0612b_DP.xls

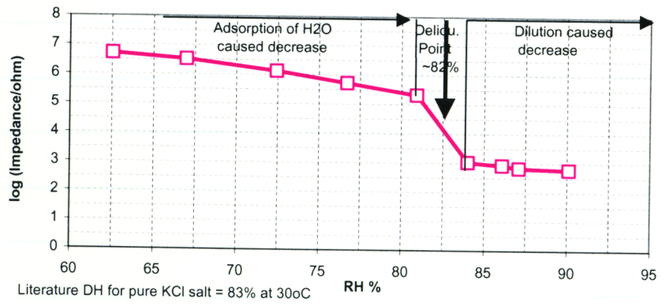
Calculation of RH based on the setting dial of the wet temperature controller
Test Results from June 12 to June 15

Time	Indicated Reading Dry Bulb	Indicated Reading Wet Bulb	Wet Bulb Corrected* by +0.5oC	RH** %	Dial Reading Dry Bulb	Dial Reading Wet Bulb	log(Z, ohm)	RH Calc.
6/12/01 16:18	30	28	28.5	90	30	30.25	2.75	90.1227
6/13/01 8:01	30	27	27.5	84	30	29.5	2.8	87.1008
6/13/01 9:57	30	27	27.5	84	30	29.25	2.9	86.0843
6/13/01 11:55	30	27	27.5	84	30	28.75	3	84.0375
6/13/01 15:27	30	27	27.5	84	30	28	5.3	80.9328
6/14/01 11:22	30	26	26.5	77	30	27	5.7	76.7288
6/14/01 13:50	30	25	25.5	71	30	26	6.1	72.4512
6/14/01 16:18	30	24	24.5	64	30	24.75	6.5	67.0007
6/14/01 18:06	30	24	24.5	64	30	23.75	6.7	62.5575

Regression expression for calculation
RH= -0.0368x2 + 6.2279x - 64.627
Calculated RH
-0.0368
6.228
-64.6

see page 44

* see Note Book Page 38
** According to Perry's Chem Eng. Handbook, 6th Ed, page 20-6



agrees well with literature data.

J. Yang. 06/15/01

06/15/01

Cont from Page 39.

Lot #961772A

16:45. $NaNO_3$ soaked paper (dry paper originally) placed in cell and cell connected, placed in Humidity chamber

16: Excess water removed.

17:00 #48 file not changed.

	Data#,	Tw/Td	Imped (Ω)	setting (Tw/Td)
17:02	49			to 27/30
17:15	57	27.5/30	log|Z| = 3.4	

06/16/01

16:17	808	26/30	log Z = 3.3	to 26/30
16:21	810	27/30		

06/18/01

7:40	1997	25/30	log Z = 5.5	to 25/30
7:47	1999	24/30		
8:46	2029	24/30	log Z = 5.8	to 22/30
9:02	2037	23/30		to 15/30
9:30		23/30		
9:35		21/30		
10:12		21/30		to 22/30
10:17		23/30		
10:31		23/30		
10:33		23/30		to 30/30
10:37		27/30		
10:38		~~30~~ 23/30		
11:04		28/30		

J.g. 06/16/01

J. Yang 7/17/02

Time	Data #	Td/Tw	Z	Set Td/Tw
13:07	2160	29/30	log Z=7.5	30/30
13:22				to 27/30
13:33		25/30		
		26/30		
13:46	2184	27/30		
13:54			program quit.	

