10×10^{-4}	
4×10^{-3}	113	4.00×10^{-3}	

range valve closed automatically at 6.10×10^{-3} Torr.

THE BENDIX COMMUNICATIONS DIVISION
AEROSPACE SYSTEMS OPERATIONS
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A	07038	TP3290648	—
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TABLE 6.1.7.4 A

N2/O2 CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM 3 X 10-3 TO 1 X 10-2 TORR

variation

1. LIQUID HELIUM PUMP VALVED OFF
2. INLET THROTTLING VALVE ~~[illegible]~~ CLOSED ALL THE WAY
3. CALIBRATION ION PUMP ~~ON~~ OUT OF THE PICTURE (closed after use)
4. MKS VALVE USED TO SET PRESSURE
5. VALVE ~~V31 CLOSED AND V30 OPEN~~ V31 OPEN V30 CLOSED AFTER SETTING PRESS
6. ORIFICE BUTTERFLY VALVE OPEN
7. VIKING INLET LEAK CLOSED
8. ION GAUGES OFF AND NOT USED
* 9. SUMS RANGE VALVE CLOSED
10. SUMS INSTRUMENT ION PUMP ON
11. PRIMARY MEASUREMENT MADE WITH BARATRON

* CHANGES REQUIRED FROM PREVIOUS RUN

large chamber valved off

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	100 Torr
~~3 X 10-3~~ 4×10^{-3}	114 1	4.22×10^{-3}	0.0033
1 X 10-2	114 2	1.00×10^{-2}	0.0090

2-4-82

TABLE 6.1.7.5 A

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N2/O2 CALIBRATION RUN

SPECIAL CONDITIONS REQUIRED THROUGHOUT THE RUN FROM 3 X 10-2 TO 20 TORR

1. LIQUID HELIUM PUMP VALVED OFF
* 2. CALIBRATION CHAMBER ION PUMP OFF
* 3. INLET THROTTLING VALVE ~~OPEN~~ CLOSED
* 4. MKS VALVE CLOSED AFTER USE
5. VALVE ~~V31 CLOSED AND V30 OPEN~~ V31 OPEN, V30 CLOSED AFTER USE
6. ORIFICE BUTTERFLY VALVE OPEN
7. VIKING INLET LEAK CLOSED
8. ION GAUGES OFF AND NOT USED
9. SUMS RANGE VALVE CLOSED
10. SUMS INSTRUMENT ION PUMP ON
11. PRIMARY MEASUREMENT MADE WITH BARATRON

variation

* CHANGES REQUIRED FROM PREVIOUS RUN —— NOTE THIS IS A COMPLETELY STATIC CALIBRATION

large chamber is valved off

NOMINAL CALIBRATION CHAMBER PRESSURE (TORR)	TAPE & FILE NUMBER	1 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)	100 TORR BARATRON READING +/- 20% OF NOMINAL (TORR)
3 X 10-2	114 3	2.985 x 10^-2	0.0290
1 X 10-1	114 4	1.003 x 10^-1	0.0995
3 X 10-1	114 5	3.023 x 10^-1	0.3012
1	114 6	1.00	1.000
3	115 1	N/A	~~3.071~~ 3.03
10	115 2	N/A	10.05
~~20~~ 30	115 3	N/A	30.1

System shut down at 48.1 Torr

THE BENDIX COMMUNICATIONS DIVISION
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ANN ARBOR, MICHIGAN

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TABLE 6.1.7.6 A

N2/O2 CALIBRATION RUN

ION PUMP CURRENT MONITOR CALIBRATION

NOMINAL CALIBRATION PRESSURE (TORR)	CALCULATED CALIBRATION PRESSURE (TORR)	ION PUMP CURRENT MONITOR (MV)	range valve	SUMS Inlet Pressure (Volts)
RESIDUALS				
1 X 10-6				
3 X 10-6				
1 X 10-5				
3 X 10-5				
1 X 10-4				
3 X 10-4				
1 X 10-3	1.00×10^{-3}	5.9	open	0.18
~~3 X 10-2~~ 4×10^{-3}	4.00×10^{-3}	16.7	open	0.26
1 X 10-2	1.00×10^{-2}	2.0	closed	0.03
3 X 10-2	2.99×10^{-2}	2.0	closed	0.03
1 X 10-1	1.00×10^{-1}	2.1	closed	—
3 X 10-1	3.02×10^{-1}	2.2	closed	0.05
1	1.00	2.6	closed	0.12
3	~~3.07~~ 3.03	3.9	closed	0.31
10	10.05	7.6	closed	0.96
~~20~~ 30	30.1	17.4	closed	2.83
5×10^{-4}	5.1×10^{-4}	3.9 mV	open	0.24
4×10^{-3}	4.22×10^{-3}	2.1	closed	0.03

THE BENDIX COMMUNICATIONS DIVISION
AEROSPACE SYSTEMS OPERATIONS
ANN ARBOR, MICHIGAN

SIZE	CODE IDENT NO.	DRAWING NUMBER	REV
A	07038	TP2290648	—
SCALE	WEIGHT	SHEET 40 A	

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RELIABILITY		REVISIONS			CONFIG MGT
APPD	PREDICTION	LTR	DESCRIPTION	DATE	APPV'D
		X-1	EXPERIMENTAL RELEASE ER19044A47	2-17-73	
		—	STANDARD RELEASE	11-1-73	
		A	REVISED DUE TO TEST EQUIP. REDESIGN	6-19-73	

TABLE OF CONTENTS

T/C G. Robertson

As-Run
1-19-82 (N_2)
1-22-82 (O_2)
1-29-82 (N_2)

DRAWING AND PART APPLICATION

PART NO	NEXT ASSY	END ITEM NO.	EFFECTIVITY
		2370700-101	EXPERIMENTAL
		2370700-201	PTC/FLIGHT

CONTR NO.	
PREP.	J. Tummers 2-7-73
CHECKED	
TEST	
QUAL CONT	
ENGR	9-10-73
SYS SPT	

THE BENDIX CORPORATION
AEROSPACE SYSTEMS DIVISION – ANN ARBOR, MICHIGAN

TITLE Calibration Station Molecular Leak Test Procedure for the Viking UAMS

SIZE	CODE IDENT NO.	DRAWING NUMBER	REV
A	07038	TP2374339	A

SCALE | WEIGHT | SHEET 1 of 18

DRAWING CLASS A ☐ B ☒ C ☐

BxA 640

REVISION STATUS INDEX

Revision Letter	Page	Section
A	5 thru 9	Section 6 rewritten

1.0 PURPOSE OF TEST

The purpose of this test is to establish the molecular leak rate of each leak of the calibration station for each species of the test gas and to determine the linearity with pressure.

2.0 SCOPE OF TEST

It is assumed personnel familiar with the calibration station and the necessary procedures will conduct the test.

3.0 APPLICABLE DOCUMENTS

PD6400445 Upper Atmosphere Mass Spectrometer

4.0 PARTICIPANTS

See Work Order Operations Sheet

5.0 EQUIPMENT REQUIRED

Item	Manufacturer	Part No. or Model	Qty	Serial No.	Calib. Date
Calibration Station					
Timer					
Pure Gases;					
~~Hydrogen~~					
~~Helium~~					
Nitrogen					
Oxygen					
~~Argon~~					
~~Carbon Dioxide~~					
~~Carbon Monoxide~~					
80% N_2 / 20% O_2					

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Equivalent items may be substituted. These and any additional items must be listed below prior to testing.

6.0 PROCEDURE

6.1 Verify that the system is in standby conditions, i.e. the inlet system is being pumped by its internal vacuum system. See Section 6.2

6.2 Standby Condition for Gas Inlet System

6.2.1 Valve V_1 CLOSED.

6.2.2 Valves V_2 through V_{14}, V_{21}, V_{22} OPEN.

6.2.3 20 l/s Ion Pump RUNNING.

Pressure, depending on condition of gas inlet system (prior use, bake, etc.) should be less than 5×10^{-6} torr.

6.2.4 Gas Supply valves (Black) - CLOSED.

6.2.5 Gas cylinder valves - CLOSED.

6.2.6 Regular Set Handles - BACKED OFF.

6.2.7 Indicated gas pressures

High- Less than 50#
Low- Less than 2#

6.3 Low Pressure (40-50 torr) Leak Calibration

6.3.1 Turn Baratron ON.

6.3.2 Liquid nitrogen chill the cryo pod for at least 20 minutes for all gases except hydrogen and helium. For these gases, connect the mechanical pump with a liquid nitrogen cooled molecular sieve in the foreline.

6.3.3 Backfilling with desired gas.

6.3.4 Torque valves V2, 3, 9, 10, 11, 13, 14 to 2 1/2 in. lbs. This assumes small calibrated leak and buffer volume will not be used.

6.3.4.1 Remove nut from valve V_{10}.

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6.3.5 Open gas cylinder to be used and set regulator at about 3 psi.

6.3.6 Close gas cylinder (same gas as 6.3.5).

6.3.7 Open bleed valve to atmosphere of gas cylinder until input regulator pressure drops to about 50 psi.

6.3.8 Repeat steps 6.3.5 thru 6.3.7 two more times.

6.3.9 Reopen gas cylinder and leave open.

6.3.10 Slowly open the Black gas supply valve. Slowly open V_3 (Inlet) and admit gas to a pressure of 20 torr, close V_{21} to 15 in lbs. Open V_3 to a pressure of 40 to 50 torr. A minimum of 20 seconds should be allowed for each of the 3 Wallace and Tierman gages to reach full scale. Close and torque the valve after this pressure range has been reached.

6.3.11 Open V_{11} for 30 seconds and then torque closed. Torque valve V_4 closed to 2 1/2 in lbs.

6.3.12 Wait 20 minutes. Reset the clock, set both micrometers to 10 millimeters.

6.3.13 Zero baratron-keep set to appropriate scale.

6.3.14 Close ~~V_5, V_8.~~ V_6 & V_7

6.3.15 Wait 5 minutes.

6.3.16 Rezero Baratron with large micrometer - keep small micrometer set at 10mm.

6.3.17 When the baratron is nulled, start the clock - record small micrometer.

6.3.18 Maintain a null reading for 10 minutes or 10mm on the micrometer, which ever comes first, adjusting the small micrometer.

6.3.19 Turn off clock when the baratron is again nulled.

6.3.20 Open valves ~~V5 and V8.~~ V_6 & V_7

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6.3.21 Record the small micrometer reading and the clock readings. Calculate leak rate per direction on Data Table.

6.3.22 Also determine whether this effective leak rate is acceptable by comparison with limits in the table.

6.3.23 If leak rate is not acceptable, repeat steps 6.3.12 thru 6.3.22.

6.3.24 Open inlet valve V11.

6.3.25 Reset the clock and set both micrometers to 20 millimeters.

6.3.26 Wait 10 minutes.

6.3.27 Zero baratron.

6.3.28 Close valves ~~V5 and V8.~~ V6 & V7

6.3.29 Quickly set the large micrometer to 15 millimeters. Keep the Baratron on an appropriate scale (readable).

6.3.30 When the Baratron passes through zero, start the clock.

6.3.31 Reset the large micrometer to 5 millimeters.

6.3.32 When the Baratron again passes through zero, stop the clock.

6.3.33 Immediately open valves ~~V5, and V8.~~ V6 & V7

6.3.34 Record the large micrometer readings and the clock readings in appropriate table.

6.3.35 ~~Calculate the leak rates per paragraph 6.11.33 of TP2374035.~~

6.4 High Pressure (400 torr) Leak Calibration

6.4.1 Open valve V4.

6.4.2 Repeat steps 6.3.10 thru 6.3.35 except at a pressure of 400 to 500 torr.

6.5 Gas inlet system is now ready for use.

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6.6 Inlet System evacuation

After the inlet system has been calibrated and used for UAMS testing, it should be returned to the standby condition as follows.

6.6.1 Check to see if cryo pump or mechanical pump trap is full of LN_2.

6.6.2 Close gas cylinder valve.

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6.6.3 Close Black gas supply valve.

6.6.4 Bleed gas inlet pressure to 50#.

6.6.5 Open V23.

6.6.6 Open appropriate roughing valve V18, V19 or V20.

6.6.7 Open V1, 3, and 11.

6.6.8 Open V4. When pressure is less than 20 torr, open V21.

6.6.9 When the pressure is less than 1 torr, open V9, V13 and V14 slowly.

6.6.10 Slowly open V2 to a 20l/s ion pump current of 15 ma maximum.

6.6.10.1 Replace nut on valve V10.

6.6.11 Slowly open V10 - Do not let Calibration Station pressure exceed 5×10^{-6} torr.

6.6.12 Continue pumping until V2 and V10 are open.

6.6.13 Continue pumping until V1 can be closed.

6.6.14 If the pressures rise when V1 is closed, reopen.

6.6.15 If the pressures decreases when V1 is closed, leave closed and torque to 2 1/2 inch pound.

6.6.16 Switch 20 l/sec pump control unit to PRESSURE. Inlet system is now in standby.

Calibration Station
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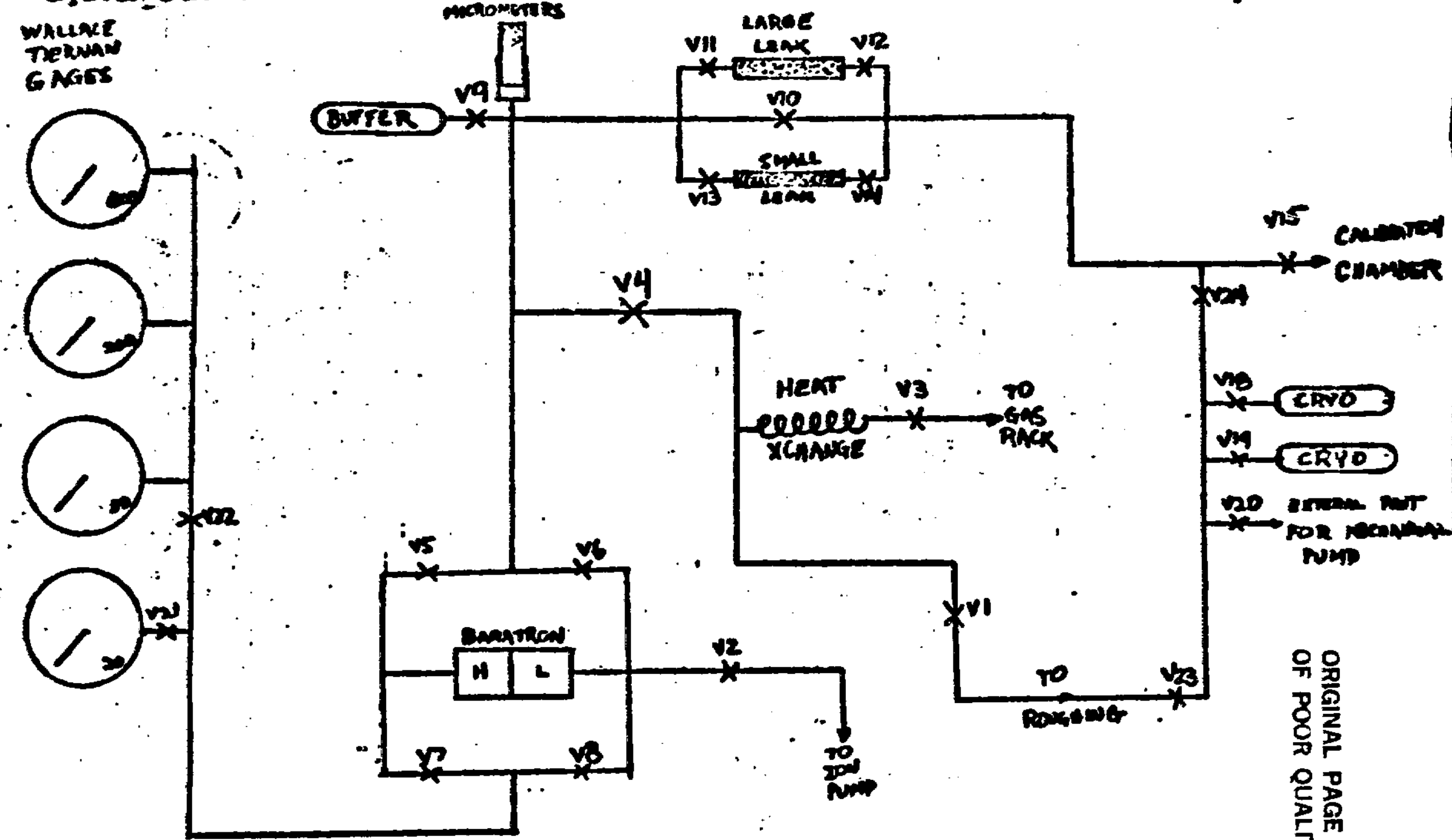

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DATA SHEET

LEAK CHECK

Run No. 1 (40 Torr)	
Gas Used Nitrogen	Nitrogen
Clock Time	1:22 p.m. t = 0
Temperature, °F	75.9
Pressure, Torr	44.4
Small micrometer, reading 1	10.0 mm
Small micrometer, reading 2	20.0 mm
Small micrometer, difference	10.0 mm
Multiply by 0.9855×10^{-6} lit/mm	0.9855×10^{-5}
Time, seconds	212
Divide by Time	4.65×10^{-8} liters/sec
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Maximum Permissable	
H_2	4×10^{-7}
He	2×10^{-7}
N_2	1×10^{-7}
O_2	9×10^{-8}
Ar	8×10^{-8}
CO_2	8×10^{-8}
CO	1×10^{-7}

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LEAK CALIBRATION

Run No. 1 (40 Torr)	
Gas Used	Nitrogen
Clock Time	2:01 p.m.
Temperature, °F	75.7
Pressure, Torr	43.5
Large micrometer, reading 1	15.0 mm
Large micrometer, reading 2	5.0 mm
Large micrometer, difference	10.0 mm
Multiply by 1.0079×10^{-4} lit/mm	1.0079×10^{-3}
Time, seconds	196
Divide by time	5.14×10^{-6} liters/sec
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Minimum Permissable	
H_2	2×10^{-5}
He	1×10^{-5}
N_2	5×10^{-6}
O_2	4×10^{-6}
Ar	4×10^{-6}
CO_2	4×10^{-6}
CO	5×10^{-6}

DATA SHEET

LEAK CHECK

Run No. 1 (400 Torr)	
Gas Used	Nitrogen
Clock Time	3:11 p.m.
Temperature, °F	75.0
Pressure, Torr	449
Small micrometer, reading 1	10.00 mm
Small micrometer, reading 2	11.45 mm
Small micrometer, difference	1.45 mm
Multiply by 0.9855×10^{-6} l/mm	1.43×10^{-6}
Time, seconds	600
Divide by Time	2.38×10^{-9} liters/sec
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Maximum Permissable

H_2	4×10^{-7}
He	2×10^{-7}
N_2	1×10^{-7}
O_2	9×10^{-8}
Ar	8×10^{-8}
CO_2	8×10^{-8}
CO	1×10^{-7}

LEAK CALIBRATION

Run No. 1 (400 Torr)	
Gas Used	Nitrogen
Clock Time	3:45 p.m.
Temperature, °F	74.6
Pressure, Torr	442
Large micrometer, reading 1	15.0 mm
Large micrometer, reading 2	5.0 mm
Large micrometer, difference	10.0 mm
Multiply by 1.0079×10^{-4}	1.0079×10^{-3} liters
Time, seconds	195
Divide by time	5.17×10^{-6} liters/sec
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Minimum Permissable

H_2	2×10^{-5}
He	1×10^{-5}
N_2	5×10^{-6}
O_2	4×10^{-6}
Ar	4×10^{-6}
CO_2	4×10^{-6}
CO	5×10^{-6}

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DATA SHEET

LEAK CHECK (40 Torr)

Run No. 1	
Gas Used	Oxygen
Clock Time	2:00 p.m. 1-25-82
Temperature, °F	75.0 °F
Pressure, Torr	44.5
Small micrometer, reading 1	10.0 mm
Small micrometer, reading 2	20.0 mm
Small micrometer, difference	10.0 mm
Multiply by 0.9855 x 10^{-6} l/mm	0.9855 x 10^{-5} liters
Time, seconds	682
Divide by Time	1.45 x 10^{-8} liters/second
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Maximum Permissable	
H_2	4 x 10^{-7}
He	2 x 10^{-7}
N_2	1 x 10^{-7}
O_2	9 x 10^{-8}
Ar	8 x 10^{-8}
CO_2	8 x 10^{-8}
CO	1 x 10^{-7}

LEAK CALIBRATION (40 Torr)

Run No. 1	
Gas Used	Oxygen
Clock Time	2:30 p.m. 1-25-82
Temperature, °F	75.2 °F
Pressure, Torr	43.85
Large micrometer, reading 1	15.0 mm
Large micrometer, reading 2	5.0 mm
Large micrometer, difference	10.0 mm
Multiply by 1.0079 x 10^{-4} l/mm	1.0079 x 10^{-3} liters
Time, seconds	208
Divide by time	4.85 x 10^{-6} liters/second
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Minimum Permissable	
H_2	2 x 10^{-5}
He	1 x 10^{-5}
N_2	5 x 10^{-6}
O_2	4 x 10^{-6}
Ar	4 x 10^{-6}
CO_2	4 x 10^{-6}
CO	5 x 10^{-6}

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DATA SHEET

LEAK CHECK

Run No. 1 (400 Torr)	
Gas Used	Oxygen
Clock Time	3:15 p.m. 1-25-82
Temperature, °F	75.3 °F
Pressure, Torr	450.0
Small micrometer, reading 1	10.0 mm
Small micrometer, reading 2	0.0 mm
Small micrometer, difference	10.0 mm
Multiply by 0.9855 x 10^{-6} l/mm	0.9855 x10^{-5} liters
Time, seconds	409
Divide by Time	2.41 x10^{-8} liters/sec
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Maximum Permissable	
H_2	4 x 10^{-7}
He	2 x 10^{-7}
N_2	1 x 10^{-7}
O_2	9 x 10^{-8}
Ar	8 x 10^{-8}
CO_2	8 x 10^{-8}
CO	1 x 10^{-7}

LEAK CALIBRATION

Run No. 1 (400 Torr)	
Gas Used	Oxygen
Clock Time	3:35 p.m. 1-25-82
Temperature, °F	75.3 °F
Pressure, Torr	445.0
Large micrometer, reading 1	15.0 mm
Large micrometer, reading 2	5.0 mm
Large micrometer, difference	10.0 mm
Multiply by 1.0079 x 10^{-4} l/mm	1.0079 x10^{-3} liters
Time, seconds	207
Divide by time	4.87 x10^{-6} liters/sec
(If available)	
Chamber I gauge, Torr	1x10^{-5} Torr
Pump I gauge, Torr	

Minimum Permissable	
H_2	2 x 10^{-5}
He	1 x 10^{-5}
N_2	5 x 10^{-6}
O_2	4 x 10^{-6}
Ar	4 x 10^{-6}
CO_2	4 x 10^{-6}
CO	5 x 10^{-6}

DATA SHEET

LEAK CHECK

Run No.	2 (40 Torr)
Gas Used	Nitrogen
Clock Time	1:15 p.m. 1-29-82
Temperature, °F	77.3°F
Pressure, Torr	45 Torr
Small micrometer, reading 1	10.0 mm
Small micrometer, reading 2	17.2 mm
Small micrometer, difference	7.2 mm
Multiply by 0.9855×10^{-6}	7.10×10^{-6} liters
Time, seconds	603
Divide by Time	1.18×10^{-8} liters/sec
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Maximum Permissable

H_2	4×10^{-7}
He	2×10^{-7}
N_2	1×10^{-7}
O_2	9×10^{-8}
Ar	8×10^{-8}
CO_2	8×10^{-8}
CO	1×10^{-7}

LEAK CALIBRATION

Run No.	2 (40 Torr)
Gas Used	Nitrogen
Clock Time	1:45
Temperature, °F	76.8°F
Pressure, Torr	43 Torr
Large micrometer, reading 1	15.0 mm
Large micrometer, reading 2	5.0 mm
Large micrometer, difference	10.0 mm
Multiply by 1.0079×10^{-4}	1.0079×10^{-3}
Time, seconds	179
Divide by time	5.63×10^{-6} liters/sec
(If available)	
Chamber I gauge, Torr	
Pump I gauge, Torr	

Minimum Permissable

H_2	2×10^{-5}
He	1×10^{-5}
N_2	5×10^{-6}
O_2	4×10^{-6}
Ar	4×10^{-6}
CO_2	4×10^{-6}
CO	5×10^{-6}

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DATA SHEET

LEAK CHECK (400 Torr)

Run No.	2
Gas Used	Nitrogen
Clock Time	2:20 p.m. 1-29-82
Temperature, °F	76.8°F
Pressure, Torr	439 Torr
Small micrometer, reading 1	10.0 mm
Small micrometer, reading 2	0.0 mm
Small micrometer, difference	10.0 mm
Multiply by 0.9855×10^{-6}	$.9855 \times 10^{-5}$ liters
Time, seconds	260
Divide by Time	3.79×10^{-8} liters/sec
(If available) Chamber I gauge, Torr	1.5×10^{-5} Torr Chamber Pressure
Pump I gauge, Torr	

Maximum Permissable

H_2	4×10^{-7}
He	2×10^{-7}
N_2	1×10^{-7}
O_2	9×10^{-8}
Ar	8×10^{-8}
CO_2	8×10^{-8}
CO	1×10^{-7}

LEAK CALIBRATION (400 Torr)

Run No.	2
Gas Used	Nitrogen
Clock Time	3:00 p.m. 1-29-82
Temperature, °F	76.4°F
Pressure, Torr	435 Torr
Large micrometer, reading 1	15.0 mm
Large micrometer, reading 2	5.0 mm
Large micrometer, difference	10.0 mm
Multiply by 1.0079×10^{-4}	1.0079×10^{-3} liters
Time, seconds	178 seconds
Divide by time	5.66×10^{-6} liters/sec
(If available) Chamber I gauge, Torr	
Pump I gauge, Torr	

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Minimum Permissable

H_2	2×10^{-5}
He	1×10^{-5}
N_2	5×10^{-6}
O_2	4×10^{-6}
Ar	4×10^{-6}
CO_2	4×10^{-6}
CO	5×10^{-6}

As - Run
started 2-23-82

6.2 DYNAMIC CALIBRATION

The dynamic calibration procedure admits nitrogen to the SUMS inlet in a controlled pressure rise from a pressure of approximately 10^{-4} to approximately 25 Torr. During the pressure rise the nitrogen 28 and 14 peaks, as measured by the SUMS instrument, are recorded on tape. Two pressure profiles are run. The admission of the gas, the data taking and recording are controlled by the test configuration. The response of the instrument from this test will be compared to the static calibration to determine the time response of the instrument.

In addition to the nitrogen peaks data, the following is also recorded once every five seconds: one SUMS housekeeping word; the twelve UAMS housekeeping words; the inlet pressure as measured by the baratron heads; the inlet pressure as measured by the SUMS inlet pressure transducer; and the time.

Only six consecutive data points (single scan mode) are stored for each of the two nitrogen peaks. These points are selected by finding the largest value for the peak and recording that value, the two values immediately before it, and the three values immediately following it.

This test is run using filament number 1 only.

6.2.1 Vacuum System Set-Up

6.2.1.1 Verify or implement the following vacuum conditions:

- Calibration StationIon Pump in Protect Mode. ✓
- Valve V-15 Closed. ✓
- Calibration Station Ion Pump On. ✓
- Liquid Helium Pump Valved Off. ✓
- Calibration Station Butterfly Valve Open. ✓
- Orifice Open. ✓
- Cryopump Cold. ✓
- Throttling Valve fully Open. ✓
- MKS Servo Valve Closed. ✓

6.2.1.2 Verify nitrogen tank is connected to valve V30. ✓

6.2.1.3 Close valve V30 and open V31. Verify pressure on servo valve is less than 50 microns. ✓

6.2.1.4 Verify chamber pressure is less than 1.0×10^{-7} Torr. ✓

1.0×10^{-8} T.

6.2.2 Test Equipment Turn-On and Preliminary Switch Settings

6.2.2.1 UAMS Test Set

6.2.2.1.1 Test set circuit breaker on. ✓

6.2.2.1.2 Instrument power circuit breaker on. ✓

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6.2.2.1.3 Set power supplies to 28.0 volts. ✓

6.2.2.1.4 SUMS/UAMS switch is SUMS position. ✓

6.2.2.1.5 Channel select thumbwheels set to 13. ✓

6.2.2.1.6 Press load pushbutton. ✓

6.2.2.1.7 Clock select switch to CLK EXT. ✓

6.2.2.1.8 Press frame select switch until CNT lights. ✓

6.2.2.1.9 Press RESET. ✓

6.2.2.1.10 Press START/DECODE. ✓

6.2.2.2 SUMS GSE Interface Unit

6.2.2.2.1 Inlet, Range, and Protection valve switches set to CLOSED. ✓

6.2.2.2.2 Control select switch set to GSE. ✓

6.2.2.2.3 Delay select switch set to SHORT. ✓

6.2.2.2.4 Set analog monitor rotary switch to position #9. (This provides a 2MΩ PCM type load.) ✓

6.2.2.2.5 Set interface power switches to ON. ✓

6.2.2.2.6 Set TEST SET/INTERNAL switch to TEST SET. ✓

6.2.2.2.7 Set VAC MAIN/ION PUMP switch to ION PUMP. ✓

6.2.2.2.8 Set sweep inhibit switch to NORMAL. ✓

6.2.2.3 Fluke Data Logger

6.2.2.3.1 Turn power on. ✓

6.2.2.3.2 Program data logger to scan channels T11, T12, and T15. (See figure 1 for thermocouple locations.) ✓

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6.2.2.4 HP1610A Logic State Analyzer

6.2.2.4.1 Connect pods 1 and 2 to the 16 bit parallel SUMS digital data lines. These lines are available inside the GSE Interface Unit. ✓

6.2.2.4.2 Connect the clock pod to the SUMS data strobe inside the GSE Interface Unit. ✓

6.2.2.4.3 Set analyzer power to ON. ✓

6.2.2.5 Fluke 8520A Digital Multimeter

6.2.2.5.1 Verify multimeter is connected to MKS electronics. ✓

6.2.2.5.2 Set power switch to ON. ✓

6.2.2.6 HP6942A Multiprogrammer

6.2.2.6.1 Verify multiprogrammer is connected to MKS electronics (D/A and digital output) and the inlet transducer 0-5V output inside the GSE Interface Unit (A/D). ✓

6.2.2.6.2 Set power switch to ON. ✓

6.2.2.7 HP 85 Computer

6.2.2.7.1 Verify the HP 85 is connected to the Logic State Analyzer, the Multiprogrammer and the Digital Multimeter via the IEEE-488 bus. ✓

6.2.2.7.2 Set power switch to ON. ✓

6.2.2.7.3 Insert SUMS programs tape. ✓

6.2.2.8 MKS Type 244A Valve Controller

6.2.2.8.1 Set power switch to ON. ✓

6.2.2.8.2 Set Phase Lead control to 5.0. ✓

6.2.2.8.3 Set Gain control to 100%. ✓

6.2.2.8.4 Set function rotary switch to CLOSED. ✓

6.2.2.9 MKS 170M-27D Digital Display

6.2.2.9.1 Set display units to TORR. ✓

6.2.2.9.2 Set Head Range to MPLX. ✓

6.2.2.9.3 Set sampling switch to AUTO. ✓

6.2.2.10 MKS 170M-6C Range Multiplier

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6.2.2.10.1 Set power switch to ON.

6.2.2.10.2 Set heater switch to OFF.

6.2.2.10.3 Set response switch to FAST.

6.2.2.10.4 Set range switch to .01.

6.2.2.11 MKS 170M-34C Head Selector

6.2.2.11.1 Verify CH.1 and CH.2 heaters have been on for a minimum of 4 hours.

6.2.2.11.2 Set selector switch to CH.1.

6.2.2.11.3 Set CH.1 head range switch to 1 Torr.

6.2.2.11.4 Adjust CH.1 coarse/fine zero for 0.000 nominal.

6.2.2.11.5 Set selector switch to CH.2.

6.2.2.11.6 Set CH.2 head range switch to 100 Torr.

6.2.2.11.7 Adjust CH.2 coarse fine zero for 0.000 nominal.

6.2.2.12 Chart Recorder

6.2.2.12.1 Connect chart recorder across input to Fluke digital multimeter.

6.2.2.12.2 Set po-er switch to ON.

NOTE

The Chart Recorder is to be used during the running of this test to indicate to the operator how smoothly the pressure is changing between five second steps. The recorder sensitivity should be changed as necessary to maximize the deflection of the pen.

6.2.3 Inst Turn-On and Warm-Up

6.2.3.1 Turn on the SUMS Ion Pump Power with the switch on the GSE I/F Unit.

6.2.3.2 Wait one minute for UAMS ion pump to come on.

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6.2.3.3 From the ion pump current monitor, verify that the instrument internal pressure is less than 1 x 10^{-5} Torr. ✓

6.2.3.4 Using the switches on the GSE I/F Unit, open the Protection, Range and Inlet valves. ✓

6.2.3.5 Turn on the SUMS Instrument Power with the switch on the GSE I/F Unit. ✓

6.2.3.6 Wait two hours minimum for the instrument ion source to warm-up. ✓

6.2.3.7 Using the 1610 logic analyser, verify the ion source temperature as recorded in the UAMS Housekeeping is at least 87 decimal. (Record value.) 90₁₀

6.2.3.8 Record thermocouple temperatures from Data Logger.

T11 74.4 °F

T12 73.7 °F

T15 80.9 °F

6.2.4 SUMS Background Spectra (Before Run)

6.2.4.1 Turn on the HP9830 calculator, printer, cassette memory and plotter. ✓

6.2.4.2 Place a marked data tape in the cassette memory and rewind it. ✓

6.2.4.3 Place the SUMS Functional test cassette tape in the calculator. ✓

6.2.4.4 Verify that the cryopump is still cold and that its pressure is less than 50 microns. ✓

6.2.4.5 Load and run file ϕ on the calculator. The program is interactive from this point. Continue with paragraph 6.2.4.5 when the calculator has finished. Record data tape information below.

SUMS Data Tape I.D. # 8

Bulk File # (1,2,3, or 4) 1

✓

6.2.5 Final Preparations

6.2.5.1 Set GSE I/F valve control switch to SUMS position. ✓

THE BENDIX COMMUNICATIONS DIVISION AEROSPACE SYSTEMS OPERATIONS ANN ARBOR, MICHIGAN	SIZE A	CODE IDENT NO. 07038	DRAWING NUMBER TP3290648	REV A
	SCALE	WEIGHT	SHEET 45	

BxA 341B-2

6.2.5.2 Open the two nitrogen tank valves and set regulator to 3 PSI. ✓

6.2.5.3 Purge the gas supply line with nitrogen. ✓

6.2.5.4 Close valve V31 and open valve V30. ✓

6.2.5.5 Close calibration station throttling valve and then reopen one full turn. ✓

6.2.5.6 On the HP 85 computer load the "DYNAM" program file. ✓

6.2.5.7 Verify calibration station Ion Pump START/PROTECT switches is in the PROTECT position. ✓

variation

6.2.5.8 Verify instrument is running on filament # 1. ✓

6.2.5.9 Set orifice to 10 liter/sec. ✓

6.2.6 <u>Data Collection (Nominal)</u>

NOTE

During the simulation of the re-entry pressure profile the gain and phase controls are to be manually adjusted to obtain as "smooth" a curve as possible. "Smooth" is defined as a linear change in pressure from one point to the next point five seconds later. The chart recorder shall be used by the test conductor throughout the run to determine how smoothly the pressure is rising.

Multiple runs of the pressure profile may be made, as determined necessary by the test conductor, in order to fully cover the pressure profile.

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6.2.6.1 Start the paper in the chart recorder. (Slow) ✓

6.2.6.2 Type RUN on the HP 85 computer. The program is interactive from this point, through the collection of all data. Continue with paragraph 6.2.6.3 when the program has finished. ✓

6.2.6.3 Close the MKS valve and stop chart recorder. ✓

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6.2.6.4 Load the "30XFER" program on the HP 85. Transfer all data to the HP 9830. Record data tape information below:

NOMINAL

Run #	Tape # (200 Series)	Bulk File #
1	201	1
2	201	2
3	201	3
4		

6.2.6.5 Pump down calibration station using the cryo and ion pumps. Open the throttling valve. ✓

6.2.6.6 Repeat paragraphs 6.2.5 and 6.2.6 as required in order to adequately cover the complete pressure profile with the desired amount of smoothness. ✓

6.2.7 Data Collection (+ 25% P/P)

6.2.7.1 Close calibration station throttling valve and then reopen one full turn. ✓

6.2.7.2 Verify calibration station ion pump START/PROTECT switch is in the PROTECT position. ✓

6.2.7.3 On the HP 85 computer, load the "DYNAM" program file. ✓

6.2.7.4 Start the paper in the chart recorder. ✓

6.2.7.5 Type RUN on the HP 85. (and run calibration test) ✓

6.2.7.6 Close MKS valve and stop chart recorder. ✓

6.2.7.7 Load the "30XFER" program on the HP 85. Transfer all data to the HP 9830. Record data type information below:

+ 25% P/P

Run #	Tape # (200 Series)	Bulk File #
1	201	4
2	202	1
3		
4		

✓

6.2.7.8 Pump down calibration station using the cryo and ion pumps. Open the throttling valve. ✓

6.2.7.9 Repeat paragraph 6.2.7 as required. ✓

6.2.8 <u>SUMS Background Spectra (After Run)</u>

6.2.8.1 Close valve V30 and open V31. ✓

6.2.8.2 Place a marked data tape in the cassette memory and rewind. ✓

6.2.8.3 Place the SUMS Functional Test cassette tape in the calculator. ✓

6.2.8.4 Verify that the cryo pump is cold and that its pressure is less than 50 microns. ✓

6.2.8.5 Verify chamber pressure is less than 1.0×10^{-7} Torr. Record. orifice open. 3×10^{-8} Torr ✓

6.2.8.6 Load and run file ϕ. Record data tape information below:

SUMS Data Tape I.D. # 008
Bulk File # (1,2,3 or 4) 2 ✓

6.2.8.7 Record Thermocouple temperatures.

T11 74.1 °F
T12 73.4 °F
T15 80.9 °F

temperature extremes during test (both days)

	max	min
T11	75.[illegible]3	73.6
T12	74.4	71.7
T15	80.9	78.4

6.2.9 <u>Instrument Turn-Off</u>

6.2.9.1 Turn off SUMS ion pump and instrument power. ✓

6.2.9.2 Turn on SUMS Vacuum Maintenance Power. ✓

6.2.9.3 Attach all data to this procedure, including chart recorder output tapes. ✓

END OF SUMS DYNAMIC CALIBRATION

test completed 2-24-82

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	SCALE	WEIGHT	SHEET 49	

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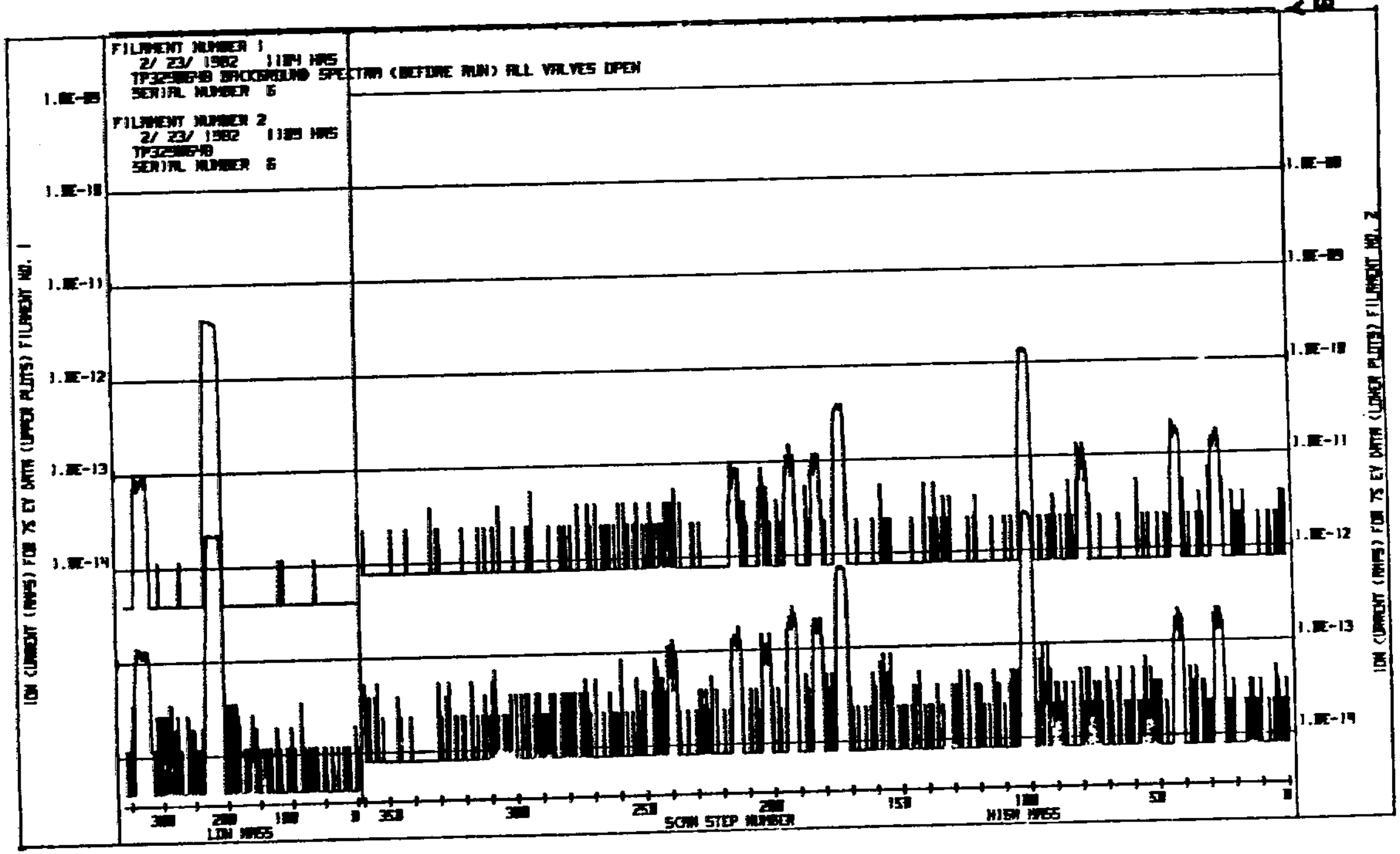
tape #008
file #1



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DATA TAPE ID 8   BULK DATA FILE # 1

SUMS FUNCTIONAL TEST

TP3290648 BACKGROUND SPECTRA (BEFORE RUN) ALL VALVES OPEN

HOUSEKEEPING DATA   FILAMENT NUMBER 1

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	1	1	1	1	1	1	1	1	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~0.190~~
MINUS 15 VOLT	130	130	130	129	130	129	129	129	-15.000
ION PUMP VOLT	180	181	181	181	181	181	181	181	7.194
ION SOURCE TEMP	91	90	90	91	90	90	91	91	3.586
PRE-AMP TEMP	169	169	169	169	169	169	169	169	6.735
PLUS 5 VOLT	121	121	121	120	121	120	120	120	4.775
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	126	125	125	126	125	126	125	126	4.982
COLLECTOR CURRENT	110	110	110	110	110	110	110	110	4.391
ELECTRON ACC VOLT	189	190	190	189	189	190	190	189	7.570
ION ACC VOLT	39	39	39	39	39	39	39	39	1.486
ION PUMP ANALOG									0.0020
28 VOLT POWER SUP									28.360

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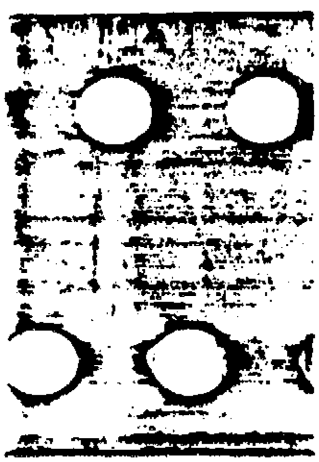

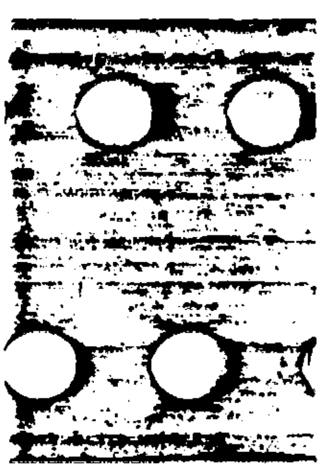

75 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	HIGH MASS COLLECTOR SCAN 2	HIGH MASS COLLECTOR SCAN 3	HIGH MASS COLLECTOR SCAN 4	LOW MASS COLLECTOR SCAN 1	LOW MASS COLLECTOR SCAN 2	LOW MASS COLLECTOR SCAN 3	LOW MASS COLLECTOR SCAN 4
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14	8	8	8	8				4
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22	8	8	8	8		4		
23	8	8	8	8			4	
24	8	8	8	8				4
25	8	8	53	23				
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27	114	175	160	145		4		
28	160	145	130	130			4	
29	114	145	114	130				4
30	84	8	38	69				
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40	8	8	8	53				
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42	130	160	175	175		4		
43	160	175	191	175			4	
44	191	145	160	191				4
45	221	160	114	53				
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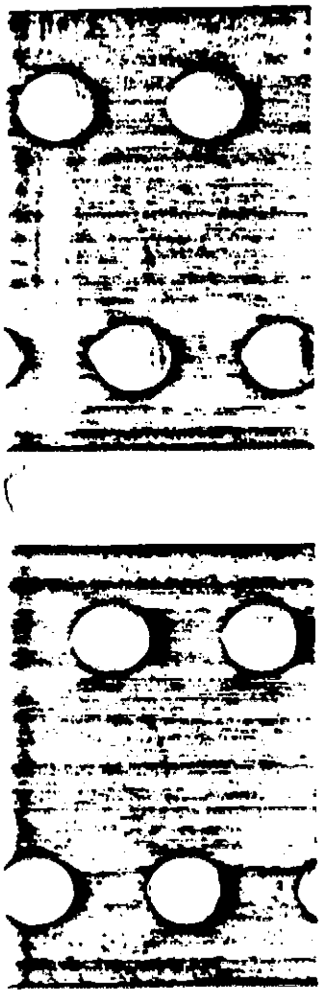

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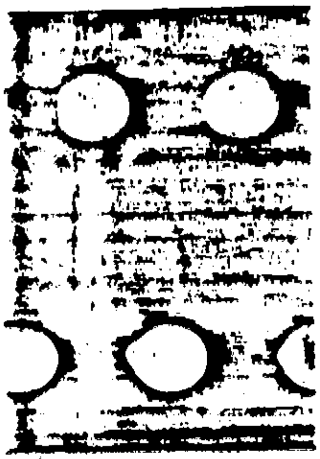

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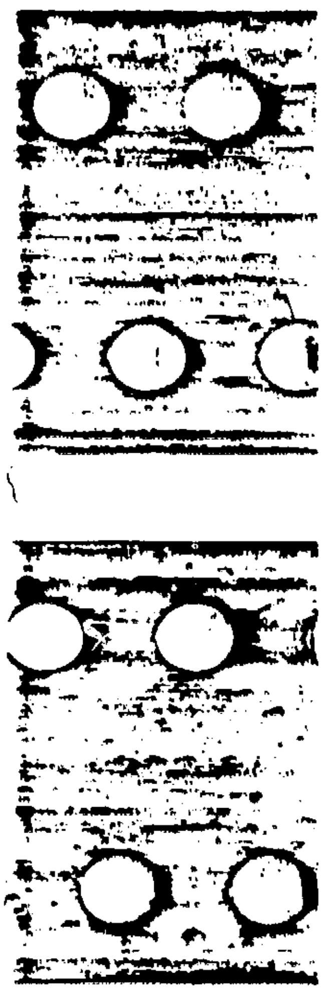

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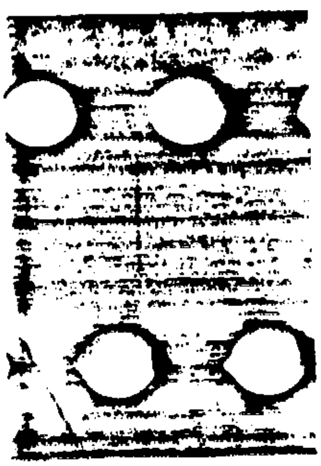

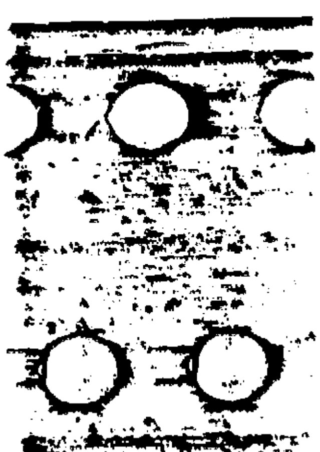

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DATA TAPE ID 8 BULK DATA FILE # 1

SUMS FUNCTIONAL TEST

2 23 1982 1104 6 PAGE 8 OF 8
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357	8	8	8	8		4		
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360	8	23	8	8				

INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	2	2	2	2	2	2	2	2	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~[illegible]~~
MINUS 15 VOLT	129	130	129	129	129	129	130	130	-14.180
ION PUMP VOLT	181	181	181	181	181	181	181	181	7.196
ION SOURCE TEMP	90	91	91	90	90	90	91	90	3.584
PRE-AMP TEMP	169	169	169	169	169	169	169	169	6.737
PLUS 5 VOLT	120	120	120	120	120	120	120	120	4.763
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	124	124	124	124	124	124	124	124	4.920
COLLECTOR CURRENT	102	102	102	102	102	102	102	102	4.047
ELECTRON ACC VOLT	190	189	189	189	190	189	189	189	7.571
ION ACC VOLT	39	39	39	39	39	39	39	39	1.488

ION PUMP ANALOG	0.0021
28 VOLT POWER SUP	28.360

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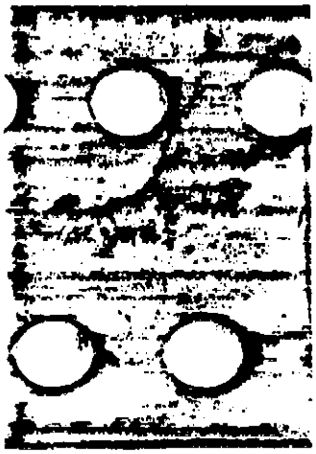

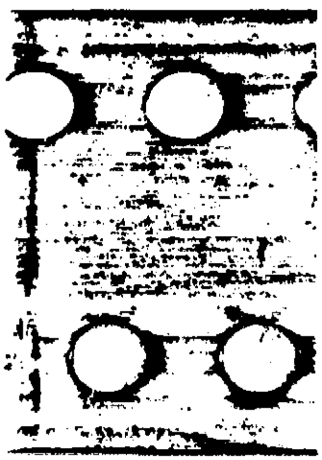

75 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
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5	38	23	8	53				
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7	8	8	8	8		4		
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13	8	8	8	23			4	
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19	8	8	8	8				12
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27	160	191	160	221		4		
28	130	175	175	221			4	
29	130	130	191	191				4
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40	8	8	8	8				
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44	160	145	130	175				4
45	145	145	114	53				
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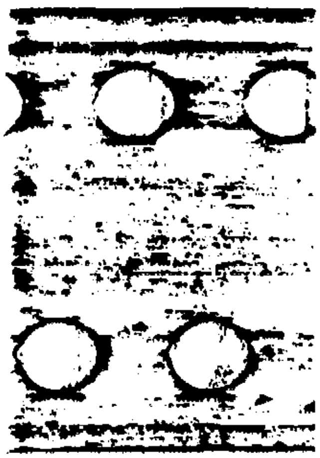

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103	2470	2530	2410	2470			12	
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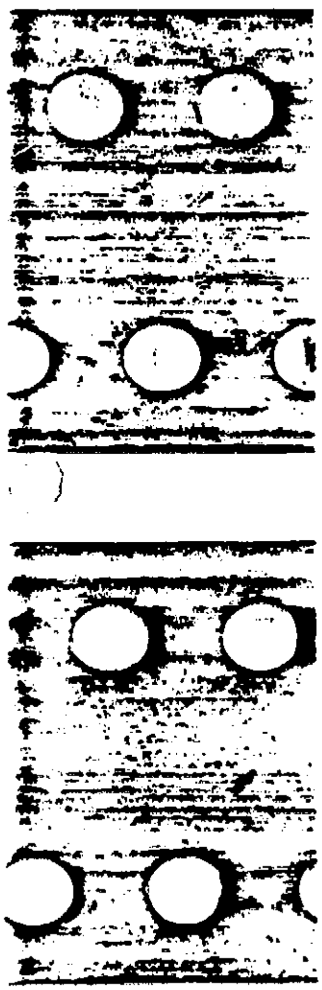

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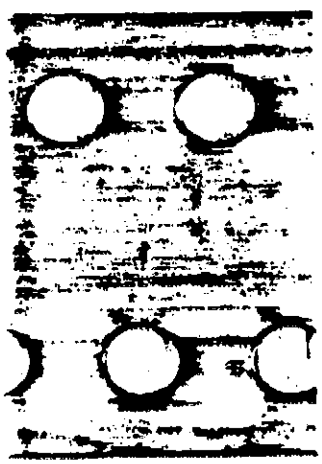

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193	206	175	175	282			4	
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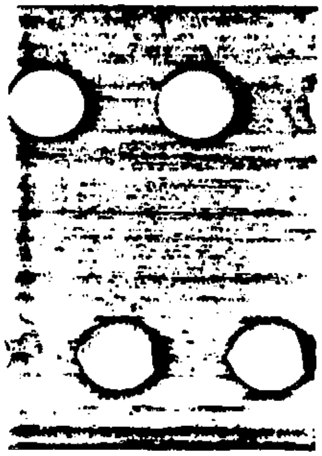

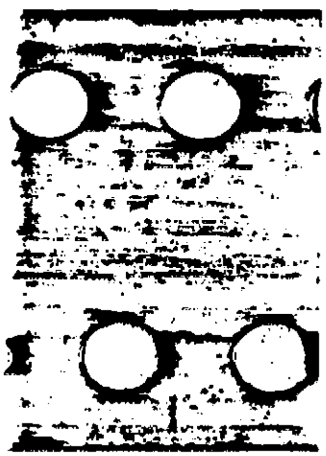

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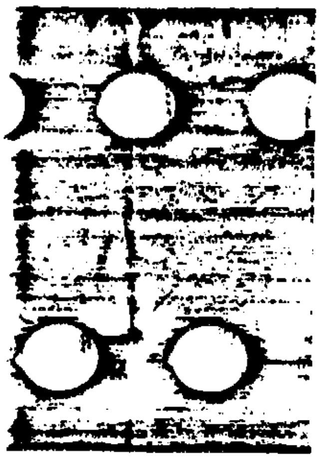

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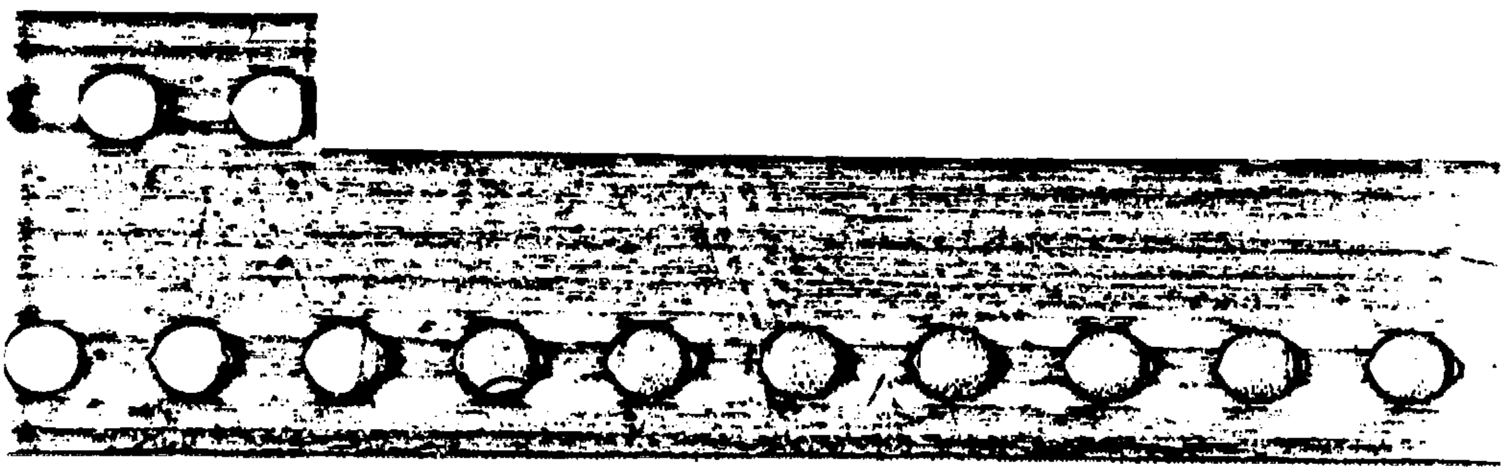

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75 REM                    SUMS DYNAMIC CALIBRATION
80 REM                        DATA TAPE FORMAT
90 REM
100 REM    0     COMMENTS                (72 CHARACTERS)     50
110 REM    1     TIME                    (SECONDS)           480
120 REM    2     INLET P. XDUCER         (VOLTS)             480
130 REM    3     BARATRON PRESS.         (TORR)              480
140 REM    4     SUMS HSK WORD           (16 BIT DECIMAL)    480
150 REM    5     UAMS HSK WORDS          (8 BIT DECIMAL)     2880
160 REM    6     AMU 28 (6 SAMPLES)      (9 BIT DECIMAL)     1440
170 REM    7     AMU 14 (6 SAMPLES)      (9 BIT DECIMAL)     1440
180 REM    8     AMU 28 (2ND HIGHEST)    (9 BIT DECIMAL)     240
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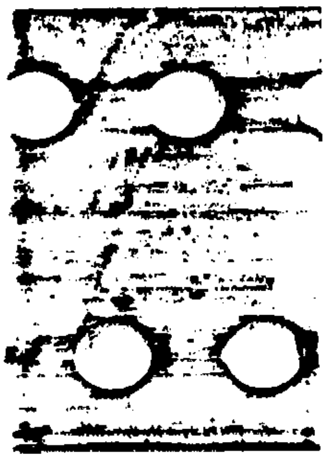


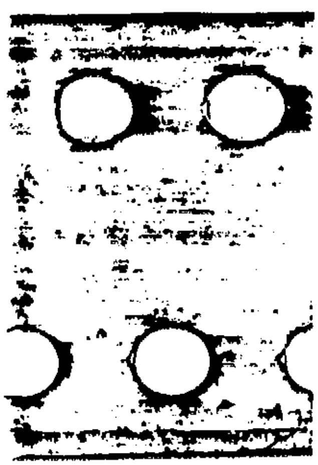
TP3290648 NOMINAL PRESSURE PROFILE. 2-23-82, RUN #1, TAPE #201, FILE#1.