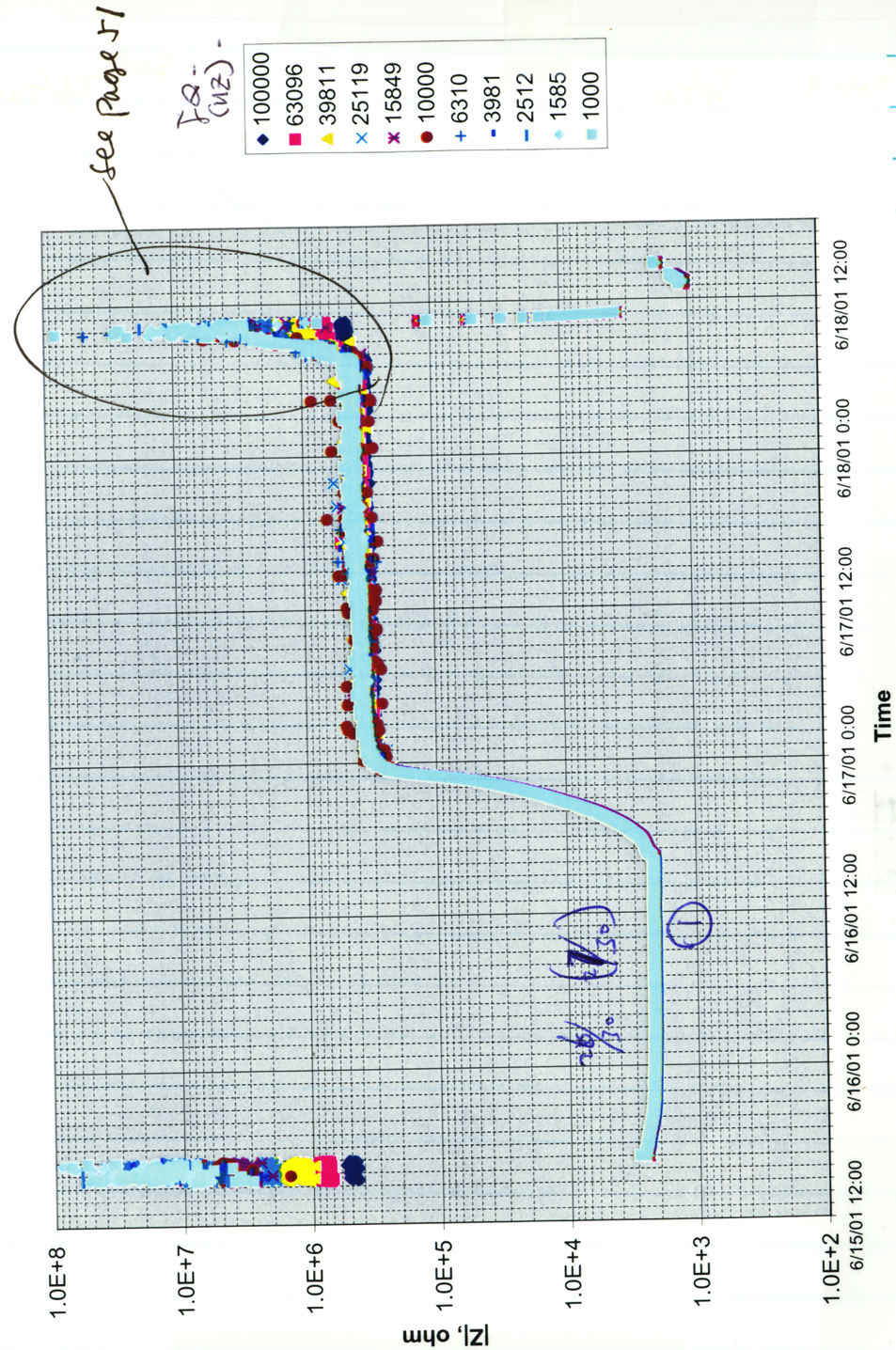
Note. From 11:01 to 13:04. open circuit measurement

see page 50

J.Y. 06/19/01

J.Yang 2/14/06

see page 51

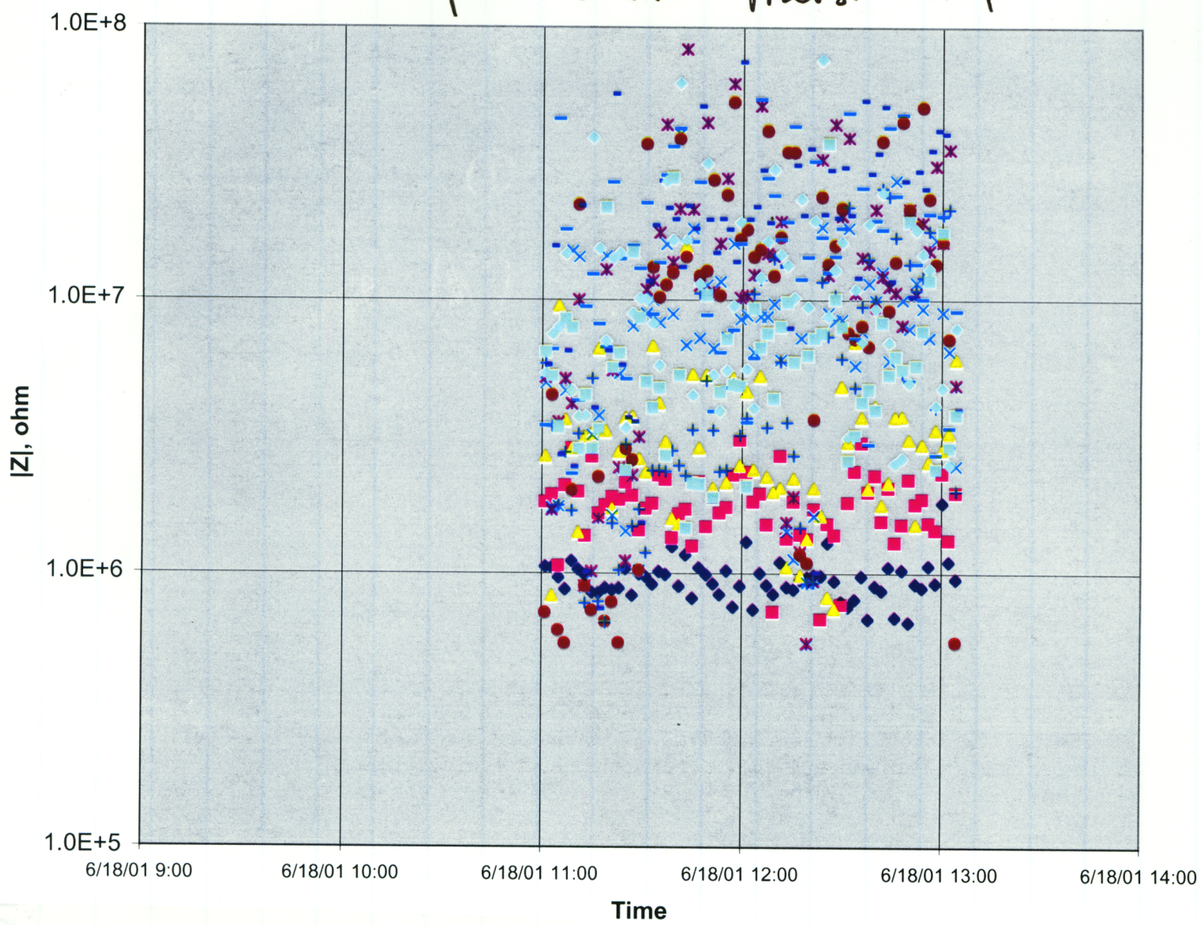


J.Yang 7/17/02

0615b00_05.xls

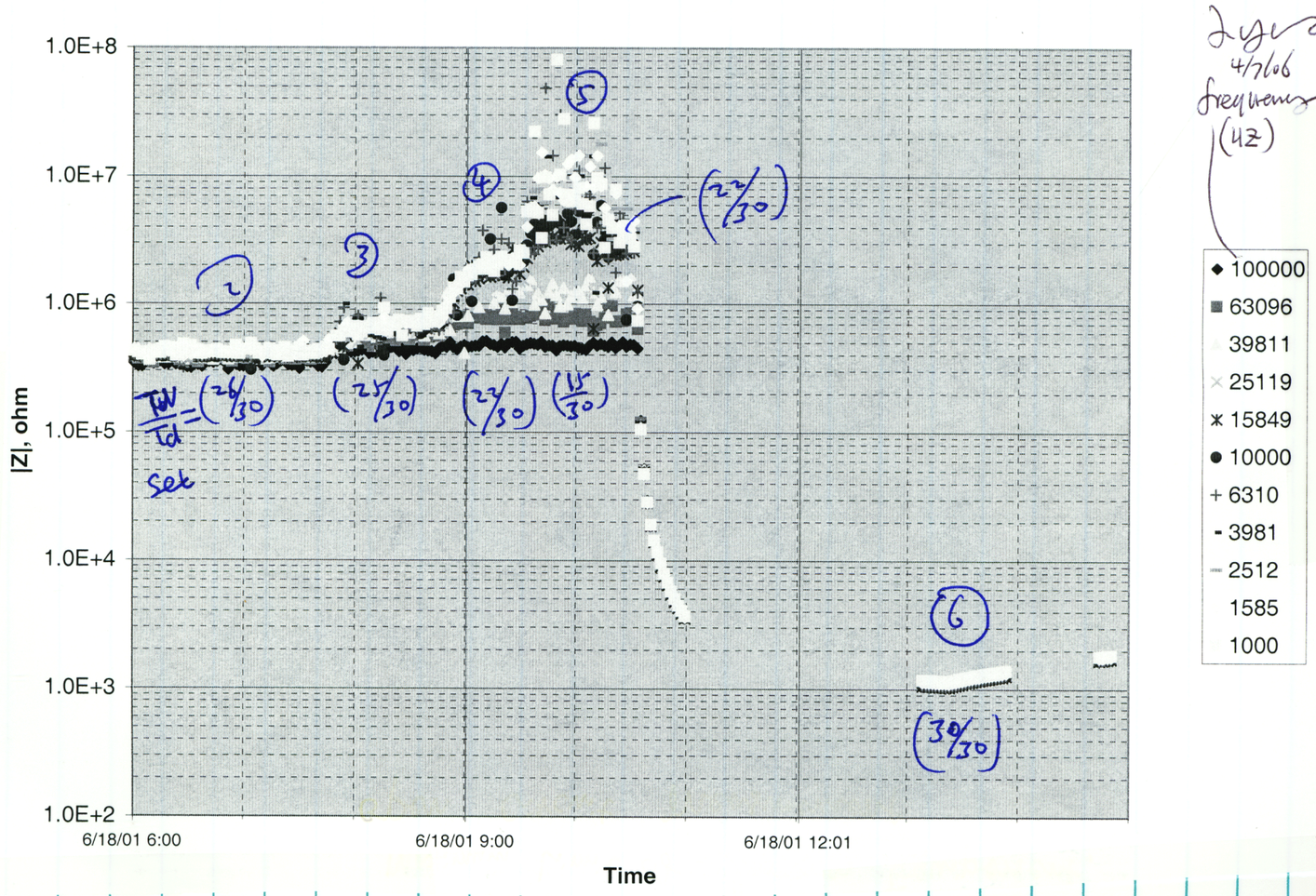
Maximum limit of solartron Equipment.
Open Circuit Measurement

Open_Circuit



0615b_00_05.xls

Conductivity



0615b_DP.xls

Data

RH based on the setting dial of the wet temperature controller
Test Results from June 16 to June 18, Scientific Notebook Page 39, 47-48

See Page 46
*** Regression expression for calculation
RH= -0.0368x2 + 6.2279x - 64.627
Constants
-0.0368
6.228
-64.6