TP3290648 NOMINAL PRESSURE PROFILE. 2-23-82, RUN #2, TAPE #201, FILE#2.

TP3290684 NOMINAL PRESSURE PROFILE. 2-23-82, RUN #3, TAPE #201, FILE#3.

TP3290648 +25% P/P PRESSURE PROFILE. 2-24-82, RUN #1, TAPE #201,FILE#4.

TP3290648 +25% P/P PRESSURE PROFILE. 2-24-82, RUN #2, TAPE #202, FILE #1



TP3290640 NOMINAL PRESSURE PROFILE, [illegible], RUN #1, TAPE #201, FILE#1.

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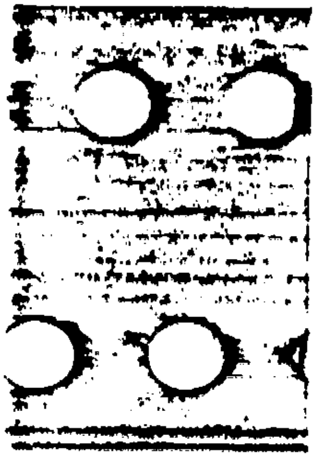

TIME	BARATRON PRESSURE	ADC 20	ADC 14
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[illegible]	0.000166	[illegible]	115
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20.0	0.000177	[illegible]	116
25.[illegible]	0.00018[illegible]	235	119
30.[illegible]	0.00018[illegible]	236	119
35.[illegible]	0.000194	237	121
40.[illegible]	0.00019[illegible]	238	122
45.2	0.000207	239	123
50.0	0.000211	240	124
55.1	0.000219	241	126
60.0	0.000224	242	128
65.1	0.00023[illegible]	243	129
70.2	0.000235	245	129
75.2	0.000243	246	130
80.2	0.000254	247	131
85.1	0.000261	248	132
89.9	0.000266	249	132
95.2	0.000269	250	133
100.0	0.000279	251	134
105.2	0.000291	252	134
110.1	0.000289	254	135
115.0	0.000302	255	136
120.0	0.000316	257	137
125.0	0.000322	259	138
130.0	0.000331	260	139
135.0	0.000340	260	140
139.9	0.000350	262	141
145.0	0.000357	261	142
150.0	0.000382	263	143
154.9	0.000387	264	145
160.0	0.000385	266	146
165.1	0.000396	266	147
170.0	0.000418	267	148
175.0	0.000435	269	150
180.1	0.000459	270	152
185.0	0.000479	271	153
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194.9	0.000547	275	158
199.9	0.000553	276	161
204.9	0.000559	281	162
210.1	0.000579	282	163
215.0	0.000608	284	165
219.9	0.000656	286	166
225.0	0.000691	289	168
229.9	0.000727	290	169
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239.9	0.000838	293	173
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249.9	0.000910	298	179
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274.8	0.001320	313	195
279.8	0.001407	316	197
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289.9	0.001684	323	202
294.8	0.001836	326	206
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310.0	0.002342	336	218
315.0	0.002552	340	223
320.0	0.002930	344	226
324.9	0.003100	349	230
329.9	0.003384	354	233
334.9	0.003667	357	236
339.9	0.004104	360	240
344.8	0.004556	364	244
349.8	0.005006	366	249
354.8	0.005842	373	255
359.8	0.006315	380	260
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369.8	0.007945	292	140
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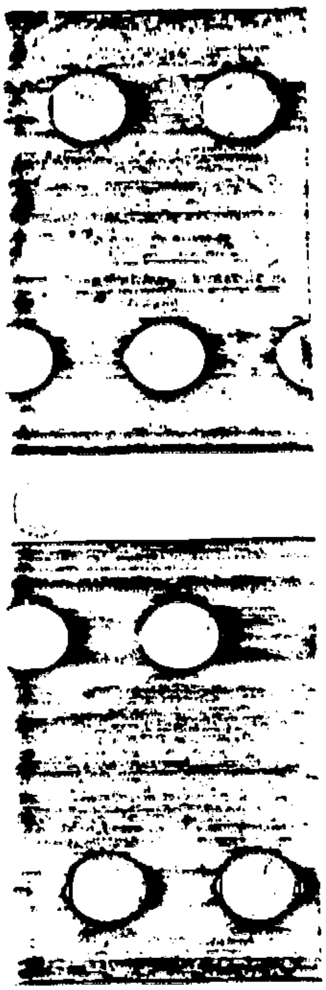

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394.9	0.012956	152	33
399.9	0.015049	149	30
404.9	0.018742	146	30
409.9	0.020440	145	34
414.9	0.024987	144	29
419.9	0.026684	143	28
424.9	0.030937	142	27
429.8	0.034428	142	28
434.8	0.041898	142	[illegible]
439.9	0.044212	141	[illegible]
444.8	0.047456	142	26
449.7	0.055151	142	27
454.8	0.062281	142	29
459.7	0.074392	144	29
464.7	0.079929	145	26
469.8	0.089083	147	30
475.0	0.097780	149	36
484.9	0.110400	152	34
489.8	0.196520	155	39
494.7	0.202290	159	38
499.7	0.197190	164	45
504.6	0.228300	167	49
509.6	0.235460	170	53
514.6	0.254500	174	58
519.6	0.288010	176	59
524.7	0.334490	179	65
529.8	0.422320	184	66
534.8	0.456390	190	72
539.7	0.523820	195	77
544.6	0.607990	199	81
549.7	0.659230	204	88
554.7	0.759340	209	95
559.6	0.875520	214	98
564.8	0.897500	219	103
569.7	1.025100	225	106
574.7	1.331600	227	109
579.6	1.382400	233	118
584.6	1.482500	238	124
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609.6	2.601900	263	143
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624.5	3.415790	275	158
629.6	3.623400	280	162
634.6	3.897500	283	165
639.5	4.106400	286	167
644.5	4.351900	290	169
649.5	4.578400	292	171
654.6	4.724200	293	173
659.7	4.953900	295	175
664.6	5.062800	297	177
669.7	5.224200	298	178
674.6	5.298100	299	179
679.5	5.435700	300	181
684.5	5.496200	302	181
689.6	5.573800	301	183
694.5	5.651500	304	183
699.6	5.727900	303	184
704.5	5.786100	305	185
709.6	5.929600	305	186
714.5	5.964300	305	187
719.5	6.064100	306	187
724.5	6.121000	307	188
729.6	6.249700	307	189
734.6	6.290100	306	190
739.6	6.400400	308	190
744.6	6.500000	310	191
749.6	6.591000	310	191
754.6	6.674400	311	193
759.6	6.746000	311	193
764.6	6.904500	312	193
769.6	6.945600	313	194
774.5	7.061800	314	194
779.4	7.159400	314	195
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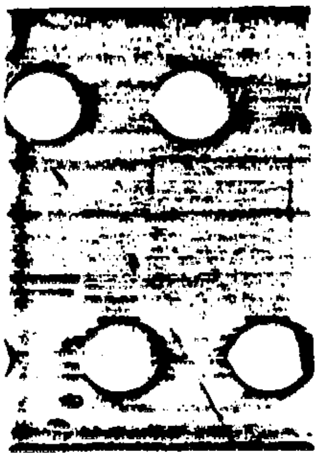

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829.6	9.285000	322	201
834.6	9.242000	326	205
839.5	9.032000	326	205
844.5	8.784000	326	205
849.6	8.769000	326	204
854.5	8.852000	325	203
859.5	8.963000	324	203
864.4	8.976000	325	204
869.4	9.023000	325	204
874.4	9.074000	326	204
879.5	9.155000	325	204
884.4	9.505000	326	205
889.4	9.577000	327	206
894.3	9.683000	328	207
899.4	9.799000	328	207
904.4	9.942000	329	208
909.5	10.072000	329	208
914.5	10.218000	330	209
919.4	10.446000	330	210
924.3	10.645000	331	211
929.3	10.802000	332	212
934.4	11.003000	333	212
939.3	11.147000	333	214
944.4	11.308000	334	214
949.3	11.469000	335	215
954.4	11.634000	335	215
959.3	11.800000	336	216
964.4	11.978000	336	217
969.3	12.121000	337	217
974.4	12.338000	337	218
979.3	12.480000	338	219
984.4	12.674000	339	220
989.3	12.817000	340	221
994.3	13.010000	340	222
999.3	13.165000	341	223
1004.3	13.387000	342	223
1009.3	13.558000	342	224
1014.3	13.776000	343	225
1019.3	13.966000	344	225
1024.2	14.126000	345	226
1029.3	14.382000	345	226
1034.4	14.568000	346	227
1039.4	14.756000	347	227
1044.4	14.958000	348	228
1049.3	15.194000	348	228
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1059.4	15.653000	350	229
1064.4	15.793000	351	230
1069.4	16.066000	351	230
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1084.3	16.736000	353	231
1089.2	16.944000	354	232
1094.2	17.226000	354	232
1099.3	17.456000	354	233
1104.2	17.683000	355	233
1109.3	17.924000	355	233
1114.2	18.207000	356	234
1119.2	18.398000	356	235
1124.3	18.731000	356	235
1129.2	18.953000	357	236
1134.1	19.181000	357	236
1139.2	19.486000	358	237
1144.2	19.784000	358	237
1149.1	20.009000	359	238
1154.2	20.323000	359	238
1159.2	20.622000	360	239
1164.2	20.865000	360	240
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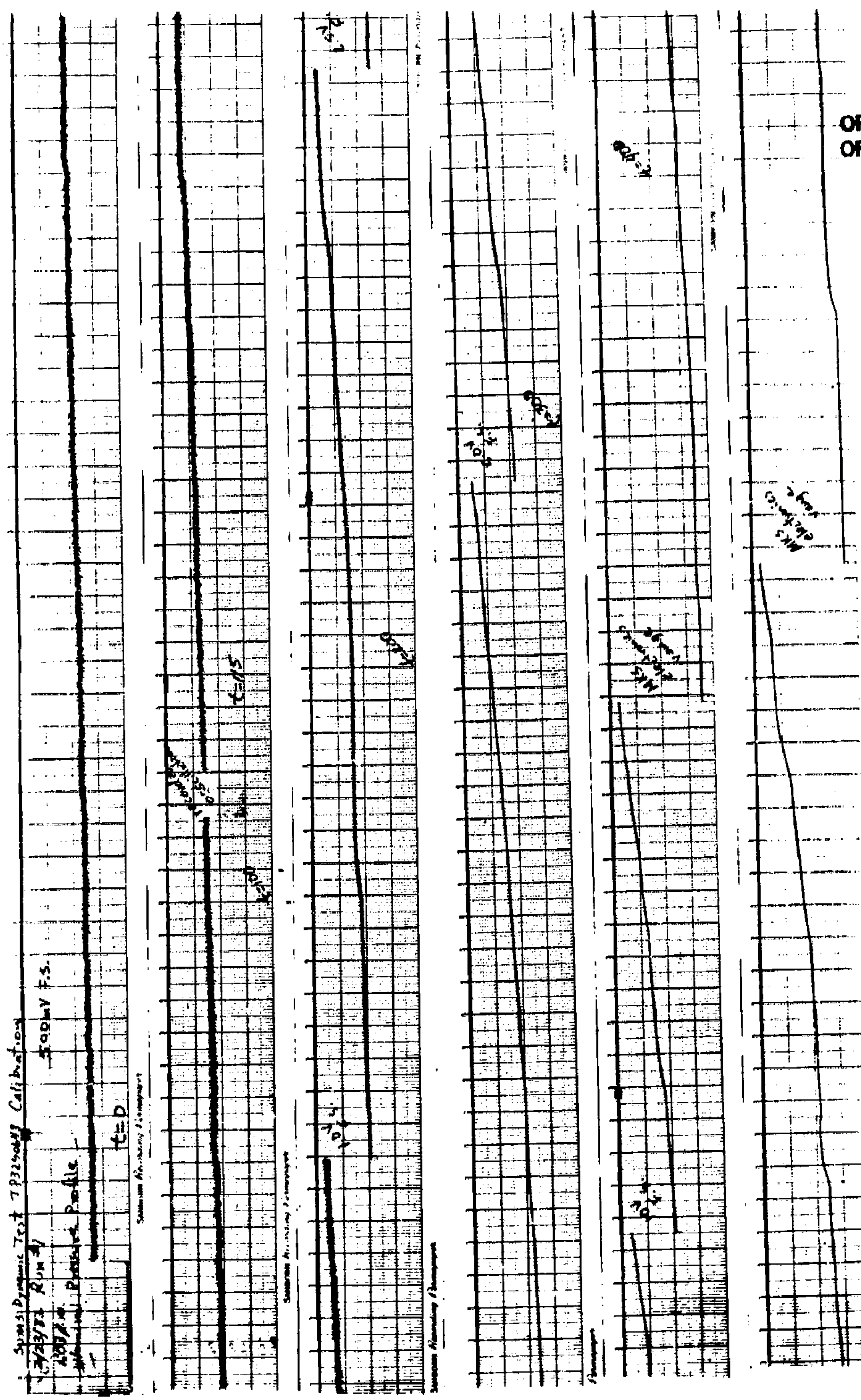

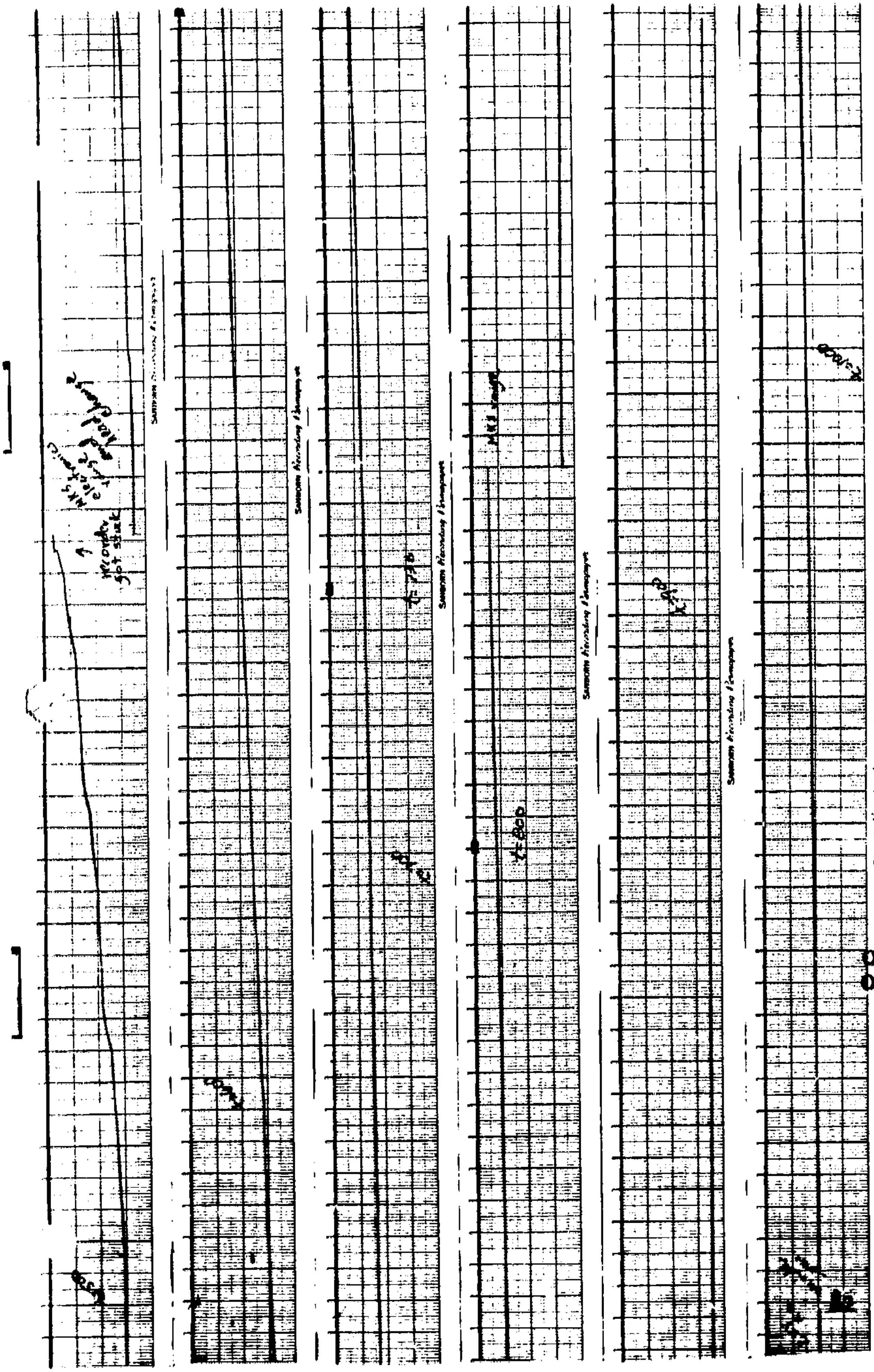

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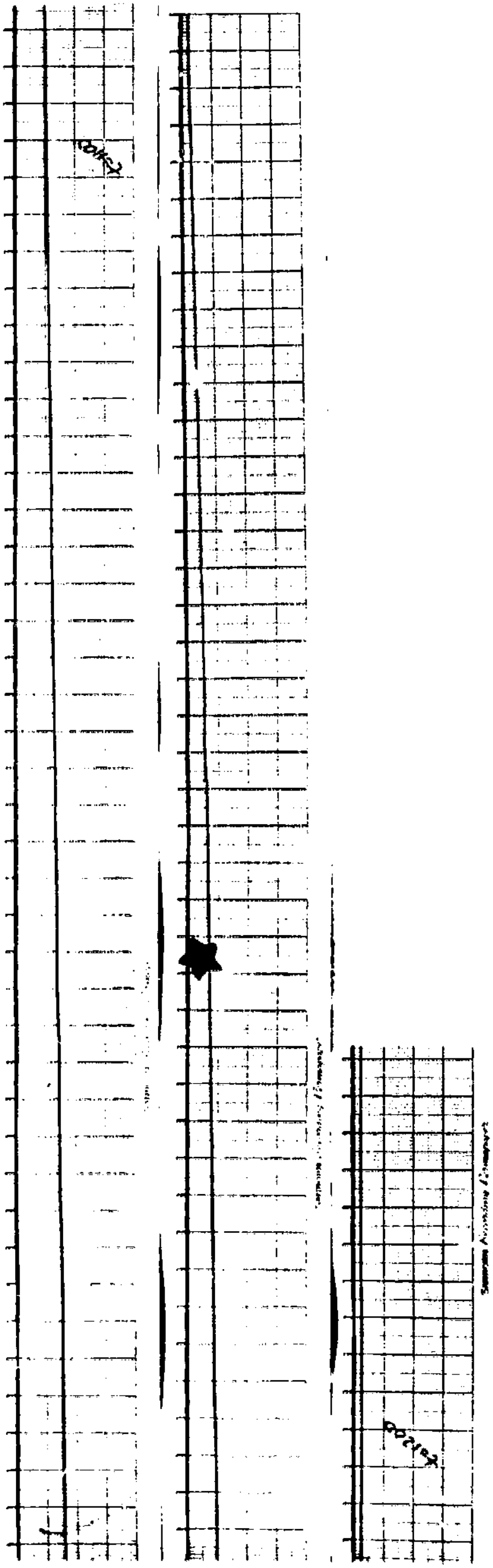

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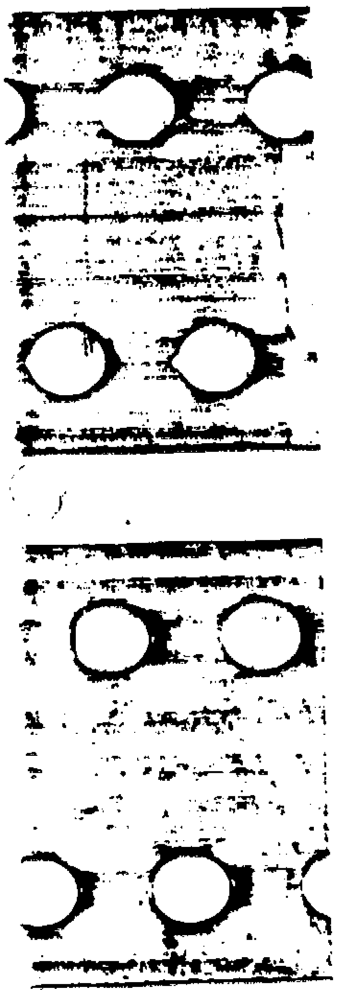
TP1290642 NOMINAL PRESSURE PROFILE. 2-23-82. RUN #2. TAPE #201. FILE#2.



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15.0	0.000163	232	114
19.8	0.000169	233	116
24.9	0.000175	233	116
29.7	0.000179	234	118
35.0	0.000183	235	116
40.0	0.000190	236	119
44.8	0.000193	237	121
49.8	0.000201	237	121
55.0	0.000209	239	124
59.8	0.000214	240	123
64.9	0.000221	241	126
69.8	0.000226	242	127
74.9	0.000236	243	129
79.9	0.000242	245	130
84.9	0.000245	246	130
89.8	0.000257	246	131
94.9	0.000263	248	132
99.8	0.000270	250	133
104.9	0.000282	251	134
109.9	0.000285	252	134
114.9	0.000296	254	135
119.8	0.000297	255	136
124.7	0.000316	256	137
129.9	0.000321	259	138
134.8	0.000326	260	139
139.7	0.000339	261	140
144.7	0.000351	264	142
149.7	0.000360	263	143
154.9	0.000372	264	144
159.8	0.000387	265	146
164.7	0.000402	266	147
169.6	0.000417	267	149
174.9	0.000432	268	151
179.8	0.000452	271	152
184.7	0.000474	273	154
189.7	0.000487	274	156
194.7	0.000522	276	158
199.8	0.000538	278	161
204.8	0.000571	279	162
209.8	0.000597	283	164
214.8	0.000636	285	165
219.8	0.000656	286	167
224.7	0.000735	289	169
229.8	0.000737	291	171
234.8	0.000763	293	173
239.8	0.000805	294	175
244.8	0.000862	296	177
249.8	0.000939	298	179
254.8	0.001000	300	183
259.7	0.001085	304	187
264.7	0.001153	307	190
269.8	0.001254	311	193
274.8	0.001328	314	196
279.7	0.001523	318	198
284.6	0.001564	322	201
289.7	0.001677	324	204
294.5	0.001814	327	208
299.8	0.001983	330	212
304.7	0.002162	333	215
309.6	0.002445	336	220
314.6	0.002577	341	225
319.7	0.002893	346	228
324.7	0.003078	351	231
329.6	0.003513	355	234
334.7	0.003755	358	238
339.7	0.004152	361	242
344.7	0.004645	365	246
349.6	0.005094	370	251
354.5	0.005950	375	255
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369.5	0.008105	391	250
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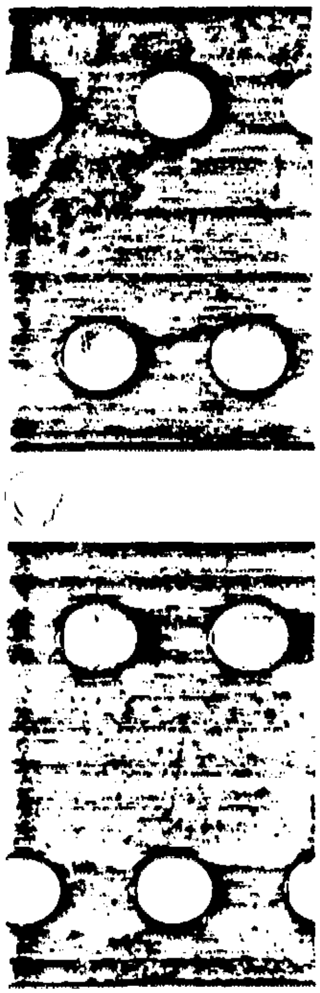

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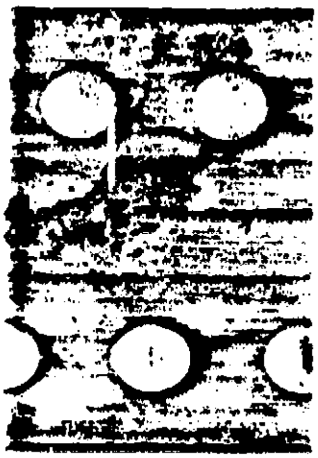
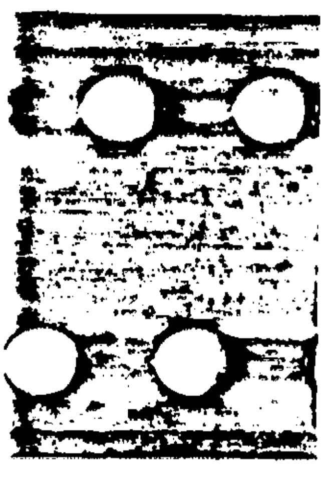
399.5	0.014140	154	35
404.6	0.019617	151	35
409.5	0.020092	148	30
414.5	0.022746	147	31
419.6	0.026664	146	30
424.7	0.031849	145	28
429.6	0.033364	144	29
434.6	0.039255	144	28
439.6	0.042899	144	29
444.5	0.052890	143	29
449.5	0.055568	144	30
454.6	0.065384	145	29
459.6	0.072978	145	29
464.6	0.085136	147	31
469.8	0.093410	148	34
479.5	0.106670	153	35
484.5	0.118740	155	38
489.6	0.152920	156	39
494.6	0.163210	160	40
499.6	0.186600	163	46
504.6	0.228640	165	47
509.6	0.244690	168	51
514.6	0.277760	172	54
519.6	0.329830	176	62
524.6	0.358670	180	65
529.5	0.418610	186	69
534.4	0.465670	193	74
539.5	0.539060	196	78
544.4	0.582680	200	84
549.4	0.696030	204	89
554.6	0.749790	209	96
559.6	0.872380	215	100
564.7	0.977100	220	104
574.4	1.163800	226	111
579.5	1.245100	233	117
584.4	1.525800	236	120
589.4	1.352400	240	127
594.6	1.925700	249	134
599.4	2.096600	255	137
604.3	2.407100	260	140
609.3	2.649300	263	145
614.4	2.898300	265	150
619.4	3.158600	272	155
624.3	3.379200	276	160
629.3	3.685200	282	163
634.4	3.760200	286	166
639.3	3.986500	288	167
644.4	4.267900	290	169
649.4	4.492700	292	171
654.3	4.678600	293	173
659.3	4.859300	295	175
664.3	5.022600	296	177
669.5	5.171900	298	179
674.4	5.272600	299	180
679.3	5.364000	301	181
684.3	5.452900	301	182
689.3	5.543100	303	184
694.4	5.621500	303	185
699.4	5.671000	304	185
704.4	5.784400	304	186
709.5	5.849800	305	186
714.3	5.930100	306	187
719.2	6.026300	306	188
724.2	6.115700	307	189
729.3	6.186100	308	189
734.3	6.274600	309	190
739.4	6.365500	309	191
744.4	6.446300	310	192
749.4	6.543100	311	193
754.4	6.650000	312	193
759.4	6.753100	312	194
764.3	6.807100	312	194
769.3	6.904900	313	194
774.2	7.009200	314	195
779.3	7.119600	315	195
784.2	7.236600	315	196
789.2	7.357500	317	196
794.2	7.416800	318	197
799.3	7.524300	320	197





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809.3	7.746100	320	198
814.2	7.861000	320	199
819.3	7.968300	321	199
824.1	8.087200	321	200
829.3	8.429000	322	201
834.3	8.286000	322	202
839.3	8.372000	323	202
844.2	8.478000	323	202
849.3	8.589000	324	202
854.2	8.634000	324	203
859.1	8.695000	324	203
864.1	8.768000	324	203
869.2	8.877000	324	203
874.3	9.015000	325	204
879.3	9.135000	326	205
884.2	9.256000	326	205
889.2	9.402000	327	206
894.2	9.544000	327	207
899.3	9.686000	328	208
904.3	9.847000	328	208
909.2	9.983000	329	209
914.1	10.145000	329	210
919.3	10.320000	330	210
924.2	10.482000	331	211
929.2	10.658000	331	212
934.2	10.816000	332	213
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959.1	11.637000	335	216
964.1	11.813000	335	217
969.1	11.981000	336	218
974.2	12.154000	337	219
979.1	12.324000	338	220
984.2	12.494000	338	221
989.2	12.660000	339	221
994.2	12.829000	340	222
999.1	12.999000	341	223
1004.0	13.175000	341	223
1009.0	13.362000	342	224
1014.1	13.569000	343	225
1019.2	13.807000	343	225
1024.1	13.987000	344	226
1029.1	14.184000	345	226
1034.0	14.376000	346	227
1039.1	14.575000	346	227
1044.2	14.780000	347	228
1049.1	14.985000	348	228
1054.1	15.191000	348	228
1059.1	15.399000	349	229
1064.0	15.606000	352	229
1069.1	15.859000	351	230
1074.1	16.102000	351	230
1079.1	16.317000	353	231
1084.1	16.553000	353	231
1089.1	16.778000	353	232
1094.1	17.003000	354	232
1099.1	17.228000	354	232
1104.1	17.456000	355	233
1109.1	17.764000	355	234
1114.1	18.003000	356	234
1119.0	18.243000	356	235
1124.1	18.489000	356	235
1129.1	18.727000	357	236
1.34.1	18.966000	357	236
1139.0	19.303000	358	237
1144.0	19.559000	358	237
1149.1	19.822000	359	238
1154.1	20.081000	359	238
1159.0	20.413000	360	239
1163.9	20.684000	360	240
1169.0	20.959000	361	240
1174.0	21.297200	362	241
1178.9	21.586000	362	241
1184.0	21.874000	363	242
1188.9	22.154000	363	206
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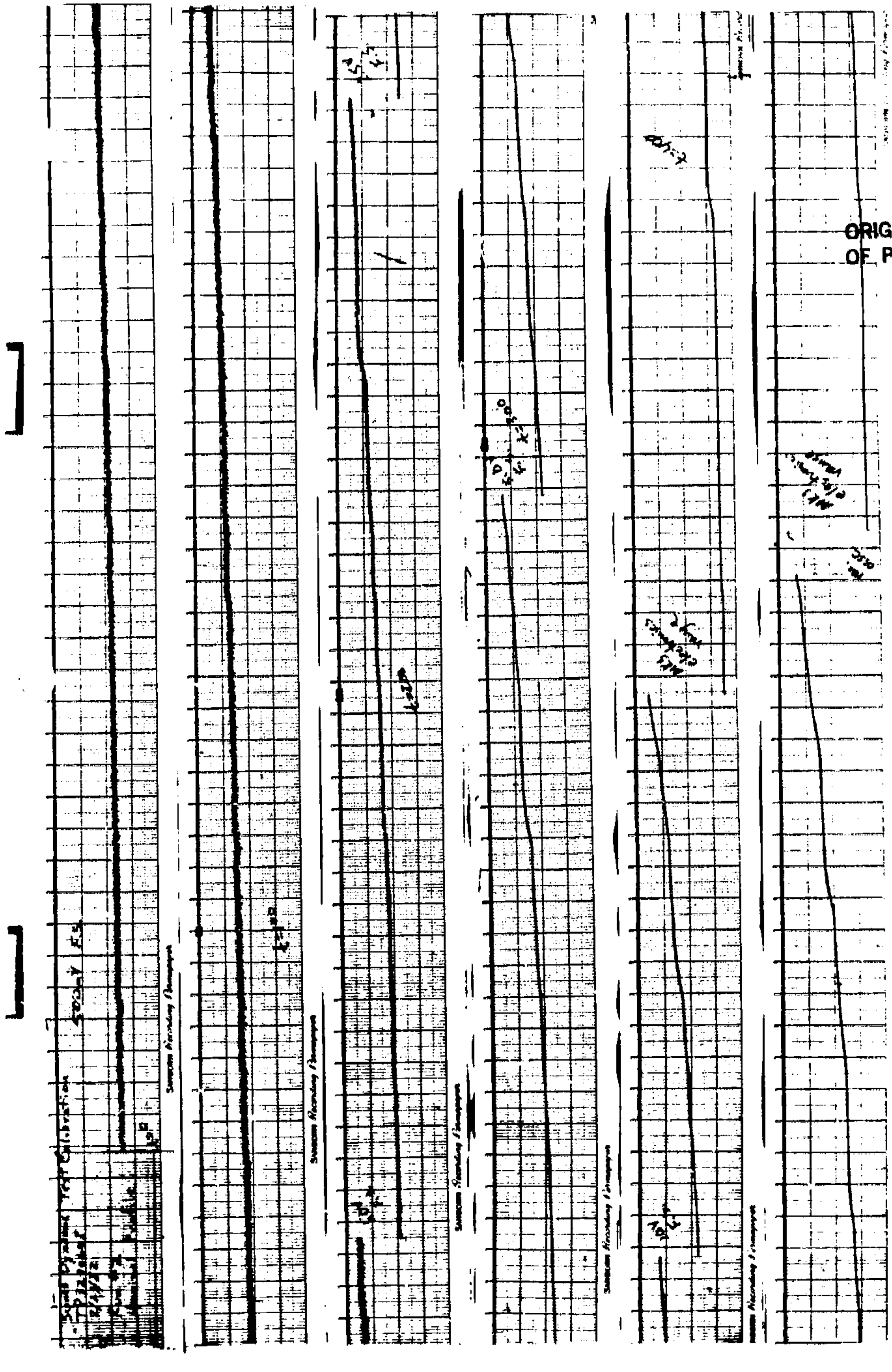

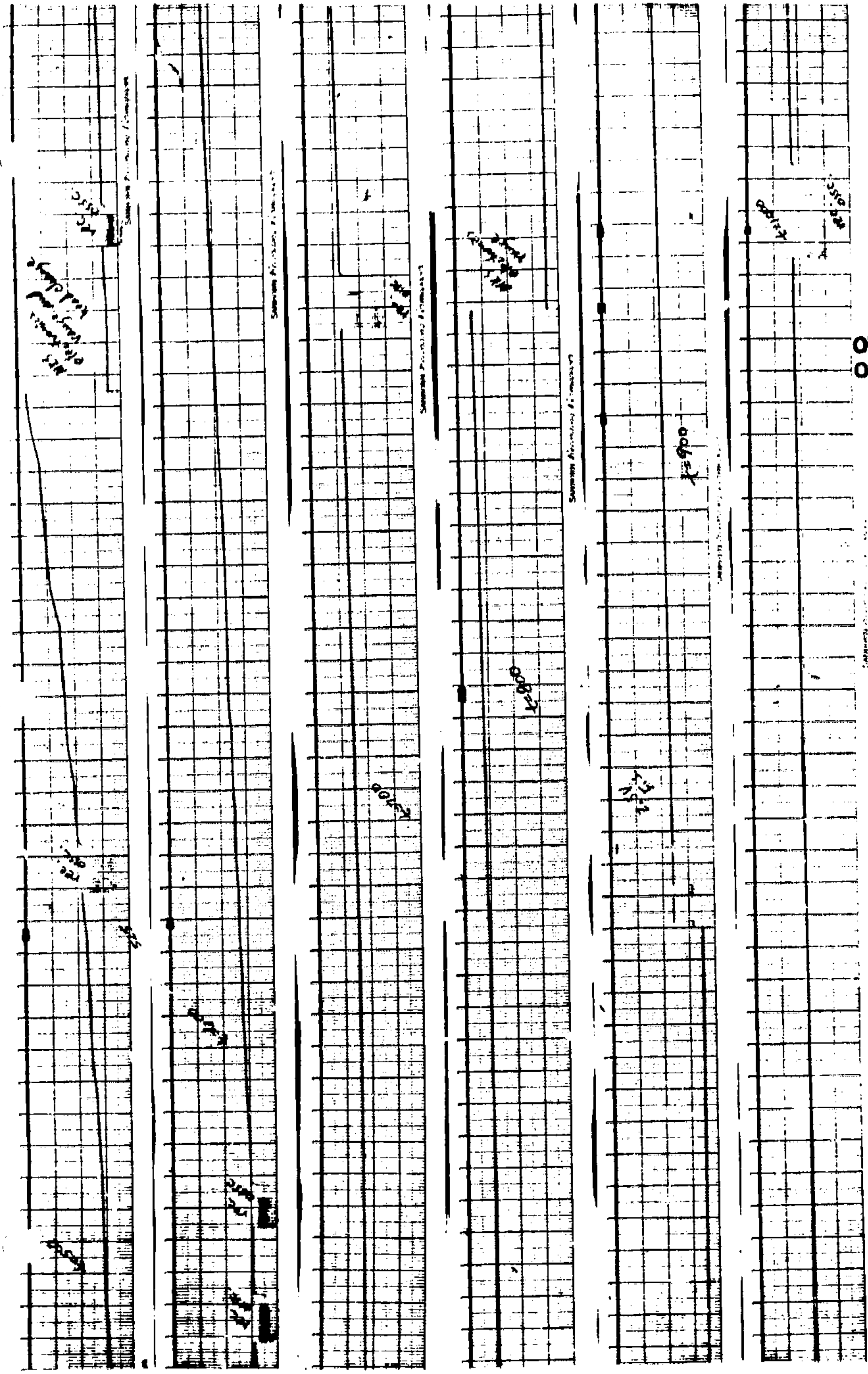

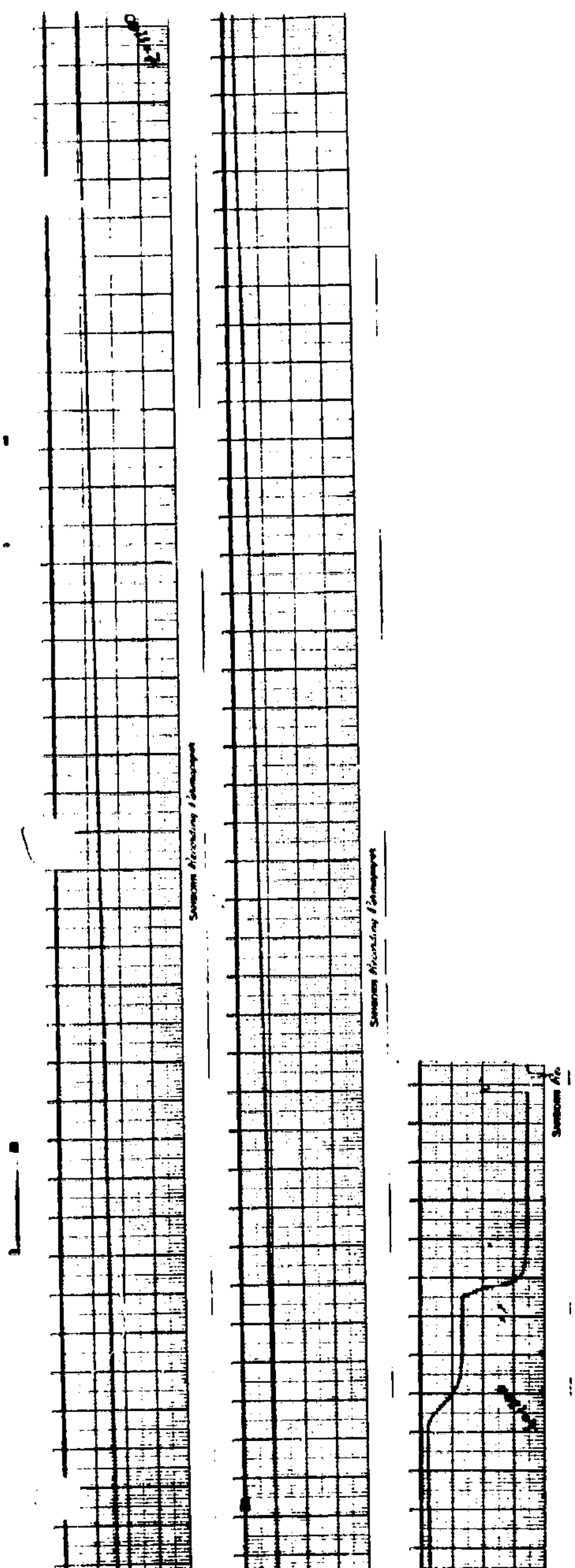

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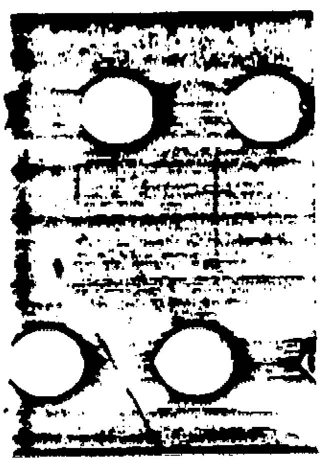

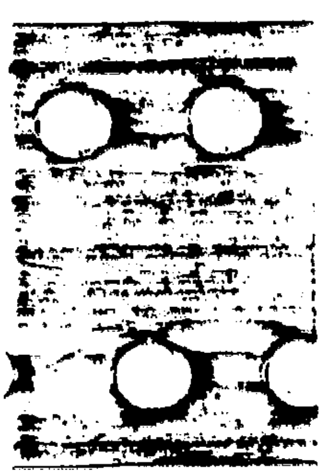

TP3290084 NOMINAL PRESSURE PROFILE. 2-13-82, RUN #5, TAPE #201, FILE#3.

TIME	BARATRON PRESSURE	AMU 28	AMU 14
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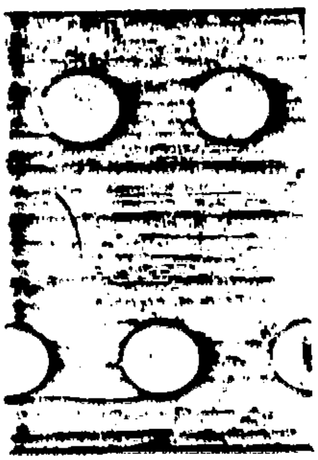
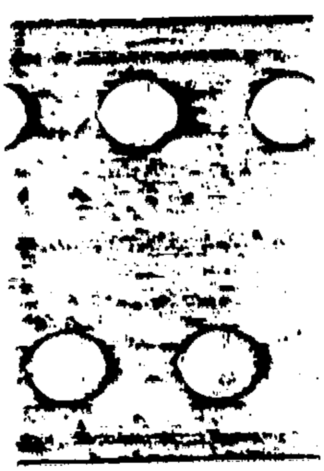
4.7	0.000153	[illegible]	114
10.0	0.000150	[illegible]	[illegible]
15.0	0.000167	[illegible]	[illegible]
19.8	0.000168	[illegible]	116
24.8	0.000175	234	[illegible]
29.0	0.000177	235	118
35.0	0.000184	236	120
39.9	0.000184	237	122
44.9	0.000197	238	122
49.9	0.000197	239	123
54.9	0.000202	240	125
59.7	0.000214	242	126
64.9	0.000220	243	128
69.9	0.000225	244	129
74.9	0.000234	245	129
79.9	0.000240	247	130
84.9	0.000248	248	131
89.9	0.000254	249	131
94.9	0.000261	249	132
99.8	0.000266	251	133
104.9	0.000274	253	134
109.8	0.000288	253	135
114.7	0.000295	255	136
119.7	0.000300	259	137
124.9	0.000315	259	138
129.8	0.000316	261	139
134.9	0.000326	261	140
139.8	0.000337	261	141
144.7	0.000351	264	142
149.9	0.000356	263	143
154.8	0.000372	264	145
159.7	0.000381	265	146
164.8	0.000410	267	147
169.8	0.00041[illegible]	268	149
174.8	0.000427	269	151
179.6	0.000445	271	153
184.6	0.000480	272	155
189.6	0.000488	274	157
194.9	0.000517	277	159
199.7	0.000538	279	162
204.6	0.000565	281	163
209.6	0.000595	284	164
214.6	0.000635	286	166
219.8	0.000667	289	168
224.7	0.000716	290	169
229.8	0.000744	292	171
234.8	0.000795	293	173
239.8	0.000829	295	176
244.8	0.000908	297	178
249.7	0.000943	300	182
254.8	0.001019	303	185
259.7	0.001103	305	188
264.6	0.001168	309	192
269.6	0.001279	312	194
274.8	0.001334	316	197
279.8	0.001524	320	199
284.8	0.001568	322	203
289.8	0.001722	325	205
294.8	0.001889	326	209
299.7	0.002046	331	213
304.5	0.002159	335	218
309.6	0.002483	336	222
314.6	0.002541	343	226
319.8	0.002760	347	229
324.7	0.003158	351	231
329.6	0.003461	355	234
334.6	0.003787	358	238
339.7	0.004336	362	243
344.7	0.004635	366	248
349.7	0.005258	371	252
354.7	0.005754	376	258
359.6	0.006596	383	261
364.5	0.007077	386	264
369.5	0.008053	392	252
374.7	0.019183	299	147





[illegible]	[illegible]	211	[illegible]
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389.6	0.000471	166	45
394.5	0.006753	161	39
399.6	0.016256	156	[illegible]
404.7	0.017683	152	[illegible]
409.7	0.019567	149	[illegible]
414.6	0.022235	148	30
419.5	0.025195	147	21
424.4	0.030401	146	24
429.4	0.034539	145	[illegible]
434.6	0.038615	145	27
439.6	0.044082	145	29
444.7	0.052556	145	[illegible]
449.5	0.055840	146	[illegible]
454.5	0.063096	146	[illegible]
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469.8	0.084120	150	34
479.4	0.102290	154	[illegible]
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489.6	0.154400	159	41
494.5	0.170330	162	44
499.4	0.197320	165	46
504.5	0.222600	167	50
509.6	0.253290	170	53
514.6	0.287980	174	56
519.6	0.311000	178	64
524.6	0.375170	183	66
529.5	0.406670	187	70
534.4	0.444700	194	75
539.4	0.523020	197	79
544.5	0.584190	201	85
549.5	0.675500	205	89
554.4	0.759110	210	96
559.5	0.871410	216	99
564.7	0.900900	222	104
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584.3	1.342500	240	124
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599.4	2.205700	254	137
604.5	2.260500	261	142
609.5	2.540000	265	146
614.4	2.787900	268	149
619.5	3.164600	272	154
624.4	3.360500	277	161
629.3	3.638000	281	163
634.4	3.867800	286	166
639.5	4.136600	289	168
644.5	4.274500	291	171
649.5	4.552200	292	172
654.4	4.711600	294	174
659.4	4.922100	296	176
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674.4	5.301900	300	181
679.4	5.390300	301	182
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689.2	5.564400	303	184
694.5	5.643700	304	185
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704.3	5.810600	305	187
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714.2	5.953000	307	188
719.3	6.040600	307	189
724.3	6.099900	307	190
729.4	6.242700	308	190
734.4	6.298000	309	191
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744.2	6.482300	310	193
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774.4	7.041800	315	195
779.4	7.146000	316	196
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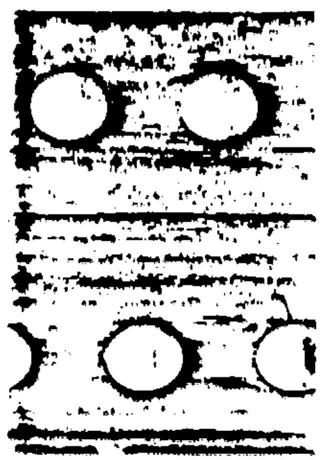

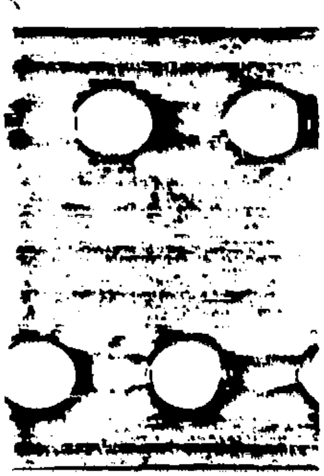

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889.2	9.479000	327	207
894.2	9.574000	328	[illegible]
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944.2	11.083000	333	214
949.1	11.229000	334	215
954.1	11.398000	335	216
959.1	11.561000	335	217
964.2	11.742000	336	217
969.1	11.923000	336	218
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984.1	12.432000	338	221
989.0	12.591000	339	221
994.1	12.786000	340	222
999.2	12.985000	341	223
1004.2	13.172000	342	223
1009.1	13.356000	342	225
1014.2	13.545000	343	225
1019.2	13.722000	344	225
1024.2	13.940000	344	226
1029.1	14.149000	345	226
1034.1	14.357000	346	227
1039.0	14.521000	347	227
1044.1	14.760000	347	228
1049.1	14.981000	348	228
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1059.1	15.413000	350	229
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1069.0	15.824000	352	230
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1079.0	16.266000	352	231
1083.9	16.539000	353	231
1088.9	16.730000	354	232
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1098.9	17.281000	355	233
1103.9	17.481000	355	233
1109.0	17.766000	355	234
1114.0	17.983000	356	234
1119.0	18.188000	356	235
1124.1	18.496000	357	235
1129.0	18.790000	357	236
1133.9	19.025000	358	237
1138.9	19.264000	358	237
1144.0	19.588000	359	238
1149.0	19.830000	359	238
1153.9	20.145000	360	239
1158.9	20.417000	360	240
1164.0	20.674000	361	240
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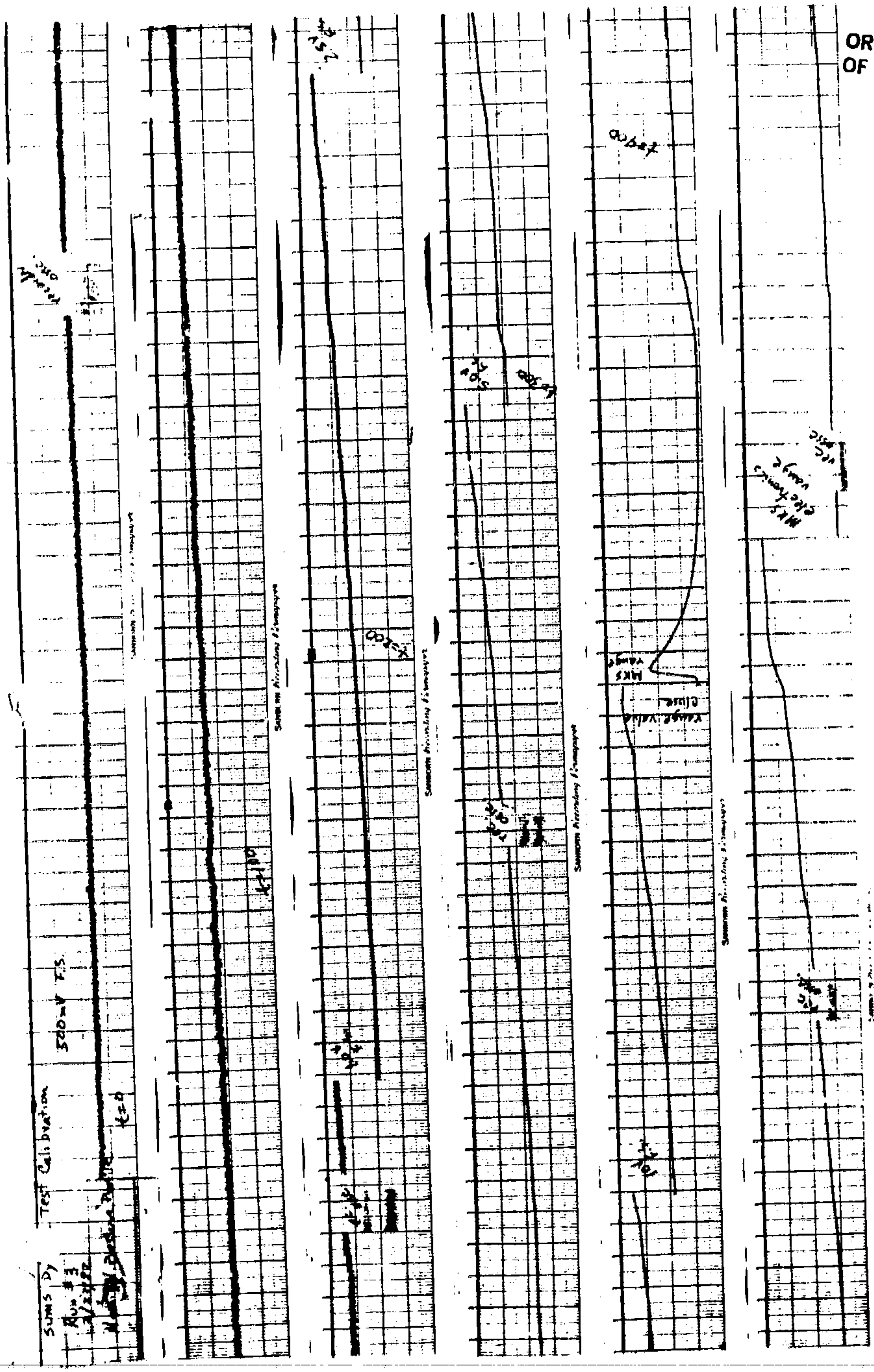