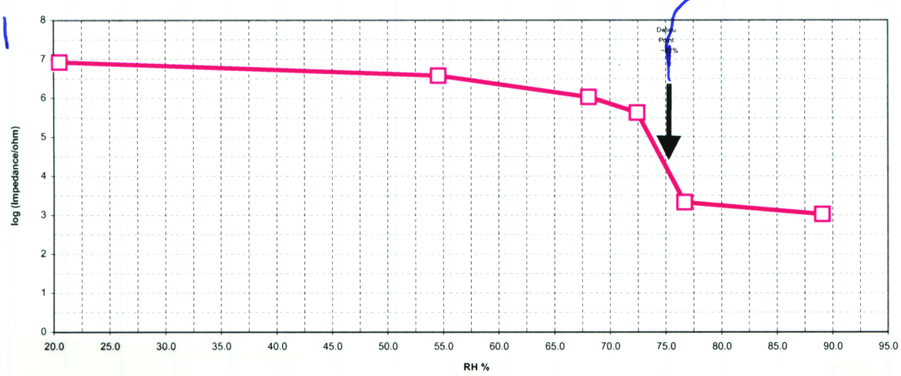
		Time	Indicated Reading Dry Bulb	Indicated Reading Wet Bulb	Wet Bulb Corrected* by +0.5oC	RH** %	Dial Reading Dry Bulb	Dial Reading Wet Bulb	log(Z, ohm)	Calc.*** RH, %
(6)	5	6/18/01 13:10	30	28	28.5	90	30	30	3	89.1
1	6	6/18/01 15:00	30	25.5	26	75	30	27	3.3	76.7
2	1	6/18/01 7:00	30	25	25.5	70	30	26	5.6	72.5
3	2	6/18/01 8:00	30	24	24.5	64	30	25	6	68.1
4	3	6/18/01 9:00	30	23	23.5	58	30	22	6.55	54.6
(5)	4	6/18/01 10:00	30	21	21.5	43	30	15	6.9	20.5

* see Note Book Page 38
** According to Perry's Chem Eng. Handbook, 6th Ed, page 20-6

d.y. 06/18/01

DP=75.

Handbook value = 73%



2/11/02 emails

PURCHASE REQUISITION
SOUTHWEST RESEARCH INSTITUTE™

513013

VENDOR	DATE OF ORDER	SHIP VIA	SUGGESTED SUPPLIER
	F.O.B. POINT	TERMS	COLE PARMER
	CONTRACT NO.		
VENDOR CODE / ATTN: / PHONE	PRIORITY		PHONE 800 323-4340 / FAX

ITEM	QTY.	UNIT	DESCRIPTION	ITEM IDENTIFIER	EST. COST EA.	UNIT PRICE	AMOUNT
A	1	EACH	FAST-RESPONSE THERMOHYGROMETER #U-03313-66		$410.00		
B	1	EACH	POWER ADAPTER U-03313-95		$ 22.00		
C	1	EACH	DATA CABLE U-03313-98		$71.00		
D	1	EACH	PARALLEL TO SERIAL CONVERTER #U-03313-99		$160.00		
QA Requirements:			NIST CALIBRATION CERTIFICATE IS REQUIRED				
			NIST Calibration Number is Required.				
			NOTE: SwRI Calibration Lab must Register and be routed To Cal Lab for checks.			TOTAL	

DATE REQUIRED	REQUISITION DATE	TO BE USED FOR	DELIVER TO NAME/LOCATION	SPECIAL INSTRUCTIONS
6/25/01	6/17/01	SALT DELIGNES.	L. YANG/BLDG. 57	SEND REQ R. ARD BLDG. 189 2ND

ACCOUNT NO.(s)
~~20.01402.561~~
20.0754

REQUESTOR'S SIGNATURE: L. YANG L. Yang EXT.NO. 2483
DEPARTMENTAL/DIVISIONAL APPROVAL: E. PEARCY E Pearcy DATE 6/18/01
ADMIN. APPROVAL DATE

1. If you have specified a brand name, would an equivalent brand or product also satisfy your need? YES NO
If "NO", and total estimate exceeds $3000.00, attach a memo of explanation.

2. If you have suggested a supplier for the item or service, could other suppliers meet your requirements ? YES NO
If "NO", and total estimate exceeds $3000.00, attach a memo of explanation.

3. If this requisition is for a repair-is the repa on campus or off campus? ON OFF
If OFF CAMPUS indicate shipping ticket #

4. Government Project? YES NO
If the item is being charged to a government contract:
a. Will it be substantially consumed, destroyed, or exhausted during the performance of the project? YES NO

b. If "NO", will it be attached to, built into, or used as an accessory to a piece of equipment either in existence or to be constructed? YES NO
c. If "NO", is the item uniquely required to instrument the project that is funding the purchase? YES NO

d. Is government furnished property being sent to vendor YES NO

e. QA Approval (if required) Bruce Mahrle 6/22/2001 Date

f. QA Footnotes: Q16, Q17 CALIBRATION CERTIFICATE
g. Inspection Criteria: L. Yang To Take To SwRI Cal Lab.

5. Do you want receiving to open and inspec your shipment? YES NO

SEE INSTRUCTIONS ON REVERSE SIDE

CONTRACT ADMINISTRATOR / DATE / BUYER SIGNATURE / DATE / EXPEDITE DATE

L. Yang 7/12/02

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate # 0972-01

Certificate of Calibration

5 July 2001

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: COLE-PARMER 03313-66
Description: THERMOHYGROMETER
Serial Number: 21189381
Asset Number: 008788
Work Order Number: 444044223

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. The results of this calibration relate only to the individual item as described above. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results of this calibration certificate were determined in accordance with the terms of accreditation unless stated otherwise below.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 75.0 Degrees Fahrenheit Humidity: 50 % RH

Calibration Date: 5 Jul 01 **Calibration Procedure:**

Condition as Received: SEE ATTACHED DATA

Condition as Released: SEE ATTACHED DATA

Remarks: SEE ATTACHED DATA SHEET FOR INSTRUMENT ERROR AND UNCERTAINTY.

Approved by:

Walt Hill, Supervisor
Institute Calibration Laboratory

Measurements performed by:

Roger Dykstra, Technician

m\a2la.rpt Rev date 8 Jan 01

J.Y. 6/29/01 J.Yang 2/14/06

TRACEABLE®
Certificate of Calibration for Digital Hygrometer/Thermometer

Certificate Number	Model Number	Serial Number
4085.057974	New 03313-66	21189381

This Electronic Digital Hygrometer/Thermometer was calibrated against National Institute of Standards and Technology Traceable Instrumentation. This calibration complies with the requirements of ISO 9000 Certification.

Calibration Test Information

Test Equipment	Serial Number	Calibration Due Date
Humidity Standard 118	99324814	2/08/02
TEMPERATURE STANDARD	20267165	2/05/02

NIST Traceable Test Number(s) NCSL Z540-1 100082023/1000101790

Accuracy

Testing was performed on the unit as shown below. Test results are as follows:

Standard %RH	Reading %RH	Standard °C	Reading °C
23.08	21.63	24.44	24.45
52.53	52.97		
78.76	78.06		

The maximum error of this unit at the time of calibration did not exceed the specified accuracy of: ± 1.5% RH with a combined uncertainty of 0.240% and a confidence level of 95% 0.2°C

Test Conditions:	Temperature °C	Relative Humidity %	Barometric Pressure (inHg)
	27	41	29.71

Maintaining Accuracy

Once measured and calibrated your Electronic Digital Hygrometer/Thermometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Electronics change little, if any at all, but can be affected by aging, temperature, and shock.

Calibration Dates

Factory Calibration Date	Next Calibration Due Date
05/07/01	05/07/03

We recommend that the unit's accuracy be recertified on an annual basis for those users with critical needs such as accreditation demands, government specifications, or ISO 9000 requirements.