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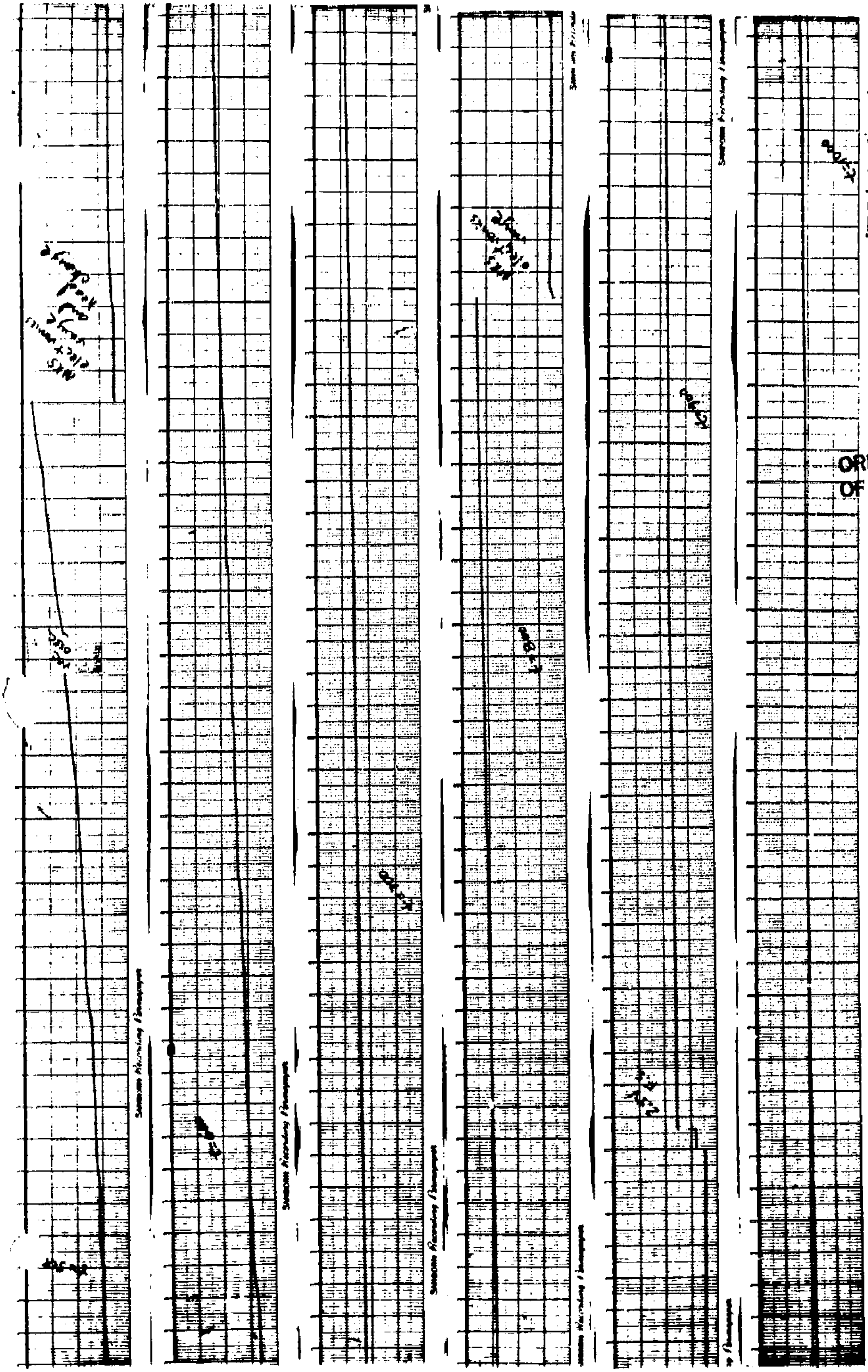

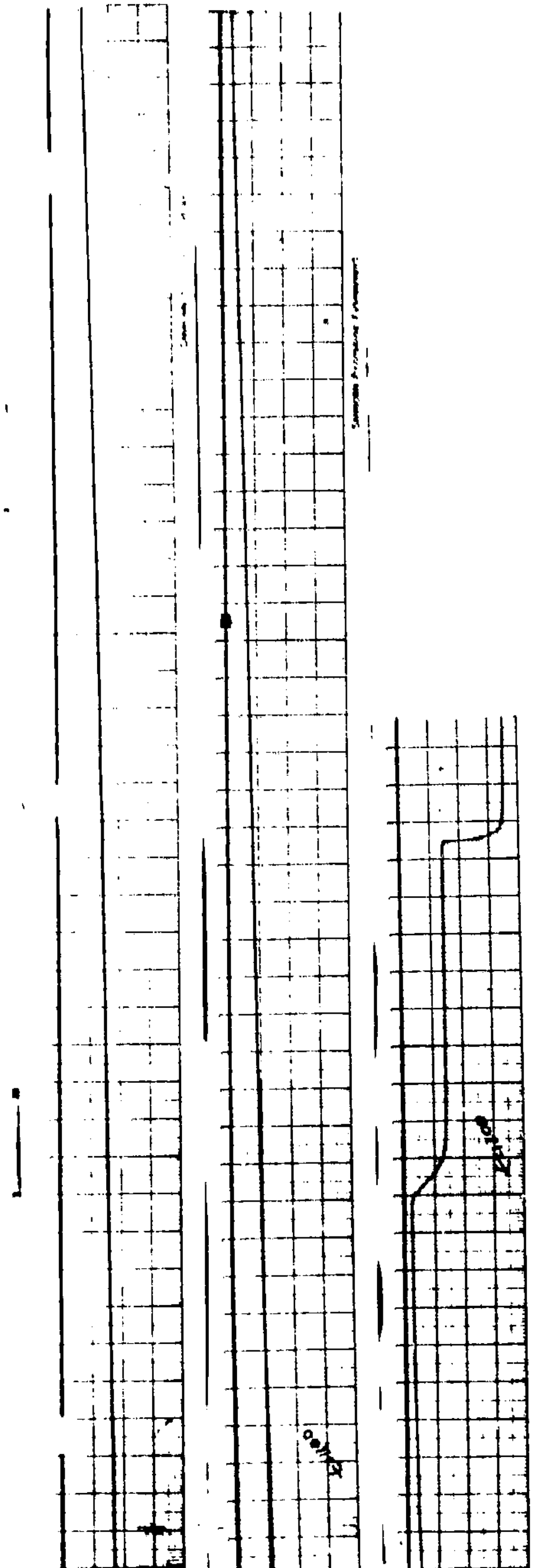

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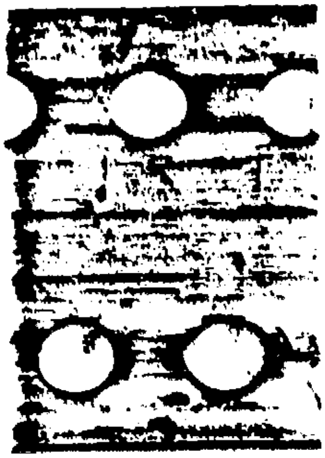

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45.1	0.000022	140	28
50.1	0.000013	140	29
55.1	0.000019	141	28
60.2	0.000018	142	29
65.1	0.000017	143	30
70.0	0.000021	143	32
75.0	0.000017	146	34
80.0	0.000027	147	35
85.0	0.000024	149	35
90.1	0.000024	152	35
95.0	0.000022	154	39
100.0	0.000025	156	39
104.9	0.000028	157	39
110.2	0.000030	159	41
115.1	0.000025	159	44
119.9	0.000030	161	42
124.9	0.000029	162	45
130.2	0.000033	164	48
135.1	0.000033	166	50
139.9	0.000034	167	53
144.9	0.000037	168	53
149.9	0.000040	170	56
155.1	0.000043	172	57
160.1	0.000045	174	60
165.0	0.000047	176	64
170.0	0.000052	177	66
174.9	0.000050	181	68
180.0	0.000056	182	68
185.1	0.000063	185	71
190.1	0.000068	188	73
195.0	0.000068	191	75
199.9	0.000073	194	77
204.9	0.000080	196	80
209.9	0.000083	197	82
215.1	0.000093	199	84
220.1	0.000098	202	88
225.1	0.000107	204	92
230.1	0.000115	206	93
235.0	0.000130	209	98
239.9	0.000139	213	100
245.0	0.000153	216	102
249.8	0.000163	220	106
254.8	0.000183	223	107
260.1	0.000196	227	111
265.0	0.000236	229	113
269.9	0.000240	232	119
274.9	0.000265	236	124
280.0	0.000298	240	128
284.9	0.000324	244	131
289.9	0.000340	247	133
294.9	0.000423	252	136
299.8	0.000441	256	141
304.9	0.000503	262	145
309.8	0.000562	266	150
314.8	0.000609	270	156
320.0	0.000735	274	162
324.9	0.000781	281	166
329.8	0.000896	286	170
334.9	0.000983	291	174
339.8	0.001177	295	179
344.9	0.001253	300	186
349.8	0.001409	306	193
354.8	0.001711	312	197
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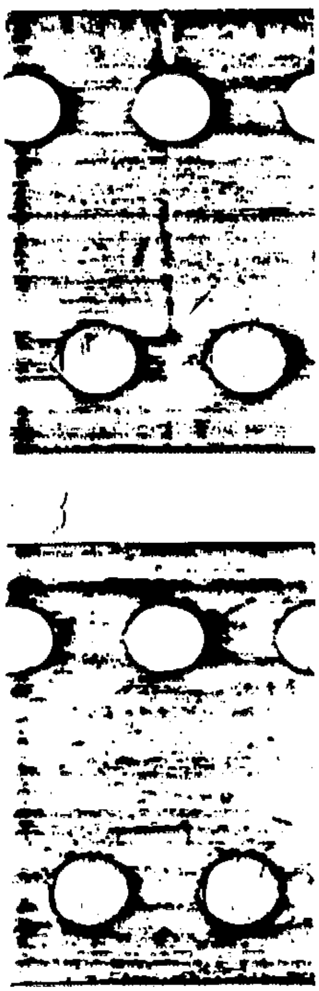

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404.8	0.007344	381	260
409.9	0.008568	382	247
415.1	0.009618	294	143
424.7	0.012687	171	51
429.9	0.013054	162	42
434.9	0.018402	153	37
439.8	0.021295	149	34
444.7	0.023737	146	34
449.7	0.030396	144	30
454.7	0.033987	142	29
459.8	0.042930	143	33
464.7	0.046459	141	29
469.8	0.056725	142	28
474.9	0.062595	142	29
479.8	0.075865	142	31
484.7	0.085033	143	32
489.9	0.086700	145	30
494.8	0.123260	147	36
499.8	0.136070	150	36
504.8	0.161830	153	37
509.8	0.201250	157	39
514.8	0.218460	162	45
519.8	0.237210	165	50
524.7	0.273200	168	52
529.8	0.331550	172	58
534.8	0.394490	177	65
539.7	0.492790	183	70
544.6	0.542240	191	75
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554.6	0.767420	202	92
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564.9	0.882700	216	103
569.8	1.157600	223	106
574.8	1.566300	227	112
579.8	1.613200	235	124
584.8	1.701600	243	131
589.7	1.795400	247	133
594.6	2.037700	251	135
599.5	2.789400	254	137
604.7	3.338800	264	149
609.8	3.579200	273	161
614.7	4.136000	281	165
619.8	4.515100	288	169
624.7	4.957200	291	173
629.6	5.376900	294	177
634.6	5.784500	298	181
639.6	6.266100	301	186
644.5	6.603400	305	191
649.6	6.998200	308	194
654.7	7.329500	312	196
659.6	7.556100	314	197
664.6	7.782400	316	199
669.7	8.007800	320	199
674.9	8.333000	320	201
684.5	8.224000	321	202
689.7	8.243000	321	202
694.7	8.277000	321	202
699.7	8.331000	321	202
704.7	8.435000	321	202
709.6	8.547000	322	202
714.5	8.717000	322	203
719.7	8.896000	323	204
724.7	9.054000	323	205
729.7	9.250000	324	206
734.7	9.436000	325	207
739.7	9.589000	326	208
744.7	9.751000	327	209
749.6	9.883000	327	210
754.6	10.033000	328	210
759.5	10.144000	329	211
764.5	10.324000	329	211
769.6	10.464000	330	212
774.6	10.611000	330	213
779.6	10.752000	331	214
784.6	10.891000	331	214
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794.6	11.188000	332	216
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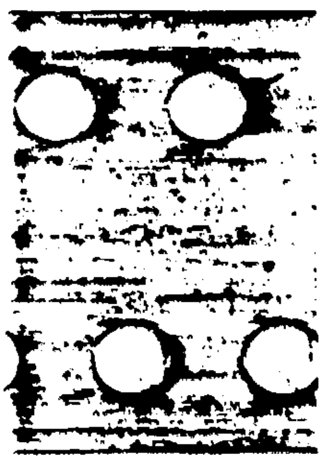

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834.5	12.467000	[illegible]	[illegible]
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844.5	12.858000	339	223
849.5	12.958000	340	225
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859.4	13.345000	341	225
864.5	13.599000	[illegible]	226
869.4	13.735000	[illegible]	[illegible]
874.5	13.912000	343	227
879.4	14.139000	344	227
884.5	14.300000	345	228
889.4	14.531000	345	228
894.4	14.723000	347	229
899.4	14.899000	347	229
904.5	15.101000	348	229
909.4	15.326000	349	230
914.4	15.503000	350	230
919.4	15.733000	350	231
924.4	15.951000	352	231
929.3	16.175000	352	232
934.4	16.410000	353	232
939.5	16.616000	354	232
944.4	16.849000	354	233
949.4	17.079000	354	233
954.5	17.307000	355	234
959.4	17.540000	355	234
964.4	17.797000	356	235
969.5	18.040000	356	235
974.5	18.284000	356	236
979.5	18.520000	357	236
984.4	18.791000	358	237
989.4	19.038000	358	238
994.4	19.296000	359	238
999.3	19.571000	359	239
1004.4	19.841000	360	239
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1019.4	20.634000	361	241
1024.3	20.950000	362	241
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1034.3	21.531000	363	243
1039.3	21.819000	364	243
1044.3	22.108000	364	244
1049.4	22.435000	364	245
1054.3	22.717000	365	245
1059.2	23.022000	366	246
1064.3	23.357000	366	246
1069.4	23.661000	367	247
1074.4	24.010000	368	248
1079.4	24.319000	368	248
1084.3	24.655000	369	249
1089.3	24.960000	370	250
1094.3	25.293000	370	250
1099.3	25.685000	371	251
1104.2	26.019000	372	252
1109.3	26.366000	373	252
1114.2	26.727000	373	253
1119.2	27.105000	374	253
1124.3	27.460000	374	254
1129.3	27.857000	375	255
1134.2	28.221000	376	255
1139.2	28.613000	377	259
1144.2	29.005000	378	259
1149.4	29.403000	378	258
1154.3	29.812000	379	258
1159.3	30.216000	380	259
1164.2	30.620000	381	259
1169.3	31.042000	381	259
1174.3	31.477000	382	260
1179.2	31.892000	382	260
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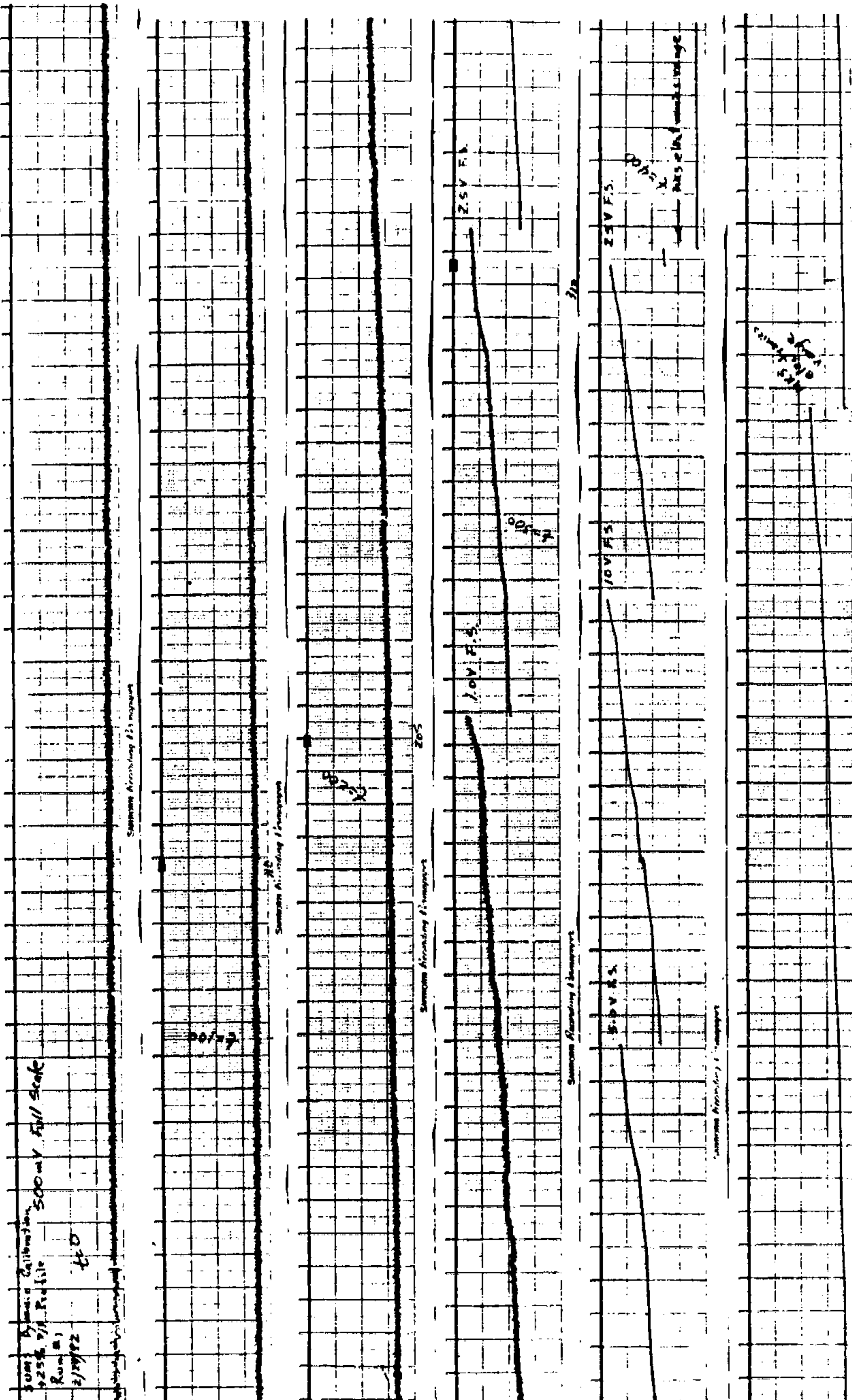

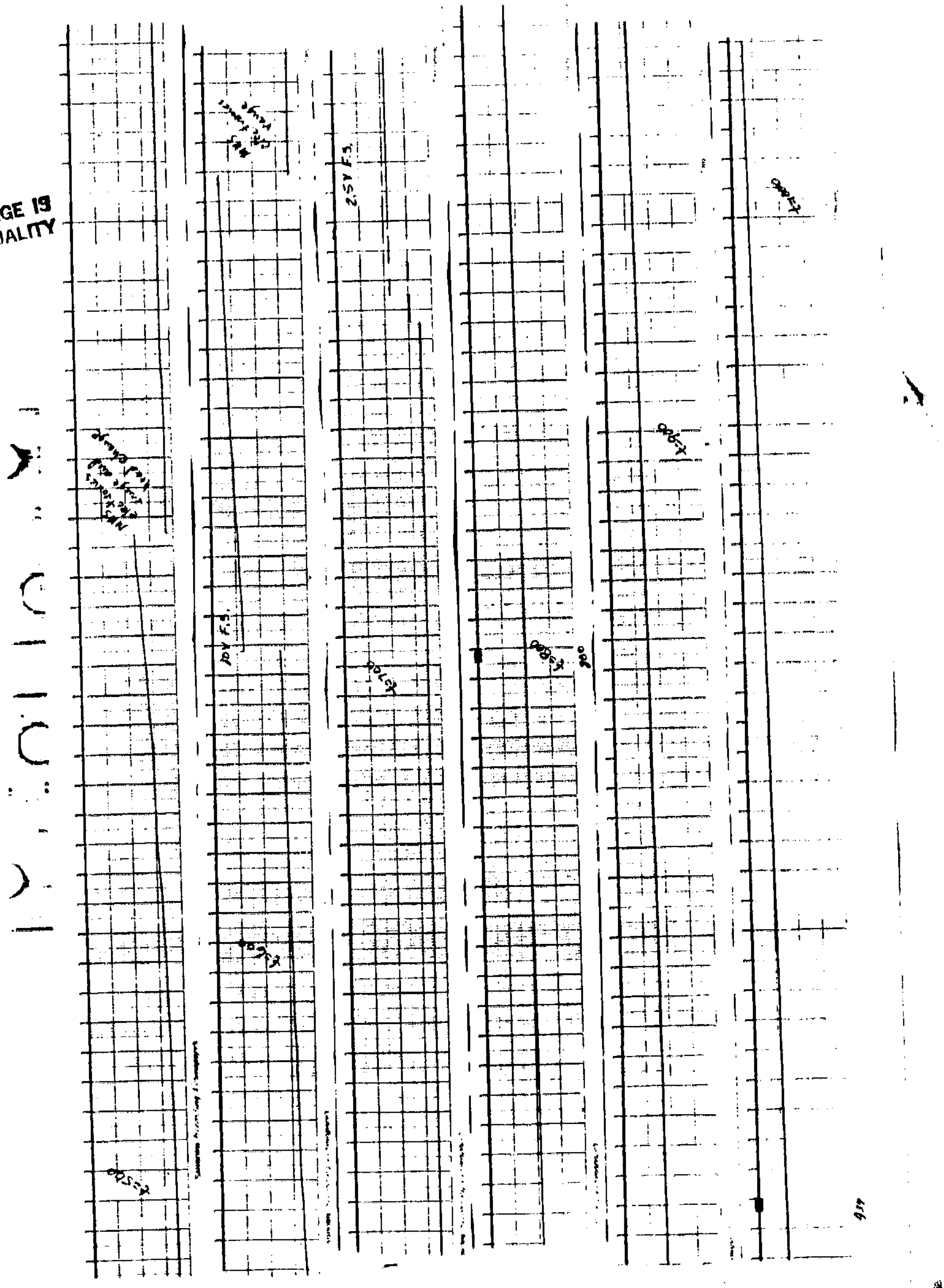

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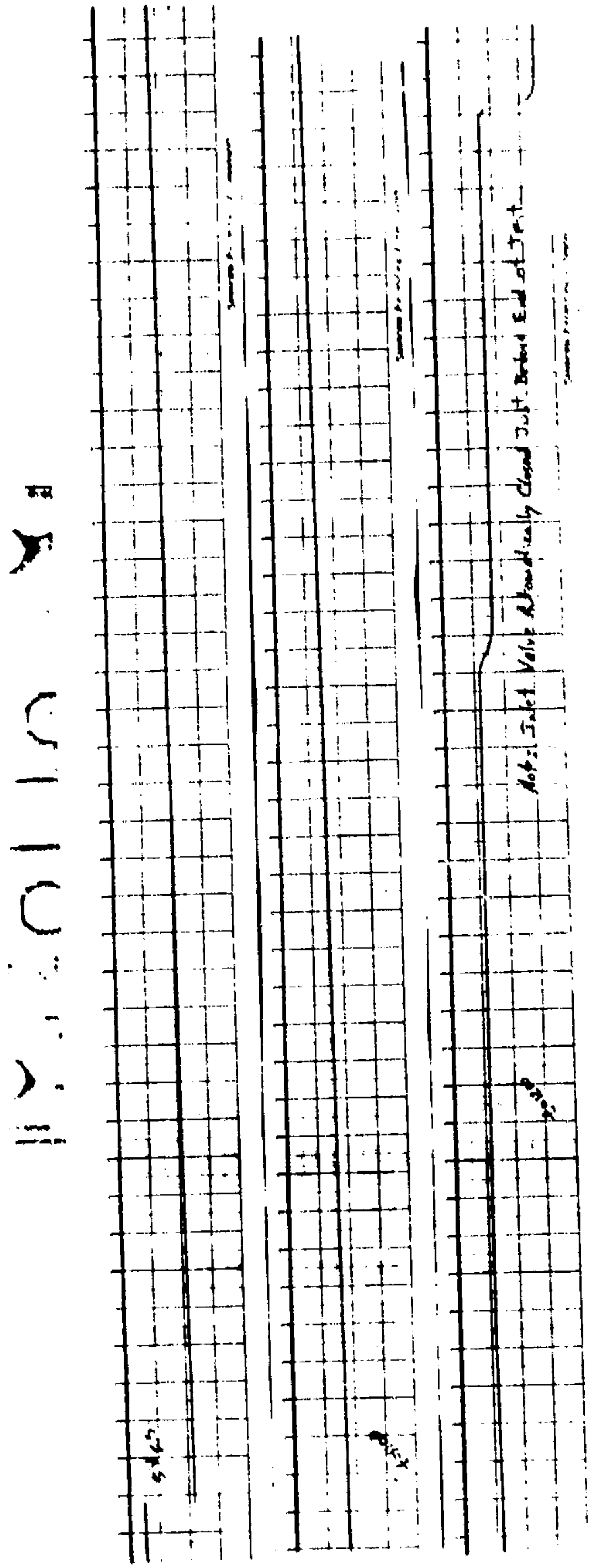

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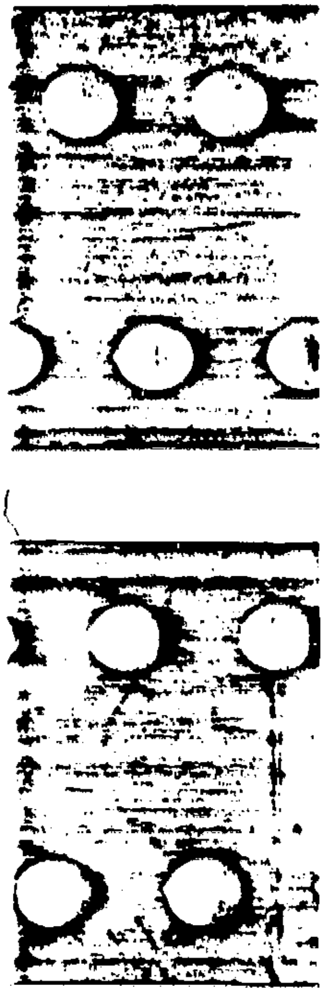

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29.9	0.000014	146	31
34.9	0.000015	14[illegible]	[illegible]
39.9	0.000016	147	32
45.0	0.000016	148	34
49.9	0.000018	150	35
55.0	0.000019	151	36
59.9	0.000018	15[illegible]	36
65.0	0.000020	154	38
70.0	0.000021	155	38
75.0	0.000021	157	41
79.9	0.000021	159	41
85.0	0.000022	160	41
90.0	0.000026	161	41
95.0	0.000024	163	45
99.8	0.000028	165	47
104.8	0.000025	165	50
109.8	0.000028	166	49
115.0	0.000027	167	51
119.9	0.000029	168	54
125.0	0.000032	169	52
129.9	0.000031	170	54
134.8	0.000032	171	57
139.9	0.000035	173	58
145.0	0.000037	173	61
149.9	0.000041	175	63
154.8	0.000042	177	64
160.0	0.000043	179	66
164.9	0.000046	181	66
170.0	0.000050	183	68
174.9	0.000053	186	71
179.8	0.000054	189	74
184.8	0.000060	191	74
189.9	0.000066	193	75
195.0	0.000072	195	79
200.0	0.000078	197	81
204.9	0.000085	199	84
209.7	0.000082	201	87
215.0	0.000098	203	90
219.9	0.000099	206	93
224.7	0.000105	208	96
229.8	0.000110	211	97
234.9	0.000122	213	100
239.8	0.000137	216	102
244.8	0.000151	219	104
249.7	0.000162	223	107
254.7	0.000179	226	109
259.8	0.000203	229	113
264.9	0.000221	231	117
269.8	0.000235	234	121
274.8	0.000279	236	126
279.9	0.000278	242	130
284.8	0.000297	246	132
289.8	0.000344	249	135
294.7	0.000399	253	137
299.7	0.000436	260	142
304.9	0.000528	263	146
309.8	0.000551	267	153
314.7	0.000627	273	159
319.7	0.000723	277	163
324.7	0.000744	287	168
329.8	0.000815	289	171
334.9	0.000971	292	174
339.7	0.001111	295	179
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349.8	0.001408	307	194
354.8	0.001476	314	198
359.7	0.001628	320	202
364.8	0.001939	323	205
369.7	0.002291	327	211
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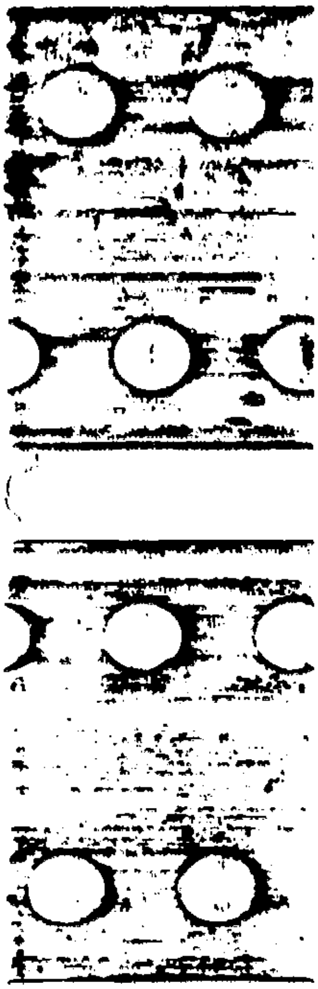

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409.6	0.008923	390	249
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629.6	5.341900	295	178
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709.5	8.810000	323	204
714.5	8.931000	324	205
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729.4	9.354000	326	207
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739.4	9.592000	326	208
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759.4	10.143000	329	211
764.3	10.267000	329	212
769.4	10.491000	330	213
774.3	10.581000	331	213
779.4	10.713000	331	214
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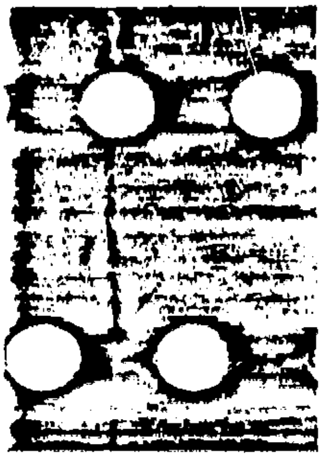

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654.3	13.160000	341	225
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664.3	13.590000	342	226
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909.2	15.313000	349	230
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1009.2	20.110000	360	240
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1019.3	20.620000	361	241
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1049.3	22.369000	364	244
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1059.2	22.995000	366	246
1064.1	23.372000	366	246
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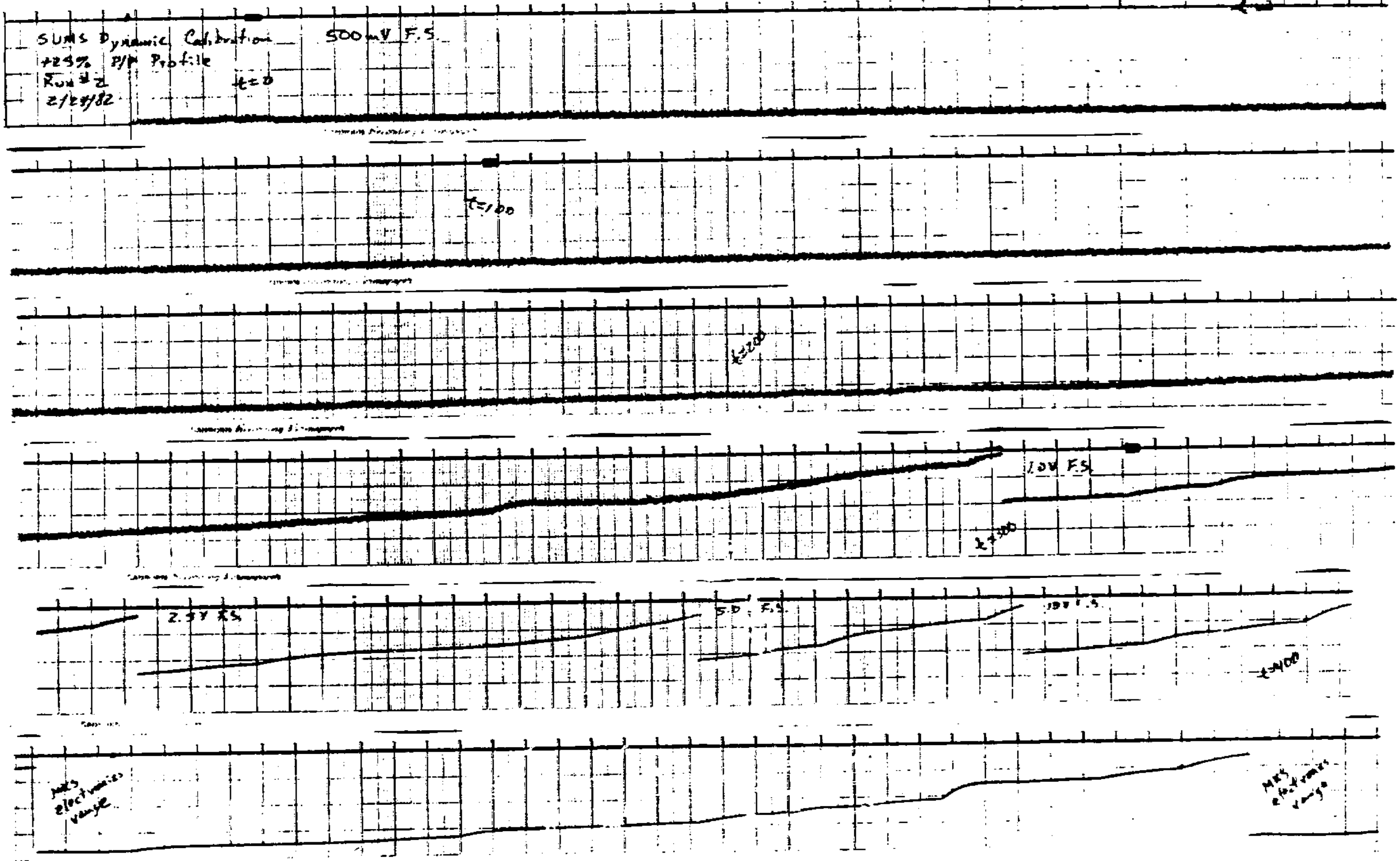
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+25% P/P Profile
Run #2
2/23/82
500 mV F.S.
t=0
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10V F.S.
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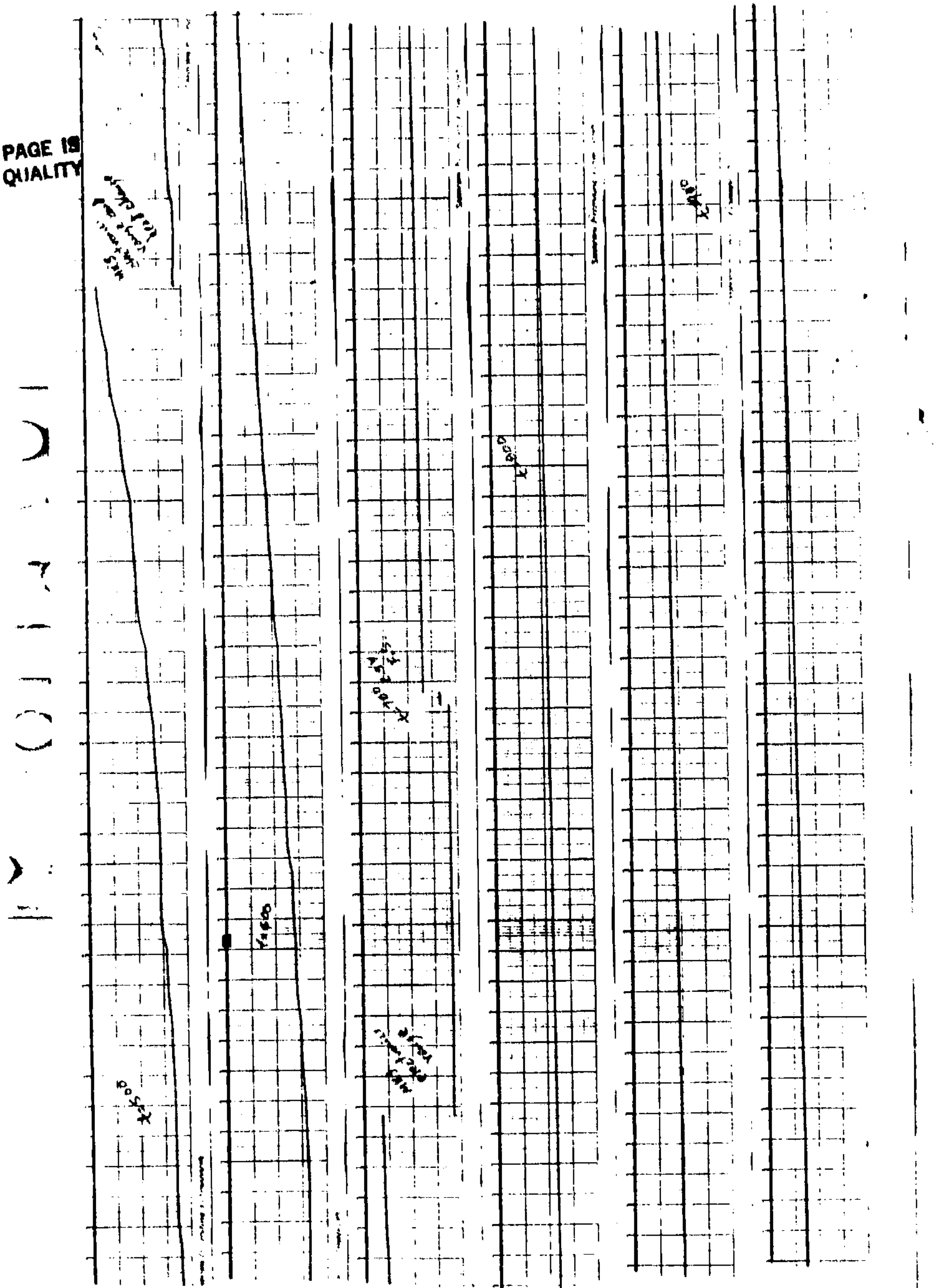
2.5V F.S.
5.0 F.S.
10V F.S.
t=400
MKS electronics range
MKS electronics range



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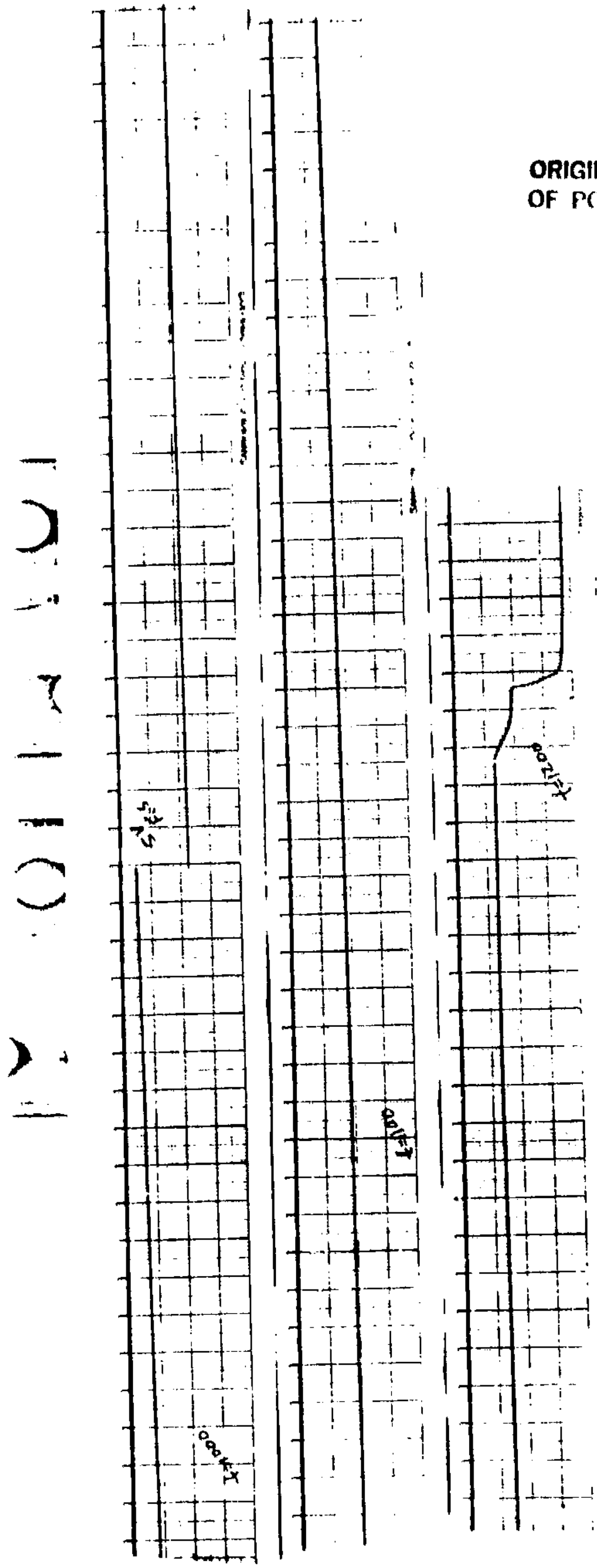

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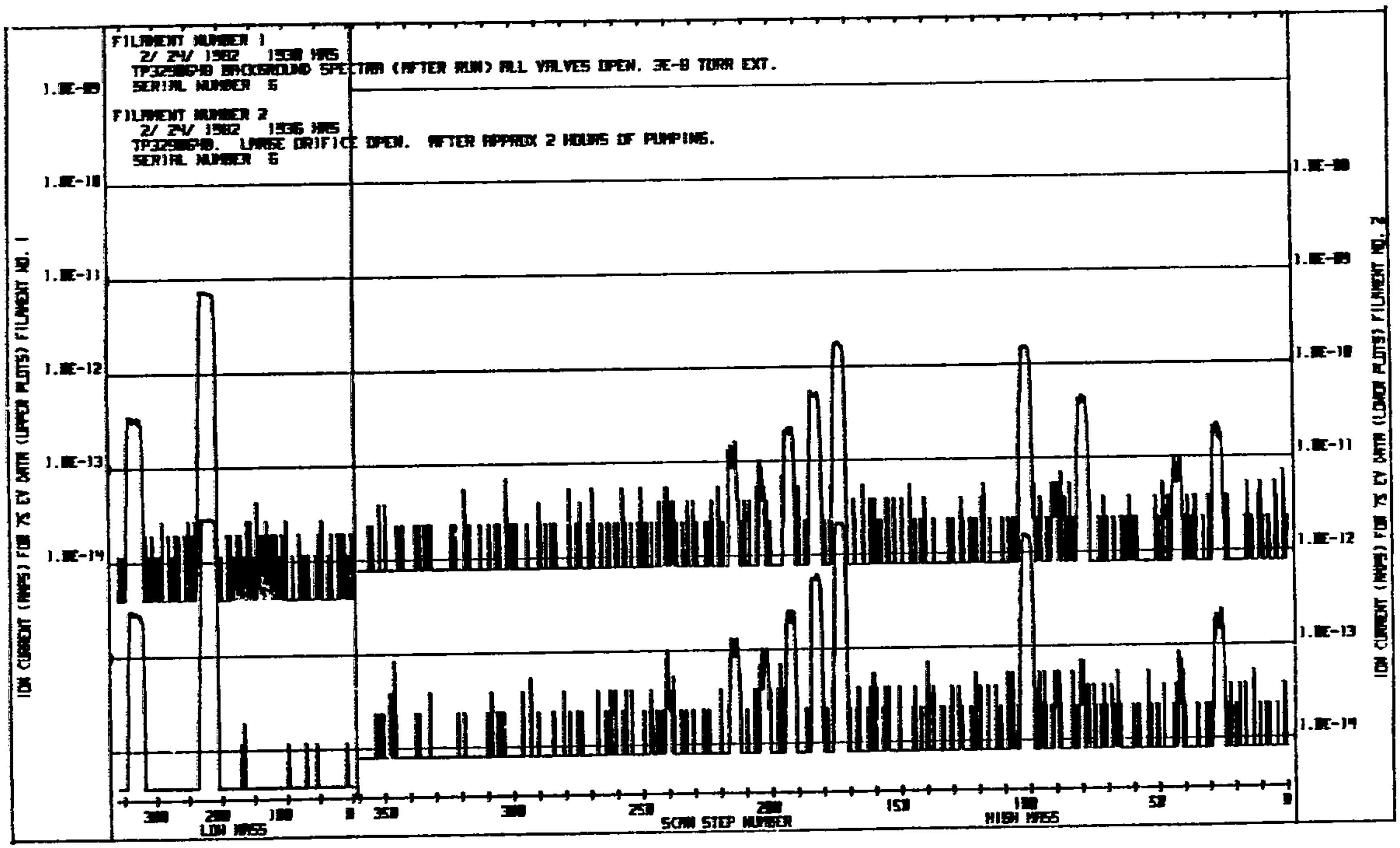
File # 2



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2/ 24/ 1982   1930 HRS   SUMS FUNCTIONAL TEST   S/N 6

DATA TAPE ID 8   BULK DATA FILE # 2

SUMS FUNCTIONAL TEST

TP3290648 BACKGROUND SPECTRA (AFTER RUN) ALL VALVES OPEN. 3E-8 TORR EXT.

HOUSEKEEPING DATA   FILAMENT NUMBER 1

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	1	1	1	1	1	1	1	1	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~15.210~~
MINUS 15 VOLT	129	130	129	129	130	129	130	130	~~-15.020~~
ION PUMP VOLT	181	180	180	180	181	181	180	181	~~1.521~~
ION SOURCE TEMP	91	90	90	90	91	90	90	91	~~1.563~~
PRE-AMP TEMP	168	169	169	169	168	169	169	168	~~1.512~~
PLUS 5 VOLT	120	120	120	120	121	120	121	120	~~2.576~~
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	126	126	125	126	126	125	126	125	~~1.502~~
COLLECTOR CURRENT	111	111	111	111	111	112	111	111	~~1.555~~
ELECTRON ACC VOLT	190	189	189	190	190	189	190	189	~~1.571~~
ION ACC VOLT	39	39	39	39	39	39	39	39	1.590
ION PUMP ANALOG									~~0.1520~~
28 VOLT POWER SUP									~~47.676~~

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75 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
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5	23	38	23	53				
6	8	8	8	8	4			
7	8	8	8	8		12		
8	23	23	23	23			12	
9	8	8	8	8				4
10	8	8	23	8				
11	23	38	53	38	4			
12	8	38	8	8		19		
13	8	8	8	8			4	
14	8	8	23	8				4
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22	8	8	8	8		19		
23	8	8	8	8			4	
24	38	8	8	38				4
25	8	8	23	23				
26	38	160	175	145	4			
27	175	191	206	160		4		
28	221	191	206	206			4	
29	175	175	206	175				4
30	114	8	8	23				
31	8	8	38	8	4			
32	8	8	8	8		19		
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35	8	8	8	8				
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37	8	38	8	8		12		
38	23	8	23	8			4	
39	8	8	8	38				4
40	8	8	8	23				
41	8	8	8	23	4			
42	53	84	99	99		4		
43	69	53	84	53			4	
44	69	53	53	69				4
45	99	69	53	38				
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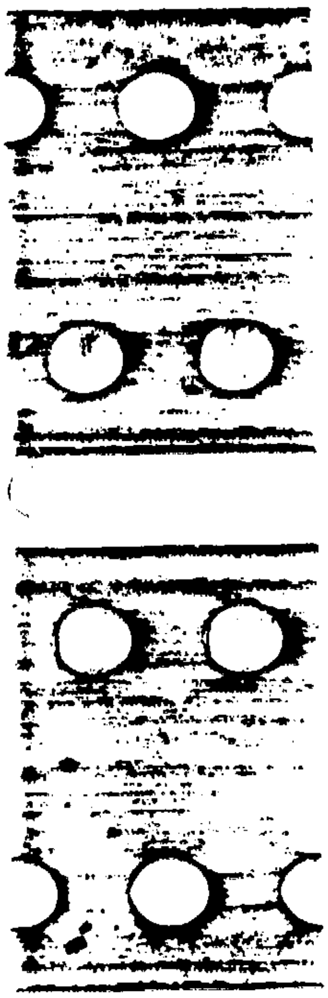

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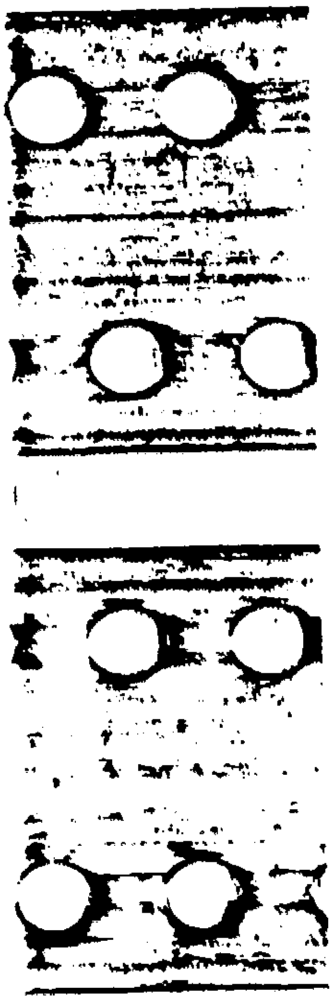

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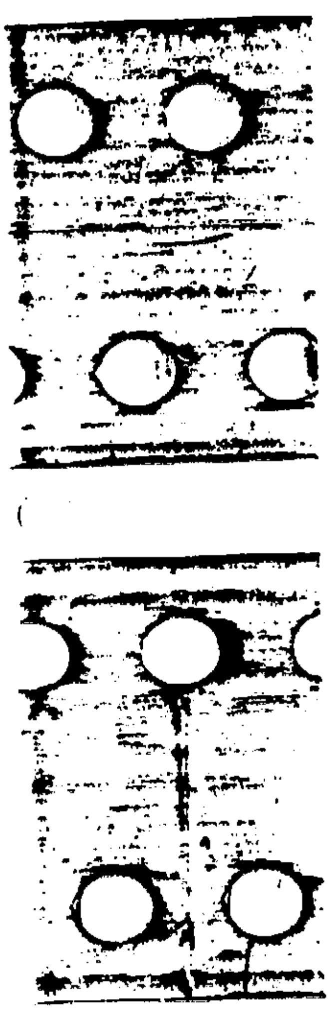

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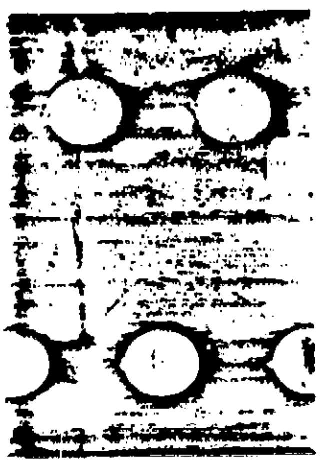

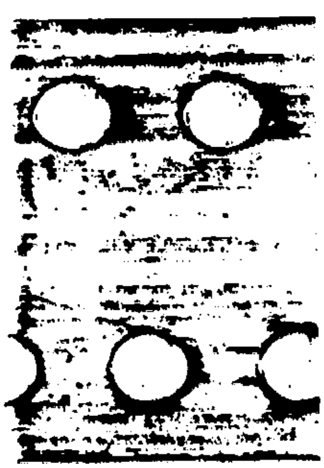

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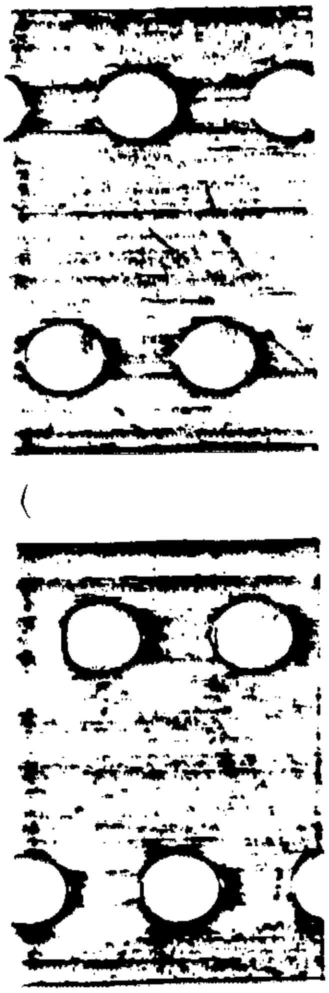

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2 24 1982   1936 HRS   SUMS
FUNCTIONAL TEST   S N 6

DATA TAPE ID 0   BULK DATA FILE # 2

SUMS FUNCTIONAL TEST

TP3290640. LARGE ORIFICE OPEN. AFTER APPROX 2 HOURS OF PUMPING.

HOUSEKEEPING DATA   FILAMENT NUMBER 2

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	2	2	2	2	2	2	2	2	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	192	193	193	15.200
MINUS 15 VOLT	130	129	130	129	130	129	130	130	-15.010
ION PUMP VOLT	181	181	181	181	180	181	180	180	~~1.500~~
ION SOURCE TEMP	90	90	90	90	90	90	90	90	~~[illegible]~~
PRE-AMP TEMP	168	168	168	168	168	168	169	169	6.715
PLUS 5 VOLT	120	120	120	120	120	120	120	120	4.763
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	125	125	125	125	125	125	125	125	4.955
COLLECTOR CURRENT	106	106	106	105	105	106	106	105	4.191
ELECTRON ACC VOLT	189	190	189	189	190	189	189	190	7.572
ION ACC VOLT	39	39	39	39	39	39	39	39	1.489
ION PUMP ANALOG									0.0020
28 VOLT POWER SUP									28.370

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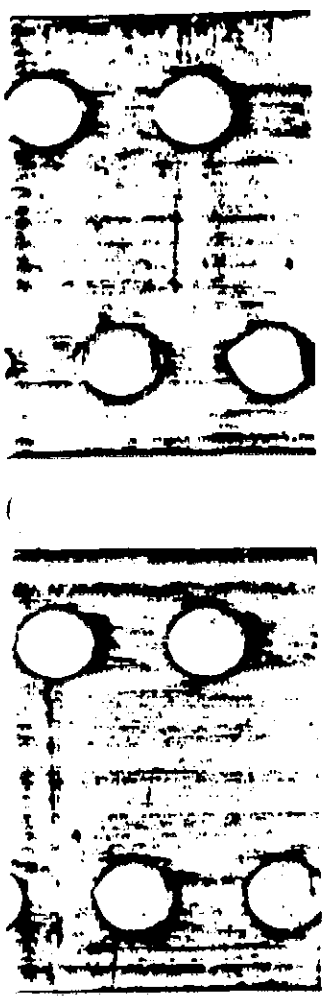

75 ELECTRON VOLTS IONIZATION ENERGY

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27	237	191	160	191		4		
28	145	160	175	206			4	
29	191	191	114	175				4
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31	23	8	8	8	4			
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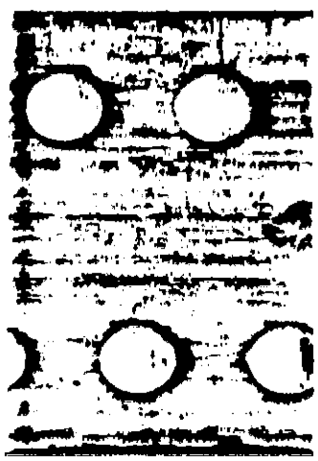

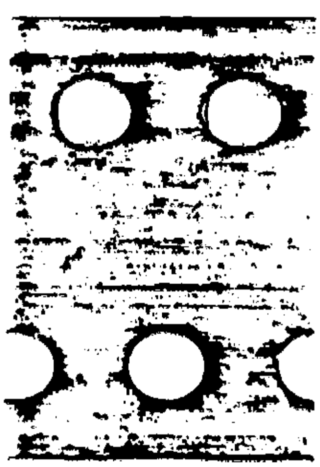

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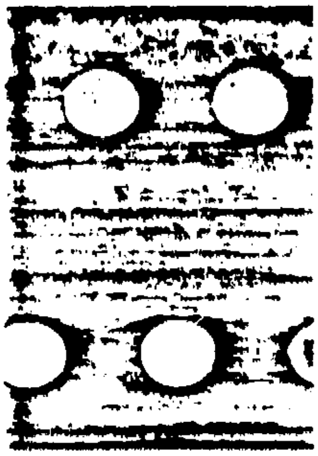

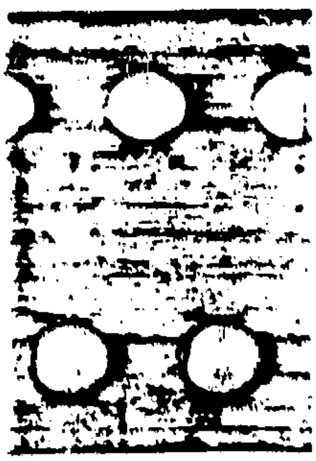

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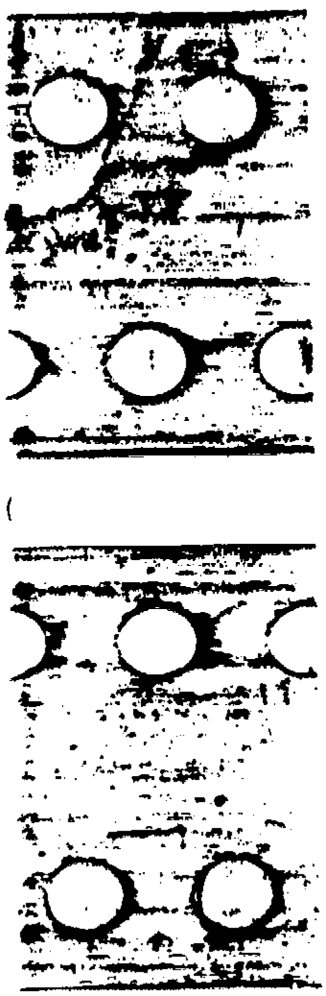

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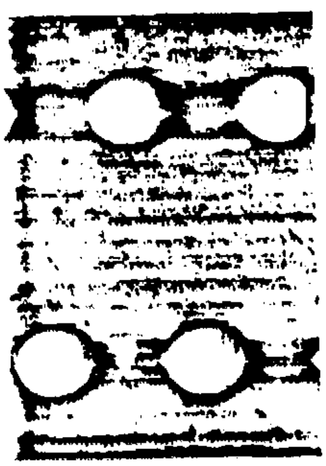

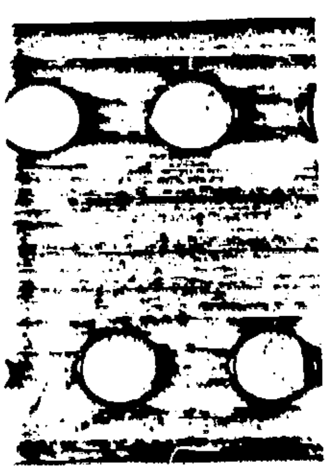

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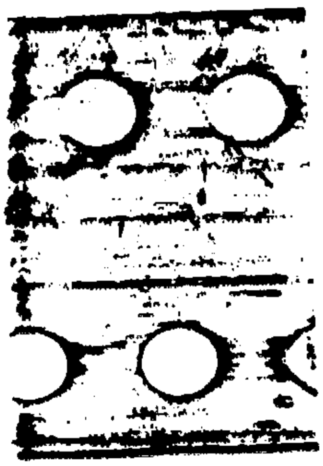

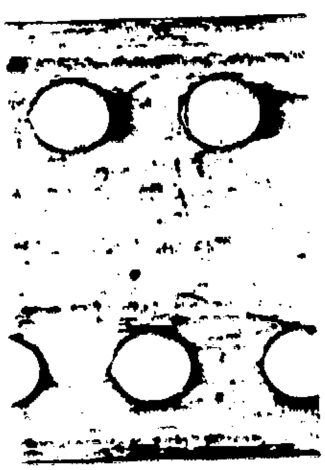

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341	8	8	8	8	302			
342	8	8	8	8		294		
343	8	8	8	8			294	
344	8	8	8	8				210
345	8	8	8	8				
346	8	8	8	8	80			
347	23	8	84	23		12		
348	8	8	38	8			4	
349	38	23	8	8				4
350	8	8	8	8				

As-Run
3/2/82

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6.3 COMPOSITION CHANGE CALIBRATION

The composition change calibration admits a gas to the SUMS inlet in a controlled pressure rise. At a given pressure point the gas is switched to another gas. The SUMS instrument and test configuration measures and records the time, pressure and a portion of the spectra so that the time response to the gas composition change can be determined.

Two sets of gasses are used during this procedure; oxygen switching to nitrogen and nitrogen switching to a nitrogen/oxygen mixture. For each set of gasses there are two pressure switch points; 1 Torr and 10 Torr. For each switch point there are two pressure profiles which are followed; the dynamic nominal profile and the dynamic +25% P/P profile. All these various combinations yield a total of 8 different pressure runs.

The data collected during this procedure consists of the time, the inlet pressure (as measured by the MRS baratron), the inlet pressure (as measured by the sums inlet pressure transducer), two of the twelve UAMS housekeeping words (status and ion source temperature), and peak data (ion currents) for the AMV 32, 28, 16 and 14 peaks.

Only six consecutive data points (single scan mode) are stored for each of the four peaks. These points are selected by finding the largest value for the peak and recording that value, the two values immediately before it and the three values immediately following it. (Note: by definition if the largest value occurs more than once, the later occurence is assumed to be "larger".

This procedure is run using filament number 1 only.

COMPOSITION CHANGE CALIBRATION
PRESSURE RUN SUMMARY

RUN TYPE	SWITCH POINT (approx.)	PROFILE	TIME (seconds) RANGE	SWITCH
#1	1 Torr	nominal	425-905	565
#2	1 Torr	+25%	440-755	565
#3	10 Torr	nominal	520-1100	900
#4	10 Torr	+25%	515-950	750

6.3.1 VACUUM SYSTEM SET UP

6.3.1.1 Verify or implement the following vacuum conditions: ✓

Calibration Station Ion Pump in Protect Mode. ✓

Valve V-15 Closed. ✓

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	Calibration Station Ion Pump On.	✓
	Liquid Helium Pump Valved Off.	✓
	Calibration Station Butterfly Valve Open.	✓
	Orifice Open.	✓
	Cryopump Cold.	✓
	Throttling Valve fully Open.	✓
	MKS Servo Valve Closed.	✓
6.3.1.2	Close valve V30 and open V31. Verify pressure on servo valve is less than 50 microns.	✓
6.3.1.3	Verify chamber pressure is less than 1.0 x 10^{-7} Torr.	6.0×10^{-8} Torr
6.3.1.4	Connect the oxygen tank to the "gas #1" fitting on the 4-way valve, via the flow meter. Reference figure 1, page 5.	✓
6.3.1.6	Open the valves on both tanks and set each regulator to approximately 5 psi.	✓
6.3.1.7	Set both flow meters so that the black ball is centered at 15 on the flow meter scale. Be certain that the flow meter is level. (A setting of 15 is equal to 39 cc/sec.)	✓
6.3.2	Test Equipment Turn-On and Preliminary Switch Settings	
6.3.2.1	UAMS Test Set	
6.3.2.1.1	Test set circuit breaker on.	✓
6.3.2.1.2	Instrument power circuit breaker on.	✓
6.3.2.1.3	Set power supplies to 28.0 volts.	✓
6.3.2.1.4	SUMS/UAMS switch is SUMS position.	✓
6.3.2.1.5	Channel select thumbwheels set to 13.	✓
6.3.2.1.6	Press load push button.	✓
6.3.2.1.7	Clock select switch to CLK EXT.	✓
6.3.2.1.8	Press frame select switch until CNT lights.	✓
6.3.2.1.9	Press RESET.	✓

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6.3.2.1.10 Press START/DECODE. ✓

6.3.2.2 <u>SUMS GSE Interface Unit</u> ✓

6.3.2.2.1 Inlet, Range, and Protection valve switches set to CLOSED. ✓

6.3.2.2.2 Control select switch set to GSE. ✓

6.3.2.2.3 Delay select switch set to SHORT. ✓

6.3.2.2.4 Set analog monitor rotary switch to position #9. (This provides a 2MΩ PCM type load.) ✓

6.3.2.2.5 Set interface power switches to ON. ✓

6.3.2.2.6 Set TEST SET/INTERNAL switch to TEST SET. ✓

6.3.2.2.7 Set VAC MAIN/ION PUMP switch to ION PUMP. ✓

6.3.2.2.8 Set sweep inhibit switch to NORMAL. ✓

6.3.2.3 <u>Fluke Data Logger</u> ✓

6.3.2.3.1 Turn power on. ✓

6.3.2.3.1 Program data logger to scan channels T11, T12, and T15. (See figure 1 for thermocouple locations.) ✓

6.3.2.4 <u>HP1610A Logic State Analyzer</u>

6.3.2.4.1 Connect pods 1 and 2 to the 16 bit parallel SUMS digital data lines. These lines are available inside the GSE Interface Unit. ✓

6.3.2.4.2 Connect the clock pod to the SUMS data strobe inside the GSE Interface Unit. ✓

6.3.2.4.3 Set analyzer power to ON. ✓

6.3.2.5 <u>Fluke 8520A Digital Multimeter</u> ✓

6.3.2.5.1 Verify multimeter is connected to MKS electronics. ✓

6.3.2.5.2 Set power switch to ON. ✓

6.3.2.6 <u>HP6942A Multiprogrammer</u>

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6.3.2.6.1 Verify multiprogrammer is connected to MKS electronics (D/A and digital output) and the inlet transducer 0-5V output inside the GSE Interface Unit (A/D).

6.3.2.6.2 Set power switch to ON.

6.3.2.7 <u>HP 85 Computer</u>

6.3.2.7.1 Verify the HP 85 is connected to the Logic State Analyzer, the Multiprogrammer and the Digital Multimeter via the IEEE-488 bus.

6.3.2.7.2 Set power switch to ON.

6.3.2.7.3 Insert SUMS programs tape.

6.3.2.8 <u>MKS Type 244A Valve Controller</u>

6.3.2.8.1 Set power switch to ON.

6.3.2.8.2 Set Phase Lead control to 5.0.

6.3.2.8.3 Set Gain control to 100%.

6.3.2.8.4 Set function rotary switch to CLOSED.

6.3.2.8.5 Set INT/EXT switch to EXT.

6.3.2.8.6 Set setpoint control to 10.00.

6.3.2.8.7 Set input switch to 10V.

6.3.2.9 <u>MKS 170M-27D Digital Display</u>

6.3.2.9.1 Set display units to TORR.

6.3.2.9.2 Set Head Range to MPLX.

6.3.2.9.3 Set sampling switch to AUTO.

6.3.2.10 <u>MKS 170M-6C Range Multiplier</u>

6.3.2.10.1 Set power switch to ON.

6.3.2.10.2 Set heater switch to OFF.

6.3.2.10.3 Set response switch to FAST.

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6.3.2.10.4 Set range switch to .01. ✓

6.3.2.11 MKS 170M-34C Head Selector

6.3.2.11.1 Verify CH.1 and CH.2 heaters have been on for a minimum of 4 hours. ✓

6.3.2.11.2 Set selector switch to CH.1. ✓

6.3.2.11.3 Set CH.1 head range switch to 1 Torr. ✓

6.3.2.11.4 Adjust CH.1 coarse/fine zero for 0.000 nominal. ✓

6.3.2.11.5 Set selector switch to CH.2. ✓

6.3.2.11.6 Set CH.2 head range switch to 100 Torr. ✓

6.3.2.11.7 Adjust CH.2 coarse fine zero for 0.000 nominal. ✓

6.3.2.12 Chart Recorder

6.3.2.12.1 Connect chart recorder across input to Fluke digital multimeter. ✓

6.3.2.12.2 Set power switch to ON. ✓

NOTE

The Chart Recorder is to be used during the running of this test to indicate to the operator how smoothly the pressure is changing between five second steps. The recorder sensitivity should be changed as necessary to maximize the deflection of the pen.

6.3.3 Instrument Turn-On and Warm-Up

6.3.3.1 Turn on the SUMS Ion Pump Power with the switch on the GSE I/F Unit. ✓

6.3.3.2 Wait one minute for UAMS ion pump to come on. ✓

6.3.3.3 From the ion pump current monitor, verify that the instrument internal pressure is less than 1×10^{-5} Torr. ✓

6.3.3.4 Using the switches on the GSE I/F Unit, open the protection and Inlet valves. Close the Range valve. ✓

6.3.3.5 Turn on the SUMS Instrument Power with the switch on the GSE I/F Unit. ✓

6.3.3.6 Wait two hours minimum for the instrument ion source to warm-up. on for 6 hours ✓

6.3.3.7 Using the 1610 logic analyser, verify the ion source temperature as recorded in the UAMS Housekeeping is at least 87 decimal. (Record value.) 90₁₀

6.3.3.8 Record thermocouple temperatures from Data Logger.

T11 72.7 °F

T12 72.5 °F

T15 77.0 °F

6.3.4 SUMS Background Spectra (Before Run)

6.3.4.1 Turn on the HP9830 calculator, printer, cassette memory and plotter. ✓

6.3.4.2 Place a marked data tape in the cassette memory and rewind it. ✓

6.3.4.3 Place the SUMS Functional test cassette tape in the calculator. ✓

6.3.4.4 Verify that the cryopump is still cold and that its pressure is less than 50 microns. ✓

6.3.4.5 Load and run file ϕ on the calculator. The program is interactive from this point. Continue with paragraph 6.3.5 when the calculator has finished. Record data tape information below.

SUMS Data Tape I.D.# 9

Bulk File #(1,2,3,or4) 1

✓

6.3.5 Conductance Setting

The calibration station throttling valve is set to a known conductance in the following steps. In this way there will always be a flow of gas out of the upper volume of the calibration station. (The part that

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the SUMS inlet is connected to.) This flow will insure that when the 4-way valve is switched to change gas composition, the gas in the upper volume will rapidly be replaced with the new gas.

6.3.5.1	Set in the 10 liter/sec orifice.	✓
6.3.5.2	Verify that the cryo pump is still cold.	✓
6.3.5.3	Close the SUMS inlet valve.	✓
6.3.5.4	Set the MKS baratron readout for 10 mili Torr full scale.	✓
6.3.5.5	Verify that oxygen is flowing through the Varian leak.	✓
6.3.5.6	Verify that the throttling valve is fully open.	✓
6.3.5.7	Using the Varian leak and watching the baratron readout, raise the pressure to .30 ±.02 x 10^{-3} Torr.	✓
6.3.5.8	Wait one minute, then record pressure.	.31x10^{-3} Torr
6.3.5.9	Leaving the Varian leak as it is, immediately close the throttling valve until the pressure increases to 6.0 ± 0.5 x10^{-3} Torr.	✓
6.3.5.10	Wait one minute and verify that the pressure is stable. Record pressure.	6.0x10^{-3} Torr
6.3.5.11	Remove the handle from the throttling valve. Do not move valve throughout the test. Conductance is now set to approximately 0.5 liters/sec.	✓
6.3.5.12	Close Varian leak valve. $\frac{10}{6.0/.31} = .52$ l/sec	✓

6.3.6 Final Preparations

6.3.6.1	Use the HP 85 to manually switch the 4-way valve to nitrogen.	✓
6.3.6.2	Verify MKS baratron pressure is less than 0.1 x 10^{-3} Torr.	✓
6.3.6.3	Open all three SUMS valves.	✓
6.3.6.4	Set valve control select switch on GSE I/F to "SUMS".	✓

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6.3.6.5 Slowly open Varian leak to raise pressure high enough to cause SUMS to automatically close the range valve. (approx. 5×10^{-3} Torr) closed at P ~ 10×10^{-3} Torr, ion pump current ~ 30 mV. ✓

6.3.6.6 Close Varian leak and again verify that pressure is less than 0.1×10^{-3} Torr. ✓

6.3.6.7 On the HP 85 load "COMPOS" program. ✓

6.3.6.8 Verify SUMS is running on filament #1. ✓

6.3.7 <u>Data Collection (O_2 switching to N_2)</u>

NOTE

For this test the pressure ramp is manually controlled by the operator using the Varian leak valve. The valve is used to obtain as smooth a curve as possible while staying close to the desired curve. The HP 85 display is used to indicate how close to the desired curve the pressure ramp is and the chart recorder shows how smooth it is.

6.3.7.1 Start the paper in the chart recorder. (Slow) ✓

6.3.7.2 Type run on the HP 85. The program is interactive through the collection of all data.

The HP 85 gives you a choice of four run types. Run each of the four until a good run is obtained for all. The data for the four runs will be stored on tape in files "COMP1", "COMP2", "COMP3" and "COMP4". ✓

6.3.7.3 Load the "3OXFER" program on the HP 85. Transfer the data from the four runs to the HP 9830. Record data tape information below:

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O_2 SWITCHING TO N_2

RUN TYPE	TAPE # (300 series)	BULK FILE #
#1	301	1
#2	301	2
#3	301	3
#4	301	4

ion currents before runs

	baratron P.	32 peak	28 peak
#1	—	—	—
#2	1.5×10^{-5} Torr	6.0×10^{-13} A	2.6×10^{-12} A
#3	$< 10^{-6}$ Torr	6.0×10^{-13} A	4.8×10^{-12} A
#4	$< 10^{-6}$ Torr	7.9×10^{-13} A	5.1×10^{-12} A

✓

6.3.8 Data Collection (N_2 Switching to N_2/O_2)

6.3.8.1 Remove the oxygen tank from the "gas #1" fitting on the 4-way valve. Replace this with the nitrogen tank, again via the flow meter. ✓

6.3.8.2 Connect the N_2/O_2 mixture to the "gas #2" fitting on the 4-way valve, via the flow meter. ✓

6.3.8.3 Open the valves on both tanks and set the regulators to 5 psi. ✓

6.3.8.4 Checking first to make sure the flow meters are level, set each so that the black ball is centered at 15. ✓

6.3.8.5 Load "COMPOS" program on the HP 85. ✓

6.3.8.6 Start the paper in the chart recorder. (Slow) ✓

6.3.8.7 Type run on the HP 85. Again run each of the four run types until four good ones are obtained. ✓

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6.3.8.8 Load the "30 XFER" program on the HP 85. Transfer the data from the four runs to the HP 9830. Record data tape information below:

N_2 SWITCHING TO N_2/O_2

RUN TYPE	TAPE # (300 series)	BULK FILE #
#1	301	5
#2	301	6
#3	302	1
#4	302	2

ion currents before runs

	baratron P.	32 peak	28 peak
#1	<10⁻⁶ T	6.0 x10⁻¹³ A	3.5 x10⁻¹² A
#2	<10⁻⁶ T	5.6 x10⁻¹³ A	3.3 x10⁻¹² A
#3	<10⁻⁶ T	6.5 x10⁻¹³ A	4.9 x10⁻¹² A
#4	<10⁻⁶ T	5.4 x 10⁻¹³ A	3.3 x10⁻¹² A

✓

6.3.9 SUMS Background Spectra (After Run)

6.3.9.1 Record the time (as read from the UAMS test set) at which the calibration station was pumped down following the last run. Pressure was 10 Torr. 20:40 Hrs.

6.3.9.2 Fully open the calibration station throttling valve. ✓

6.3.9.3 Verify that the chamber pressure is less than 1×10^{-6} Torr. 5×10^{-8} Torr

6.3.9.4 Load and run file Ø of the SUMS functional test tape on the HP 9830. Record data tape information below.

range valve was still closed.

SUMS Data Tape I.D.# 9

Bulk File #(1,2,3 or 4) 2

6.3.10 Instrument Turn-Off

6.3.10.1 Turn off SUMS ion pump and instrument power. ✓

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6.3.10.2 Turn on SUMS Vacuum Maintenance Power. ✓

6.3.10.3 Attach all data to this procedure, including chart recorder output tapes. ✓

END OF SUMS COMPOSITION CHANGE CALIBRATION

7.0 Procedure Variation Sheet

B.0 Hardware Discrepancy Sheet

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9.0 Sign-Off Sheet

The SUMS instrument has been successfully calibrated per this procedure.

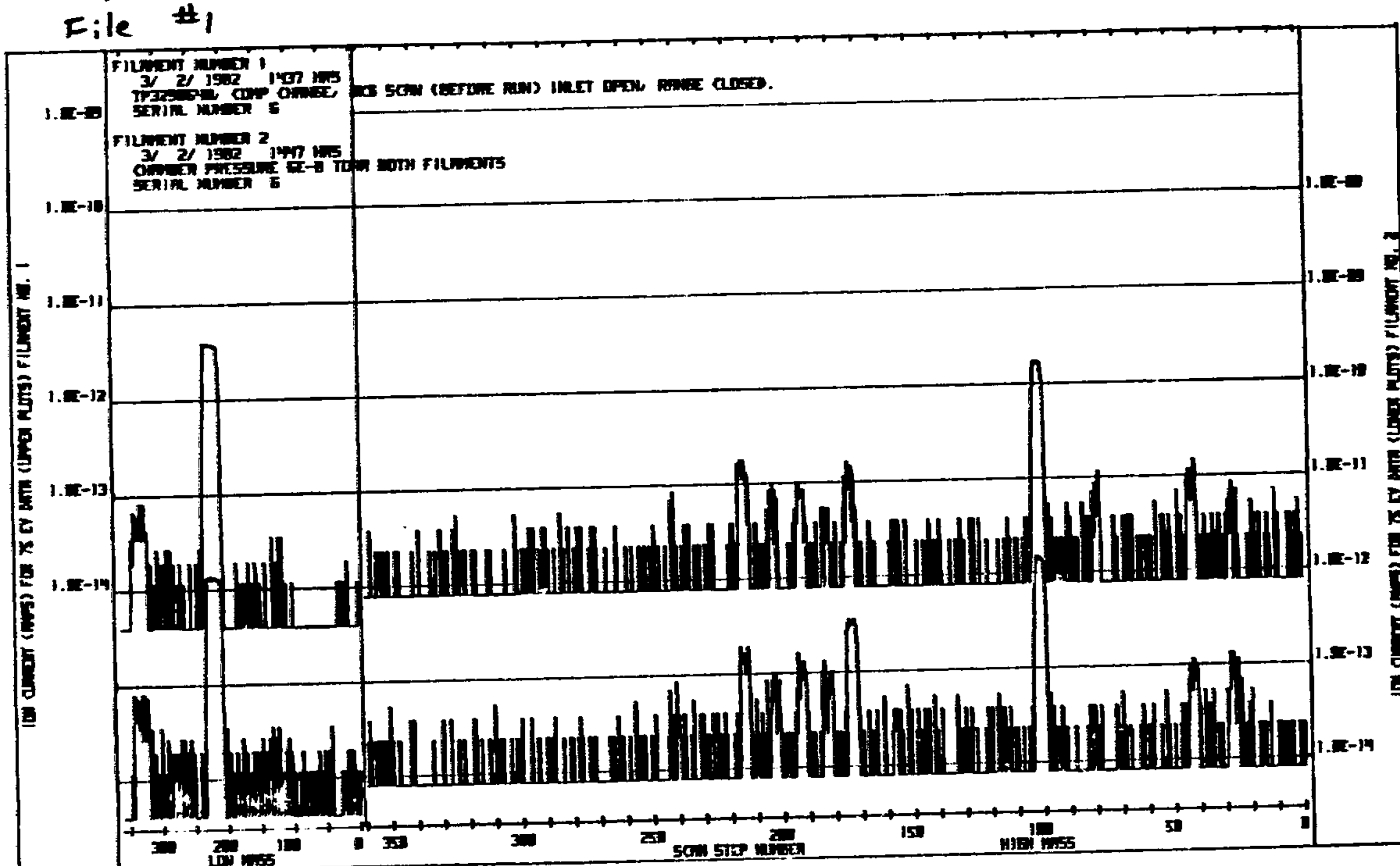
SUMS SN# 1

UAMS SN# 6

Greg Robertson — 3-4?-82

Test Conductor — Date

Tape #009
File #1



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3 2 1982 1437 HRS SUMS FUNCTIONAL TEST S/N 6

DATA TAPE ID 9 BULK DATA FILE # 1

SUMS FUNCTIONAL TEST

TP3290648, COMP CHANGE, BKG SCAN (BEFORE RUN) INLET OPEN, RANGE CLOSED.

ext. press (chamber 6×10^{-8} Torr)

HOUSEKEEPING DATA FILAMENT NUMBER 1

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	1	1	1	1	1	1	1	1	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~0.200~~
MINUS 15 VOLT	130	130	130	130	130	130	130	130	-15.090
ION PUMP VOLT	181	181	181	180	181	180	181	181	~~[illegible]~~
ION SOURCE TEMP	90	90	90	90	90	90	90	90	~~[illegible]~~
PRE-AMP TEMP	167	167	167	167	167	167	167	167	~~[illegible]~~
PLUS 5 VOLT	120	121	121	120	121	121	120	120	~~[illegible]~~
A D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	126	125	125	126	125	125	.26	126	~~[illegible]~~
COLLECTOR CURRENT	113	112	112	112	112	112	113	112	~~[illegible]~~
ELECTRON ACC VOLT	190	190	190	189	189	190	190	189	~~[illegible]~~
ION ACC VOLT	39	39	39	39	39	39	39	39	~~[illegible]~~
ION PUMP ANALOG								2.0 mV	0.0020
28 VOLT POWER SUP									~~0.070~~

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75 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
1	8	8	23	8	4			
2	8	8	23	53		12		
3	8	8	8	38			4	
4	8	8	8	8				4
5	23	8	8	38				
6	8	8	8	38	4			
7	8	8	8	8		4		
8	8	8	8	8			4	
9	8	8	8	8				4
10	8	8	38	8				
11	8	8	23	69	4			
12	8	8	8	8		4		
13	8	8	8	23			4	
14	23	8	8	38				4
15	8	8	23	8				
16	8	8	8	8	4			
17	8	8	38	38		19		
18	8	8	8	23			4	
19	8	8	8	38				4
20	8	8	38	53				
21	8	8	23	8	4			
22	8	8	23	8		12		
23	8	8	8	8			4	
24	8	8	8	8				4
25	8	8	8	23				
26	23	8	69	69	4			
27	23	23	23	8		12		
28	8	84	69	69			4	
29	53	38	23	53				4
30	23	8	38	8				
31	8	8	8	23	12			
32	8	8	8	8		12		
33	38	8	38	23			4	
34	8	23	8	8				4
35	8	23	8	38				
36	8	23	8	23	4			
37	8	8	23	8		4		
38	8	8	8	23			4	
39	38	8	23	8				4
40	8	8	8	23				
41	8	8	8	23	4			
42	53	38	130	145		4		
43	84	114	84	114			4	
44	53	99	99	114				4
45	99	84	99	84				
46	8	8	23	8	4			
47	8	8	8	8		4		
48	38	8	38	8			4	
49	8	8	69	8				4
50	8	8	8	8				

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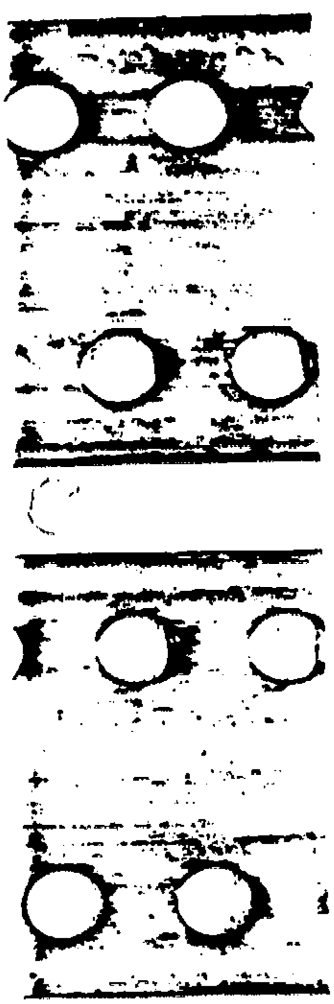

51	8	8	8	23	4			
52	8	8	38	23		4		
53	8	8	8	23			4	
54	8	8	23	38				4
55	8	8	38	8				
56	8	8	8	8	4			
57	8	8	8	53		4		
58	8	8	8	8			4	
59	8	8	8	23				4
60	8	23	8	8				
61	8	8	8	23	4			
62	8	8	8	8		4		
63	8	8	23	8			4	
64	8	8	8	23				4
65	8	8	8	8				
66	8	8	8	38	4			
67	8	8	38	38		4		
68	8	8	23	38			4	
69	8	8	8	8				4
70	8	38	8	8				
71	8	8	8	8	4			
72	8	8	8	23		4		
73	8	8	8	38			4	
74	38	8	8	8				4
75	8	8	8	8				
76	8	8	8	8	4			
77	8	8	8	8		4		
78	8	8	8	8			4	
79	53	53	114	69				4
80	38	53	84	84				
81	38	23	69	53	4			
82	69	8	38	38		4		
83	8	8	8	38			4	
84	8	8	8	38				4
85	8	8	8	53				
86	8	8	8	8	4			
87	8	8	8	23		4		
88	8	8	8	23			4	
89	8	8	8	23				4
90	8	8	38	8				
91	8	8	53	23	4			
92	8	8	8	23		4		
93	8	8	23	8			4	
94	8	8	23	8				4
95	8	8	23	23				
96	8	8	23	8	4			
97	8	23	8	38		4		
98	23	8	8	53			4	
99	8	8	8	8				4
100	130	725	877	1110				
101	1390	1630	1630	1690	4			
102	1630	1690	1690	1660		12		
103	1660	1690	1690	1630			4	
104	1420	877	694	496				4
105	221	38	23	8				
106	8	8	23	23	4			
107	38	8	38	8		4		
108	8	23	8	23			4	
109	8	8	8	8				4
110	8	8	8	23				

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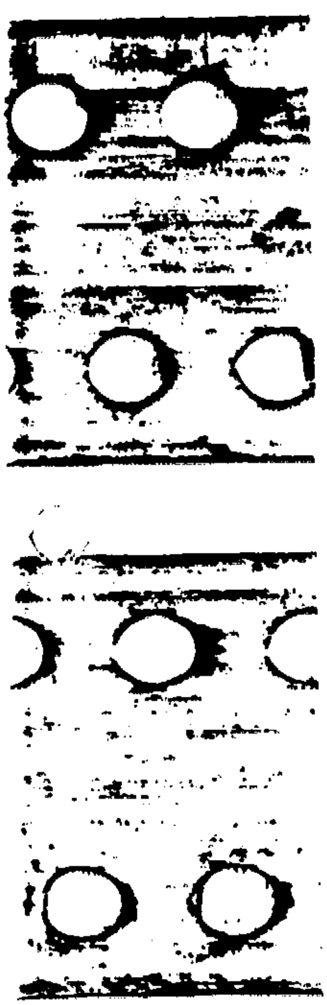

111	8	8	8	23	4			
112	8	8	8	8		12		
113	8	8	8	23			4	
114	8	8	38	8				4
115	8	8	8	23				
116	8	8	8	8	4			
117	8	8	8	8		35		
118	8	23	8	8			12	
119	8	8	8	8				4
120	8	8	8	8				
121	8	8	8	8	4			
122	8	8	23	8		35		
123	8	8	8	8			4	
124	8	8	8	8				4
125	8	8	38	8				
126	8	8	8	8	4			
127	8	8	38	8		19		
128	8	8	8	38			4	
129	8	8	8	8				4
130	8	8	8	8				
131	8	8	23	8	4			
132	8	8	8	38		35		
133	8	8	8	23			4	
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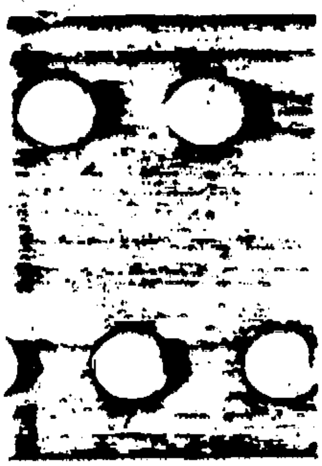

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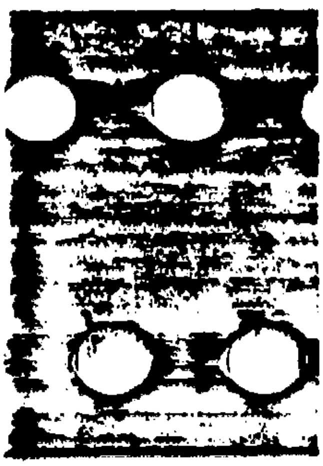

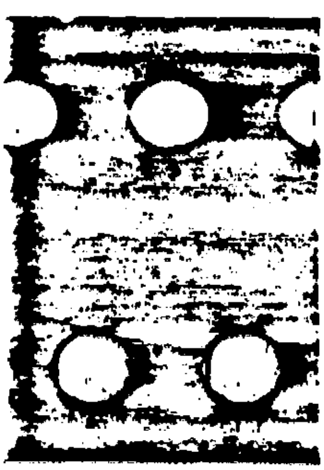

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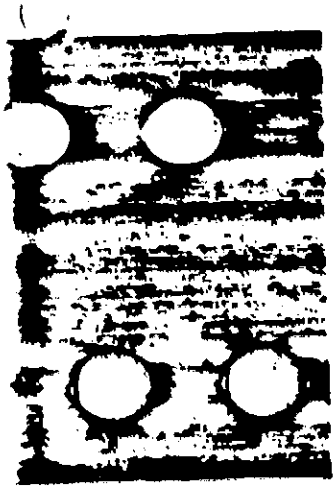

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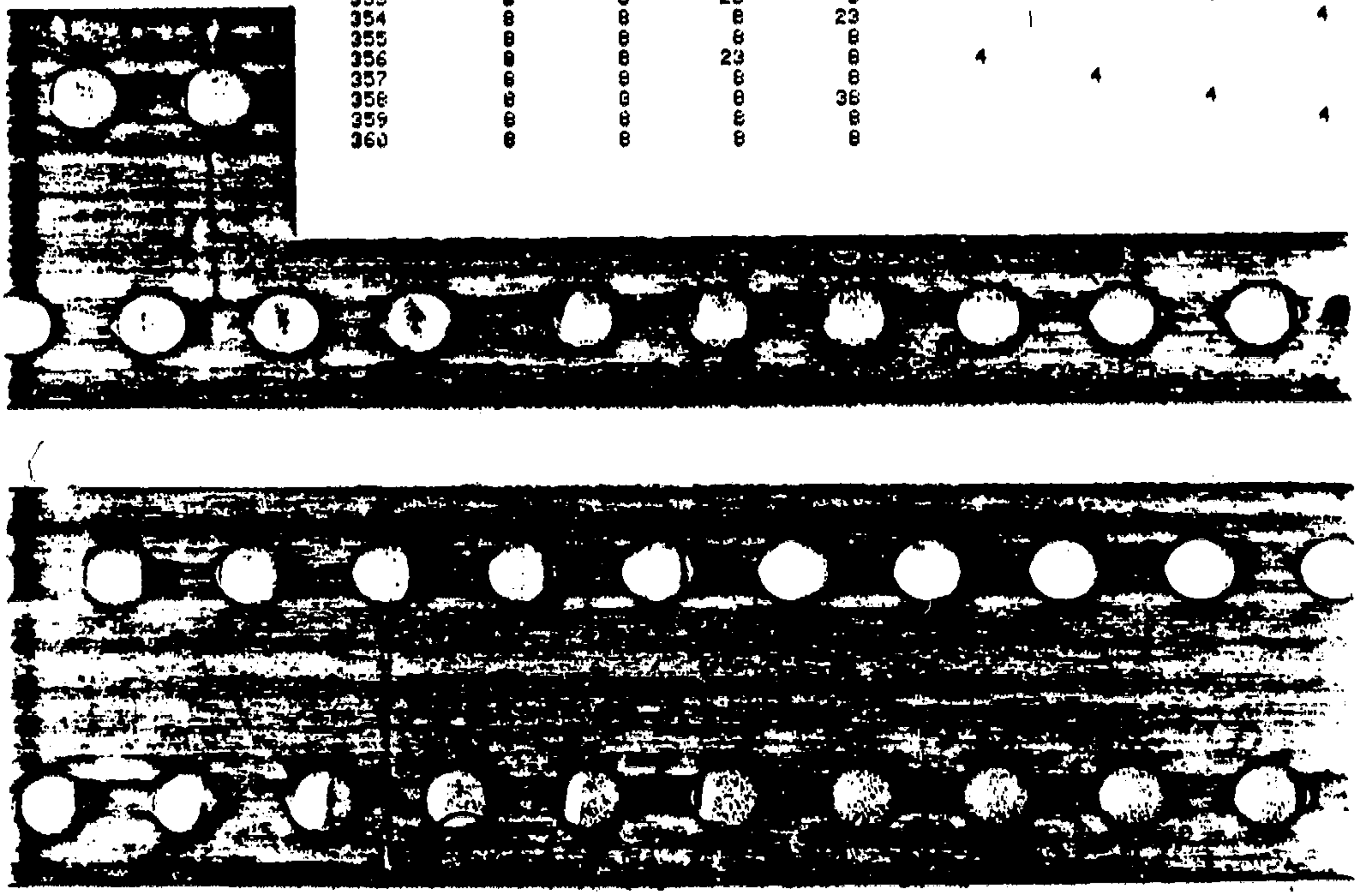

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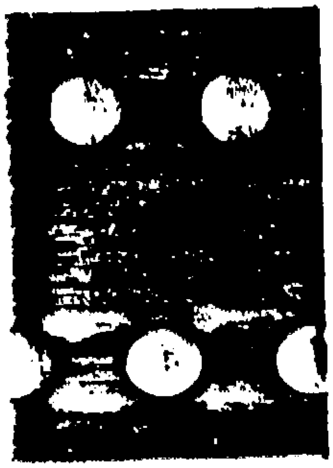

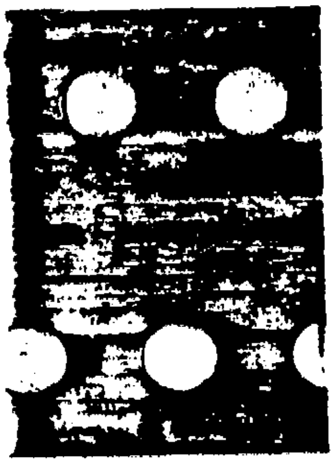

DATA TAPE ID 9 BULK DATA FILE # 1

SUMS FUNCTIONAL TEST

CHAMBER PRESSURE 6E-8 TORR BOTH FILAMENTS

HOUSEKEEPING DATA FILAMENT NUMBER 2

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	2	2	2	2	2	2	2	2	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~[illegible]~~
MINUS 15 VOLT	130	130	130	129	130	130	130	130	-15.000
ION PUMP VOLT	181	181	181	180	181	181	181	181	~~[illegible]~~
ION SOURCE TEMP	90	90	89	90	90	89	90	89	~~[illegible]~~
PRE-AMP TEMP	167	167	167	167	167	167	167	167	~~[illegible]~~
PLUS 5 VOLT	120	120	120	120	120	120	120	120	~~[illegible]~~
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	125	125	125	125	125	125	125	125	~~[illegible]~~
COLLECTOR CURRENT	106	105	106	106	105	105	105	106	~~[illegible]~~
ELECTRON ACC VOLT	189	190	189	189	190	190	190	189	~~[illegible]~~
ION ACC VOLT	39	39	39	39	39	39	39	39	~~[illegible]~~
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28 VOLT POWER SUP									~~[illegible]~~

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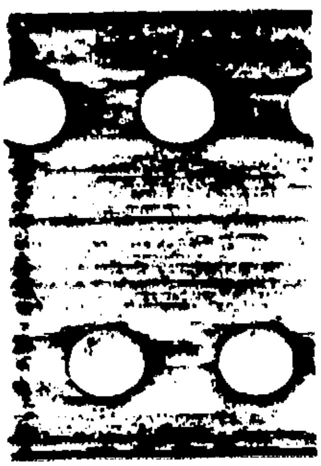

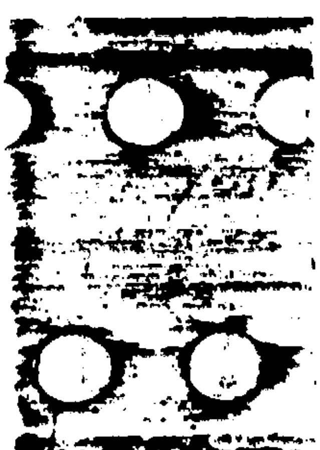

75 ELECTRON VOLTS IONIZATION ENERGY

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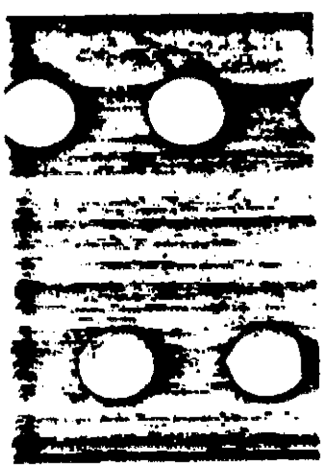

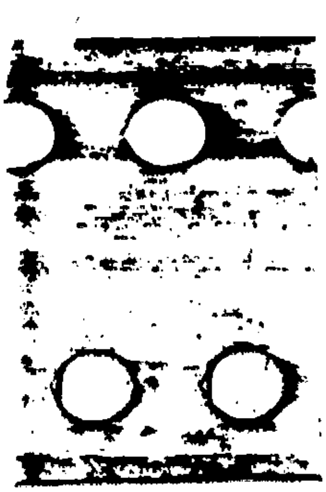

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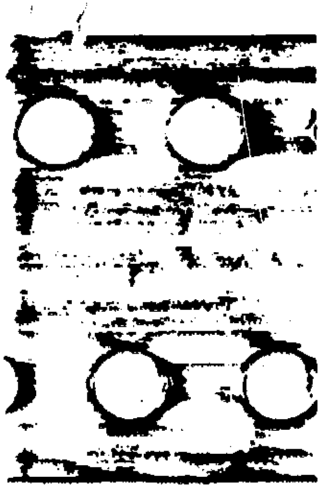

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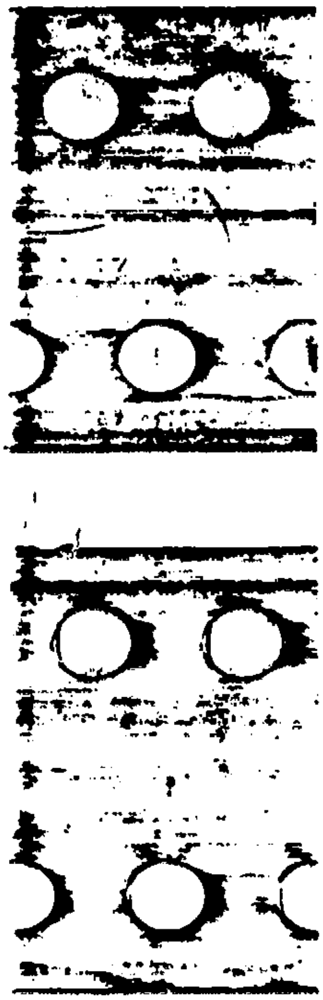

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204	23	99	53	99				4
205	53	53	84	53				
206	38	38	8	8	4			
207	38	8	84	8		4		
208	23	23	8	8			19	
209	8	8	38	8				378
210	8	8	8	8				
211	23	23	23	53	925			
212	8	8	8	8		1175		
213	8	8	23	8			1295	
214	84	114	191	130				1295
215	130	160	160	99				
216	160	130	130	145	1295			
217	145	160	191	114		1330		
218	8	23	8	8			1360	
219	38	8	8	8				1330
220	23	8	8	8				
221	8	8	8	8	1330			
222	8	8	8	8		1295		
223	8	23	8	38			1360	
224	8	8	8	8				1330
225	8	23	8	8				
226	23	8	8	38	1330			
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229	8	8	8	8				1330
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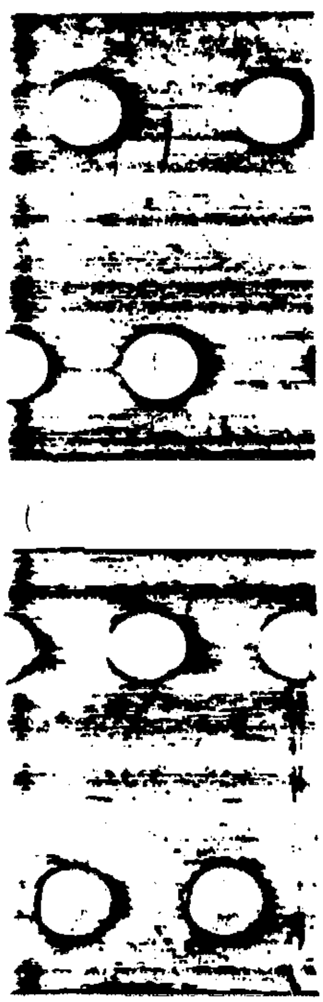

231	8	23	8	8	1330			
232	8	38	8	8		1055		
233	38	23	8	8			570	
234	8	8	8	8				195
235	8	8	8	53				
236	8	8	8	23	50			
237	8	8	8	8		4		
238	8	8	8	8			12	
239	38	8	8	38				4
240	8	8	8	8				
241	23	23	38	23	4			
242	23	84	8	23		4		
243	8	38	8	8			19	
244	8	8	8	69				12
245	23	23	8	8				
246	8	8	8	8	4			
247	8	8	8	8		4		
248	8	8	8	8			4	
249	8	8	8	8				4
250	8	38	8	8				
251	8	8	8	23	4			
252	8	8	8	8		4		
253	8	8	8	8			12	
254	8	8	23	23				19
255	8	23	8	8				
256	8	23	23	8	4			
257	8	8	8	53		4		
258	38	8	8	8			27	
259	8	8	8	8				19
260	8	23	8	8				
261	8	8	8	8	4			
262	8	8	8	23		4		
263	8	8	8	8			19	
264	8	8	38	8				19
265	8	8	8	8				
266	8	23	8	8	4			
267	8	8	23	23		4		
268	8	8	8	8			19	
269	8	8	8	8				27
270	8	8	8	8				
271	8	8	8	8	4			
272	8	8	8	8		4		
273	8	23	23	8			27	
274	8	8	8	8				4
275	23	8	23	8				
276	8	8	8	8	4			
277	8	8	8	8		4		
278	8	23	8	8			19	
279	38	8	8	23				12
280	8	8	8	8				
281	8	8	8	8	4			
282	23	8	8	23		4		
283	8	8	8	8			19	
284	8	8	8	8				19
285	8	8	23	8				
286	8	8	8	8	12			
287	8	8	8	8		4		
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289	8	8	8	23				12
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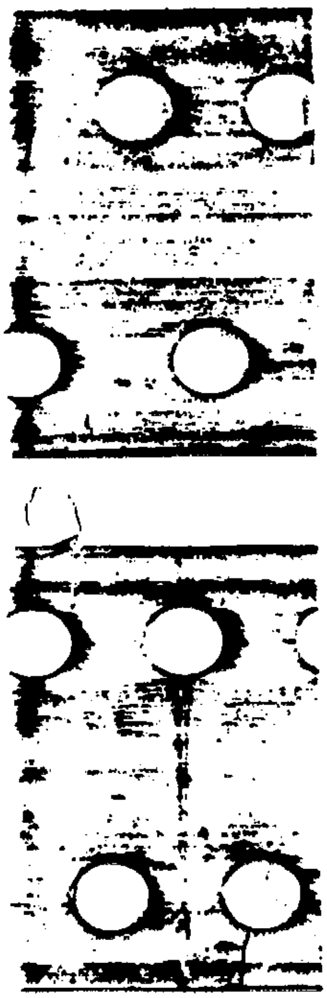

291	23	8	8	23	4			
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293	8	8	8	8			27	
294	8	8	8	23				19
295	8	23	8	8				
296	8	8	8	8	4			
297	8	8	38	23		4		
298	8	8	8	8			12	
299	8	8	8	8				12
300	8	8	8	8				
301	8	38	8	8	4			
302	8	23	23	8		4		
303	8	8	23	8			35	
304	8	8	8	8				12
305	8	8	23	8				
306	8	8	8	8	4			
307	8	8	8	8		4		
308	8	8	23	8			12	
309	8	23	8	8				12
310	8	8	23	8				
311	8	8	53	23	4			
312	8	8	8	8		4		
313	8	8	23	23			19	
314	8	8	8	8				12
315	8	8	8	8				
316	8	8	8	23	4			
317	8	8	8	8		4		
318	8	8	8	23			35	
319	8	38	8	38				19
320	8	8	8	8				
321	8	8	8	8	4			
322	8	8	8	8		4		
323	8	8	23	8			65	
324	8	8	8	8				73
325	8	8	23	8				
326	8	8	8	8	50			
327	8	8	8	8		27		
328	8	8	38	8			73	
329	8	8	8	8				80
330	8	8	8	8				
331	8	8	38	23	80			
332	8	8	8	8		27		
333	8	8	8	8			65	
334	8	8	8	8				65
335	8	8	23	8				
336	8	8	8	8	57			
337	8	8	8	8		35		
338	8	8	8	8			65	
339	8	8	8	8				73
340	8	8	8	8				
341	8	8	8	8	73			
342	8	8	8	38		42		
343	8	8	8	8			57	
344	38	8	8	8				80
345	8	8	8	8				
346	8	8	8	8	27			
347	8	8	8	8		4		
348	8	23	8	23			12	
349	8	8	8	8				12
350	8	8	8	23				

351	8	8	8	53	4			
352	8	23	8	8		4		
353	23	8	23	8			4	
354	8	8	8	23				4
355	8	8	23	8				
356	8	23	23	8	4			
357	8	8	23	8		4		
358	8	8	8	8			4	
359	8	23	8	38				4
360	8	23	8	8				

SUM. COMP CHANGE CAL DATA. RUN TYPE #1, O2==>N2, TAPE #301,BULK FILE #1

TIME (SEC)	BARATRON PRESSURE (TORR)	AMU 32 ($ BIT)	AMU 28 ($ BIT)	AMU 16 ($ BIT)	AMU 14 ($ BIT)
425.0	0.028197	17	103	6	13
430.1	0.031556	16	104	7	12
435.3	0.039504	18	104	4	13
445.0	0.046640	18	103	5	11
449.8	0.043625	21	103	5	10
455.1	0.058579	21	103	7	13
460.1	0.070416	22	103	8	12
465.0	0.066071	24	103	6	11
469.9	0.077958	32	103	12	14
475.0	0.063562	31	103	8	12
480.1	0.103468	35	103	7	12
485.1	0.115640	38	103	8	11
490.1	0.161000	44	102	7	9
495.1	0.169130	51	102	10	10
500.1	0.198870	63	102	8	12
504.9	0.211430	71	102	12	11
509.9	0.262460	76	103	13	14
515.0	0.287340	84	103	13	12
519.9	0.315450	96	103	17	13
525.0	0.381460	100	104	16	11
530.1	0.414870	107	104	20	10
534.9	0.475620	117	105	20	13
539.9	0.537390	124	106	26	12
545.1	0.620760	133	106	28	12
549.9	0.649010	138	107	32	12
555.0	0.858410	147	108	38	14
559.9	0.859400	156	109	48	16
565.0	0.993500	165	110	52	12
	*** COMPOSITION SWITCH ***				
569.9	1.075500	169	112	58	15
575.0	1.231900	167	162	50	58
579.9	1.374400	159	197	47	89
585.0	1.574700	147	216	41	104
589.9	1.714300	138	228	37	115
594.8	1.973100	131	236	31	125
599.9	2.202500	122	242	30	131
605.0	2.487000	110	251	27	137
610.0	2.598300	105	259	23	143
615.0	2.865500	98	264	23	147
619.9	3.108400	98	267	24	151
624.9	3.362300	91	270	22	157
629.9	3.662600	88	275	22	162
635.0	3.852700	82	280	22	165
639.9	4.165000	79	287	23	167
644.8	4.389600	76	288	20	169
650.0	4.569300	74	290	23	172
654.9	4.776300	73	291	21	173
659.8	4.853500	74	293	21	175
664.9	5.112700	76	294	20	177
669.9	5.235800	76	296	20	179
674.9	5.377600	78	297	22	180
679.9	5.414800	80	298	23	181
685.0	5.557500	84	299	26	182
689.8	5.534500	90	300	24	184
694.8	5.633100	95	300	25	184
699.8	5.712500	103	301	27	184
705.0	5.859000	106	301	29	185
709.8	5.924600	107	302	27	186
714.8	5.975100	106	302	28	187
719.8	6.035100	111	303	31	187
724.7	6.082200	115	303	32	187
729.8	6.319100	119	304	32	188
734.7	6.324300	119	304	31	189
739.8	6.390100	114	306	31	190
744.9	6.486200	119	306	31	191
749.8	6.557500	121	307	32	191
754.7	6.701300	122	307	33	192
759.7	6.789000	122	308	31	193
764.8	6.874700	119	309	30	193
769.7	6.959900	119	310	31	194
774.7	7.048200	119	310	32	194
779.9	7.142800	120	311	31	195