Tester's Initials: PUL

Metrology Manager: Wallace Berry

Recalibration

For factory calibration and recertification of this Hygrometer/Thermometer contact:
Control Company • 308 West Edgewood • Friendswood, Texas 77546 • USA
Phone 281 482-1714 • Fax 281 482-9448
Control Company is an ISO 9001 Quality Certified Company
ISO 9001 Certificate No. CERT-01805-2000-AQ-HOU-RAB

82-9000-85 © 1998 © Control Company Rev. 11/00 Traceable is a registered trademark of © Control Company

J.Y. 6/29/01 J.Yang 2/14/06

SWRI Calibration Laboratory Data Sheet

Work Order: 444044223	**Manufacturer:** Cole-Parmer	**Technician:** R Dykstra
Asset Number: 008788	**Model:** 03313-66	**Procedure:** Pending
Serial Number: 21189381	**Type:** Thermo-hygro	**Calibration Date:** 7/3/01

Remarks: The instrument error of this unit did not exceed the specified limit of +/- 1.5 % R.H. with a combined uncertainty (K=2) of 0.5 % RH and a confidence level of approximately 95%.
The instrument error of this unit did not exceed +/-0.2 degree C with a combined uncertainty (K=2) of 0.2 degree C and a confidence level of approximately 95%.

Humidity Tolerance: 1.5
Range: 10 to 95 % RH

Applied Value % RH	As Found Ind. Value (% RH)	Instrument Error	Instrument Tolerance	Measurement Uncertainty
24.99	23.53	1.46	1.5	0.5
50.78	49.71	1.07	1.5	0.5
75.03	74.15	0.88	1.5	0.5

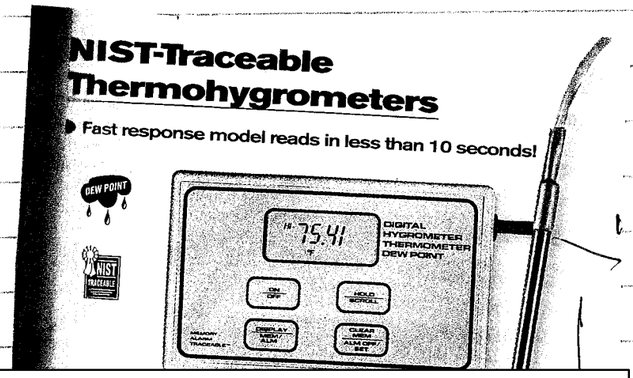
Applied Value % RH	As Left Ind. Value (% RH)	Instrument Error	Instrument Tolerance	Measurement Uncertainty
24.99	23.53	1.46	1.5	0.5
50.78	49.71	1.07	1.5	0.5
75.03	74.15	0.88	1.5	0.5

Temperature Tolerance: 0.2
Range: -40 to 60 Degree C

Applied Value Deg C	As Found Ind. Value (Deg C)	Instrument Error	Instrument Tolerance	Measurement Uncertainty
24.97	25.10	-0.13	0.2	0.2

Applied Value Deg C	As Left Ind. Value (Deg C)	Instrument Error	Instrument Tolerance	Measurement Uncertainty
24.97	25.10	-0.13	0.2	0.2

J. Yang
7/09/01



Information potentially subject to copyright protection was redacted from this location. The redacted material was from a catalog for thermohygrometers.

J. Yang
7/09/01

07/16/01

Experiments using Arc Cell (see Page 28-29)

Test will be conducted at 30°C because the humidity

Chamber can not go down to 30% of RH at 30°C

Cell II — KCl Saturated (at 24°) soln
lot # 005773

Cell ~~II~~ I — KNO_3 Saturated (at 24°) soln
dy. 07/16/01
lot # 7023 KDPO

Put as much solution as possible on to the paper until it flows off.

Electrodes are 0.1 mm Pt (see Page 27)

9:02 Cells installed in Chamber and set T_d/T_w = 50.2/51.2°C

Until 07/18 14:16. having problem with the Humidity controller.

07/18/01

14:16 Program started. File name: 0718a.

14:16 45/50 $\log|Z|_I$ = 2.71 Ω, cell connected to I

14:30 $\log|Z|_{II}$ = 2.10 Ω, Cell connected to II

Note: Solartron system was manually connected to one of the two cells at a time. J. Yang 7/17/02

Note: Hygrometer was used, see page 57. It was inserted into the chamber.