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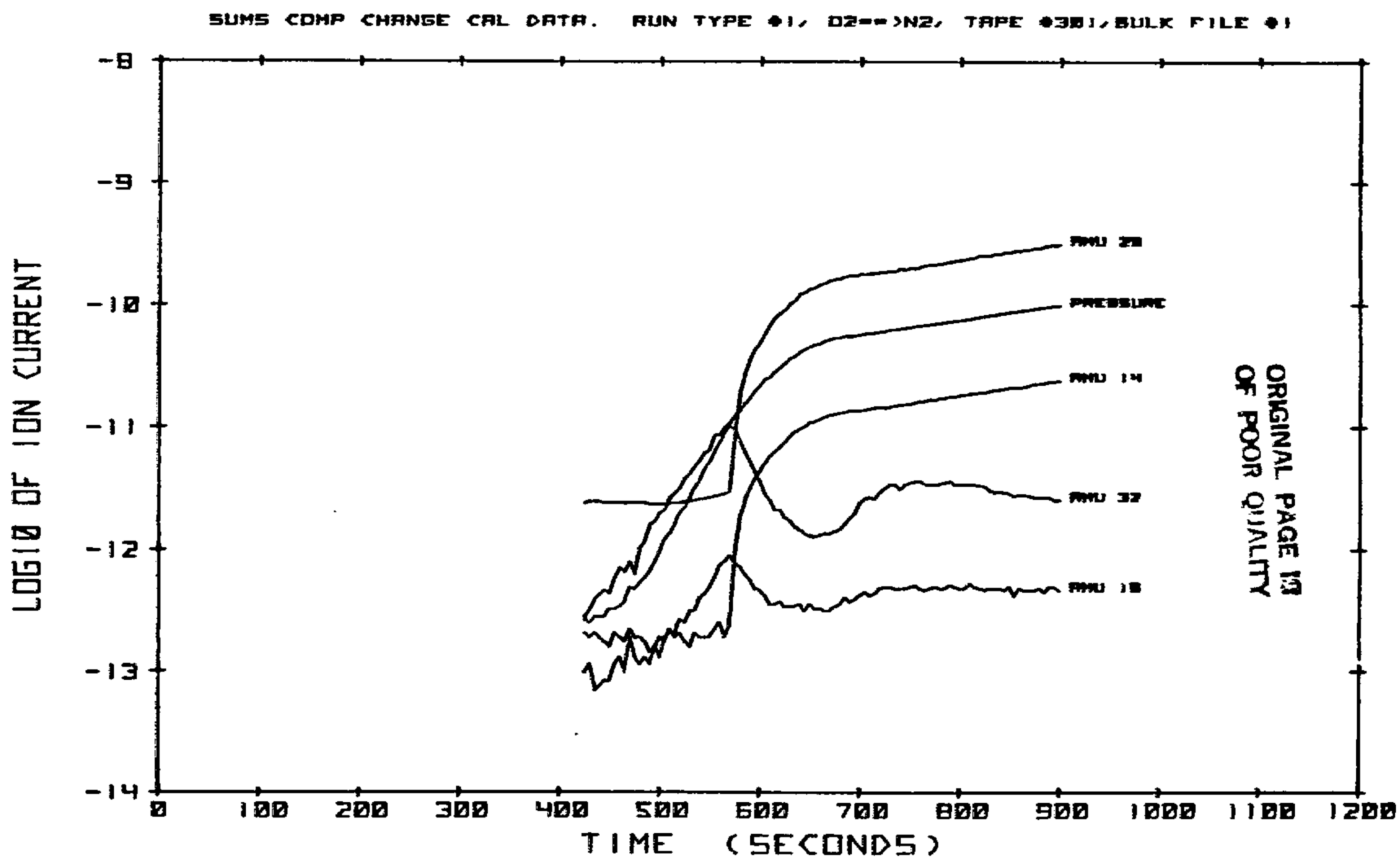
784.6	7.249300	121	312	31	195
789.7	7.357500	122	313	33	196
794.9	7.459500	119	314	32	196
799.8	7.557900	119	315	31	197
804.7	7.653000	119	316	31	197
809.7	7.756300	119	317	34	198
814.7	7.860900	119	317	32	198
819.8	8.019900	118	320	31	199
824.8	8.154000	117	320	30	199
829.9	8.265000	113	320	31	200
834.8	8.374000	111	321	31	201
839.7	8.491000	112	321	31	201
844.6	8.605000	111	322	30	202
849.7	8.725000	110	322	32	203
854.6	8.841000	108	323	27	203
859.6	8.960000	109	323	31	203
864.7	9.082000	109	324	30	204
869.7	9.207000	108	324	30	205
874.6	9.334000	107	325	30	206
879.7	9.449000	107	325	31	206
884.6	9.574000	107	326	29	207
889.8	9.700000	107	327	32	208
894.8	9.834000	105	327	32	208
899.7	9.924000	105	328	30	209
904.7	10.052000	105	328	31	209



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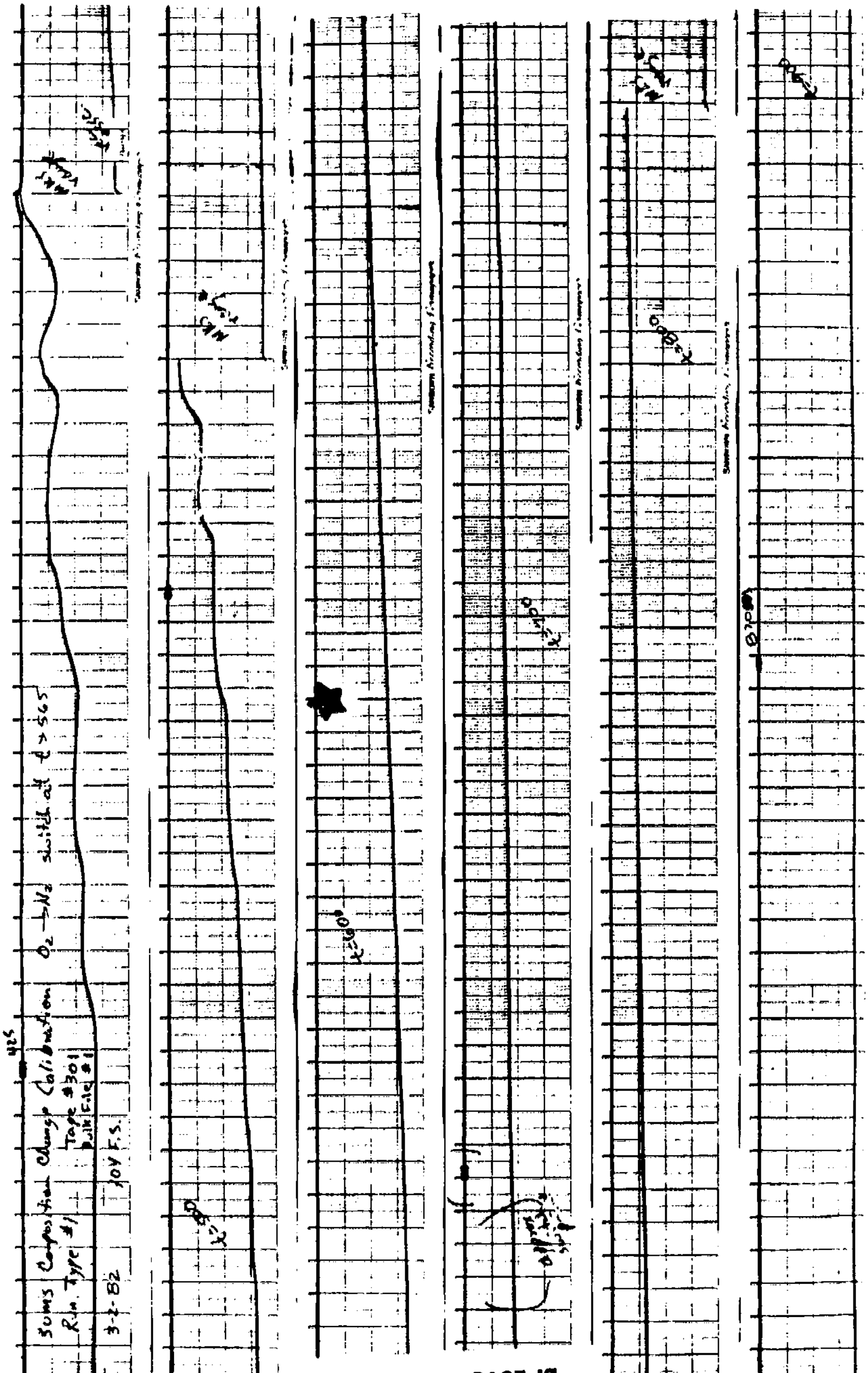

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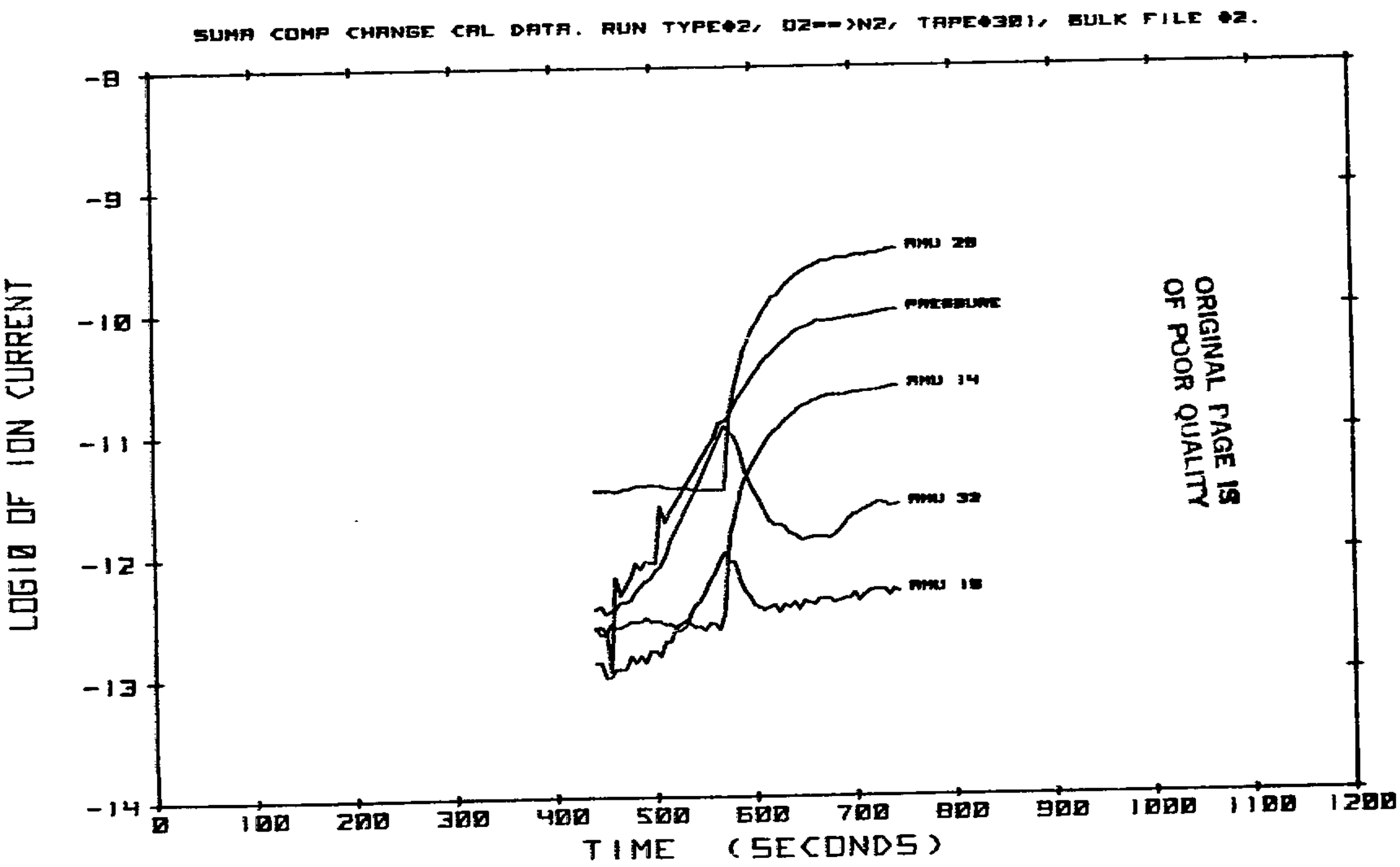
SUMA COMP CHANGE CAL DATA. RUN TYPE#2, O2==>N2, TAPE#301, BULK FILE #2.

TIME (SEC)	BARATRON PRESSURE (TORR)	AMU 32	AMU 28	AMU 16	AMU 14
		(9 BIT)			
440.0	0.024586	23	118	8	16
445.0	0.025435	24	118	8	14
450.2	0.023356	21	118	6	14
455.0	0.011084	22	118	6	17
460.0	0.064315	23	117	7	16
465.1	0.046336	26	118	7	16
469.9	0.053901	26	120	7	17
475.0	0.064276	27	120	9	18
479.9	0.093642	32	122	8	18
484.9	0.075810	35	123	9	18
489.9	0.086440	39	123	8	19
494.9	0.086080	41	124	10	18
500.1	0.084700	48	123	10	18
504.9	0.243390	51	123	9	18
510.0	0.182520	61	121	12	17
515.0	0.221720	72	120	12	17
520.0	0.252660	81	120	15	16
524.9	0.297720	91	120	15	17
529.9	0.351790	100	120	16	18
535.0	0.410310	107	119	20	17
539.9	0.471430	116	118	24	16
545.0	0.564750	127	118	26	16
550.0	0.659710	135	118	31	15
554.8	0.766690	143	118	38	17
559.8	0.872300	155	118	44	17
565.0	1.173200	164	118	55	15
	*** COMPOSITION SWITCH ***				
570.0	1.217200	173	118	65	22
574.9	1.300900	168	180	56	75
579.9	1.627000	165	203	55	94
584.9	1.897000	154	223	40	111
589.8	2.172500	136	237	32	127
595.0	2.481300	127	248	29	134
599.8	2.879300	116	259	24	141
604.8	3.274400	108	264	23	149
609.8	3.782100	100	272	22	158
615.0	4.127600	92	279	23	164
619.9	4.472800	88	288	24	168
624.8	4.959900	88	289	21	171
629.8	5.409700	86	293	24	176
634.8	5.857800	80	297	23	180
639.8	6.366300	78	301	25	185
644.7	6.754600	75	305	22	190
649.8	7.010900	73	308	26	193
654.7	7.264800	74	311	25	194
659.8	7.596900	76	313	24	196
664.9	8.096500	76	316	27	197
669.9	8.007000	76	319	27	199
674.8	8.063000	75	319	27	200
679.7	8.153000	77	320	25	200
684.8	8.232000	81	321	26	200
689.8	8.362000	87	321	27	200
694.9	8.530000	94	321	27	201
699.8	8.625000	97	322	30	202
704.8	8.740000	98	323	26	202
709.7	8.839000	100	323	29	203
714.7	8.920000	102	323	31	203
719.7	9.112000	104	324	32	204
724.8	9.316000	106	324	32	204
729.8	9.514000	105	325	32	205
734.7	9.614000	103	326	29	206
739.8	9.698000	103	327	32	207
744.7	9.779000	104	327	31	207
749.7	9.947000	107	328	32	208
754.6	10.101000	109	328	36	208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-8
-9
-10
-11
-12
-13
-14
LOG10 OF ION CURRENT
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
TIME (SECONDS)
AMU 28
PRESSURE
AMU 14
AMU 32
AMU 18

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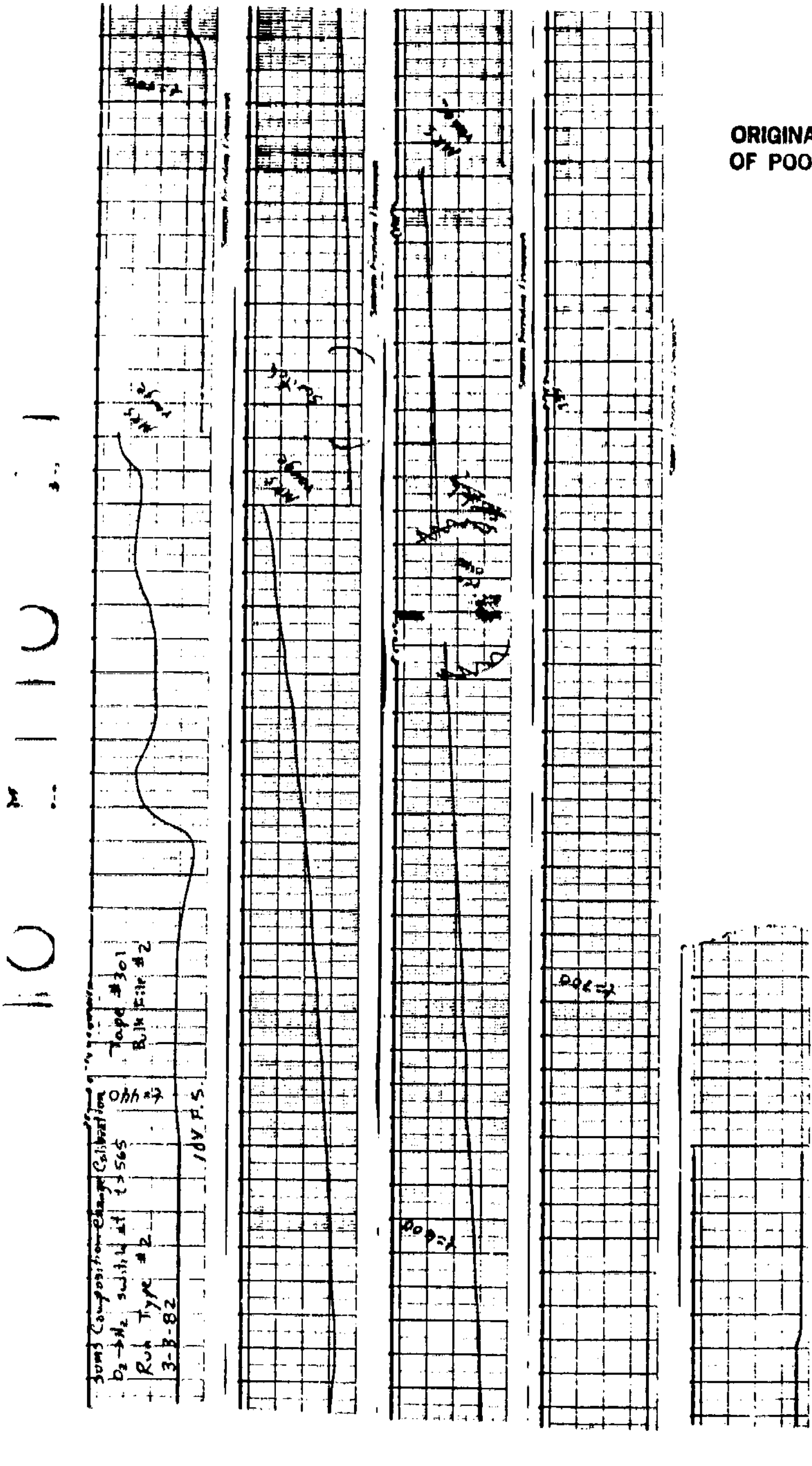

SUMS COMP CHANGE CAL DATA. RUN TYPE #3, O2==>N2, TAPE #901, FILE #3.

TIME (SEC)	BARATRON PRESSURE (TORR)	AMU 32	AMU 28	AMU 16	AMU 14
		(9 BIT)			
520.0	0.320620	123	140	25	19
525.0	0.322240	129	142	27	21
530.3	0.324130	132	143	27	22
535.4	0.326220	135	144	31	23
540.2	0.534600	137	145	31	21
545.2	0.594160	141	145	34	22
550.2	0.670320	151	145	39	22
555.2	0.750030	162	145	47	23
560.1	0.865040	167	146	53	22
565.2	0.896000	175	148	63	25
570.3	1.090100	182	150	66	24
575.3	1.226800	189	152	71	25
580.1	1.374800	196	154	78	29
585.2	1.540900	202	158	85	31
590.1	1.760700	208	162	93	30
595.2	1.955500	216	163	100	31
600.1	2.143400	223	165	104	33
605.2	2.342100	228	166	109	37
610.1	2.635700	233	170	114	37
615.1	2.937200	238	172	120	39
620.2	3.126300	245	173	127	41
625.1	3.496700	249	175	130	40
630.1	3.759900	255	177	135	42
635.2	3.873600	262	179	138	43
640.3	4.105700	263	181	140	46
645.1	4.380000	265	184	143	47
650.1	4.565700	268	185	146	50
655.1	4.738500	271	187	149	50
660.	4.850000	272	188	151	51
665.1	5.186100	274	190	153	54
670.2	5.191800	277	190	157	54
675.1	5.334100	279	190	158	54
680.2	5.400700	280	190	159	53
685.2	5.479300	282	191	161	55
690.0	5.552700	282	193	162	59
695.1	5.626500	283	193	162	57
700.0	5.718600	287	193	162	59
705.1	5.794300	288	194	163	59
710.0	5.904400	288	195	164	59
715.1	5.991200	288	196	164	62
720.2	6.074600	289	196	165	63
725.2	6.131700	289	197	166	64
730.0	6.181100	290	197	167	64
735.1	6.318100	290	198	167	65
740.0	6.408700	291	198	167	66
745.1	6.510800	291	199	168	66
750.1	6.592400	292	200	169	67
755.0	6.688200	293	200	169	67
760.2	6.776100	293	200	169	68
765.0	6.854800	294	201	170	68
770.1	6.961600	294	202	171	69
775.1	7.061600	295	202	172	69
780.0	7.140400	295	202	172	69
785.1	7.294600	296	203	173	70
790.0	7.349000	296	204	174	70
795.0	7.423100	297	204	175	70
799.9	7.566500	297	205	174	70
805.0	7.657800	298	205	175	72
810.0	7.744800	299	206	176	72
814.9	7.846400	299	206	177	71
820.0	7.9[illegible]00	300	207	177	71
824.8	8.1[illegible]300	301	208	178	73
829.9	8.[illegible]7000	302	209	180	74
835.0	8.[illegible]7000	302	209	180	74
839.9	8.412000	303	209	180	73
845.0	8.546000	304	210	181	74
849.9	8.634000	304	211	182	75
855.0	8.748000	305	211	182	75
859.9	8.848000	305	211	183	75
865.0	9.023000	306	211	184	76
870.0	9.168000	307	211	185	76
874.9	9.304000	308	211	186	76
879.9	9.440000	309	211	186	75

885.1	9.583000	310	212	187	77
889.9	9.691000	310	213	189	77
894.9	9.814000	311	213	189	77
899.9	10.228000	311	213	189	76
*** COMPOSITION SWITCH ***					
905.0	10.305000	312	214	191	76
909.9	10.427000	315	216	193	79
914.9	10.554000	315	221	193	88
920.0	10.648000	315	231	191	103
924.9	10.772000	314	241	191	113
929.9	10.896000	313	253	190	125
934.9	11.010000	311	262	188	133
9[illegible]	11.145000	310	269	186	140
9[illegible]	11.283000	309	275	185	146
9[illegible]	11.420000	308	282	184	153
954.9	11.564000	306	288	182	159
959.8	11.697000	305	292	180	163
964.9	11.884000	304	295	180	167
969.8	12.082000	302	298	179	171
974.8	12.270000	301	302	176	175
979.9	12.447000	299	306	174	180
984.8	12.612000	297	311	172	184
989.9	12.790000	296	315	172	188
994.9	12.968000	295	320	170	191
999.8	13.152000	294	321	169	194
1004.8	13.356000	293	322	168	195
1009.9	13.541000	292	324	167	197
1014.8	13.722000	291	325	166	199
1019.9	13.893000	290	327	164	200
1024.8	14.058000	289	329	164	202
1029.9	14.254000	288	330	164	203
1034.8	14.418000	288	330	163	204
1039.8	14.639000	288	332	162	206
1044.9	14.853000	284	334	161	207
1049.8	15.078000	282	335	159	209
1054.7	15.317000	281	336	158	210
1059.8	15.565000	278	338	156	212
1064.9	15.776000	277	340	154	214
1069.8	15.997000	275	341	153	216
1074.7	16.201000	273	342	151	217
1079.8	16.422000	272	343	149	219
1084.7	16.660000	271	345	148	220
1089.8	16.900000	270	346	148	221

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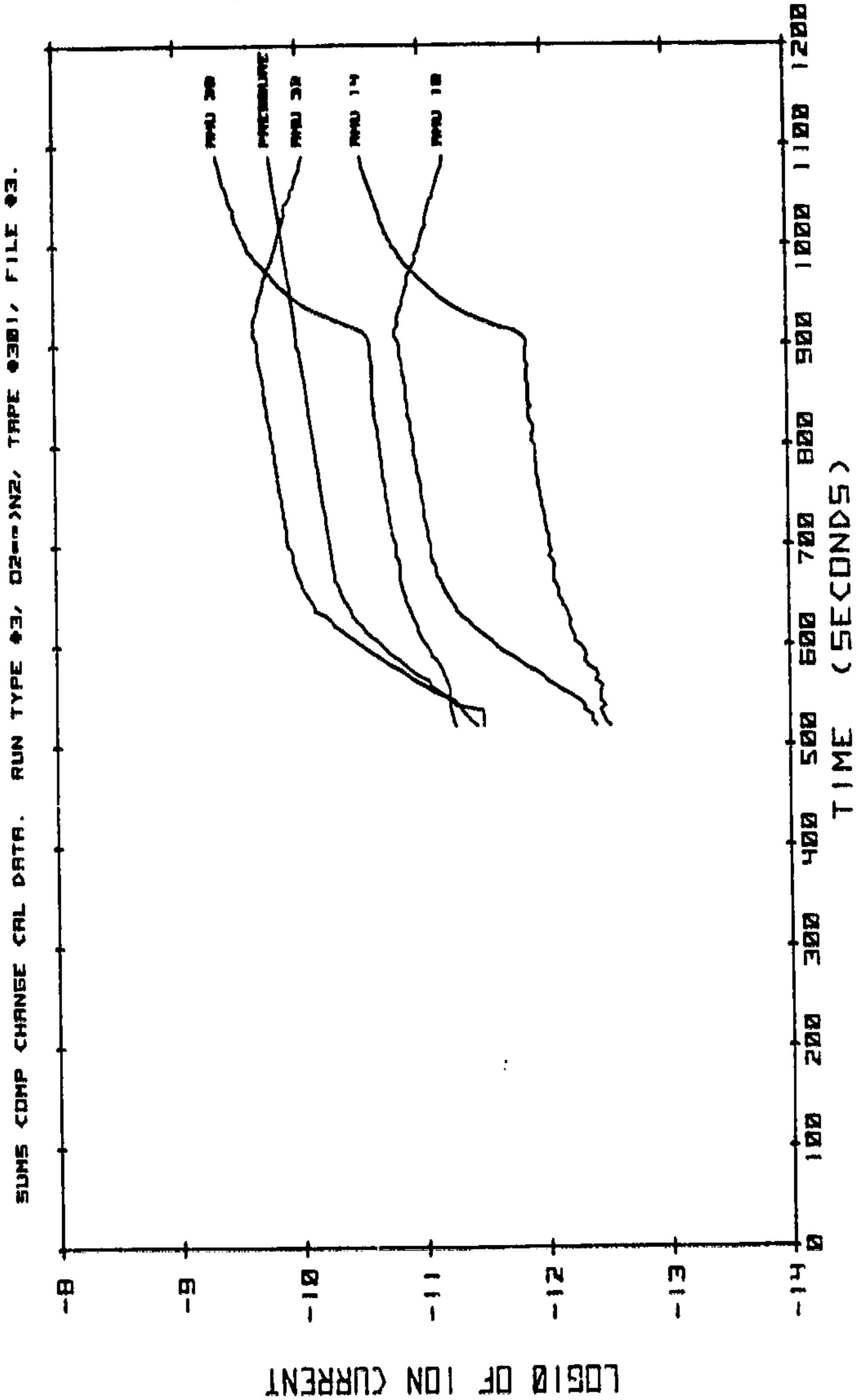

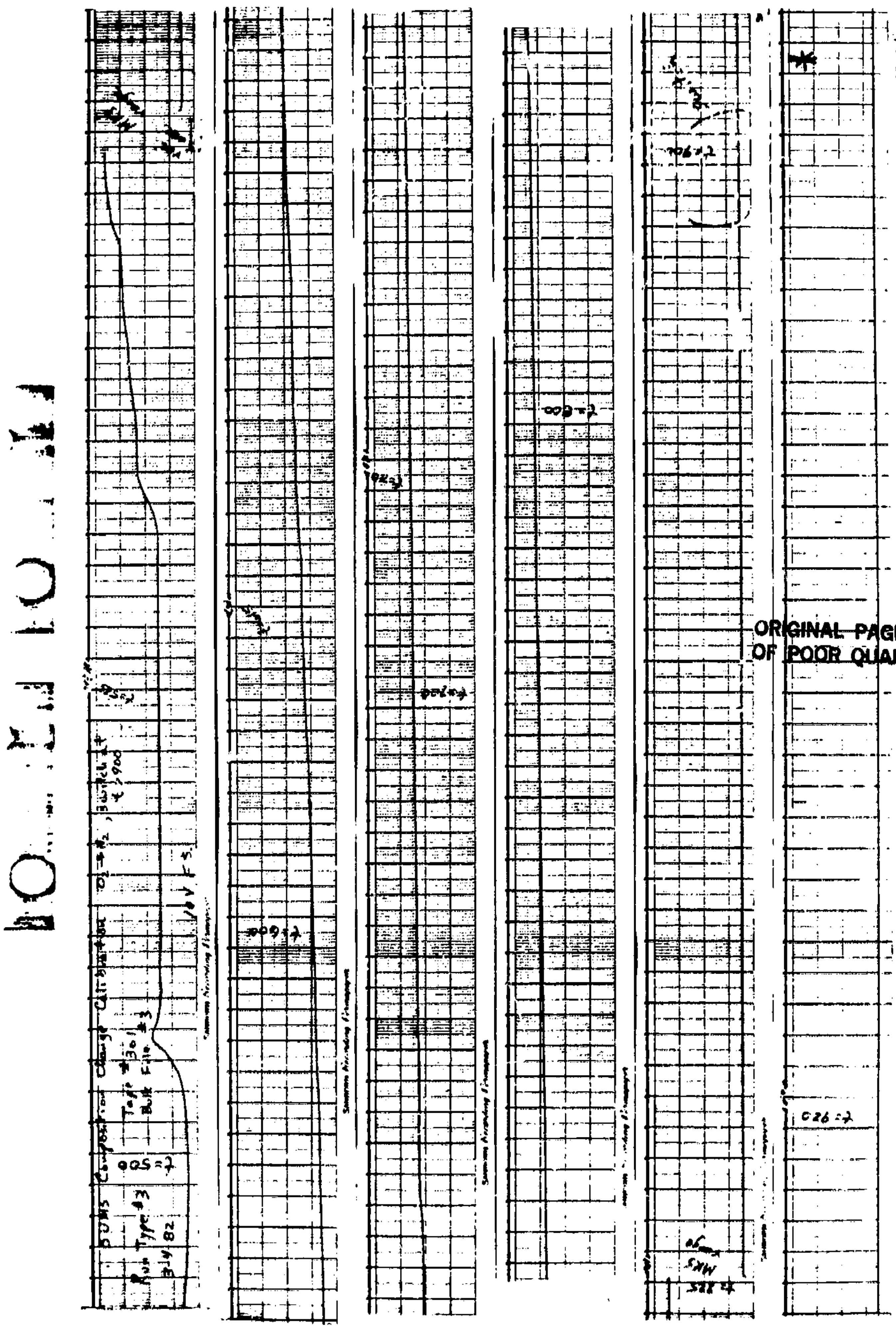

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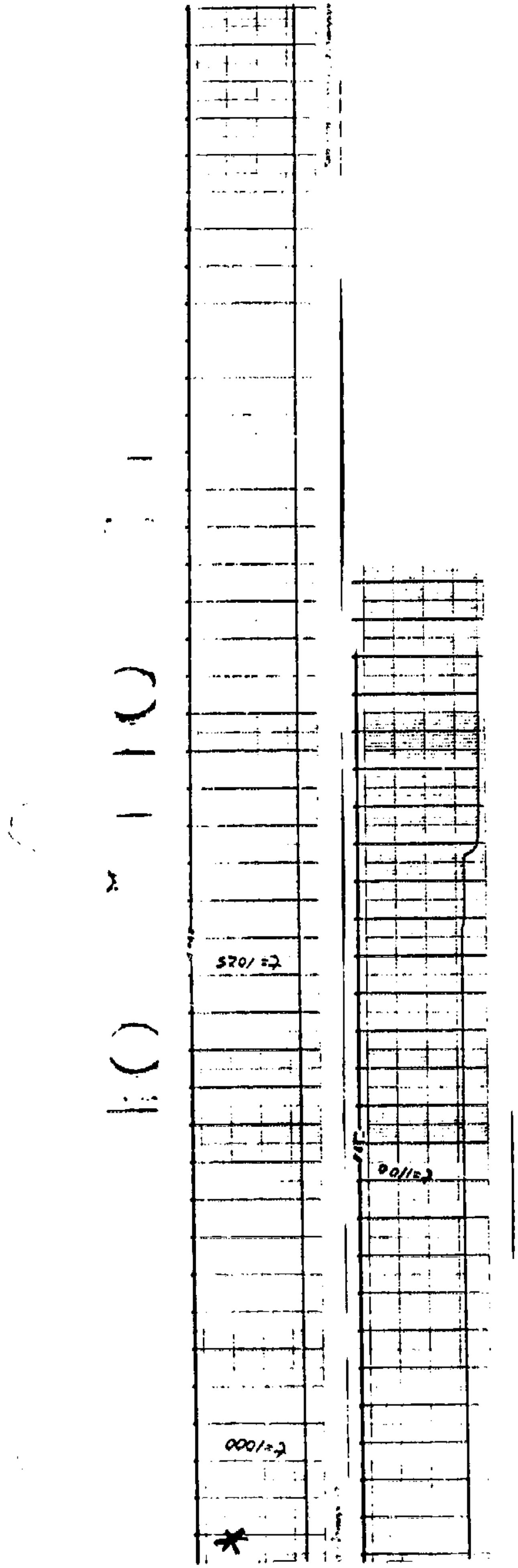

SUMS COMP CHANGE CAL DATA. RUN TYPE #4. O2==>N2. TAPE #301. FILE #4.

TIME (SEC)	BARATRON PRESSURE (TORR)	AMU 32	AMU 28	AMU 16	AMU 14
		(9 BIT)			
515.0	0.223370	122	142	22	19
520.2	0.225020	125	143	23	21
525.4	0.309930	127	143	27	21
530.2	0.336340	130	143	26	21
535.2	0.411820	134	144	29	23
540.1	0.466320	139	145	33	21
545.2	0.541210	145	146	36	22
550.3	0.652170	153	146	41	21
555.1	0.767960	162	149	47	22
560.2	0.896300	170	150	58	25
565.1	1.075800	178	153	66	25
570.2	1.206200	188	154	70	25
575.1	1.370600	197	159	80	28
580.1	1.573800	203	163	86	29
585.2	1.915100	211	165	97	33
590.1	2.106800	222	167	103	36
595.2	2.712100	228	171	108	37
600.2	2.805600	236	173	120	41
605.1	3.071900	245	176	128	41
610.2	3.654400	250	177	131	45
615.1	4.157000	260	180	138	48
620.1	4.456400	267	185	143	50
625.2	4.889300	269	188	147	53
630.1	5.421000	274	190	152	55
635.2	5.860400	280	191	159	56
640.1	6.329100	285	194	163	59
645.2	6.688700	289	195	166	60
650.2	7.011700	292	196	168	62
655.2	7.382600	294	198	171	65
660.1	7.615400	296	200	173	66
665.0	7.827300	298	201	175	68
670.1	8.010900	299	202	176	69
675.1	8.088000	301	204	178	71
680.1	8.219000	302	206	179	71
685.3	8.344000	302	206	179	70
690.1	8.433000	303	206	179	72
695.0	8.604000	304	207	181	72
700.1	8.774000	305	208	182	74
705.0	8.736000	306	209	183	73
710.0	8.752000	306	209	182	73
715.1	8.997000	306	210	183	75
720.1	9.171000	307	211	185	76
725.0	9.241000	308	211	186	75
730.2	9.250000	309	212	186	77
735.0	9.492000	309	212	187	75
740.1	9.548000	310	212	188	76
745.0	9.627000	311	212	188	76
750.0	10.353000	311	212	188	76
	*** COMPOSITION SWITCH ***				
755.1	10.390000	313	218	191	77
760.0	10.424000	316	223	193	90
765.0	10.528000	315	227	192	93
770.0	10.630000	315	230	191	100
775.0	10.737000	315	237	191	108
780.2	10.844000	314	247	191	117
785.0	10.950000	313	257	190	127
790.0	11.064000	312	263	188	133
795.1	11.235000	311	268	187	138
800.0	11.400000	310	274	186	145
805.0	11.574000	309	283	184	155
810.1	11.748000	306	291	181	163
815.1	11.909000	304	295	180	167
820.1	12.076000	303	299	178	172
825.0	12.251000	301	303	176	175
830.0	12.463000	300	307	174	179
835.1	12.624000	299	311	173	184
840.1	12.792000	297	315	172	187
845.0	12.935000	296	320	170	190
849.9	13.126000	294	321	169	193
855.0	13.334000	294	322	169	194
859.9	13.445000	293	324	168	196
865.0	13.617000	292	325	167	197
869.9	13.813000	291	326	166	198
875.0	13.999000	291	327	165	200

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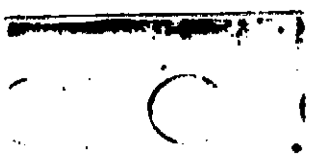
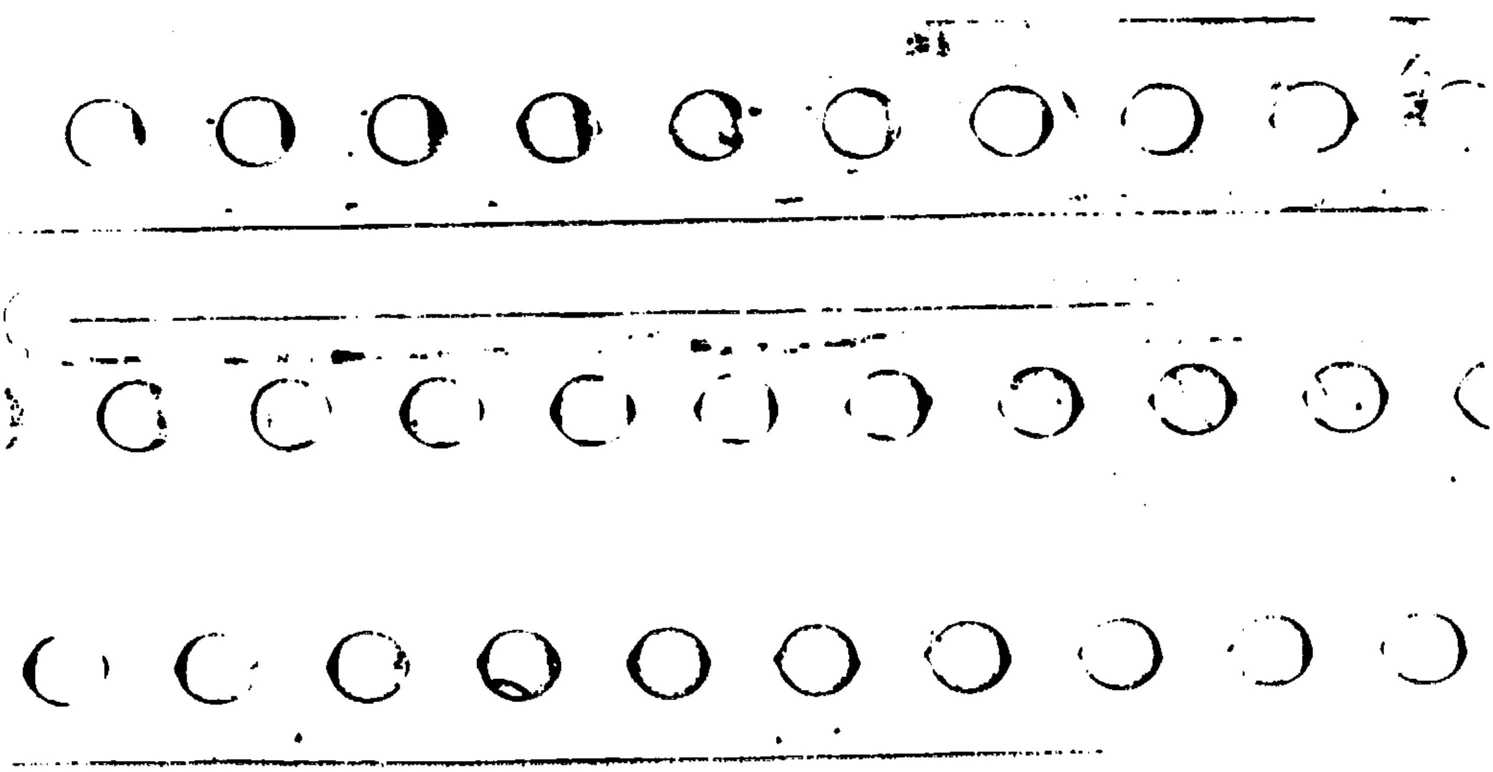
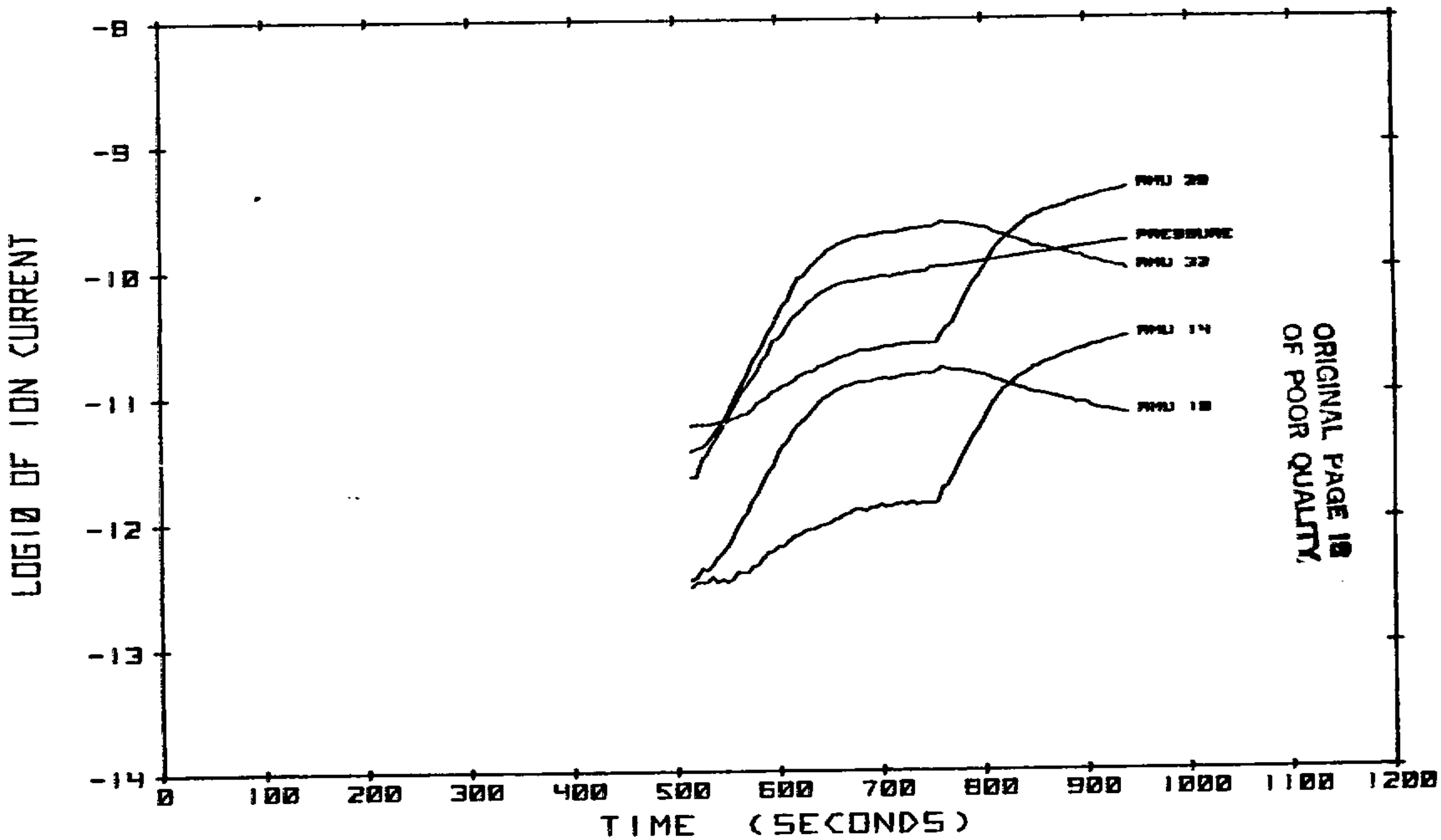


879.9	14.178000	290	328	164	202
884.9	14.362000	289	330	164	203
890.1	14.556000	288	331	162	205
895.0	14.741000	288	333	162	206
899.9	14.927000	285	334	162	207
904.9	15.116000	283	335	160	209
910.0	15.299000	283	336	158	210
914.9	15.493000	281	338	157	211
919.8	15.688000	279	339	157	213
924.9	15.900000	279	340	155	214
929.9	16.110000	277	341	154	215
934.8	16.330000	277	342	153	217
939.9	16.536000	274	344	152	218



SUMS COMP CHANGE CAL DATA. RUN TYPE #4, O2==>N2, TAPE #381, FILE #4.



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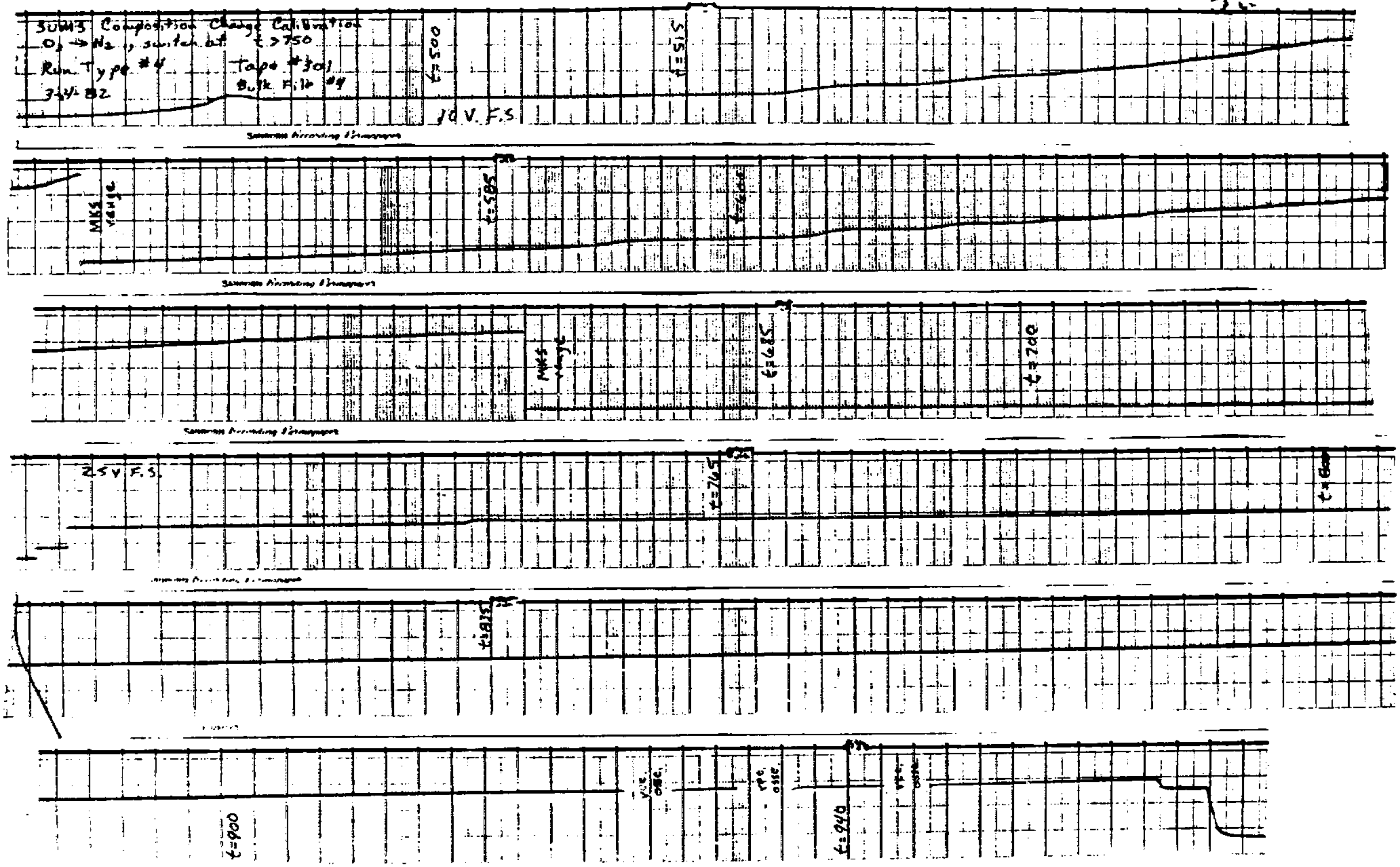
SUWS Composition Change Calibration
$O_2 \to N_2$, switch at t > 750
Run Type #4
Tape #301
Bulk File #4
3-4-82
t=500
t=515
10 V. F.S.
MKS range
t=585
t=600
MKS range
t=685
t=700
25 V F.S.
t=765
t=800
t=835
t=900
vpe osc.
t=940

SUMS COMP CHANGE CAL DATA. RUN TYPE#1, #2 ==> N2/O2, TAPE #301, FILE#5.

TIME (SEC)	BARATRON PRESSURE (TORR)	AMU 32	AMU 28	AMU 16	AMU 14
		(9 BIT)			
425.0	0.029590	35	130	10	18
430.4	0.028755	33	131	9	17
435.6	0.046585	37	132	7	18
445.3	0.043030	35	134	7	18
450.3	0.058622	35	135	8	18
455.1	0.061732	38	137	6	21
460.2	0.069210	38	138	8	20
465.3	0.078212	36	141	8	22
470.3	0.081831	35	144	8	24
475.2	0.083890	36	146	8	24
480.2	0.107810	37	149	7	28
485.4	0.137650	34	151	6	28
490.2	0.144100	33	156	7	31
495.1	0.169530	35	161	5	35
500.2	0.192730	33	164	7	37
505.3	0.219760	33	167	6	40
510.3	0.248690	32	171	7	45
515.3	0.273560	32	175	6	50
520.1	0.322780	35	180	7	56
525.2	0.369480	35	186	9	63
530.1	0.409660	34	193	10	67
535.1	0.460470	32	196	10	70
540.3	0.500640	32	200	5	74
545.1	0.608180	36	205	9	80
550.1	0.675780	32	211	7	87
555.1	0.774730	34	216	10	92
560.1	0.850850	34	223	7	98
565.1	0.970300	35	227	7	101
	*** COMPOSITION SWITCH ***				
570.2	1.085200	33	231	10	106
575.1	1.203300	58	234	13	109
580.1	1.381300	81	236	14	112
585.1	1.565200	101	240	18	116
590.1	1.723100	118	245	23	121
595.1	1.980800	127	249	24	125
600.3	2.146300	135	254	30	130
605.1	2.366100	142	259	34	133
610.1	2.696100	149	262	36	136
615.1	2.870400	158	266	43	140
620.1	3.192300	164	269	45	144
625.2	3.432700	167	274	52	148
630.1	3.635000	172	278	58	153
635.0	3.827400	176	281	63	156
640.1	4.145300	179	288	67	159
645.0	4.343300	183	289	68	162
650.0	4.561600	188	290	69	164
655.1	4.759400	191	292	71	165
660.0	4.963000	194	293	74	167
665.1	5.082500	195	294	77	168
670.1	5.135600	197	296	77	170
675.1	5.353700	198	297	78	170
680.1	5.378900	200	298	80	172
685.0	5.506700	200	299	80	173
690.1	5.661800	201	300	82	173
695.0	5.660700	203	300	82	174
700.0	5.730400	203	302	83	175
705.0	5.813000	203	302	84	176
710.0	5.870300	204	302	84	176
715.2	5.966200	205	303	85	176
720.0	6.014400	206	304	86	177
725.0	6.133300	206	304	86	178
730.1	6.221900	207	305	88	179
735.0	6.304600	208	306	88	180
739.9	6.393200	209	306	89	180
745.0	6.451300	209	308	91	181
749.9	6.573600	210	308	91	181
754.9	6.663000	211	308	91	182
760.0	6.714400	212	310	93	183
765.0	6.790500	213	310	94	184
770.1	6.967200	214	310	94	184
775.0	7.094500	215	311	96	185
779.9	7.152800	217	312	98	186
785.0	7.257800	217	313	97	187
790.0	7.331600	218	314	98	187

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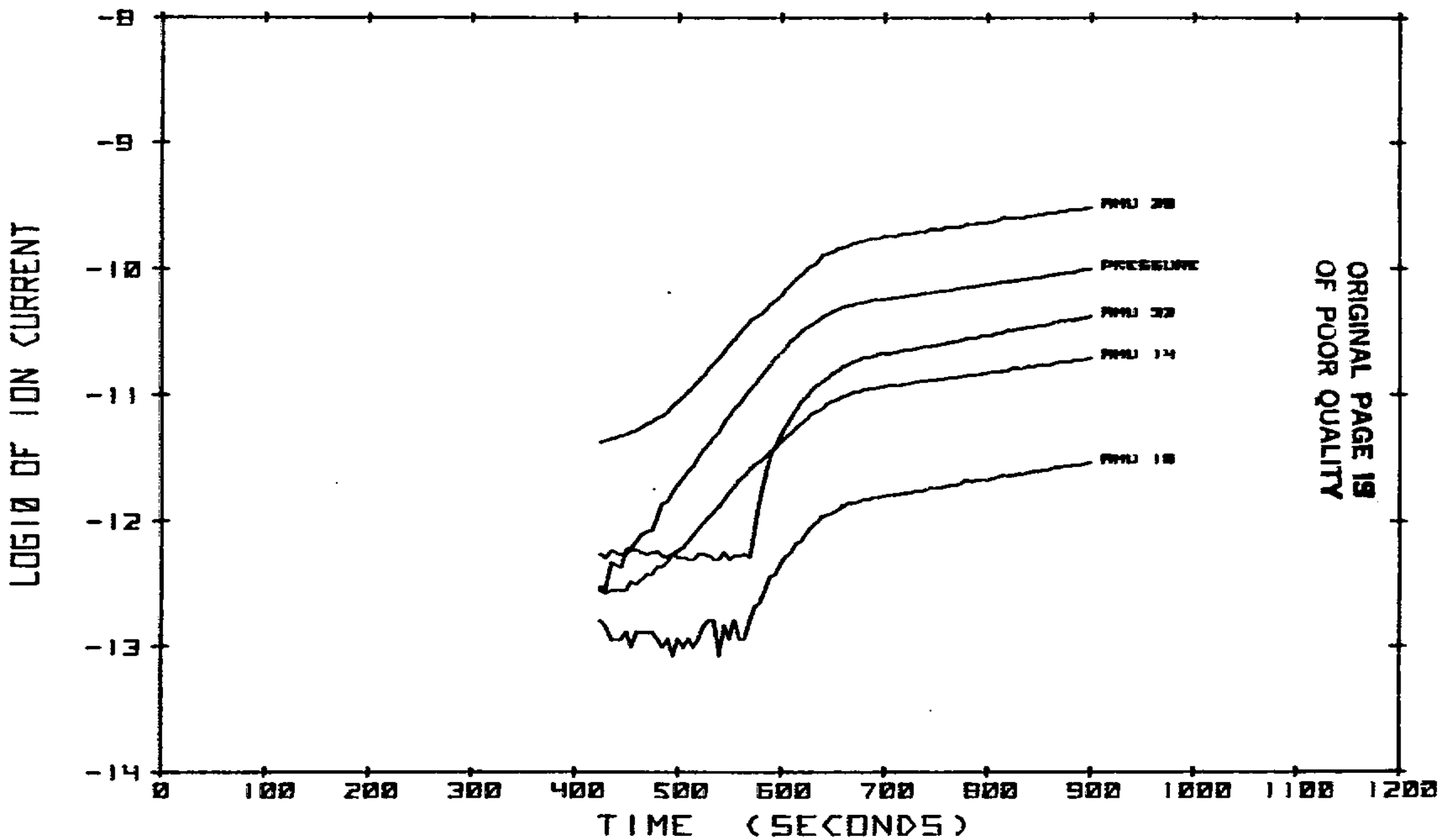
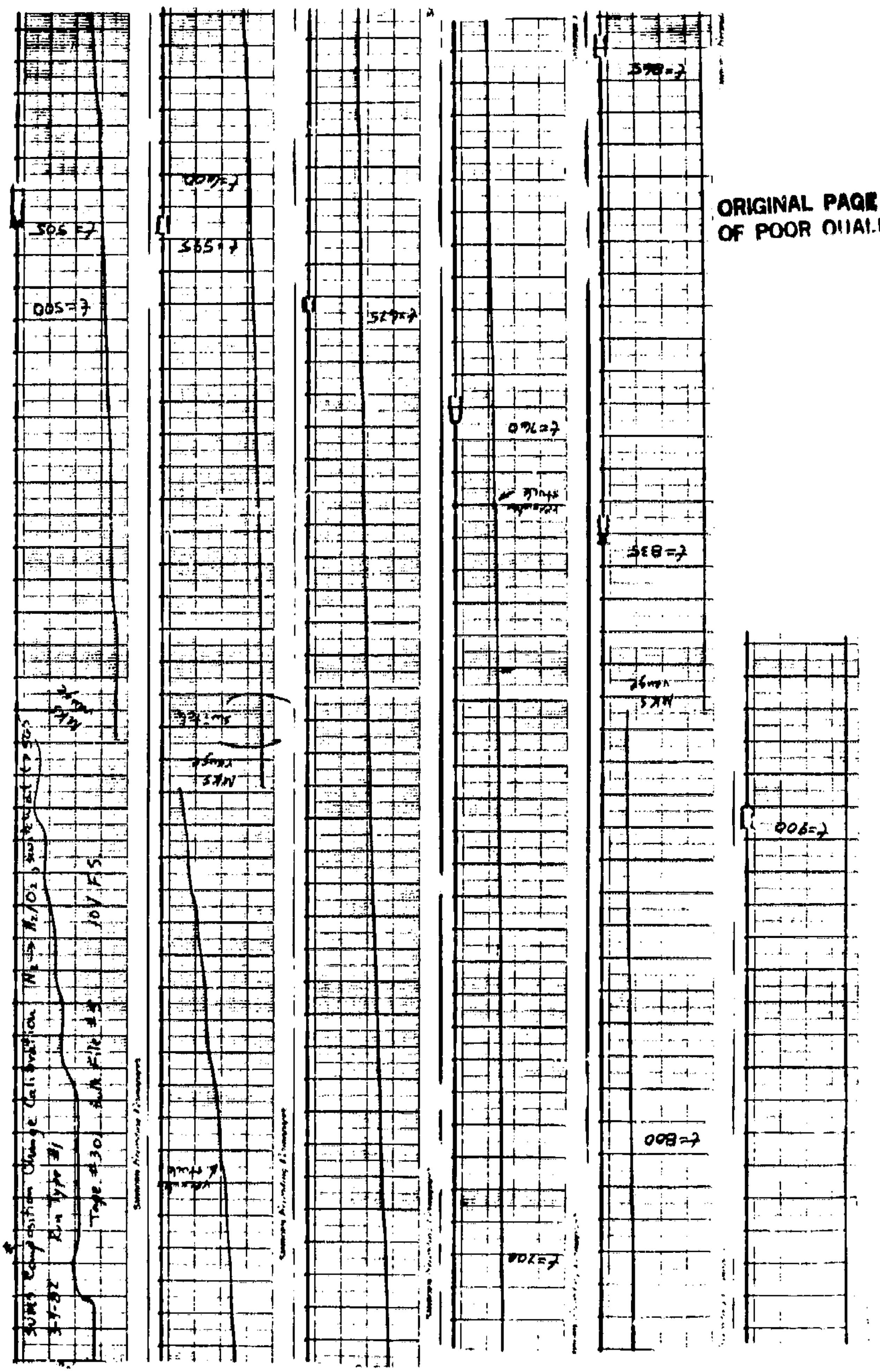
795.0	7.451100	220	314	98	188
799.9	7.560600	220	315	98	189
805.0	7.646500	221	316	99	190
809.9	7.781700	222	317	100	190
815.0	7.883400	223	320	101	191
819.9	7.979500	225	320	101	191
824.9	8.070000	225	320	101	193
830.0	8.167000	226	320	102	193
834.9	8.297000	226	320	102	193
839.9	8.391000	227	321	103	194
844.9	8.486000	227	321	104	194
849.8	8.581000	228	322	104	195
854.8	8.698000	228	322	105	195
859.9	8.946000	229	323	105	195
864.8	9.066000	230	323	107	196
869.9	9.176000	231	324	107	197
875.0	9.285000	231	324	108	197
879.9	9.344000	232	325	108	197
884.8	9.446000	232	325	109	198
889.9	9.750000	233	325	109	198
894.8	9.881000	234	326	110	199
899.9	10.006000	235	327	111	200

SUMS COMP CHANGE CAL DATA. RUN TYPE#1, N2 ==> N2/O2, TAPE #301, FILE#5.





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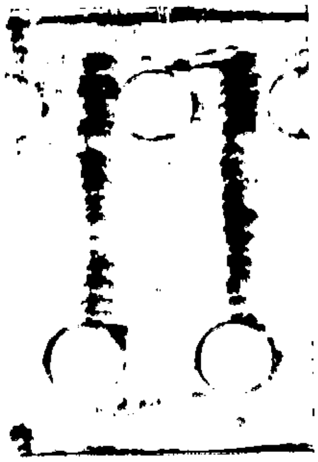
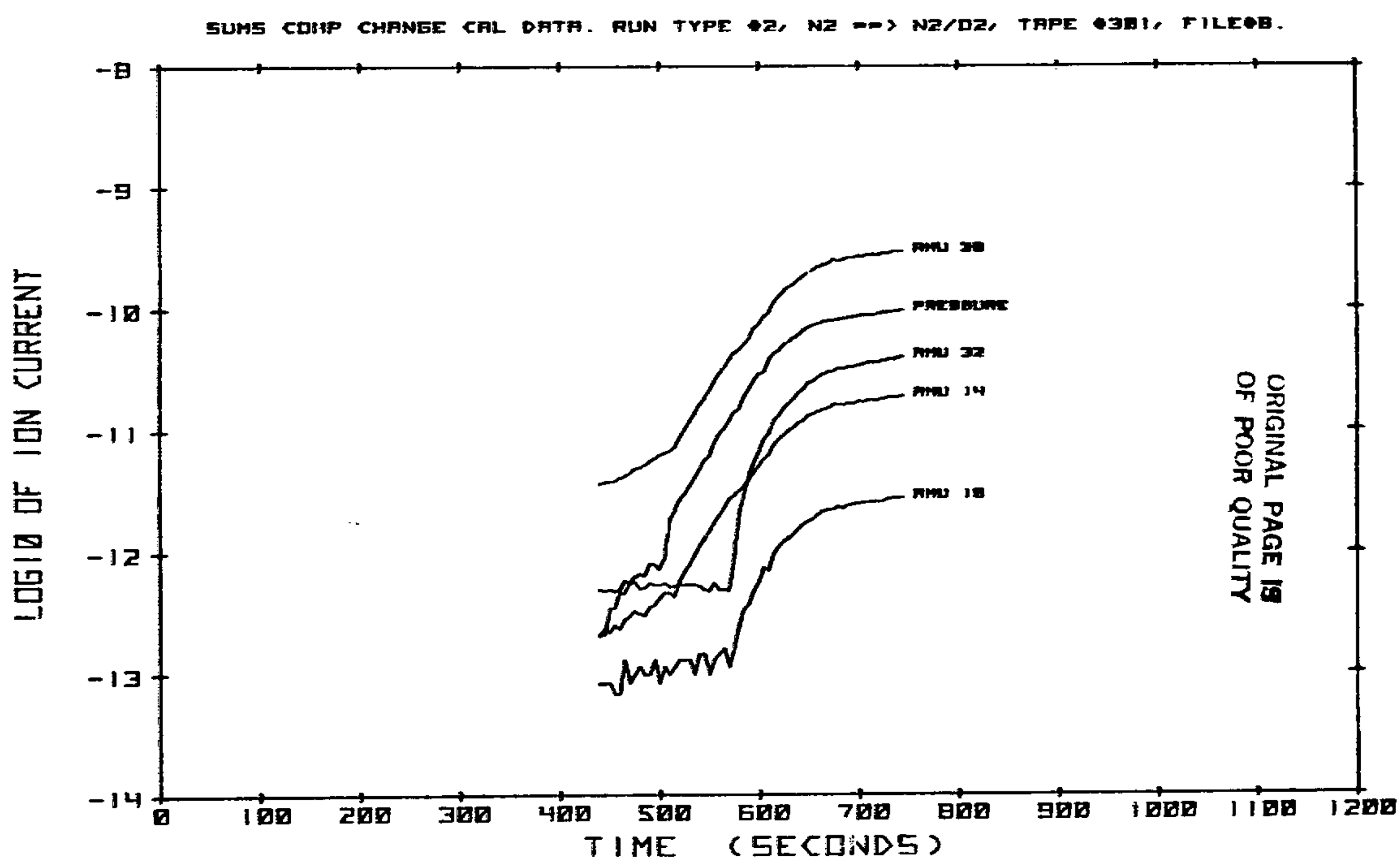
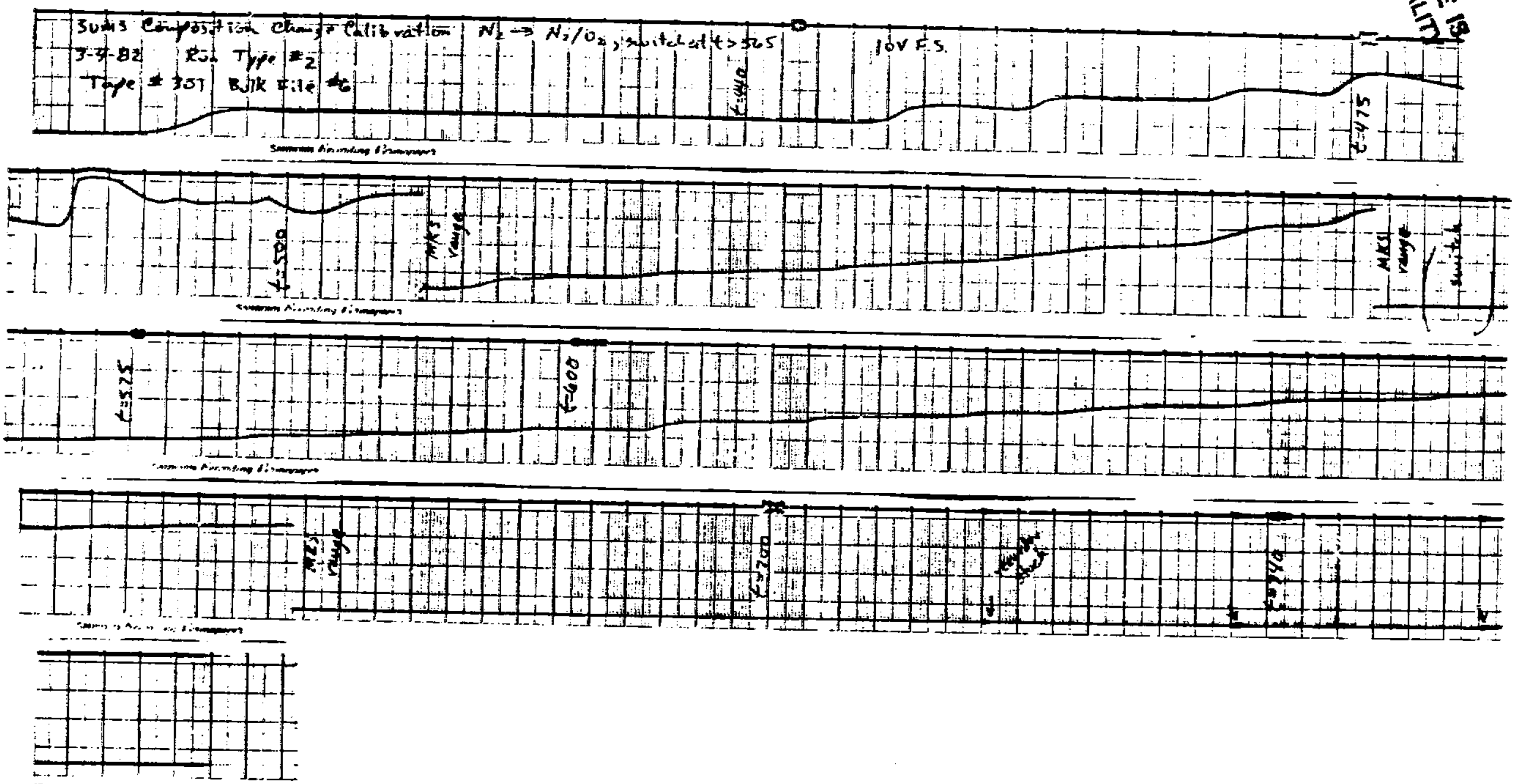
SUMS COMP CHANGE CAL DATA. RUN TYPE #2, N2 **> N2 O2, TAPE #301, FILE#6.



TIME (SEC)	BARATRON PRESSURE (TORR)	AMU 32	AMU 28	AMU 16	AMU 14
			(9 BIT)		
440.0	0.021463	32	123	5	13
445.1	0.021820	31	125	5	15
450.0	0.034950	32	126	5	14
455.0	0.035[illegible]	31	126	4	16
460.1	0.046782	32	129	4	15
465.0	0.046207	36	130	6	16
470.0	0.057230	36	132	5	19
475.0	0.064165	37	135	6	21
480.0	0.067122	33	136	7	20
485.[illegible]	0.065[illegible]	33	136	6	19
490.0	0.079766	36	141	5	22
495.1	0.079547	35	144	6	24
499.9	0.072617	35	147	5	27
505.0	0.090279	36	149	7	30
509.9	0.181970	34	151	6	30
514.9	0.217940	34	155	7	28
520.0	0.268070	35	162	6	36
524.9	0.299640	35	169	6	45
530.0	0.349550	35	176	6	51
535.0	0.404370	35	184	6	61
539.9	0.467800	34	193	9	63
544.9	0.564630	32	197	9	73
550.1	0.612690	31	204	6	80
554.9	0.777890	36	211	6	88
559.9	0.936200	32	219	9	96
565.1	1.029800	33	226	10	101
	*** COMPOSITION SWITCH ***				
570.0	1.201100	31	231	7	108
574.9	1.425400	59	236	10	111
580.1	1.516800	97	239	16	115
584.9	1.908200	112	244	22	120
589.8	2.194400	129	250	24	127
594.9	2.561700	140	259	31	132
600.0	2.923300	150	262	37	137
604.9	3.025500	162	266	48	143
610.0	3.823900	166	271	46	147
614.9	4.299200	176	281	63	157
620.1	4.536400	182	288	68	162
624.9	5.080700	190	291	71	165
629.9	5.473200	194	294	74	168
635.0	5.870600	197	296	78	171
639.9	6.215100	202	300	83	175
644.8	6.672800	205	303	87	177
649.9	7.022200	210	307	90	182
654.8	7.341600	212	309	93	184
659.8	7.579300	216	312	97	187
664.9	7.859900	219	314	99	189
669.8	8.041300	222	316	100	191
674.9	8.100000	223	320	100	193
679.8	8.232000	225	319	102	193
684.9	8.346000	225	320	101	193
689.8	8.509000	226	321	103	194
694.8	8.607000	226	321	104	194
699.9	8.799000	227	322	104	195
704.9	8.886000	228	322	105	195
709.8	8.907000	229	323	105	196
714.8	8.922000	229	323	106	196
719.7	9.199000	229	323	106	196
724.8	9.344000	230	324	106	197
729.8	9.422000	231	324	108	198
734.8	9.531000	231	325	109	198
739.8	9.616000	232	325	109	198
744.8	9.763000	233	325	109	199



SUMS COMP CHANGE CAL DATA. RUN TYPE #2, N2 ==> N2/O2, TAPE #381, FILE#8.
AMU 28
PRESSURE
AMU 32
AMU 14
AMU 18
-8
-9
-10
-11
-12
-13
-14
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
TIME (SECONDS)
LOG10 OF ION CURRENT


SUMS Composition Change Calibration N2 → N2/O2, switched at t>565
3-4-82 RS2 Type #2
Tape # 351 Bulk File #6
10V F.S.
t=440
t=475
t=500
MKS range
MKS range
switch
t=525
t=600
t=700
MKS range
t=944

SUMS COMP CHANGE CAL DATA, RUN TYPE #3, N2 ==> N2/O2, TAPE #302, FILE#1.

TIME (SEC)	BARATRON PRESSURE (TORR)	AMU 32	AMU 28	AMU 16	AMU 14
		(9 BIT)			
520.0	0.322800	70	197	10	69
525.1	0.324320	71	198	11	70
530.3	0.457740	72	199	10	71
540.2	0.467760	67	205	13	78
545.0	0.543540	67	208	14	81
550.0	0.710890	66	211	10	83
554.9	0.740320	57	219	11	93
560.0	0.897770	60	225	11	98
565.0	0.988800	56	228	11	101
570.0	1.074200	55	233	12	106
575.0	1.197600	51	237	10	111
580.0	1.342400	54	241	10	115
585.1	1.550900	50	246	11	120
590.0	1.678800	47	251	10	126
595.0	1.973000	45	259	9	130
600.0	2.175200	44	262	12	134
605.1	2.427700	42	266	10	138
610.1	2.672700	44	272	12	144
614.9	2.901300	44	276	10	148
620.0	3.190100	42	279	11	153
625.0	3.455600	45	288	11	158
629.9	3.690600	43	289	11	162
634.9	3.878000	44	292	13	164
640.0	4.086400	42	293	11	165
644.9	4.382000	45	295	13	168
649.9	4.595000	45	298	12	170
654.9	4.738100	42	300	11	173
660.0	4.935900	44	302	14	175
664.8	5.079400	47	304	13	176
669.7	5.217200	45	306	12	178
675.0	5.339800	43	307	14	180
680.0	5.405800	45	308	13	180
684.9	5.476200	46	309	12	181
690.0	5.562300	50	310	13	182
695.0	5.653300	47	311	15	183
700.0	5.719200	49	312	16	183
704.8	5.798800	50	312	11	184
709.9	5.881200	51	313	12	185
714.8	5.972100	51	314	14	186
719.9	6.045800	50	314	13	186
725.0	6.146600	52	315	13	188
729.8	6.220200	52	316	13	188
734.9	6.321200	52	317	13	189
739.9	6.447700	53	320	14	190
744.8	6.496300	53	320	10	191
749.9	6.608900	54	320	13	191
754.8	6.619100	55	320	14	192
759.8	6.782800	54	321	15	193
765.0	6.854900	55	321	14	193
769.8	6.941700	55	322	15	194
774.8	7.035300	51	322	13	194
779.9	7.144300	56	322	13	194
784.9	7.237300	56	323	13	195
789.8	7.335200	55	323	15	195
794.8	7.463500	54	324	14	196
799.8	7.586100	55	324	14	196
804.9	7.693000	54	325	14	197
809.7	7.773600	54	326	13	198
814.8	7.877700	53	326	14	198
819.8	7.981400	55	327	14	198
824.8	8.087000	53	327	14	199
829.9	8.190000	55	328	14	200
834.8	8.281000	55	328	15	200
839.7	8.391000	53	329	15	200
844.8	8.504000	55	329	14	201
849.8	8.601000	55	330	16	202
954.7	8.806000	55	330	15	202
859.8	8.966000	52	331	15	203
864.7	9.056000	53	332	14	204
859.7	9.150000	54	333	18	204
874.8	9.289000	53	333	17	205
879.8	9.400000	54	333	15	205
884.7	9.509000	54	334	18	206

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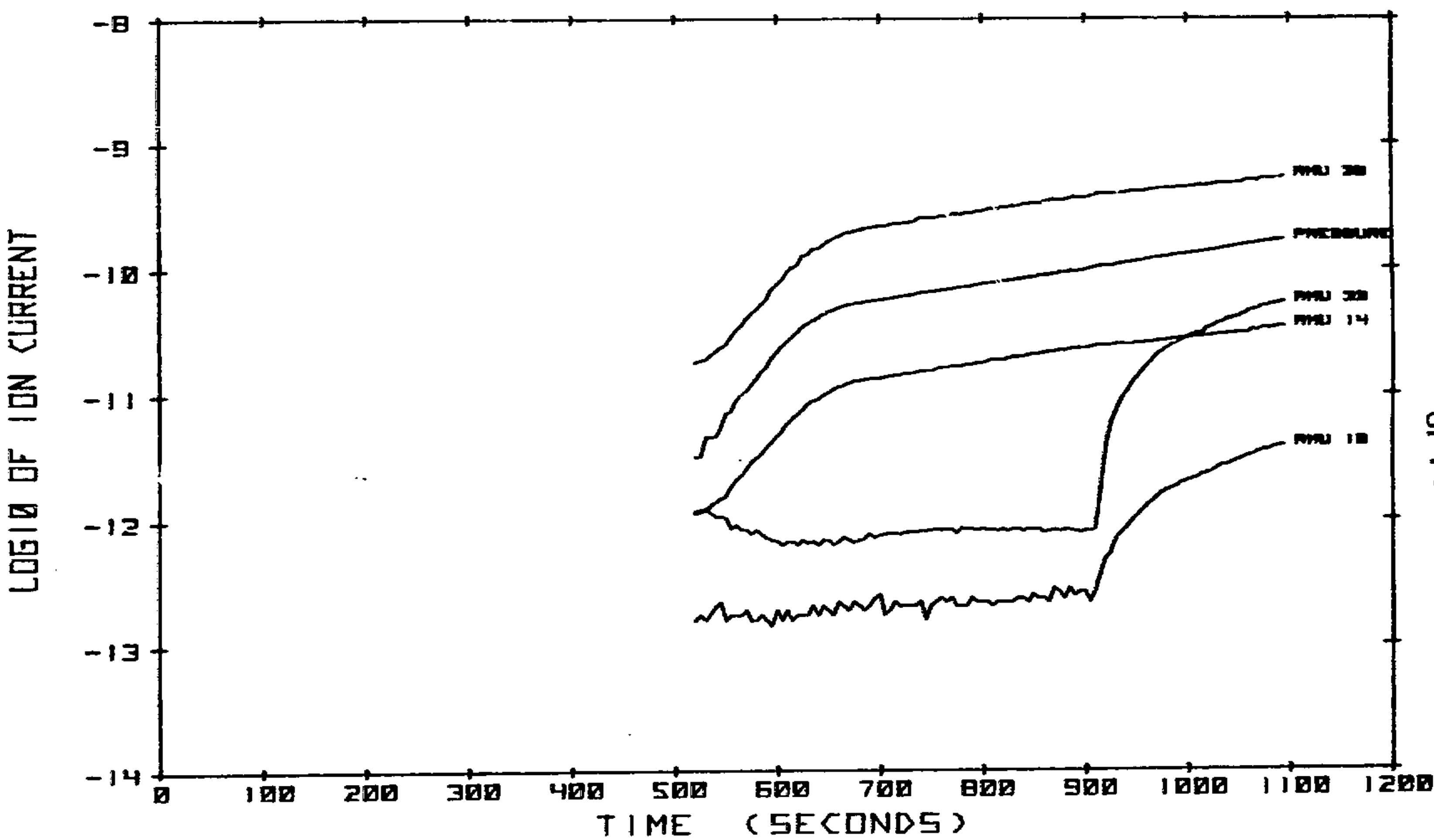
889.8	9.591000	53	335	16	207
894.8	9.647000	52	335	17	207
899.7	9.760000	53	335	17	207
	*** COMPOSITION SWITCH ***				
904.8	10.028000	53	336	14	208
909.7	10.247000	55	337	17	209
914.7	10.389000	90	338	24	210
919.7	10.540000	126	338	32	210
924.6	10.674000	142	338	35	210
929.7	10.819000	155	339	45	211
934.8	10.967000	164	339	51	211
939.8	11.118000	170	339	56	211
944.7	11.279000	176	340	63	211
949.8	11.435000	182	340	66	212
954.7	11.609000	189	340	70	212
959.6	11.792000	194	341	73	213
964.7	11.997000	197	342	77	213
969.6	12.151000	201	342	81	214
974.6	12.300000	204	343	85	215
979.6	12.448000	207	343	88	215
984.7	12.613000	210	343	90	216
989.6	12.795000	212	344	92	216
994.7	12.948000	215	344	96	217
999.6	13.096000	219	345	97	217
1004.6	13.248000	220	345	98	218
1009.6	13.392000	221	346	99	218
1014.6	13.609000	223	346	101	219
1019.7	13.826000	226	346	102	219
1024.7	14.011000	227	347	103	220
1029.7	14.213000	229	348	106	221
1034.7	14.406000	230	348	108	221
1039.7	14.618000	232	348	109	222
1044.7	14.845000	233	349	110	222
1049.6	15.072000	234	350	112	223
1054.6	15.326000	236	350	114	223
1059.5	15.581000	238	352	116	223
1064.6	15.800000	240	352	117	225
1069.8	16.050000	241	351	120	225
1074.7	16.246000	243	353	122	226
1079.7	16.466000	244	353	122	226
1084.6	16.663000	245	353	125	226
1089.6	16.856000	246	353	126	227
1094.7	17.055000	247	354	127	227

SUMS COMP CHANGE CAL DATA. RUN TYPE #3, N2 ==> N2/O2, TAPE #302, FILE#1.



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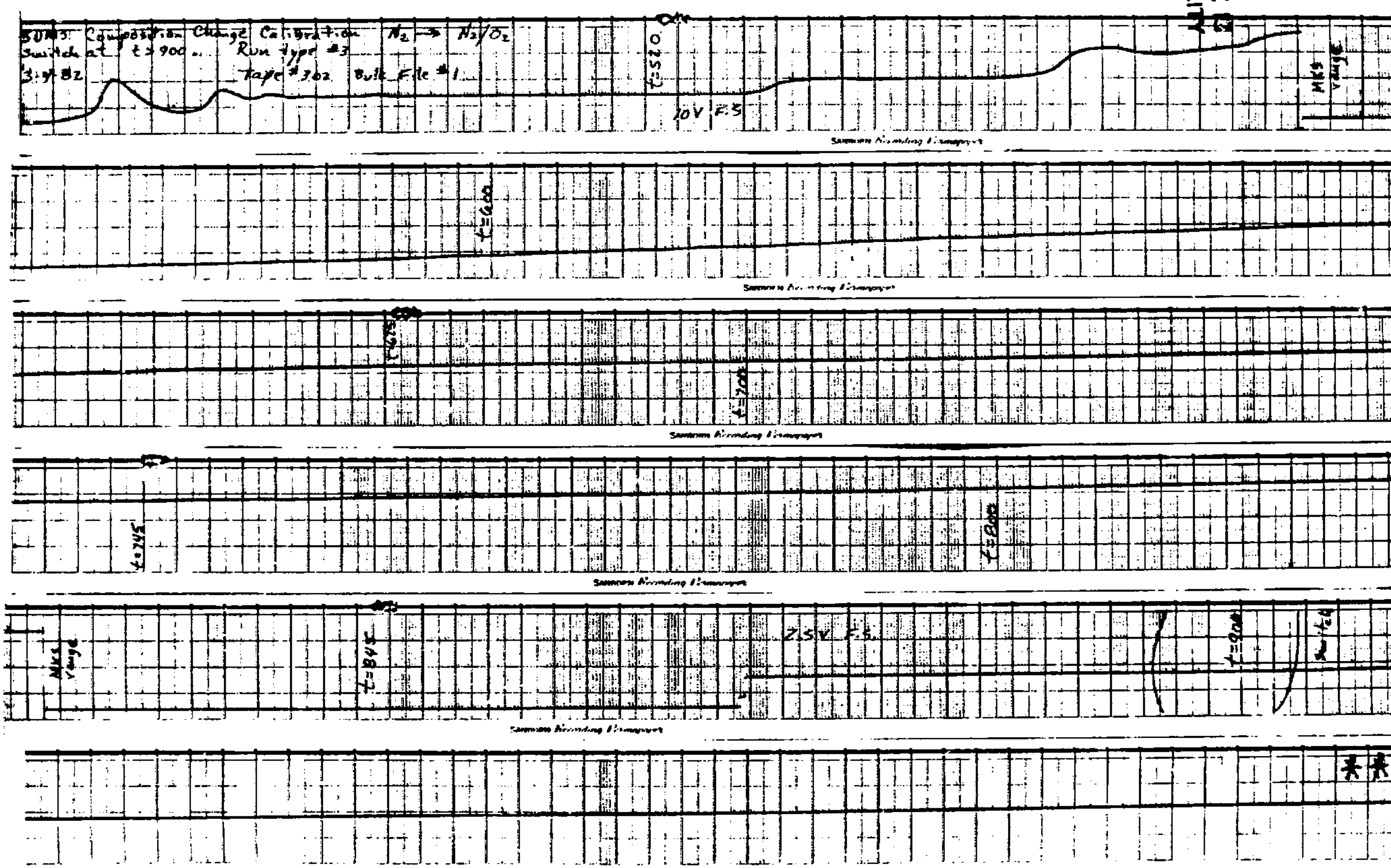
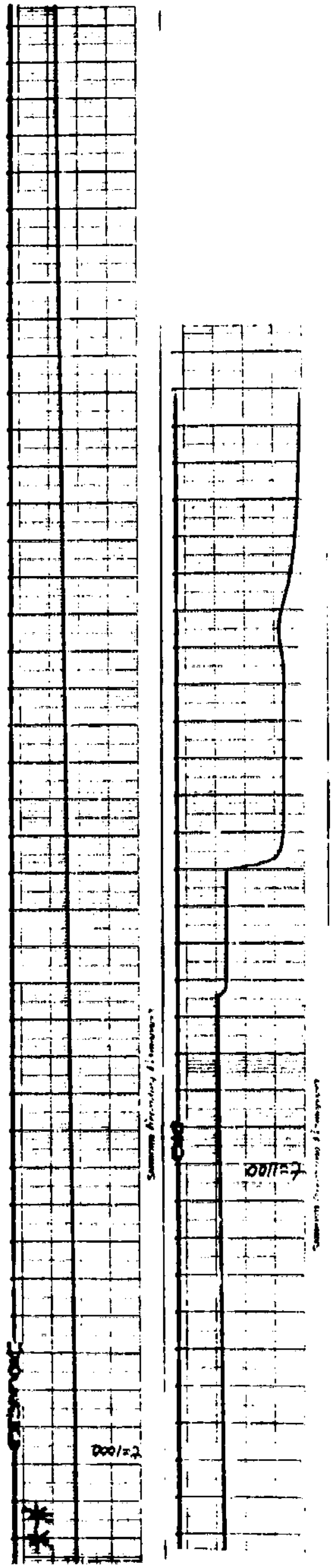
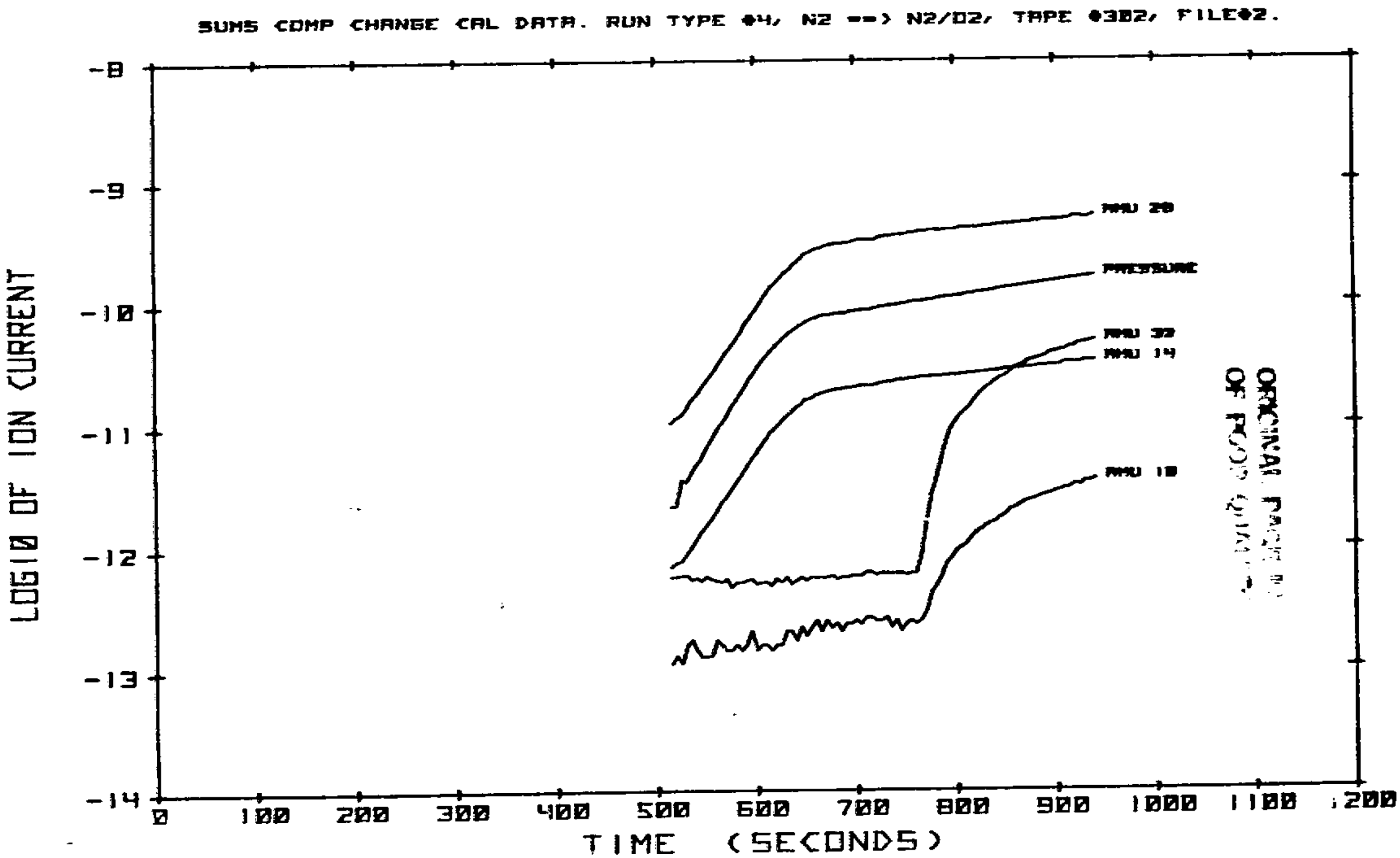




SUMS COMP CHANGE CAL DATA, RUN TYPE #4, N2 ==> N2 O2, TAPE #302, FILE#2.

TIME (SEC)	BARATRON PRESSURE (TORR)	AMU 32 (9 BIT)	AMU 28 (9 BIT)	AMU 16 (9 BIT)	AMU 14 (9 BIT)
515.0	0.221110	38	171	7	46
519.9	0.222330	36	175	6	49
525.1	0.358450	39	176	7	51
529.9	0.349060	39	184	10	58
535.0	0.409450	36	193	11	65
540.0	0.479510	37	196	9	70
545.0	0.537940	35	201	6	76
549.9	0.649700	38	207	8	82
555.1	0.772260	36	213	8	88
560.1	0.902730	35	220	11	96
565.0	1.035100	34	227	10	102
569.9	1.176500	36	232	9	106
574.9	1.414300	31	237	9	112
580.0	1.615900	34	243	10	120
585.1	1.855900	34	251	9	127
589.9	2.126300	35	259	10	132
594.9	2.512700	36	263	13	138
600.1	2.856000	33	269	9	144
604.9	3.282500	34	275	10	151
609.9	3.680800	34	283	10	159
615.1	4.118600	32	290	9	164
619.9	4.511000	36	293	10	167
624.9	4.947800	34	297	10	171
629.9	5.365500	37	301	12	176
634.9	5.903200	33	305	13	180
639.8	6.274900	35	310	11	185
644.9	6.647600	37	314	14	189
649.8	7.017700	35	320	12	193
654.9	7.399000	37	321	14	194
660.0	7.624300	37	323	16	196
664.8	7.847500	37	324	13	197
669.9	8.020700	37	325	16	198
674.8	8.109000	38	326	14	199
679.9	8.216000	36	327	15	200
684.9	8.324000	37	327	13	200
689.8	8.345000	37	328	15	201
694.9	8.564000	38	328	15	201
699.8	8.669000	38	329	16	202
704.8	8.720000	38	330	15	203
710.0	8.772000	41	330	17	203
714.8	8.864000	41	330	17	203
719.9	9.131000	39	330	16	204
724.8	9.320000	40	332	16	205
729.9	9.449000	40	333	17	206
734.9	9.622000	40	333	14	206
740.0	9.723000	40	334	16	207
744.8	9.843000	40	334	13	208
749.8	9.963000	39	335	15	208
	*** COMPOSITION SWITCH ***				
755.0	10.127000	40	336	16	209
759.9	10.257000	40	336	15	209
764.8	10.365000	55	337	16	210
769.9	10.478000	84	337	19	210
774.8	10.633000	106	338	27	211
779.8	10.832000	121	338	31	211
784.9	10.963000	138	338	37	211
789.8	11.119000	155	339	47	212
794.8	11.244000	165	339	52	212
799.9	11.387000	171	339	60	212
804.8	11.519000	177	340	64	[illegible]
809.7	11.682000	181	340	66	[illegible]
814.8	11.917000	186	340	70	214
819.9	12.065000	193	341	74	214
824.8	12.213000	197	341	77	215
829.7	12.390000	200	342	81	215
834.9	12.553000	203	342	83	216
839.8	12.726000	206	343	85	216
844.8	12.899000	209	343	89	217
849.7	13.134000	211	344	92	218
854.7	13.331000	215	344	97	218
859.8	13.512000	219	345	98	219
864.9	13.689000	222	345	100	219
869.7	13.862000	224	346	102	220

874.7	14.036000	226	346	103	220
879.7	14.219000	227	347	104	221
884.7	14.397000	228	347	106	222
889.7	14.582000	229	348	107	222
894.6	14.762000	231	348	108	223
899.6	14.949000	232	349	110	223
904.7	15.171000	233	349	111	223
909.8	15.384000	234	350	113	225
914.9	15.606000	236	350	114	225
919.8	15.804000	237	352	117	225
924.8	15.989000	239	352	116	225
929.8	16.165000	240	351	120	226
934.8	16.413000	241	351	120	226
939.7	16.641000	242	353	122	226



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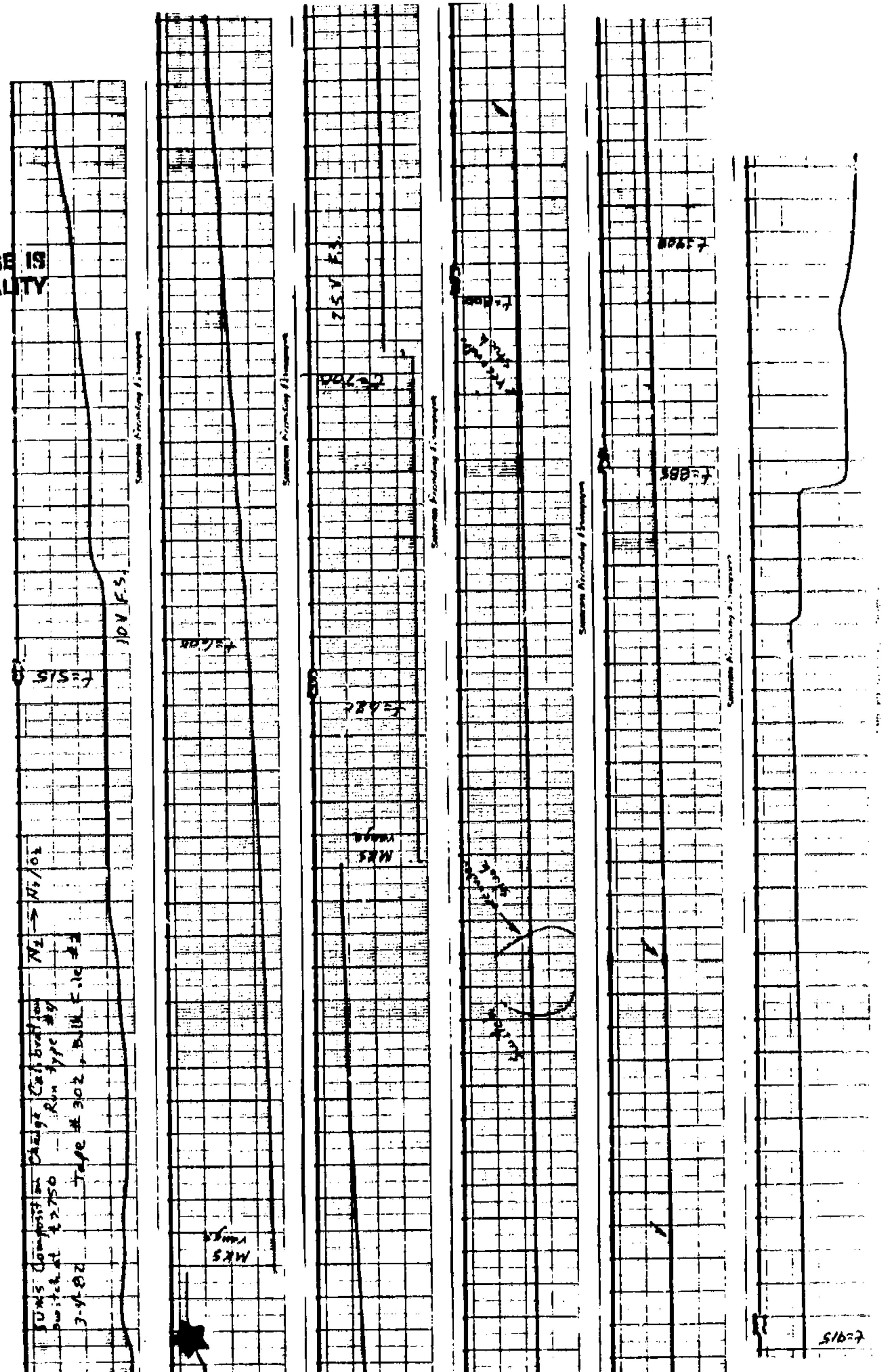
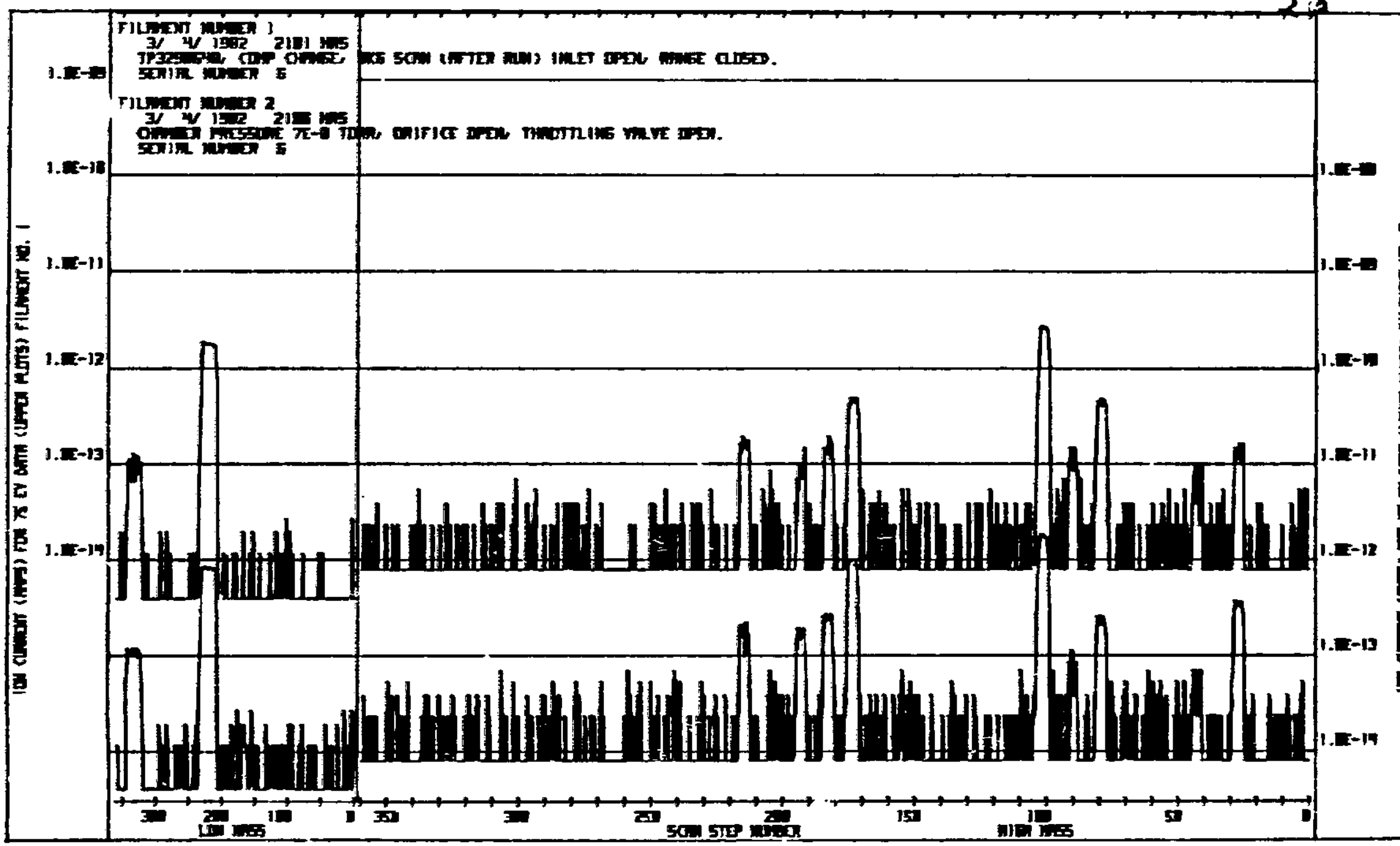


Tape #009
File #2



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3 4 1982 2101 HRS SUMS S/N 6
FUNCTIONAL TEST

DATA TAPE ID 9 BULK DATA FILE # 2

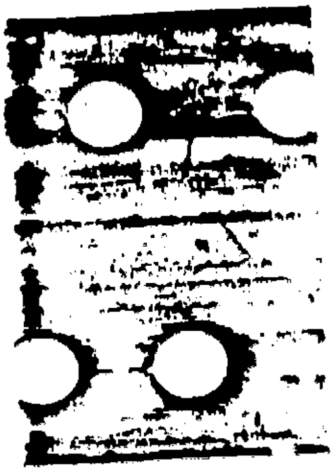
SUMS FUNCTIONAL TEST

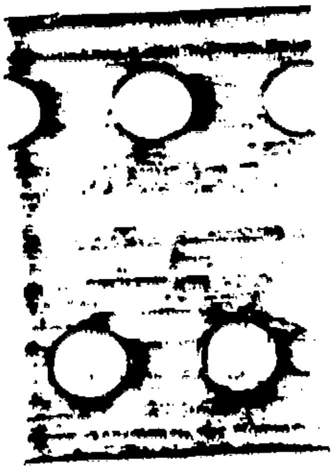
TR82906AS, COMP CHANGE, BIG SCAN (AFTER RUN) INLET OPEN, RANGE CLOSED.

HOUSEKEEPING DATA FILAMENT NUMBER 1

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	1	1	1	1	1	1	1	1	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~0.280~~
MINUS 15 VOLT	130	130	130	130	130	130	130	129	~~[illegible]~~
ION PUMP VOLT	181	181	180	180	180	181	180	181	~~[illegible]~~
ION SOURCE TEMP	90	90	90	90	90	90	90	90	~~[illegible]~~
PRE-AMP TEMP	169	169	168	169	168	168	168	168	~~[illegible]~~
PLUS 5 VOLT	120	121	120	120	121	121	120	121	~~[illegible]~~
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	126	125	126	126	125	125	126	125	~~[illegible]~~
COLLECTOR CURRENT	115	115	115	115	115	115	115	115	~~[illegible]~~
ELECTRON ACC VOLT	190	190	189	189	189	190	189	189	~~[illegible]~~
ION ACC VOLT	39	39	39	39	39	39	39	39	~~[illegible]~~
ION PUMP ANALOG									0.0020
28 VOLT POWER SUP									~~[illegible]~~

3/ 4/ 1982 2101 HRS SUM: FUNCTIONAL TEST 6-H 6





25 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
1	6	6	6	6	4	4	4	27
2	53	6	23	53				
3	6	6	6	6				
4	6	6	6	6				
5	53	6	6	6				
6	6	6	6	6	4	4	4	4
7	6	6	23	6				
8	38	6	6	6				
9	6	6	6	6				
10	6	6	6	6				
11	6	6	23	6	4	4	4	4
12	6	6	6	6				
13	6	6	6	6				
14	6	6	6	6				
15	6	6	6	6				
16	6	6	6	6	4	4	4	4
17	23	6	23	6				
18	6	6	6	6				
19	6	6	6	6				
20	6	6	[illegible]	38				
21	6	6	6	6	4	4	4	4
22	6	6	6	6				
23	6	6	23	6				
24	6	6	6	6				
25	6	6	6	6				
26	38	130	160	160	4	4	4	4
27	130	145	99	160				
28	114	114	145	130				
29	130	130	145	114				
30	69	6	6	6				
31	6	6	6	6	4	4	4	4
32	23	6	6	6				
33	6	6	6	6				
34	53	6	6	6				
35	6	6	6	6				
36	38	6	6	23	4	4	4	4
37	6	6	6	6				
38	6	6	6	38				
39	6	6	6	23				
40	6	6	6	6				
41	23	6	6	6	4	4	4	4
42	99	53	64	53				
43	64	23	53	38				
44	99	69	64	99				
45	64	64	69	38				
46	6	6	6	6	4	4	4	12
47	6	6	6	6				
48	23	6	6	53				
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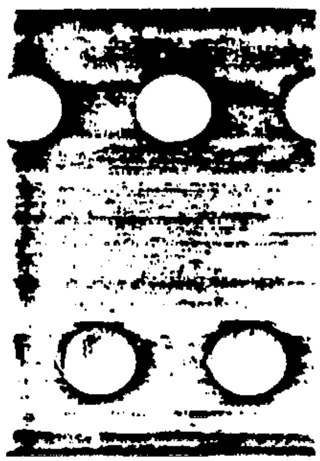
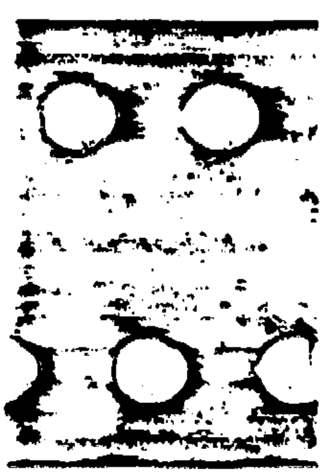
50	6	6	6	6				

1





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54	23	8	8	53				12
55	8	23	23	8				
56	23	8	8	8	4			
57	23	38	23	8		4		
58	8	8	8	23			4	
59	8	8	23	8				4
60	8	23	8	8				
61	38	8	8	8	4			
62	8	8	8	23		4		
63	23	8	8	8			4	
64	8	8	8	8				4
65	8	8	8	8				
66	23	8	8	8	4			
67	8	8	8	8		4		
68	8	8	38	8			4	
69	23	8	8	8				4
70	8	38	8	8				
71	23	8	23	38	4			
72	8	8	8	8		4		
73	8	23	8	8			4	
74	23	8	23	8				4
75	8	8	8	8				
76	8	8	8	8	4			
77	8	8	8	53		4		
78	23	175	206	267			4	
79	404	420	420	465				12
80	465	404	461	450				
81	450	450	435	450	4			
82	404	262	160	114		4		
83	69	8	8	8			4	
84	38	8	8	8				4
85	23	23	23	8				
86	8	8	8	8	4			
87	8	23	8	8		4		
88	23	69	23	8			4	
89	8	84	53	69				4
90	99	99	130	145				
91	145	84	99	99	4			
92	145	114	99	84		4		
93	99	8	23	8			4	
94	8	8	8	69				12
95	23	8	8	8				
96	8	23	38	23	4			
97	23	53	8	23		4		
98	23	8	8	8			12	
99	8	23	8	53				19
100	298	1170	1390	1750				
101	2230	2530	2590	2660	4			
102	2660	2660	2590	2660		4		
103	2720	2590	2590	2530			4	
104	2110	1210	969	694				27
105	374	53	23	8				
106	8	8	8	8	4			
107	8	8	38	23		4		
108	8	38	8	23			4	
109	38	8	8	23				12
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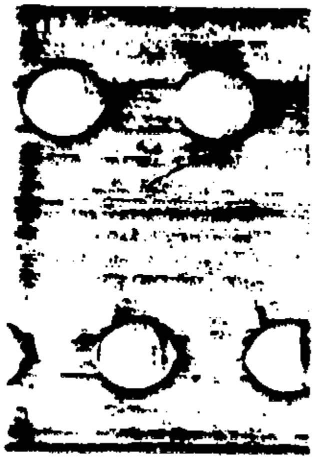

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117	23	8	8	8		4		
118	8	23	8	8			4	
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120	38	8	8	8				
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123	38	8	8	8			4	
124	8	8	8	8				4
125	8	8	8	8				
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127	8	8	23	8		4		
128	38	8	8	8			4	
129	8	8	8	8				12
130	8	8	8	38				
131	38	8	8	8	4			
132	8	8	8	8		4		
133	8	8	8	8			4	
134	23	8	8	8				4
135	8	8	8	23				
136	8	8	8	8	4			
137	8	8	8	8		4		
138	8	8	8	8			4	
139	8	8	8	8				4
140	23	8	8	8				
141	23	8	8	8	4			
142	23	8	8	23		4		
143	38	8	8	8			4	
144	8	8	8	8				12
145	8	8	8	8				
146	38	8	8	38	4			
147	23	8	8	8		4		
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150	23	23	8	8				
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153	23	38	8	53			4	
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155	8	8	8	23				
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157	8	8	8	8		4		
158	8	8	8	8			4	
159	23	8	8	8				12
160	8	8	23	8				
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162	38	8	8	38		4		
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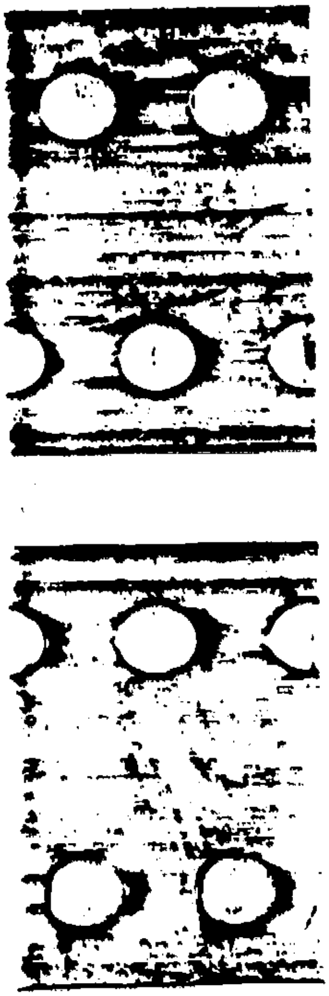

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173	326	435	481	450			4	
174	481	481	481	481				4
175	450	465	481	420				
176	420	404	359	298	4			
177	130	23	8	38		4		
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179	8	8	8	8				12
180	8	8	8	23				
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182	69	84	114	130		4		
183	160	175	114	145			4	
184	191	130	130	130				12
185	130	130	145	99				
186	38	8	8	8	4			
187	8	8	8	23		4		
188	8	8	8	8			4	
189	23	8	8	8				4
190	8	8	8	8				
191	38	8	8	38	4			
192	8	38	8	84		4		
193	145	84	84	69			4	
194	84	99	84	99				12
195	99	53	53	69				
196	23	38	8	8	4			
197	8	8	8	8		4		
198	8	8	8	8			4	
199	23	8	8	8				12
200	8	8	8	8				
201	8	8	23	23	4			
202	23	8	8	38		4		
203	8	8	23	38			4	
204	23	23	8	8				4
205	8	53	38	8				
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207	8	23	8	8		4		
208	38	8	8	53			19	
209	8	8	8	8				570
210	8	8	8	8				
211	8	23	8	23	1235			
212	8	8	23	8		1570		
213	23	8	8	23			1695	
214	114	145	175	175				1755
215	145	160	160	145				
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217	130	160	160	99		1755		
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219	8	23	8	8				1785
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223	8	8	8	8			1785	
224	8	8	8	8				1815
225	8	8	8	8				
226	23	8	8	23	1785			
227	8	8	8	8		1815		
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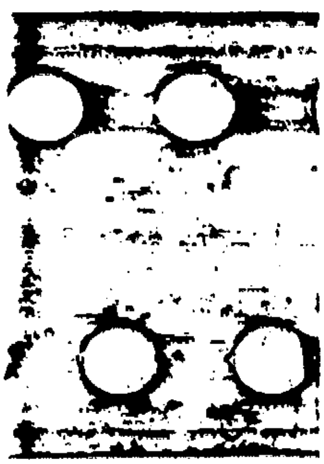

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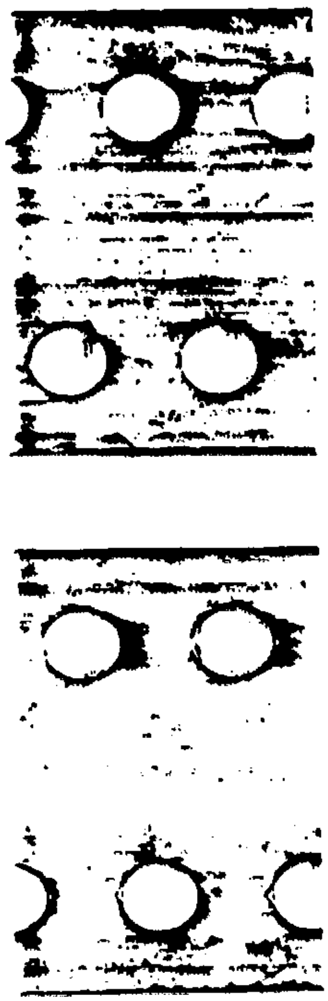

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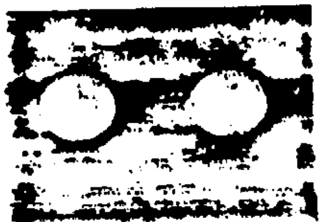
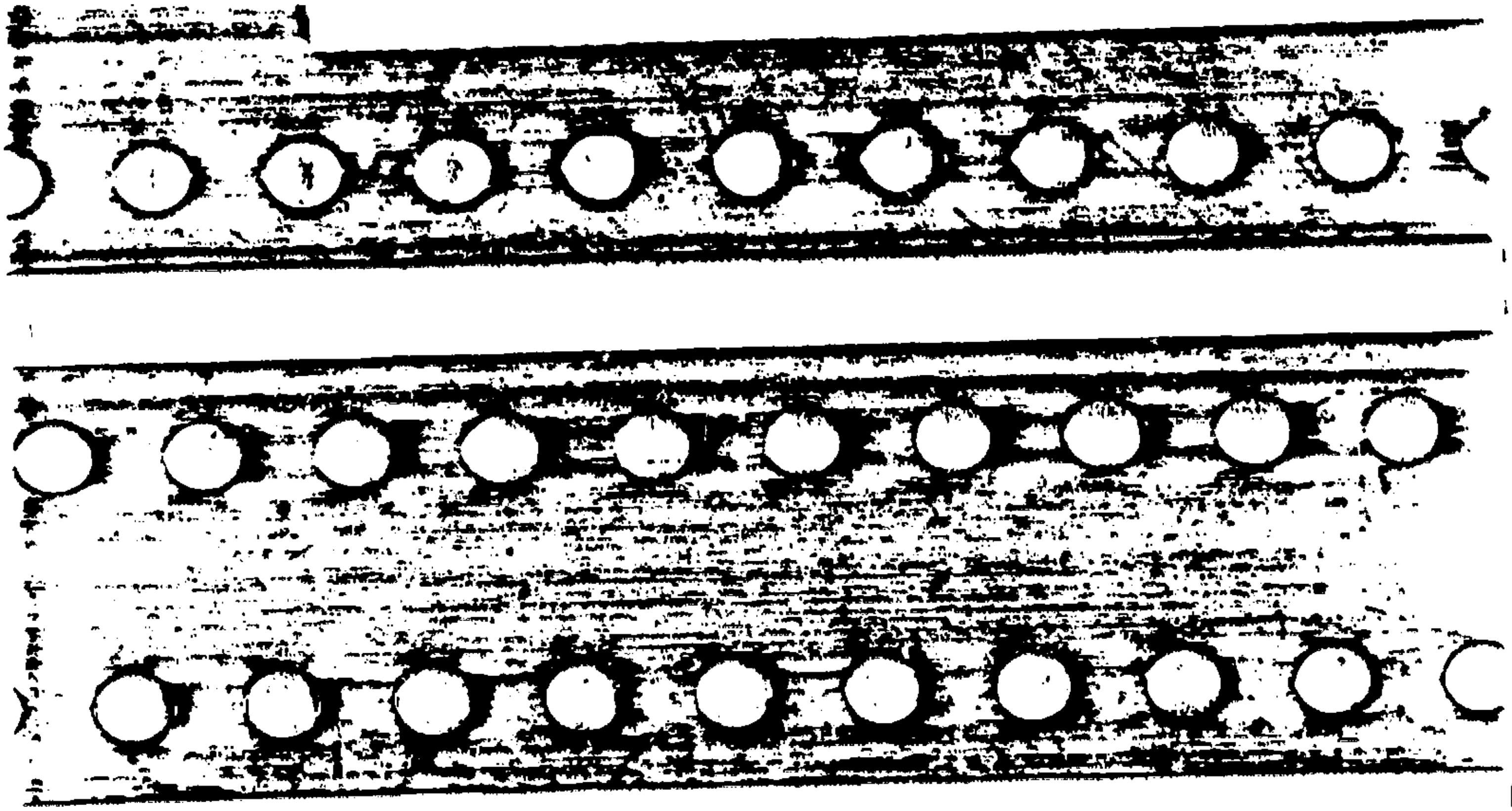

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3 4 1982 2106 HRS SUMS S/N 6
FUNCTIONAL TEST

DATA TAPE ID 9 BULK DATA FILE # 2

SUMS FUNCTIONAL TEST

CHAMBER PRESSURE 7E-8 TORR, ORIFICE OPEN, THROTTLING VALVE OPEN.

HOUSEKEEPING DATA FILAMENT NUMBER 2

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	2	2	2	2	2	2	2	2	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~0.200~~
MINUS 15 VOLT	130	130	130	130	129	129	129	129	~~-0.020~~
ION PUMP VOLT	181	181	181	181	180	180	180	180	~~0.010~~
ION SOURCE TEMP	90	90	90	90	90	90	90	90	~~[illegible]~~
PRE-AMP TEMP	168	169	169	168	169	169	169	169	~~[illegible]~~
PLUS 5 VOLT	121	120	120	120	120	120	120	120	~~[illegible]~~
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	125	125	125	125	125	125	125	125	~~[illegible]~~
COLLECTOR CURRENT	105	106	106	106	106	105	106	106	~~[illegible]~~
ELECTRON ACC VOLT	190	189	189	189	189	190	190	190	~~[illegible]~~
ION ACC VOLT	39	39	39	39	39	39	39	39	~~[illegible]~~
ION PUMP ANALOG									0.0020
28 VOLT POWER SUP									~~0.210~~

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75 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
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4	8	38	8	8				27
5	8	8	23	8				
6	8	23	23	8	12			
7	8	8	8	8		12		
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16	23	38	23	8	27			
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19	8	8	8	8				4
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21	8	8	8	8	4			
22	8	23	38	8		4		
23	23	8	8	8			4	
24	23	8	8	8				4
25	8	8	8	38				
26	145	282	282	312	19			
27	359	359	359	329		4		
28	343	343	359	359			4	
29	359	374	312	298				4
30	206	69	53	23				
31	8	8	8	23	4			
32	8	8	8	8		4		
33	8	8	8	8			4	
34	8	8	8	23				12
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37	8	8	23	8		4		
38	23	8	8	8			4	
39	8	8	23	8				4
40	8	8	8	8				
41	8	8	8	8	12			
42	8	69	69	53		4		
43	53	53	53	23			4	
44	69	53	69	69				19
45	69	69	23	38				
46	8	8	8	23	4			
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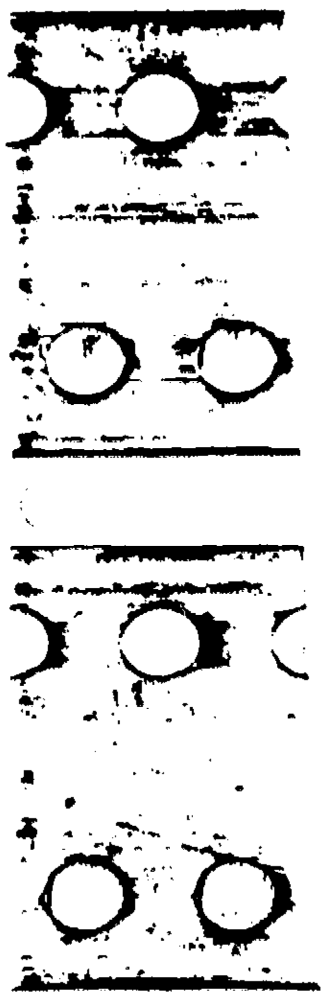

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77	8	8	8	8
78	8	5[illegible]	14[illegible]	160
79	191	221	[illegible]	253
80	[illegible]	221	253	221
81	253	206	221	237
82	253	160	114	38
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91	53	64	114	69
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96	8	23	38	8
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98	38	8	69	8
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103	1820	1790	1750	1720
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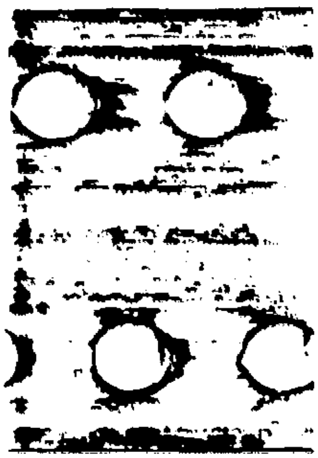

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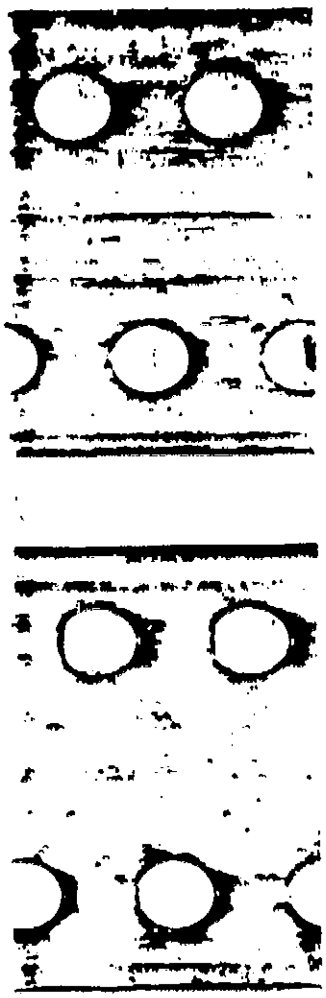

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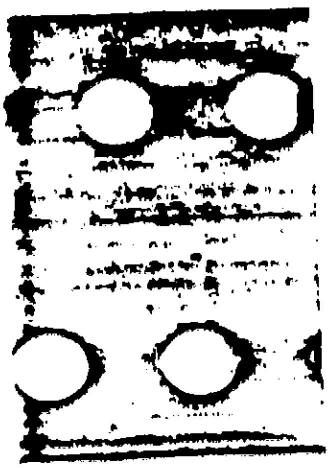

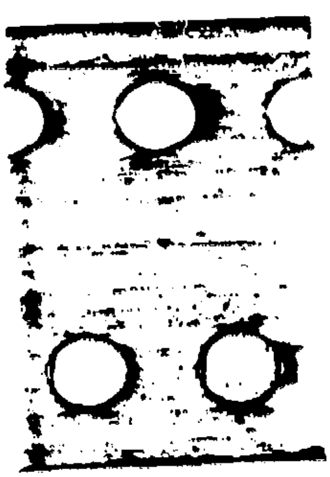

231–290

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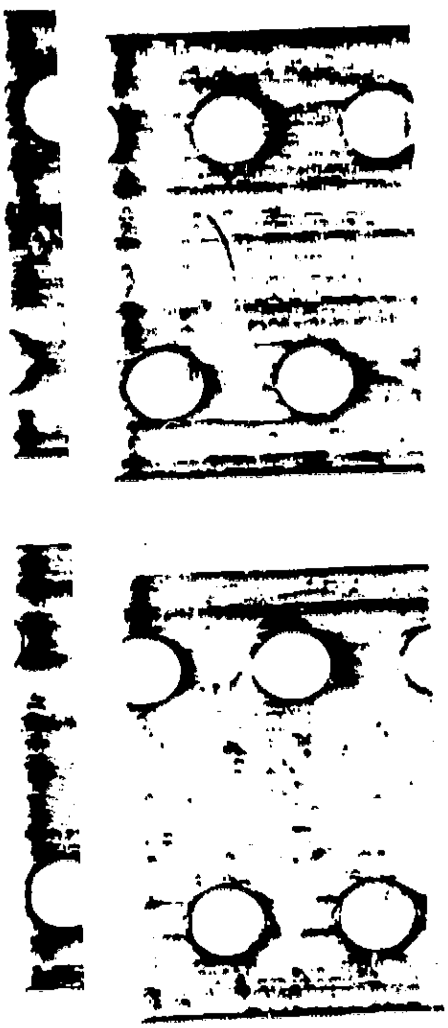

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103	111	111	103
111	119	119	80
57	4	4	4

SPECIAL TESTS FOLLOWING COMPLETION OF DYNAMIC CALIBRATION

SUMS S/N 1
UAMS S/N 6
T/C G. Robertson
Date 2-25-82

- All tests were run with filament #1.

- Background spectra taken with all SUMS valves open, calibration station orifice open, and station chamber pressure at 6×10^{-9} Torr. SUMS has been pumping on itself with the inlet valve closed and the range valve open for ∿ 24 hours prior to this time. Before this the inlet pressure was as high as 33 Torr. Background data stored on tape #008, file #3.

- Temperatures:

  UAMS ion source = 90_{10} (i.e. fully warmed up)

  T11 73.7°F
  T12 73.0°F
  T15 78.9°F

- Special Test #1

  Nominal Pressure Profile followed up to time = 150 seconds, then pressure was held constant and data was taken for another 50 seconds. Data stored on HP9830 tape #202, bulk file #2.

- Special Test #2

  Same as above except pressure was held at t = 650 seconds. Data stored on HP9830 tape #202, bulk file #3.

- Special Test #3

  Exponential pressure profile was followed starting at P = .1 Torr. Curve followed was:

  $$P = Poe^{at}$$
  $$Po = .1 \text{ Torr}$$
  $$a = 0.0132$$

  Range valve closed for entire test. Inlet valve allowed to close automatically. Data stored on HP9830 tape #202, bulk file #4. After pumping down system at the end of the run, AMU28 peak was less than 2.7×10^{-12} Amps.

- Special Test # 1 (Again)

  First run was done with filament #2 by mistake. Test was rerun using filament #1. Same profile. Data on tape #202, bulk file #2.

	ext. press.	before	after
AMU 28 peak @	3×10^{-8} Torr	3.51×10^{-12} A	3.73×10^{-12} A

- Special Test #2 (Again)

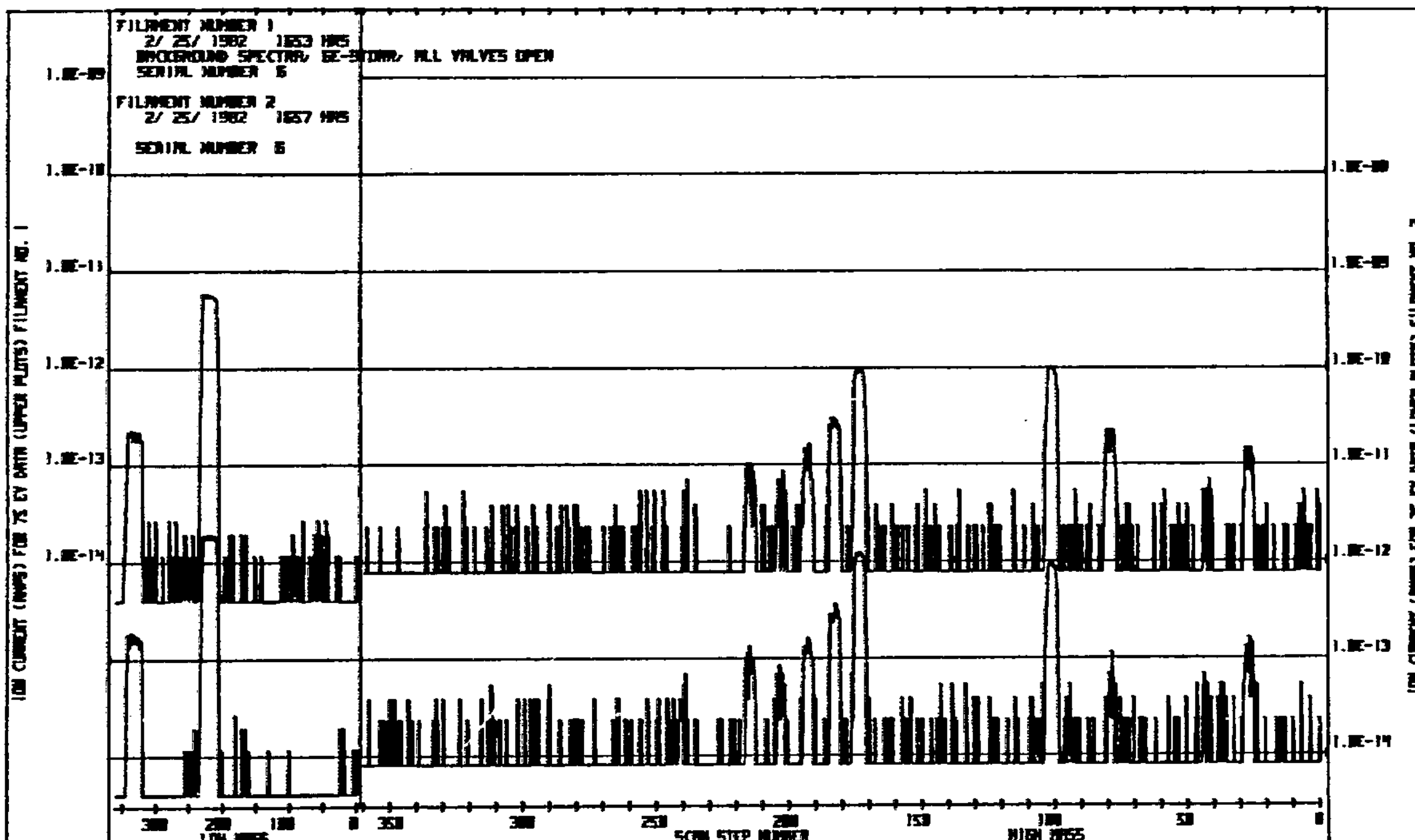
First run done with filament #2 by mistake. Test rerun using filament #1. Nominal profile from t = 500 to t = 630, hold at 630. Data on tape #202, bulk file #3.

	ext. press.	before	after
AMU 28 peak	@ 2×10^{-8} T	2.59×10^{-12} A	2.47×10^{-12} A
AMU 14 peak	@ 2×10^{-8} T	1.75×10^{-13} A	1.91×10^{-13} A

T11 75.2 °F
T12 74.6 °F
T15 75.9 °F

- After running the three special tests a second background spectra was taken. This spectra was taken with all SUMS valves open, the calibration station throttling valve fully open, the orifice open and the chamber pressure at 3×10^{-8} Torr. The background data is stored on HP9830 tape #008, bulk file #4.

tape #008
file #3



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2 25 1982 1053 HRS SUMS FUNCTIONAL TEST S N 6 PAGE 1 OF 8

DATA TAPE ID 8 BULK DATA FILE # 3

SUMS FUNCTIONAL TEST

BACKGROUND SPECTRA, 6E-9TORR, ALL VALVES OPEN Before Special Tests

HOUSEKEEPING DATA FILAMENT NUMBER 1

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	1	1	1	1	1	1	1	1	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	15.200
MINUS 15 VOLT	129	130	130	130	130	130	130	130	-15.010
ION PUMP VOLT	181	181	181	181	180	180	181	181	7.196
ION SOURCE TEMP	90	90	90	90	90	90	90	90	3.560
PRE-AMP TEMP	167	168	168	168	168	168	168	168	6.683
PLUS 5 VOLT	120	120	121	120	121	120	121	121	4.772
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	125	126	126	126	126	125	126	126	4.982
COLLECTOR CURRENT	111	111	111	111	111	111	111	111	4.422
ELECTRON ACC VOLT	190	190	190	190	190	189	189	190	7.572
ION ACC VOLT	39	39	39	39	39	39	39	39	1.485
ION PUMP ANALOG									0.0020
28 VOLT POWER SUP									28.380

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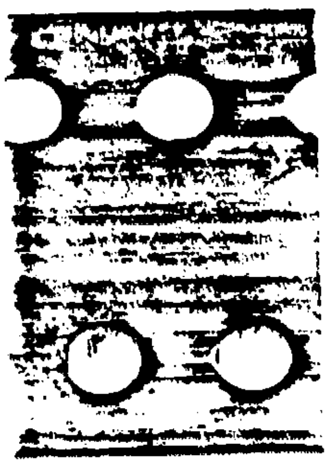

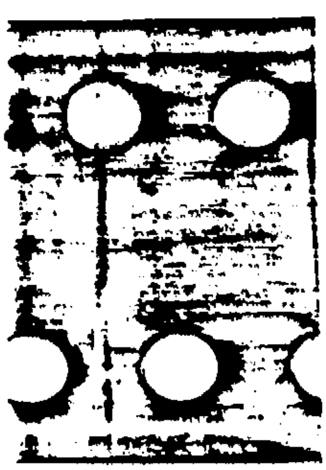

2 25 1982 1653 HRS SUMS S N 6
FUNCTIONAL TEST

75 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
1	8	38	8	8	4			
2	8	53	8	8		12		
3	8	8	8	8			4	
4	8	8	23	8				4
5	8	23	8	23				
6	8	23	8	8	4			
7	8	53	8	8		4		
8	23	8	8	8			4	
9	38	23	8	8				4
10	8	23	8	8				
11	8	8	8	8	4			
12	8	8	8	8		4		
13	8	8	23	8			4	
14	8	23	8	23				4
15	8	8	8	8				
16	8	8	8	8	4			
17	8	8	8	8		4		
18	8	8	23	8			4	
19	8	8	8	8				4
20	8	8	8	8				
21	8	38	8	8	4			
22	8	8	23	8		4		
23	8	8	8	8			4	
24	8	8	23	8				4
25	8	8	6	8				
26	23	114	53	84	4			
27	130	145	84	99		12		
28	99	114	99	84			4	
29	145	130	130	53				1[illegible]
30	53	8	8	23				
31	8	8	8	8	4			
32	8	8	8	8		12		
33	8	8	8	23			4	
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35	8	23	[illegible]	8				
36	8	23	8	8	4			
37	8	8	8	8		4		
38	8	8	8	8			4	
39	8	8	8	8				4
40	8	8	8	8				
41	8	8	8	8	4			
42	38	53	23	8		4		
43	69	53	53	8			4	
44	38	53	38	53				1[illegible]
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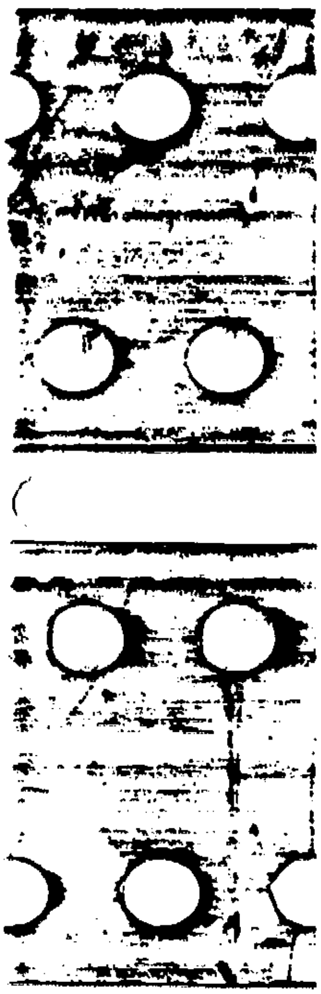

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56	8	23	8	8	4			
57	8	8	23	8		19		
58	8	8	8	8			4	
59	8	8	8	8				27
60	53	23	8	8				
61	8	38	8	8	4			
62	8	8	8	8		4		
63	8	8	8	8			12	
64	38	8	8	8				19
65	8	8	8	8				
66	8	8	8	8	4			
67	8	8	8	8		12		
68	8	8	8	8			4	
69	8	8	8	8				4
70	8	23	8	8				
71	8	8	8	8	4			
72	8	23	8	8		12		
73	8	38	8	8			4	
74	8	8	38	8				4
75	8	23	8	8				
76	23	8	8	8	4			
77	8	8	8	38		4		
78	8	64	99	114			4	
79	160	221	221	206				4
80	221	221	191	130				
81	191	175	175	221	4			
82	206	130	99	53		27		
83	23	23	8	8			4	
84	8	8	8	23				4
85	8	8	8	8				
86	8	8	8	8	4			
87	8	8	8	8		12		
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89	8	23	8	8				4
90	8	8	8	8				
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92	23	8	8	8		12		
93	8	8	53	8			4	
94	8	8	8	8				4
95	23	8	23	8				
96	8	23	8	8	4			
97	8	8	8	23		19		
98	8	23	8	8			4	
99	8	8	8	8				12
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101	847	938	938	969	4			
102	954	969	1020	992		12		
103	992	992	992	923			12	
104	771	374	282	252				12
105	130	23	8	8				
106	8	8	8	8	4			
107	8	8	23	8		4		
108	8	8	8	8			12	
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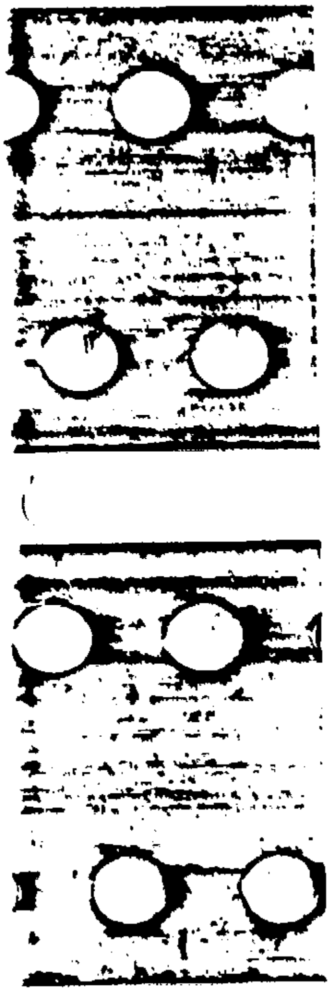

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130	6	6	6	23				
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137	6	53	6	6		4		
138	6	39	6	6			4	
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140	6	23	23	6				
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142	6	6	6	6		4		
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146	6	39	6	6	4			
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149	6	6	6	53				4
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152	6	6	6	39		4		
153	6	23	6	23			4	
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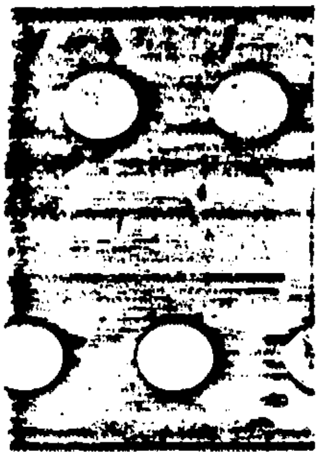

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177	191	38	23	23		4		
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182	99	221	237	252		4		
183	237	252	282	252			4	
184	267	298	298	237				4
185	298	252	237	252				
186	175	84	8	38	4			
187	8	23	8	8		19		
188	8	8	8	8			4	
189	8	8	8	8				4
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191	8	8	8	8	4			
192	38	53	69	69		19		
193	69	145	160	145			4	
194	84	99	99	114				12
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199	8	8	8	23				12
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202	23	53	23	38		4		
203	8	84	38	53			4	
204	23	53	8	23				4
205	69	38	38	38				
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218	23	8	8	8			5450	
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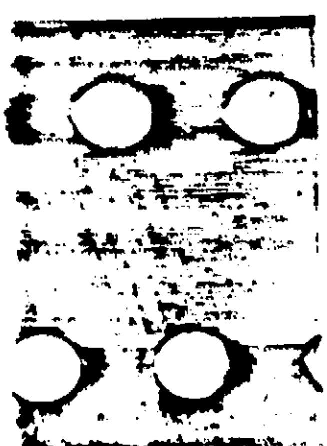

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247	8	23	8	8		19		
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268	8	23	8	8			4	
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271	8	8	8	8	4			
272	8	8	8	8		27		
273	8	8	8	8			4	
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276	8	23	8	8	4			
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279	8	23	8	8				4
280	8	8	8	38				
281	8	8	8	38	4			
282	8	8	8	8		27		
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284	23	8	8	38				4
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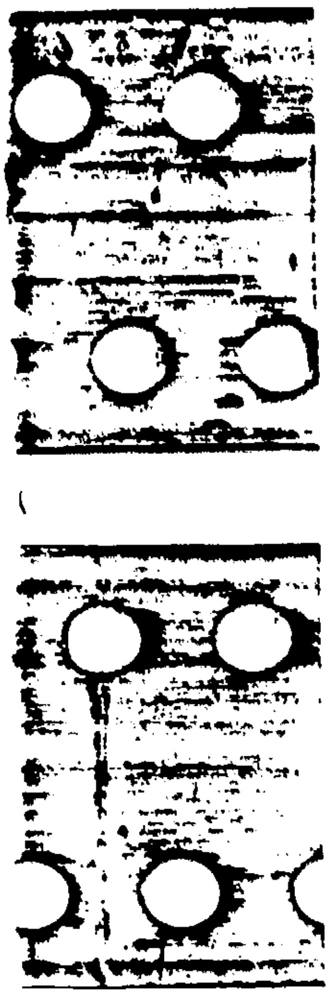

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300	8	8	8	8				
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302	8	8	8	8		27		
303	8	38	8	8			4	
304	23	8	8	8				4
305	8	8	8	23				
306	8	8	8	38	4			
307	8	8	8	8		12		
308	8	8	8	38			4	
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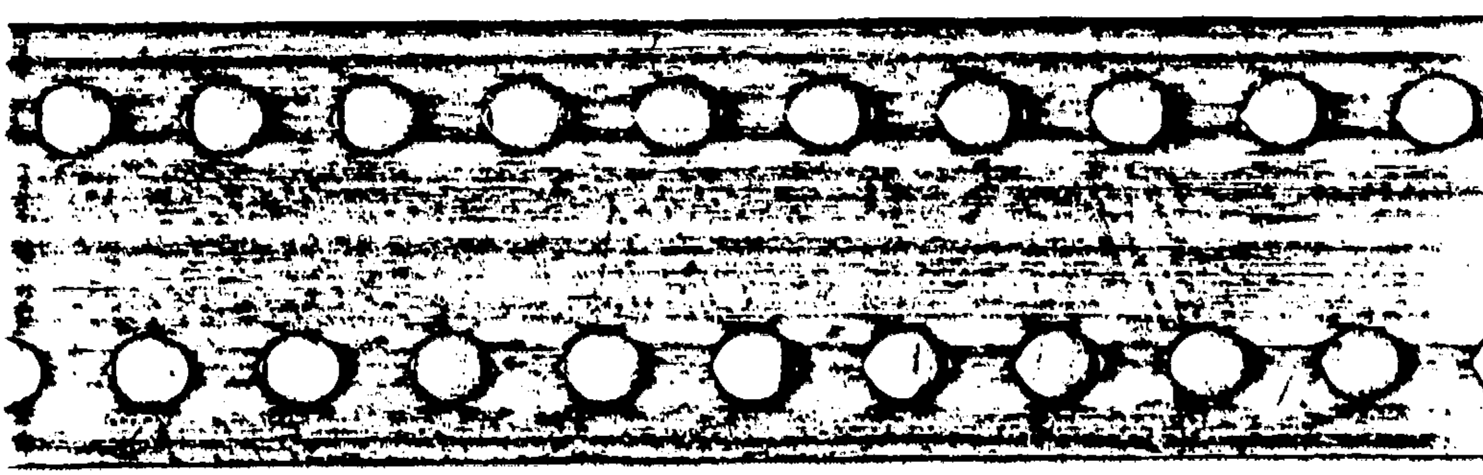

DATA TAPE ID 8 BULK DATA FILE # 3

SUMS FUNCTIONAL TEST

HOUSEKEEPING DATA FILAMENT NUMBER 2

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	2	2	2	2	2	2	2	2	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	15.170
MINUS 15 VOLT	129	129	129	129	130	130	130	129	-14.980
ION PUMP VOLT	180	180	180	180	180	181	181	181	7.200
ION SOURCE TEMP	90	90	90	90	90	90	90	90	3.559
PRE-AMP TEMP	168	168	168	168	168	167	168	168	6.685
PLUS 5 VOLT	120	120	120	120	120	120	120	120	4.763
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	125	125	125	125	125	125	125	125	4.955
COLLECTOR CURRENT	106	106	106	106	106	106	106	106	4.198
ELECTRON ACC VOLT	190	189	190	190	190	190	190	189	7.570
ION ACC VOLT	39	39	39	39	39	39	39	39	1.487
ION PUMP ANALOG									0.0020
28 VOLT POWER SUP									28.370

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75 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
1	8	23	8	8	12			
2	8	8	8	8		4		
3	8	8	8	8			4	
4	8	8	8	38				4
5	8	8	8	8				
6	8	8	8	8	12			
7	8	8	8	8		4		
8	8	53	8	8			4	
9	8	8	8	8				4
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11	8	23	8	8	4			
12	8	8	8	8		4		
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14	8	23	8	23				4
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19	8	8	8	8				4
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21	8	8	8	23	19			
22	8	8	8	8		4		
23	8	8	8	8			4	
24	8	8	8	53				4
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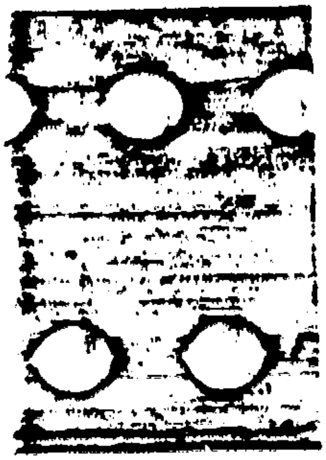

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104	740	374	313	237				4
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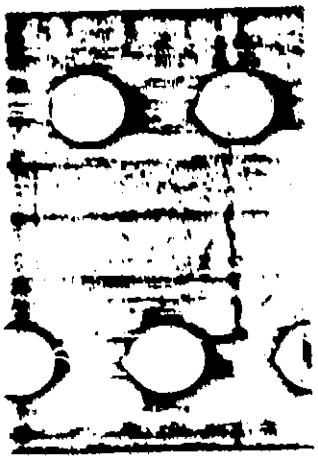

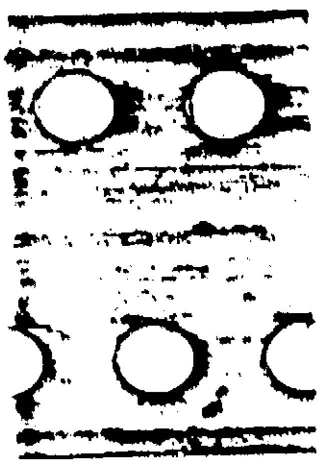

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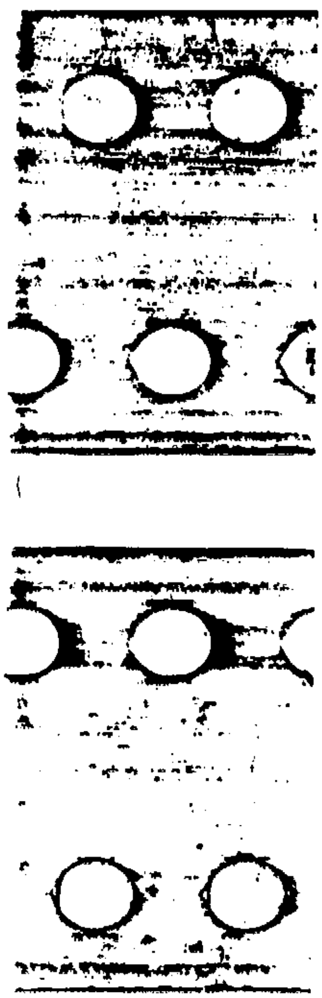

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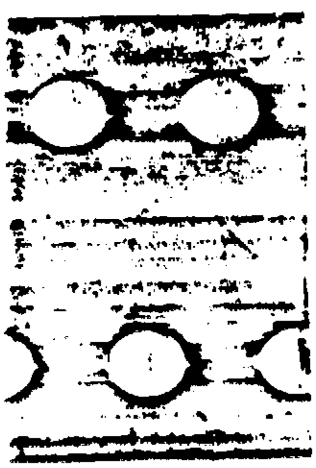

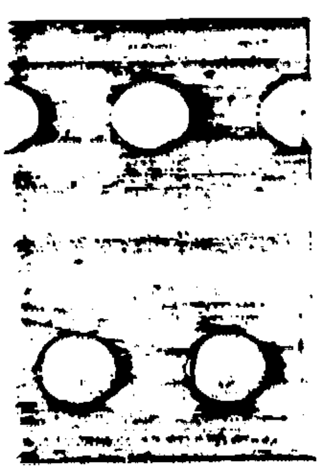

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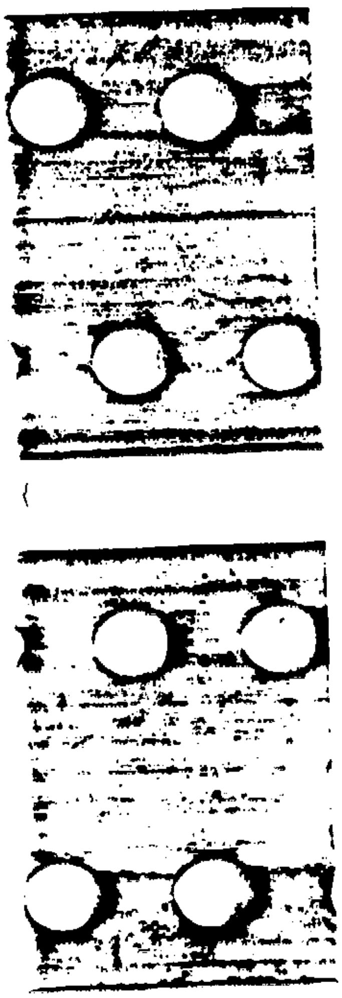

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337	8	8	8	8		149		
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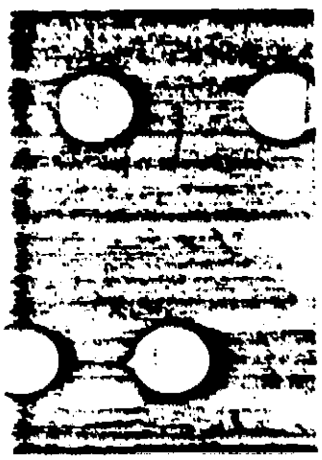
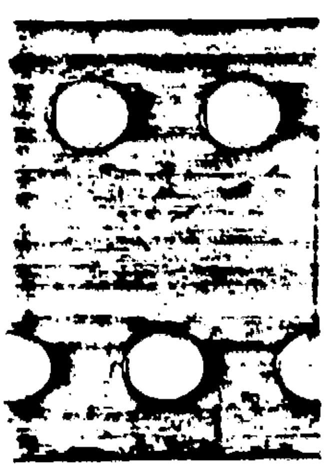
.1*E.3F,.0132*T PRESSURE PROFILE, 2-24-82, TAPE #20, FILE #4.





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20.0	0.114260	132	27
25.2	0.125730	[illegible]	27
30.0	0.135460	135	32
35.0	0.145270	136	32
40.0	0.156010	138	32
45.1	0.166410	140	36
50.2	0.179770	142	36
55.1	0.192520	144	38
60.2	0.206490	147	40
65.2	0.221440	149	39
70.0	0.237070	153	44
75.1	0.251540	156	47
80.0	0.272230	159	52
85.0	0.289850	162	51
90.1	0.310080	164	55
95.0	0.328860	166	59
100.0	0.358770	168	62
104.9	0.378190	171	65
109.9	0.399110	173	67
115.2	0.441370	177	70
120.0	0.460870	179	70
124.9	0.480850	183	75
129.9	0.521020	186	76
135.1	0.559040	189	80
140.1	0.601900	192	81
145.1	0.640430	194	86
150.1	0.688060	196	89
155.1	0.725810	198	93
160.0	0.787620	200	96
164.9	0.833250	203	97
170.1	0.901900	205	100
175.0	0.939300	209	102
179.9	1.041000	210	103
185.0	1.098500	213	105
189.9	1.125600	216	108
194.9	1.153000	219	110
199.8	1.195200	220	112
205.1	1.279300	223	112
210.1	1.387000	225	115
215.0	1.545800	227	118
219.8	1.715700	229	122
225.1	1.829700	232	127
229.9	1.927200	235	130
235.0	2.058900	236	132
240.0	2.233100	240	134
245.0	2.398700	244	137
250.0	2.502800	247	139
255.0	2.665500	251	142
260.0	2.885900	253	144
265.0	3.098700	259	147
270.0	3.254900	261	151
275.0	3.484000	263	154
280.0	3.758900	265	157
284.9	3.997600	267	162
289.8	4.291600	271	164
294.8	4.554700	273	166
299.8	4.940800	277	168
305.0	5.246200	281	171
309.9	5.578100	284	174
314.8	5.970400	288	177
319.8	6.434200	290	180
324.8	6.807300	293	184
330.0	7.349700	295	187
334.9	7.780500	297	191
339.9	8.427000	300	194
345.1	8.980000	304	197

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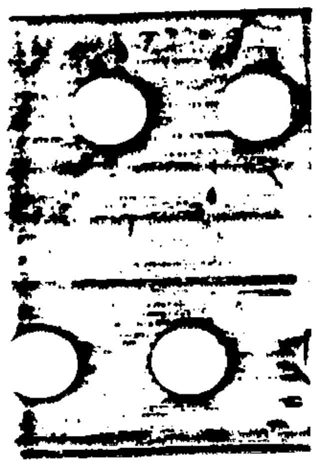
354.9	9.477000	310	201
359.9	9.740000	311	202
364.9	10.350000	312	203
369.9	11.445000	315	205
374.8	12.873000	317	204
379.9	13.951000	324	216
384.8	15.008000	327	221
389.9	16.036000	331	225
394.8	17.090000	333	227
399.7	18.391000	336	229
404.8	19.281000	340	231
409.9	21.100000	342	233
414.8	22.067000	347	236
419.7	24.036000	352	238
424.8	26.207000	355	242
429.9	26.901000	356	245
434.9	28.808000	359	246
439.9	30.944000	362	249
444.8	33.043000	364	252
449.8	35.319000	367	255
454.7	37.627000	371	259
459.8	40.314000	374	260
464.9	42.980000	377	262
469.8	45.992000	380	263
474.7	49.049000	383	264
479.8	52.421000	385	267
484.7	55.899000	385	266
489.7	36.032000	385	266



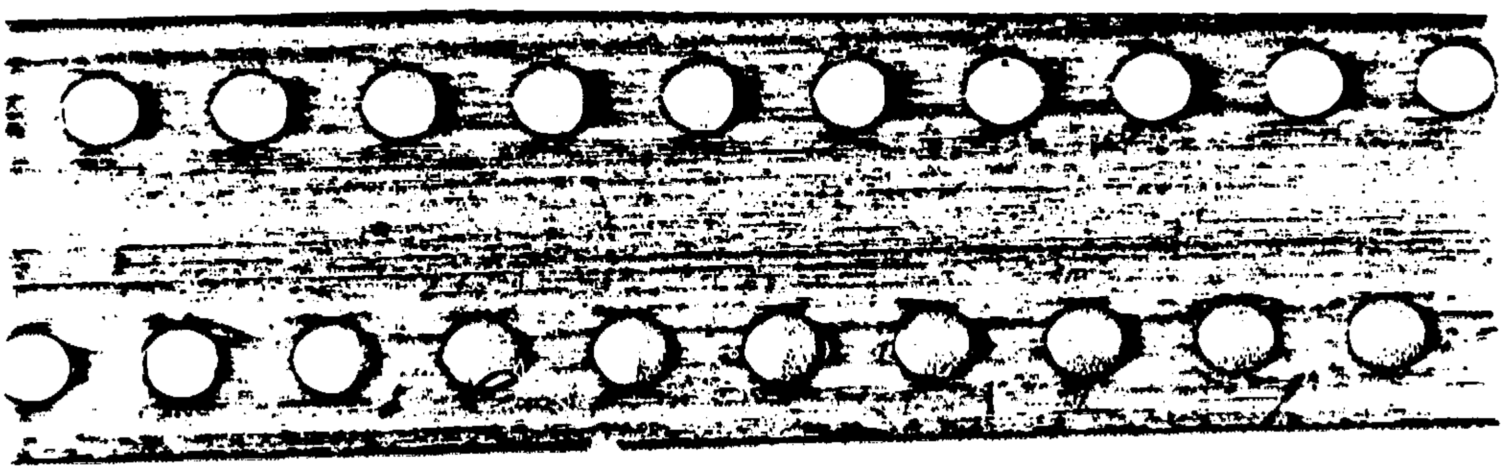
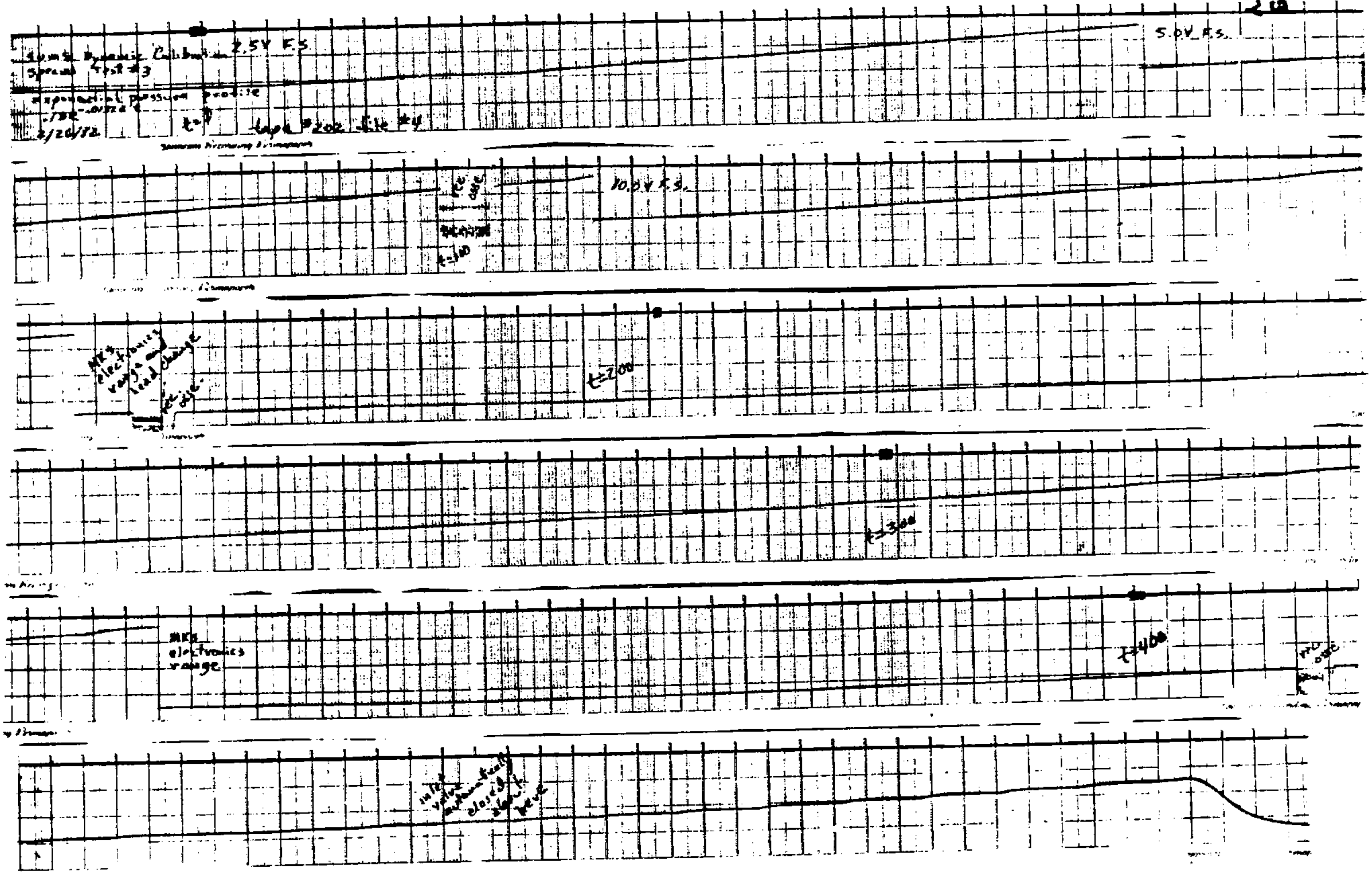


FIGURE 10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tape #202 file #4
2/20/72
5.0V F.S.
10.0V F.S.
t=100
t=200
t=300
t=400
MKS electronics range

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NOM PRESS PROFILE TO 150 SEC THEN HOLD, 2-26-82, TAPE #202, FILE #2.

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20.0	0.000163	227	112
25.0	0.000173	228	112
30.0	0.000177	229	113
35.0	0.000180	229	114
40.0	0.000188	230	115
45.0	0.000194	231	116
50.0	0.000199	232	118
55.0	0.000208	233	119
59.8	0.000211	234	120
64.7	0.000218	235	122
70.0	0.000222	236	123
74.8	0.000228	237	125
79.8	0.000242	238	126
84.7	0.000250	240	128
89.9	0.000248	241	129
94.9	0.000265	242	130
99.9	0.000263	244	131
104.9	0.000274	245	132
109.8	0.000280	247	133
114.7	0.000293	248	134
119.7	0.000303	250	135
124.7	0.000307	251	136
129.9	0.000321	253	137
134.9	0.000324	255	138
139.9	0.000337	257	139
144.9	0.000345	258	140
149.9	0.000361	259	142
154.9	0.000373	260	143
159.9	0.000369	262	144
164.8	0.000369	262	145
169.9	0.000369	263	146
174.9	0.000367	263	146
179.9	0.000368	264	147
184.9	0.000369	264	146
189.8	0.000368	264	147
194.8	0.000371	264	147
199.8	0.000370	264	147
204.8	0.000368	263	147
209.8	0.000371	264	147
214.8	0.000372	265	147
219.8	0.000368	264	147
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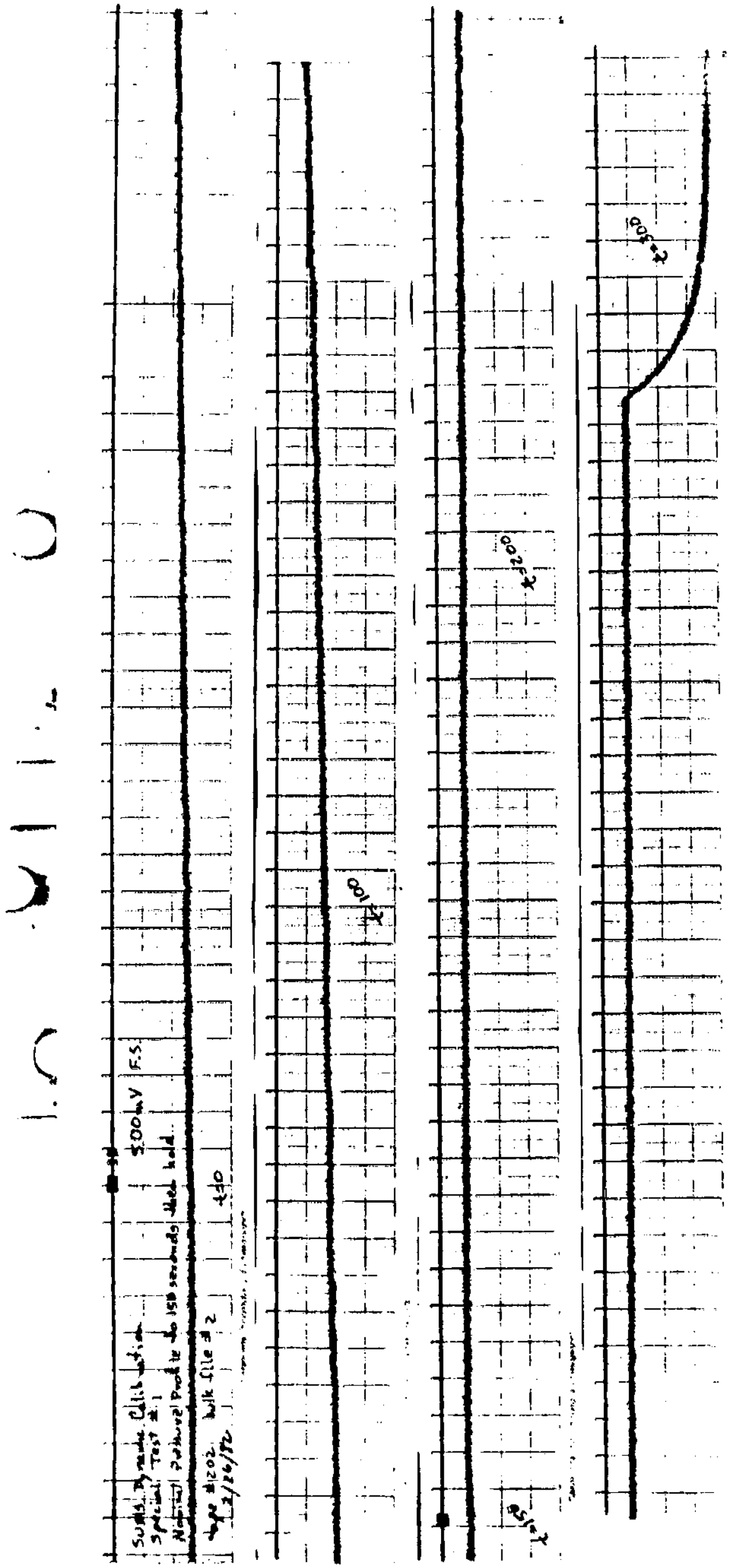

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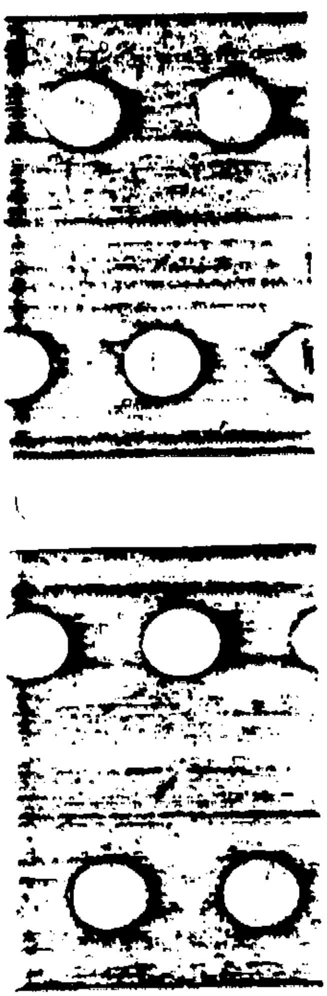
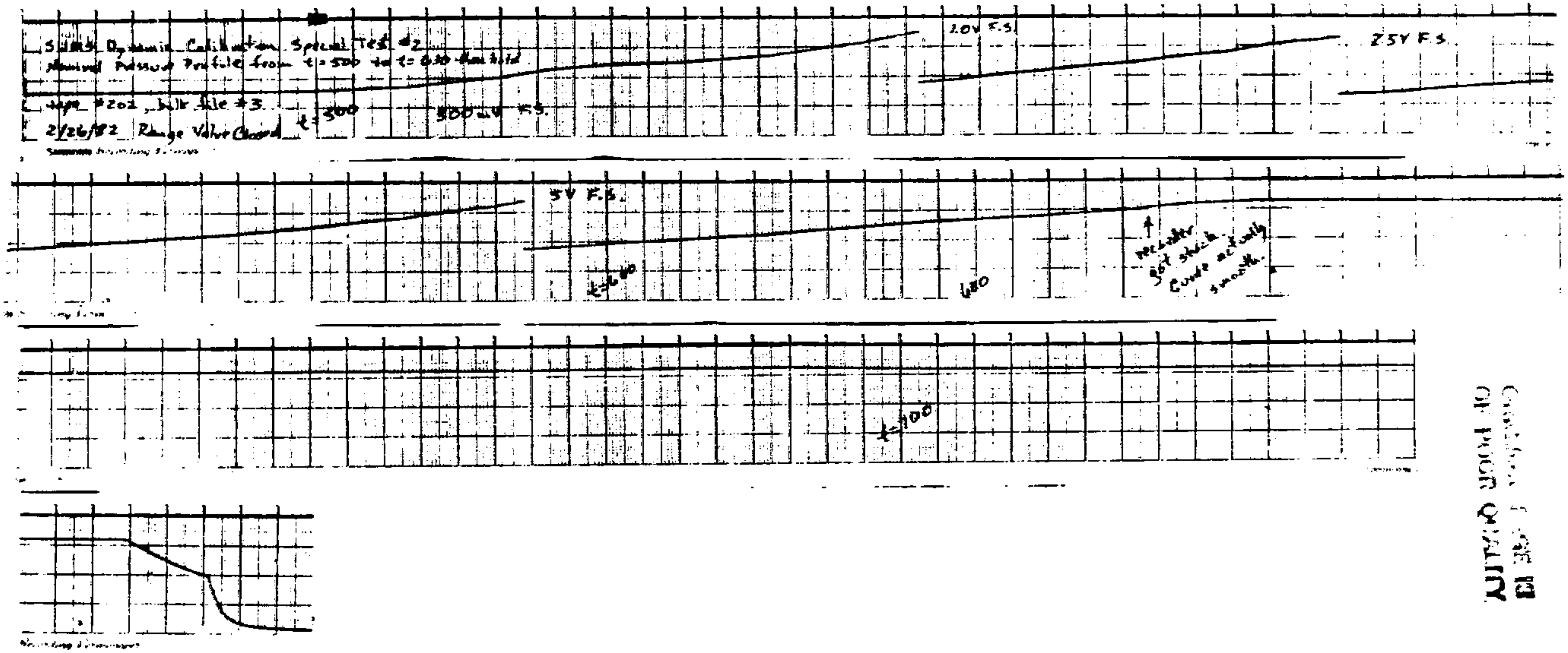
NOM PFL ? PROFILE TO 630 SEC THEN HOLD, 2-26-82, TAPE #20, FILE #..



TIME	BARATRON PRESSURE	AMU [illegible]	AMU 14
500.0	0.183800	169	54
505.2	0.198100	169	54
510.5	0.234000	170	57
520.2	0.296600	172	61
525.2	0.322600	175	61
530.2	0.371600	179	68
535.2	0.439400	184	71
540.2	0.513700	189	75
545.2	0.583300	194	80
550.2	0.669300	199	85
555.2	0.770000	203	93
560.2	0.852200	208	98
565.2	0.962300	214	102
570.2	1.089700	220	106
575.2	1.207100	226	110
580.2	1.323000	229	116
585.0	1.469100	232	121
590.1	1.665900	237	126
595.0	1.900600	241	130
600.0	2.176300	246	134
605.1	2.408900	254	139
610.1	2.608600	260	144
614.9	2.879500	265	149
620.2	3.171500	268	153
625.0	3.362300	272	159
630.1	3.609200	276	162
635.1	3.887000	279	164
640.0	3.996200	282	167
645.0	3.981900	288	168
649.9	3.941200	288	169
654.9	3.912700	288	168
659.9	3.890000	288	169
665.0	3.883900	288	168
670.1	3.884200	285	169
675.0	3.883500	285	168
680.0	3.884000	288	168
684.8	3.882700	288	168
690.1	3.884300	285	168
695.1	3.884100	285	168
700.1	3.883700	288	168
705.1	3.882400	288	168
710.1	3.884400	288	168
715.1	3.884300	285	168
720.1	3.883800	288	168
724.9	3.884000	288	168
730.0	3.885000	288	168
735.0	3.884100	285	168
739.9	3.038100	288	168
744.8	0.269200	284	164
749.8	0.121500	267	142
754.9	0.102100	240	119
759.9	0.095300	224	104


Dynamic Calibration Special Test #2
tape #202, bulk file #3
2/26/82 Range Valve Closed
t=500
500 mV F.S.
10V F.S.
25V F.S.
5V F.S.
recorder got stuck. Curve actually smooth.

tape # 208
file # 4

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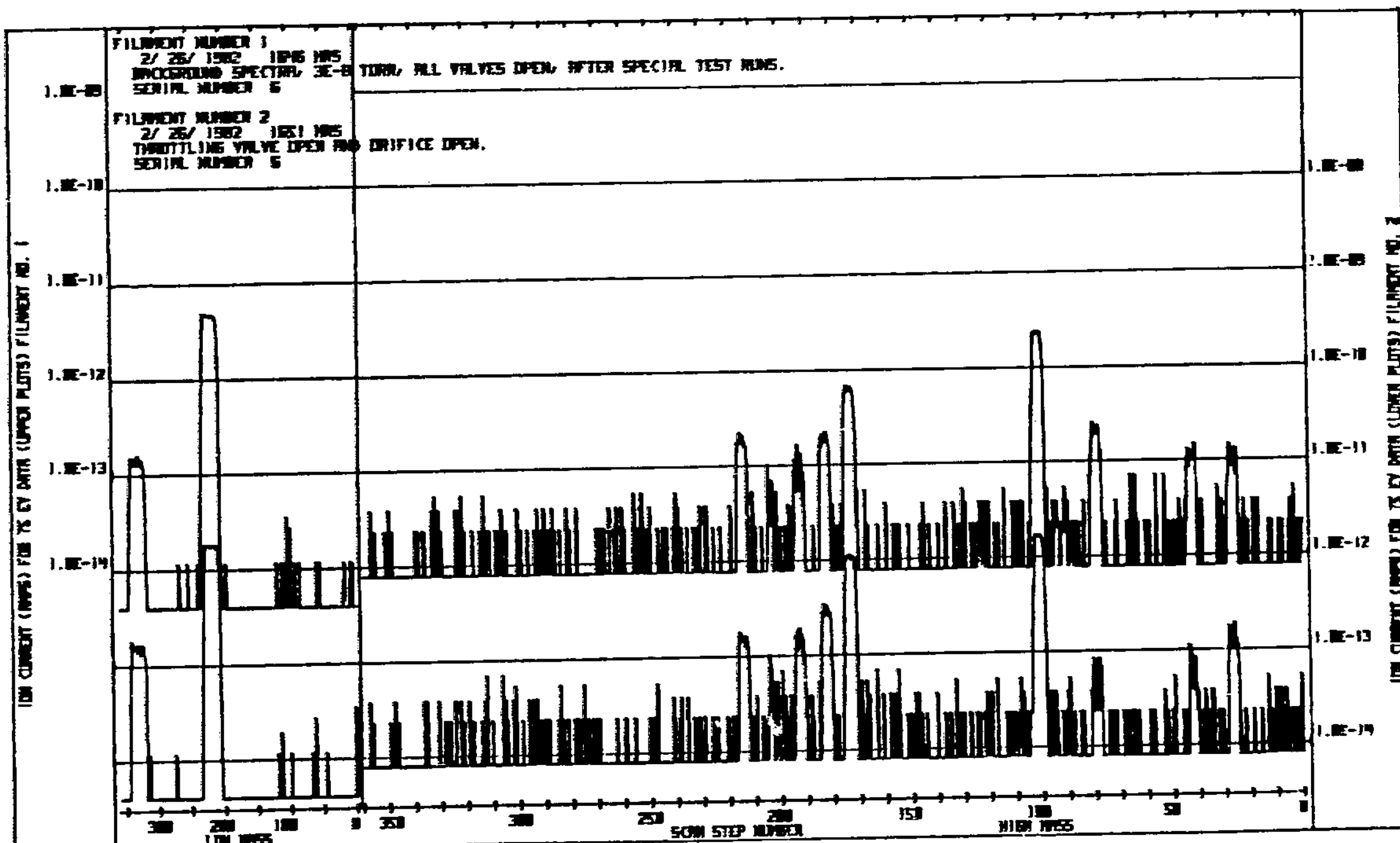

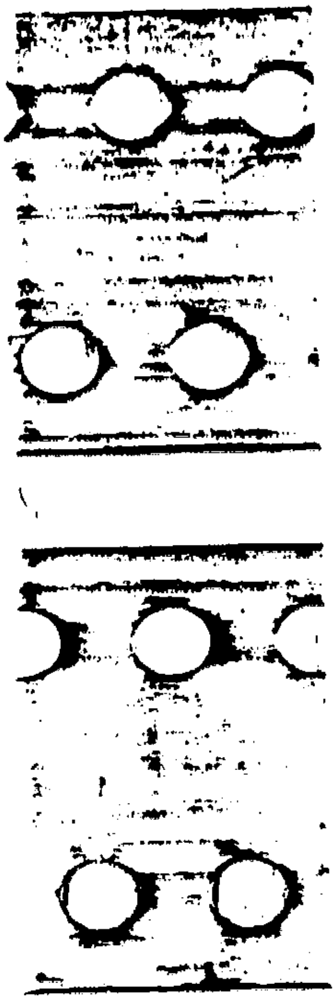

2 26 1982 1640 HRS SUMS FUNCTIONAL TEST S N 6

DATA TAPE ID 6 BULK DATA FILE # 4

SUMS FUNCTIONAL TEST

BACKGROUND SPECTRA, 3E-8 TORR, ALL VALVES OPEN, AFTER SPECIAL TEST RUNS.

HOUSEKEEPING DATA FILAMENT NUMBER 1

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	1	1	1	1	1	1	1	1	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~0.200~~
MINUS 15 VOLT	129	130	130	130	130	130	130	130	-14.970
ION PUMP VOLT	181	180	181	181	181	181	181	181	~~0.020~~
ION SOURCE TEMP	91	91	91	90	90	91	90	91	~~2.500~~
PRE-AMP TEMP	169	169	169	169	169	169	169	169	~~0.200~~
PLUS 5 VOLT	120	120	120	121	121	121	121	121	~~6.775~~
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	125	126	126	125	125	125	125	125	~~0.000~~
COLLECTOR CURRENT	112	112	112	112	112	112	112	112	~~0.000~~
ELECTRON ACC VOLT	190	189	189	190	189	190	190	189	~~0.007~~
ION ACC VOLT	39	39	39	39	39	39	39	39	~~7.505~~
ION PUMP ANALOG									2.0mV ~~0.0120~~
28 VOLT POWER SUP									~~0.200~~

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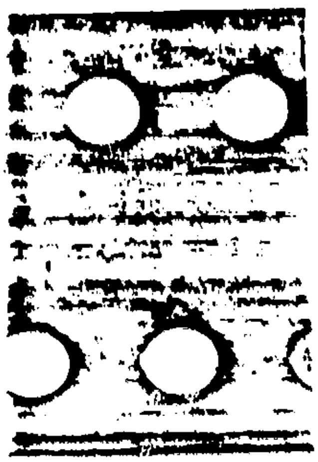
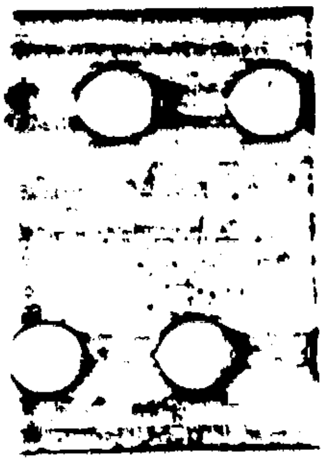
75 ELECTRON VOLTS IONIZATION ENERGY





SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
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3	8	8	8	8			4	
4	8	53	8	8				4
5	23	8	38	23				
6	8	23	8	8	4			
7	8	8	8	8		12		
8	8	8	8	23			4	
9	8	8	8	8				12
10	23	8	8	8				
11	8	8	8	8	4			
12	8	8	8	8		4		
13	23	23	8	8			4	
14	23	8	8	8				4
15	8	8	8	8				
16	8	8	8	8	4			
17	8	8	8	8		4		
18	38	8	38	8			4	
19	8	8	8	23				12
20	38	8	8	8				
21	8	8	8	8	4			
22	8	23	8	8		4		
23	8	8	38	8			4	
24	8	8	23	8				4
25	8	8	8	8				
26	84	130	69	69	4			
27	130	99	114	114		4		
28	114	130	84	99			4	
29	145	130	84	53				4
30	53	8	23	8				
31	8	8	8	8	4			
32	8	38	8	8		4		
33	8	8	23	53			4	
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37	8	8	8	8		4		
38	8	8	8	8			4	
39	8	8	8	38				4
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41	8	8	8	38	4			
42	69	130	145	114		4		
43	99	114	99	99			4	
44	114	114	84	114				4
45	130	99	84	23				
46	38	8	23	8	4			
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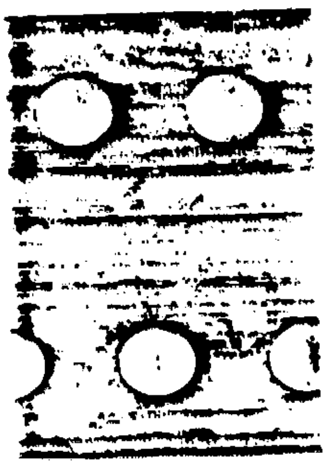

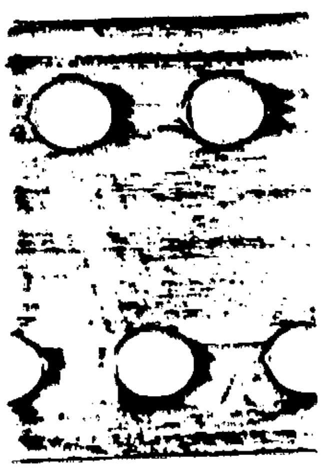

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80	221	191	221	206				
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103	2290	2290	2230	2110			4	
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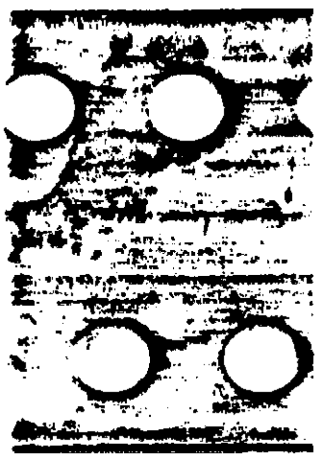

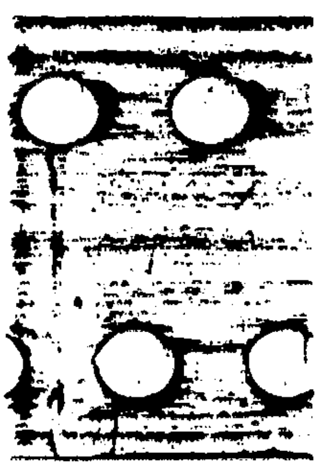

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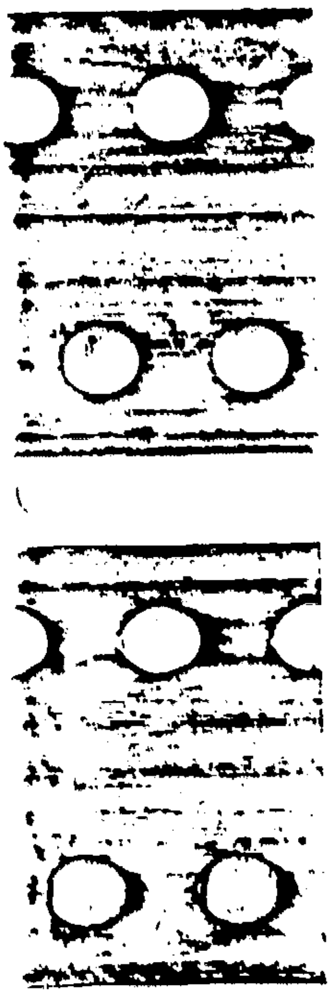

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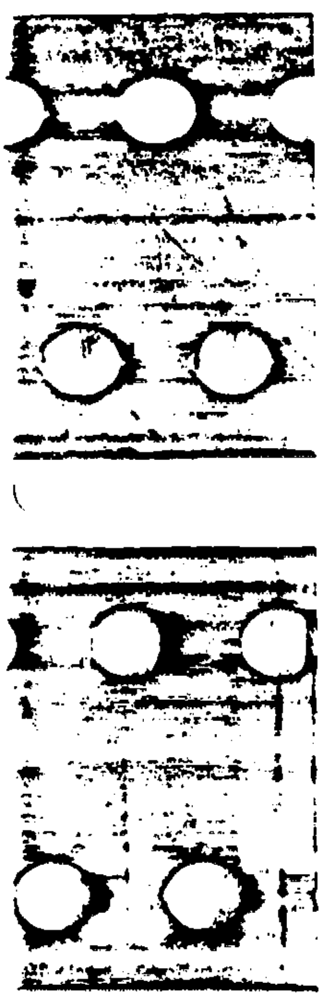

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2 26 1982 1651 HRS SUMS [illegible]

FUNCTIONAL TEST

DATA TAPE ID [illegible] BULK DATA FILE # 4

SUMS FUNCTIONAL TEST

THROTTLING VALVE OPEN AND ORIFICE OPEN.

HOUSEKEEPING DATA FILAMENT NUMBER 2

SCAN NUMBER	1	2	3	4	5	6	7	8	ANAL MUX
INTERLACE STEP	1	2	3	4	1	2	3	4	
IONIZATION ENERGY	75	75	75	75	75	75	75	75	
FILAMENT NUMBER	2	2	2	2	2	2	2	2	
CAP ON=1, OFF=2	1	1	1	1	1	1	1	1	
PLUS 15 VOLT	193	193	193	193	193	193	193	193	~~[illegible]~~
MINUS 15 VOLT	130	129	130	130	130	129	130	130	-14.960
ION PUMP VOLT	181	181	181	181	181	181	180	180	~~[illegible]~~
ION SOURCE TEMP	91	90	90	90	90	90	90	90	~~[illegible]~~
PRE-AMP TEMP	169	169	169	169	169	169	169	169	~~[illegible]~~
PLUS 5 VOLT	120	120	120	120	120	120	120	120	~~[illegible]~~
A/D REFERENCE VOLT	163	163	163	163	163	163	163	163	
EMISSION CURRENT	125	125	125	125	125	125	125	125	~~[illegible]~~
COLLECTOR CURRENT	106	106	106	106	106	106	106	106	~~[illegible]~~
ELECTRON ACC VOLT	190	189	190	189	189	190	189	190	~~[illegible]~~
ION ACC VOLT	39	39	39	39	39	39	39	39	~~[illegible]~~
ION PUMP ANALOG									2.0 mV ~~[illegible]~~
28 VOLT POWER SUP									~~[illegible]~~

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75 ELECTRON VOLTS IONIZATION ENERGY

SCAN STEP NO	HIGH MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4	LOW MASS COLLECTOR SCAN 1	SCAN 2	SCAN 3	SCAN 4
1	8	8	8	53	12			
2	23	23	8	23		4		
3	8	8	8	8			35	
4	23	8	8	8				4
5	8	23	8	8				
6	8	8	8	8	4			
7	23	8	8	38		4		
8	8	8	8	8			4	
9	23	8	23	38				4
10	8	8	38	8				
11	8	8	8	38	4			
12	8	8	8	8		4		
13	8	8	8	23			4	
14	8	8	23	53				4
15	8	8	8	8				
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17	8	23	8	8		4		
18	8	8	8	8			4	
19	8	8	8	8				4
20	8	23	8	8				
21	8	8	8	8	4			
22	8	8	8	8		4		
23	8	8	23	8			4	
24	8	8	8	8				4
25	8	8	8	8				
26	53	114	84	114	4			
27	130	130	191	145		4		
28	99	130	99	160			4	
29	160	99	175	114				4
30	69	8	8	8				
31	8	8	8	8	4			
32	8	23	23	8		4		
33	8	8	8	23			4	
34	8	8	8	8				4
35	8	8	8	8				
36	38	8	38	8	4			
37	8	8	8	8		4		
38	8	23	8	8			4	
39	38	8	8	23				4
40	8	8	8	8				
41	8	8	8	23	4			
42	38	23	23	84		4		
43	84	53	38	69			4	
44	69	84	99	99				4
45	114	23	23	8				
46	8	8	8	8	4			
47	8	8	23	8		4		
48	8	8	8	8			12	
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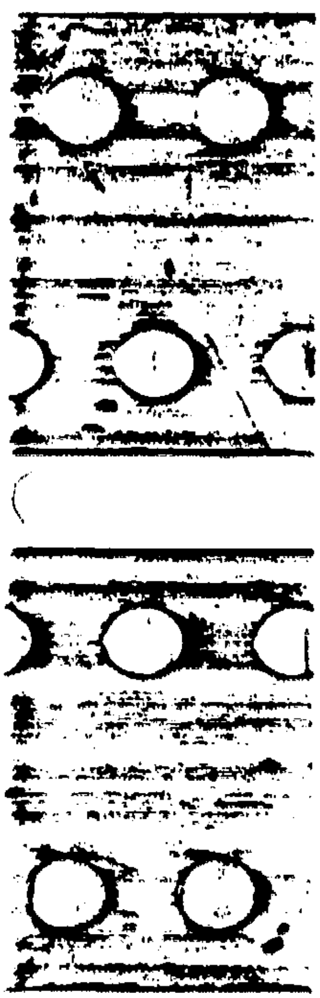

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79	23	53	84	84				4
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97	38	8	8	38		4		
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100	191	877	1050	1270				
101	1420	1600	1630	1660	4			
102	1690	1630	1630	1690		12		
103	1660	1690	1630	1570			4	
104	1300	526	481	326				4
105	160	23	23	23				
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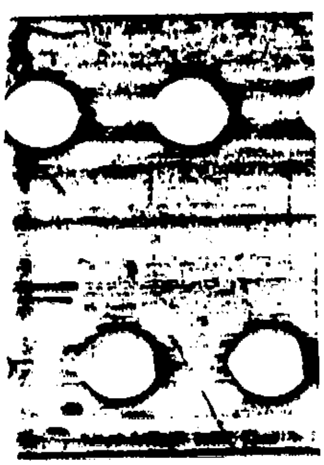

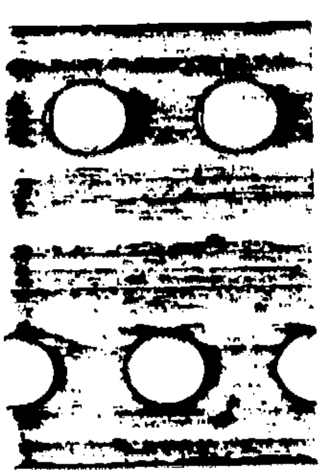

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119	8	8	8	8				4
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124	8	8	8	8				4
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128	8	8	8	23			4	
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137	8	8	8	8		4		
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141	8	8	8	38	4			
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171	8	8	8	38	4			
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173	816	1020	1020	1020			4	
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177	221	53	38	23		4		
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183	267	267	313	328			4	
184	267	267	267	343				4
185	262	262	262	221				
186	114	23	8	53	4			
187	8	8	8	8		4		
188	8	8	8	8			4	
189	8	23	8	38				4
190	8	8	8	8				
191	8	8	8	38	4			
192	23	99	84	145		4		
193	84	114	160	191			4	
194	145	175	160	175				4
195	114	145	160	69				
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197	23	8	8	38		4		
198	23	8	8	8			4	
199	8	8	23	38				4
200	8	8	23	69				
201	23	8	8	8	4			
202	8	38	38	53		4		
203	23	8	8	53			4	
204	38	8	38	23				4
205	53	84	38	99				
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214	114	145	160	160				1755
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219	8	8	23	23				1785
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222	23	8	8	8		1785		
223	8	8	8	8			1785	
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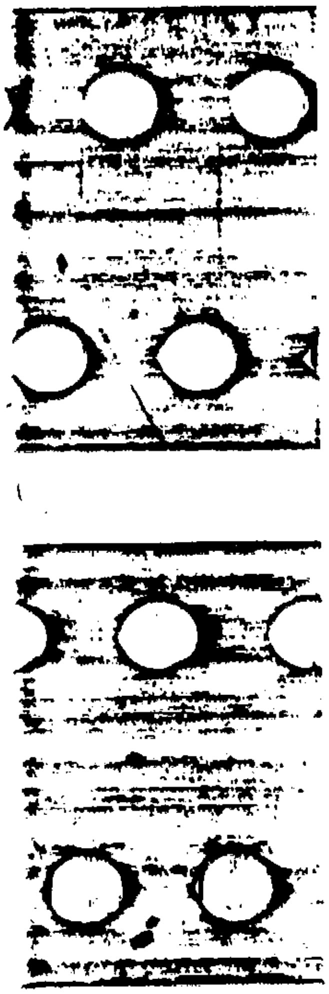

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239	8	8	8	38				4
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248	8	8	8	53			4	
249	8	8	8	23				4
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252	8	8	8	8		4		
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256	8	8	8	8	4			
257	8	23	8	8		4		
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273	8	23	8	8			4	
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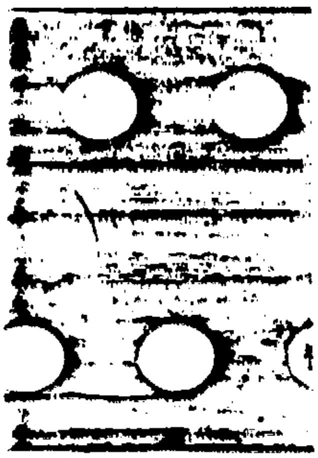

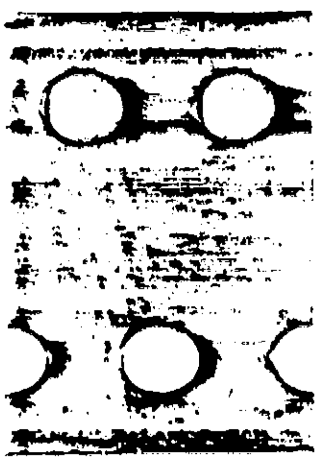

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322	8	8	8	23		73		
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326	8	8	8	8	164			
327	8	8	8	23		149		
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329	8	8	8	8				134
330	23	8	8	8				
331	8	8	8	8	164			
332	8	38	8	8		149		
333	8	8	8	8			157	
334	8	8	8	8				141
335	8	8	8	8				
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337	8	8	23	38		164		
338	8	8	8	8			157	
339	8	8	8	8				149
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341	8	8	8	8	149			
342	8	8	8	8		164		
343	8	8	8	8			180	
344	8	8	8	8				103
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347	8	8	8	23		4		
348	8	8	8	8			4	
349	38	38	8	8				4
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EXTRA DYNAMIC CALIBRATION RUNS

Runs made 3-5-82

* Before Runs $I_{28} = 2.72 \times 10^{-12}$ A, inlet and range valves open, orifice open, throttling open, $P_{chamber} = 7 \times 10^{-9}$ Torr.

* Ion Source Temperature = 90_{10} (HSK output) before above data was taken.

* First run was full Dynamic, nominal profile.
  (Data attached)

  - after completion of run, $I_{28} = 2.72 \times 10^{-12}$ A, 8 minutes after pump-down, range valve closed, inlet valve open, orifice open, throttling valve open, $P_{chamber} < 10^{-7}$ Torr.

* Second run was nominal to 155 sec, then hold.
  (Data attached)

  - before run, $I_{28} = 3.63 \times 10^{-12}$ A, range valve open, inlet valve open, orifice open, throttling valve open, $P_{chamber} < 10^{-7}$ Torr.

* Third run was nominal from 500 sec to 635 sec, then hold.
  (Data attached)
  - before run, $I_{28} = 4.58 \times 10^{-12}$ A, range closed, inlet open, orifice open, throttling valve open, $P_{chamber} = 3 \times 10^{-8}$ Torr.

EXTRA NOMINAL DYNAMIC PRESSURE PROFILE. 3-5-82, TAPE #203, FILE #1.

TIME	BARATRON PRESSURE	AMU 28	AMU 14
0.0	0.000146	225	107
5.2	0.000152	226	107
10.4	0.000155	227	108
20.1	0.000164	227	110
25.1	0.000169	228	110
30.0	0.000175	229	112
35.0	0.000183	230	113
40.0	0.000184	231	114
45.2	0.000195	232	115
50.0	0.000199	233	118
55.0	0.000205	235	118
60.1	0.000212	235	119
65.2	0.000217	236	121
70.2	0.000221	238	123
75.0	0.000229	239	124
80.0	0.000237	239	125
85.2	0.000247	241	126
90.2	0.000251	243	129
95.2	0.000259	243	129
100.2	0.000268	243	129
105.0	0.000272	245	131
110.2	0.000280	247	131
115.2	0.000293	248	132
120.0	0.000296	249	133
125.1	0.000301	251	133
130.1	0.000311	252	135
135.0	0.000322	254	136
140.1	0.000329	254	137
145.1	0.000340	257	138
150.0	0.000359	258	139
155.1	0.000369	260	140
160.0	0.000381	261	142
165.1	0.000387	262	143
170.0	0.000454	263	144
174.9	0.000449	265	147
179.9	0.000441	267	149
185.1	0.000457	268	151
190.1	0.000476	271	152
195.1	0.000510	271	154
200.0	0.000531	272	156
205.1	0.000560	275	158
210.[illegible]	0.000597	278	162
214.[illegible]	0.000620	278	163
219.9	0.000670	282	164
225.0	0.000691	285	166
229.9	0.000742	288	168
235.0	0.000784	290	170
239.8	0.000829	291	172
244.8	0.000946	293	174
249.8	0.000951	296	178
255.1	0.000995	299	181
259.9	0.001100	302	184
265.0	0.001150	305	188
269.9	0.001296	308	191
275.0	0.001318	312	195
280.0	0.001402	316	196
285.0	0.001594	320	199
290.0	0.001677	322	202
294.9	0.001865	325	205
300.0	0.002006	328	209
305.0	0.002195	332	214
309.9	0.002417	336	218
314.8	0.002659	340	223
320.0	0.002895	345	227
324.9	0.003359	352	230
329.8	0.003429	355	234
335.0	0.003800	358	237
339.9	0.004279	361	241
344.7	0.004706	365	246
350.0	0.005400	369	251
354.8	0.005894	375	260
360.0	0.006032	382	262
365.0	0.007003	386	245
369.9	0.008234	294	141
375.0	0.013667	207	75

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379.9	0.010265	175	53
384.9	0.010415	166	44
389.9	0.011587	162	40
394.9	0.013237	157	35
399.9	0.015997	153	35
404.8	0.018255	150	32
409.7	0.020793	149	31
414.7	0.023400	147	31
419.9	0.027089	145	29
424.8	0.029478	144	25
429.7	0.035146	144	26
434.7	0.038481	144	26
439.7	0.044661	144	27
444.9	0.050706	144	27
449.9	0.056260	144	30
454.8	0.067024	145	28
459.7	0.069773	145	29
464.7	0.081597	147	32
469.9	0.091230	148	30
474.9	0.093560	150	34
479.7	0.111600	152	35
484.7	0.142740	154	34
489.8	0.149840	157	35
494.8	0.163520	161	41
499.7	0.203160	163	44
504.9	0.216340	165	46
509.8	0.252910	168	51
514.7	0.285660	172	56
519.7	0.324270	175	58
524.7	0.363700	180	65
529.8	0.416250	185	69
534.8	0.459660	192	73
539.8	0.519660	195	77
544.7	0.598910	199	82
549.6	0.671090	204	88
554.6	0.777400	208	94
559.6	0.847510	213	99
564.8	0.852100	219	102
569.8	1.057800	222	104
574.8	1.215800	226	108
579.7	1.344200	230	113
584.8	1.530300	235	120
589.8	1.714000	241	127
594.7	1.930200	246	131
599.5	2.149400	251	134
604.8	2.399900	259	139
609.6	2.639000	261	143
614.8	2.909400	266	149
619.6	3.102300	269	153
624.8	3.395600	274	157
629.7	3.653200	278	162
634.5	3.884200	281	164
639.8	4.139100	288	166
644.6	4.336000	289	169
649.5	4.548900	290	170
654.6	4.785500	292	172
659.6	4.903900	294	174
664.6	5.071200	295	176
669.6	5.175500	297	178
674.5	5.336700	298	179
679.5	5.391900	299	180
684.5	5.471100	300	181
689.5	5.553300	300	182
694.7	5.643200	301	183
699.6	5.725500	302	183
704.5	5.789600	303	184
709.5	5.896000	304	185
714.5	5.949500	304	186
719.4	6.029500	305	187
724.7	6.122400	306	187
729.6	6.219500	306	189
734.7	6.323200	307	189
739.6	6.367900	309	190
744.4	6.507900	308	191
749.7	6.547900	310	191
754.5	6.670400	310	193
759.4	6.758400	311	193
764.4	6.859800	312	193
769.6	6.919700	312	194
774.6	7.083200	313	194
779.6	7.124600	314	195
784.6	7.258000	315	195
789.6	7.315400	316	196
794.6	7.481500	316	196

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799.6	7.529400	320	197
804.6	7.651900	320	197
809.6	7.756700	319	198
814.5	7.867700	320	198
819.6	7.993100	321	198
824.5	8.120500	321	199
829.7	8.609000	322	201
834.5	8.257000	324	202
839.5	8.277000	322	200
844.4	8.337000	322	200
849.4	8.382000	322	200
854.4	8.477000	322	200
859.4	8.632000	323	201
864.4	8.821000	323	201
869.4	9.004000	324	202
874.3	9.174000	324	203
879.3	9.324000	325	204
884.5	9.457000	326	205
889.5	9.593000	327	205
894.5	9.720000	327	206
899.4	9.859000	328	207
904.3	10.005000	328	207
909.4	10.150000	329	208
914.5	10.286000	329	208
919.4	10.409000	330	209
924.4	10.576000	331	210
929.5	10.744000	331	211
934.4	10.904000	332	211
939.4	11.025000	333	212
944.3	11.210000	333	213
949.3	11.381000	334	214
954.5	11.530000	334	214
959.4	11.664000	335	215
964.3	11.875000	336	216
969.4	12.028000	336	217
974.3	12.225000	337	217
979.3	12.393000	338	218
984.3	12.554000	339	219
989.4	12.726000	339	220
994.3	12.891000	340	220
999.3	13.087000	341	221
1004.3	13.257000	342	222
1009.5	13.457000	342	223
1014.4	13.640000	343	223
1019.3	13.869000	343	223
1024.3	14.030000	345	225
1029.2	14.256000	345	225
1034.3	14.413000	346	226
1039.3	14.641000	346	226
1044.4	14.818000	347	227
1049.4	15.062000	349	227
1054.3	15.232000	349	228
1059.2	15.513000	352	228
1064.2	15.690000	352	228
1069.2	15.919000	351	229
1074.3	16.142000	351	229
1079.4	16.363000	353	230
1084.3	16.606000	353	230
1089.3	16.826000	353	231
1094.2	17.091000	354	231
1099.1	17.299000	355	232
1104.4	17.578000	355	232
1109.3	17.817000	355	233
1114.2	18.052000	356	233
1119.2	18.289000	356	234
1124.3	18.559000	357	234
1129.4	18.841000	357	235
1134.3	19.057000	358	235
1139.2	19.350000	358	236
1144.3	19.638000	359	236
1149.2	19.900000	359	237
1154.2	20.181000	359	237
1159.1	20.481000	360	238
1164.2	20.759000	360	239
1169.3	21.048000	361	239
1174.2	21.349000	362	240
1179.2	21.658000	362	241
1184.1	21.921000	362	241

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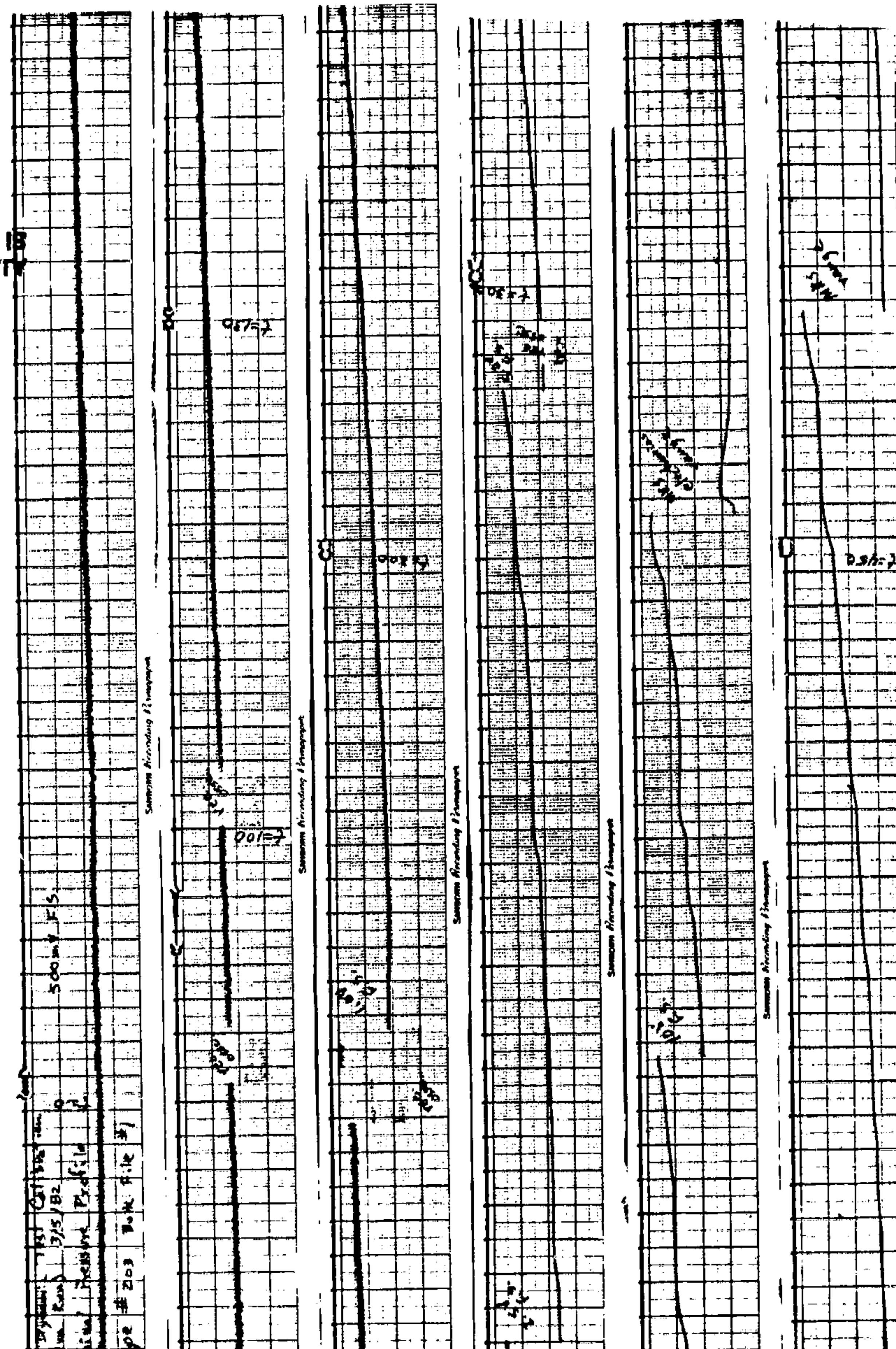

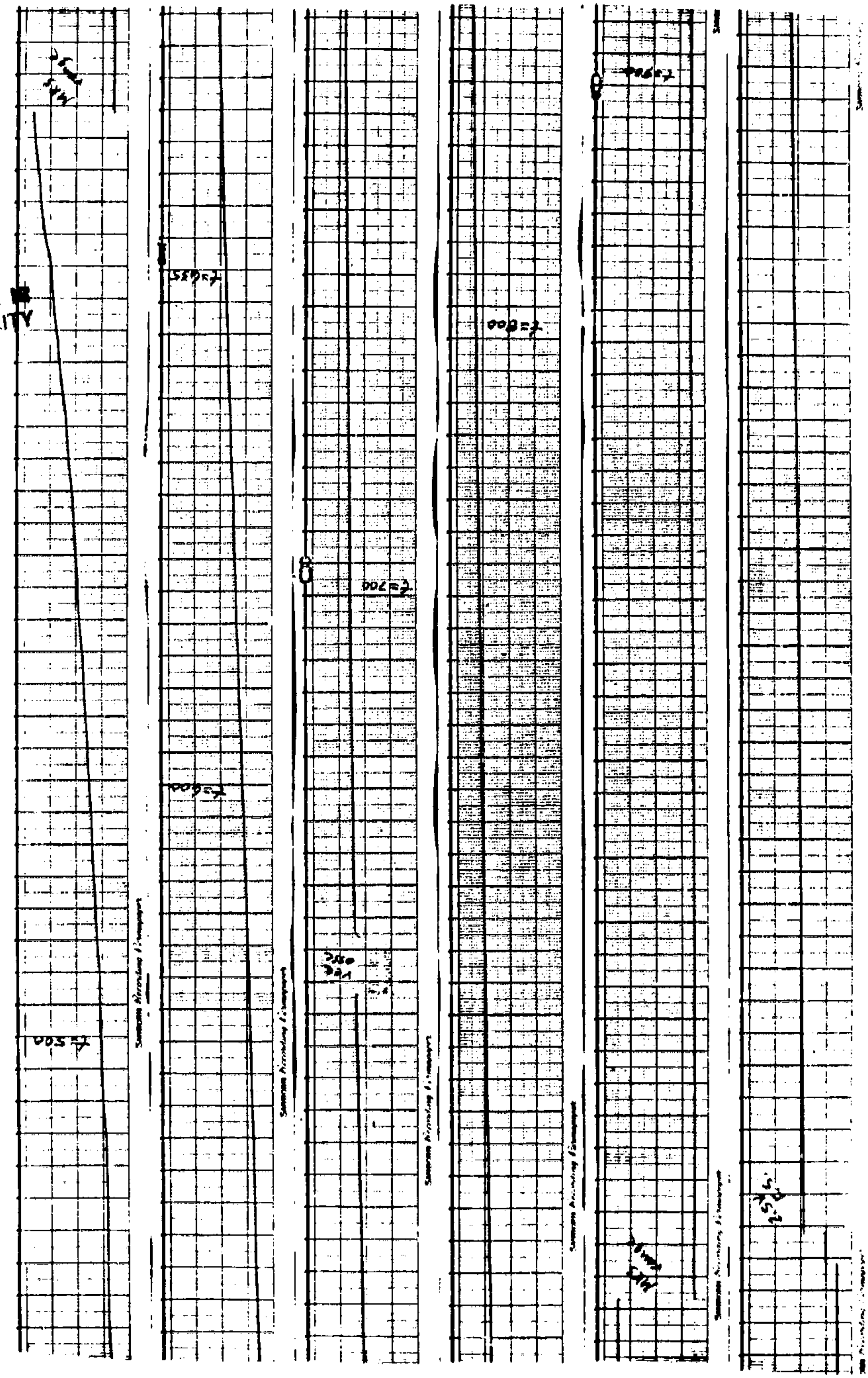

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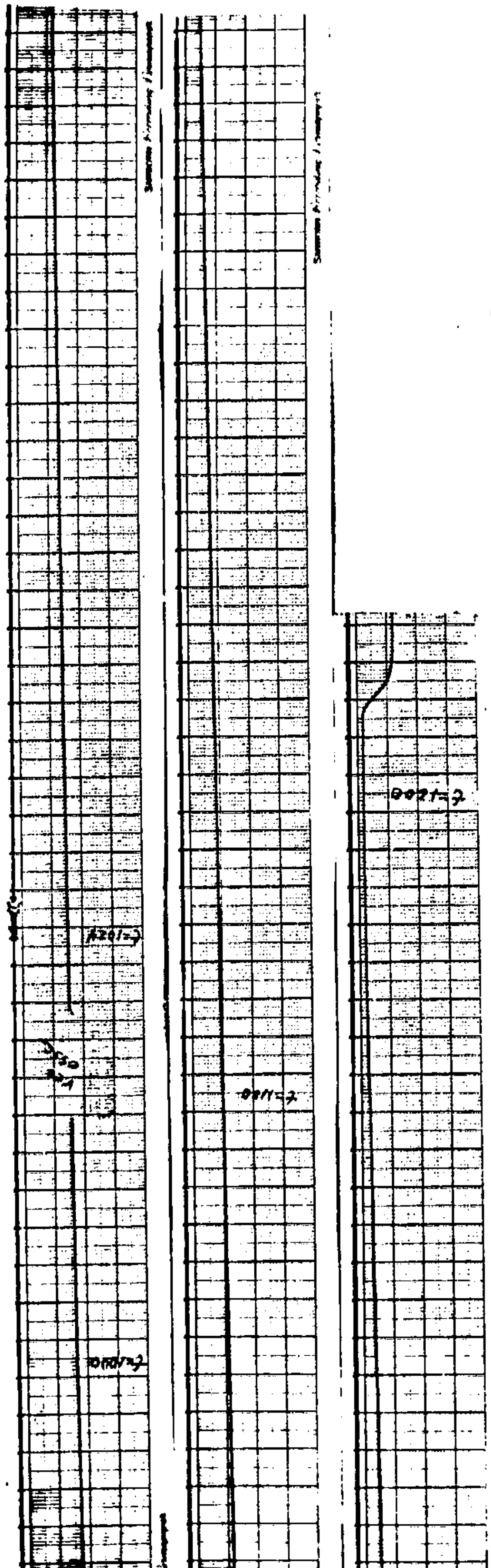

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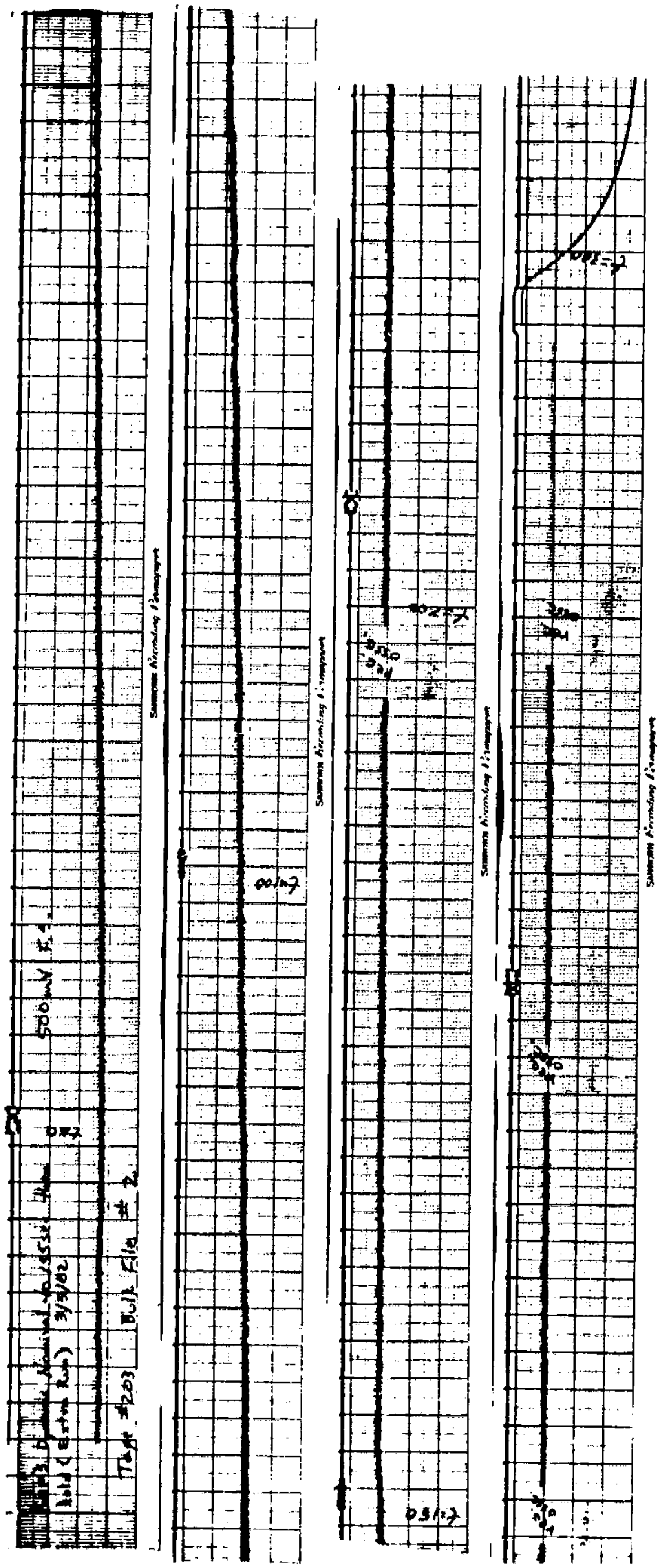
EXTRA. NOM. PROFILE TO 155 SEC. THEN HOLD. 3-5-82. TAPE #203. FILE #2.

TIME	BARATRON PRESSURE	AMU 28	AMU 14
0.0	0.000142	225	107
5.0	0.000147	225	106
10.2	0.000147	226	106
19.8	0.000150	226	107
24.9	0.000165	226	108
30.0	0.000178	227	110
34.8	0.000179	229	111
39.9	0.000185	230	113
45.0	0.000194	231	114
49.8	0.000196	232	115
54.9	0.000205	234	117
59.8	0.000207	235	119
64.9	0.000217	236	120
69.7	0.000223	237	121
74.9	0.000232	238	123
79.9	0.000238	239	125
84.9	0.000243	241	126
89.9	0.000256	242	128
94.8	0.000259	243	129
99.8	0.000266	244	129
104.9	0.000274	245	131
109.9	0.000280	247	131
114.9	0.000295	248	132
119.8	0.000298	249	133
124.9	0.000309	251	134
129.9	0.000316	253	135
134.8	0.000325	254	136
139.9	0.000333	256	137
144.9	0.000350	259	138
149.9	0.000356	258	140
154.8	0.000371	259	140
159.9	0.000369	261	141
164.8	0.000369	262	143
169.9	0.000375	262	143
174.7	0.000368	264	144
179.8	0.000368	263	144
184.8	0.000368	264	145
189.6	0.000367	264	145
194.8	0.000367	264	145
199.8	0.000368	264	145
204.8	0.000369	264	145
209.8	0.000369	264	145
214.6	0.000368	264	145
219.9	0.000369	264	145
224.8	0.000370	264	145
229.7	0.000369	264	145
234.7	0.000368	264	145
239.8	0.000366	264	145
244.8	0.000369	264	145
249.8	0.000366	264	145
254.8	0.000369	264	145
259.8	0.000368	263	145
264.7	0.000370	263	145
269.8	0.000366	264	145
274.8	0.000365	265	145
279.7	0.000370	264	145
284.8	0.012396	264	144
290.2	0.058093	295	240



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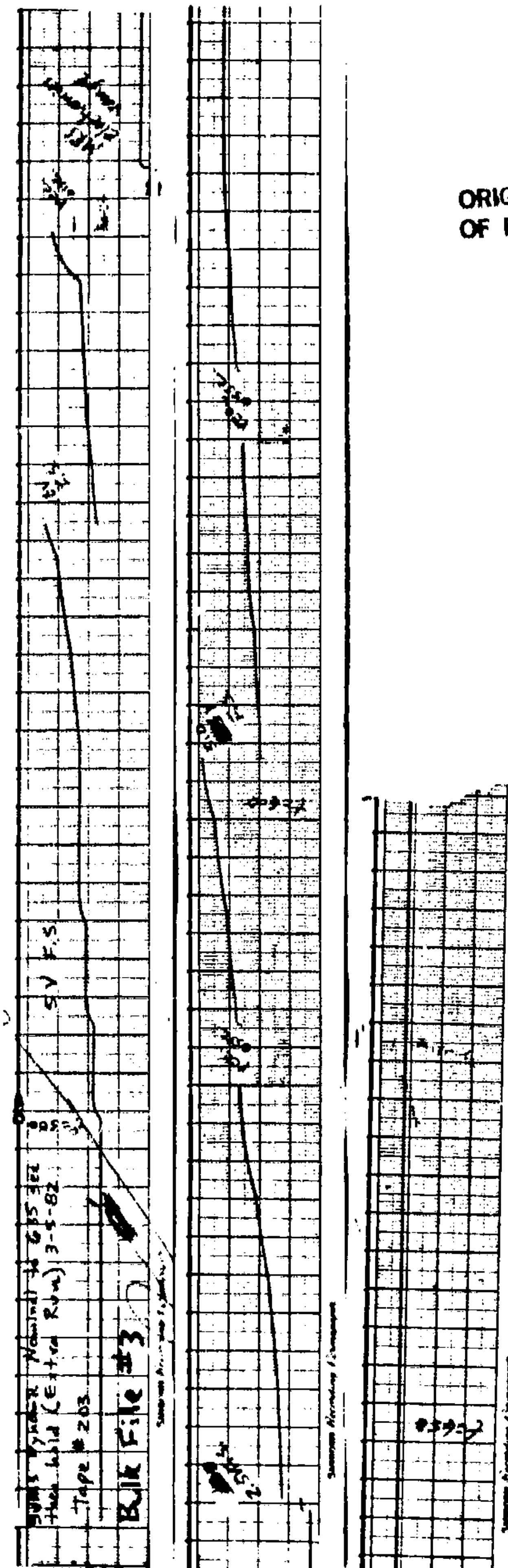
EXTRA. NOM. PROFILE TO 635 SEC, THEN HOLD. 3-5-82, TAPE #209, FILE [redacted]. #3

TIME	BARATRON PRESSURE	AMU 28	AMU 14
500.0	0.192550	177	57
505.0	0.219800	179	58
510.3	0.250570	180	61
520.2	0.279150	186	66
525.1	0.313420	189	69
530.0	0.367030	192	70
535.0	0.459240	194	73
540.1	0.518830	197	75
545.0	0.556160	202	81
549.9	0.822940	206	88
555.1	0.751000	213	97
560.1	0.733700	221	101
565.1	0.761300	223	102
570.1	0.839800	225	103
575.1	0.989700	225	104
580.1	1.260500	228	107
585.0	1.586600	232	114
590.2	1.702000	241	125
595.1	1.870200	248	131
600.0	2.112300	254	134
605.1	2.424400	260	139
610.0	2.621500	264	143
615.0	2.914700	268	149
620.1	3.120000	274	153
625.1	3.387600	277	156
630.0	3.628800	281	162
634.9	3.857100	288	164
640.0	3.912200	289	166
645.0	3.888300	289	167
650.1	3.882700	290	167
655.0	3.881400	290	167
660.1	3.880700	290	167
665.1	3.882400	290	167
670.1	3.883000	290	167
675.0	3.880700	290	167
679.9	3.882800	290	167
685.1	3.880600	290	167
690.0	3.882600	290	167
694.9	3.881300	290	167



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