Time	Data# in File	T_w/T_d °C	Z, Ω	Hygrom. Cell#	control T_w/T_d °C
14:39	#10	45/50	,	100%, II	(41/50.2, 35°C)

** 35°C — Cooling set Temp.

14:52	#16	43/50	,	94.6% ~ 100%, II	to (39/50, 35°C)
15:34	#38	42/50	,	97.8 ~ 85.9%, II to I	
16:02	#51	41.5/50	,	94.34 ~ 83.29% to II	
16:43	73,	41/50		94.2 ~ 81.3%, to I	

17:11 program terminated because the C-22 test need equipment.

07/19/01

08/

08:19 program started, File: 0719a, to I.

08:19 41/50 78.3 ~ 89.7%

8:37 to II

9:01 #20 to I

9:36 # 41/50 to (37/50.2, 35°C)

10:09 40/50

10:57 #74 to II J. Yang 7/17/02

Time	Data#	Tw/Td Id/Tw	Z, ω	Hygrom.	Cell #	Control	Tw/Td Id/Tw
							d.g. 07/20/01
13:16	#141	40/50 d.g. 07/20/01			to Cell I	~~to II~~	d.g. 07/20/01
15:56	#213	40/50			I	to (37/50.2, 35°C) * **	

* Tw/Td ; ** Temperature of cooling water

16:04	#216	39/50				to (33/50.2, 30°C)	
16:04	#219	38/50			to II		
16:23	#226	38/50					

Program terminated for C-22 testing.

07/20/01

8:38		Program restarted		File: 0720a			
8:38		48/50 (water in wet bulb gone)		water refilled,	to cell I		
9:03					to cell II		
10:01		38/50			to cell I (at 11:14)		
11:39		38/50				to (37/50.2, 35°C)	
12:04		40/50					
12:28					to Cell II		
14:28		40/50			to Cell I		
14:56						to (39/50.2, 37°C)	
15:49		41/50					
18:56	#205				to Cell II		
16:57	#234				to Cell I		
17:16	#243	41/50				to (41/50.2, 37°C)	
17:27		42/50			to cell II		
17:29		42/50					
17:33	#250	Program terminated for C-22 testing.					

7/18/02

07/21/01

14:20	42/50 (after water added)	Program started,	File: 0721a	, Cell I
14:32	41/50		to Cell II	
14:41	#4			to (41.2/50.2, 37°C)

07/23/01

08:15	#120	43/50 (water in W. Bulb gone)	to cell I	
10:02		42/50 (after water refilled)	to cell II	
12:17			to cell I	
12:33		41/50		to (42.5/50.2, 37°C)
12:49		42/50		
12:57		43/50		to (43.2/50.2, 37°C)
13:24		43/50	to cell I	
13:37		43/50		to (45.0/50.2, 35°C)
16:37				to (43/50.2, 37°C, 3/16 **)

3/16 ** — means 3/16 turn of the valve from being closed.

must turn this value to achieve high RH (> 43/50)

17:20		45/50			

07/24/01

7:40	45/50	Program restarted	File: 0724a	Cell I
9:19	45/50	Program restarted after bag fixing,	File: 0724b.	
9:32			to cell II	
9:56	#15	44/50		to (45.0/50.2, 37°C, 2/16)

7/17/02

10:44	#46	45/50	to cell I
12:22	#88	45/49.5	to II
12:39	#97	45/50	to I — to (47/50.2, 35, 3/16)
12:56	#105	46/50	
13:18	#116	46/50	
13:21			
13:31		46/50	
15:06			to II
15:19		46/50	to (49.5/50.2, 352, 1/8)
15:53		48/51	to I
16:32		49/51	
16:48	#223	49/51	to II — set (43/50, 352, 3/16)

program terminated for C-22 testing.

07/27/01

8:15		44/50	program started, File: 0727a, with cell I
8:47	#17	44/50	to II
9:16		44/50	to (44.5/50.2, 352, 1/8)
12:32		50/51	to I
14:30	#144		to (50.2/50.2, 35, 1/8)
15:01	#211	51/52	to (50.2/49.5, 35, 1/8)
15:10	#216	51/52	to I
17:16	#281		to II — to (50.2/49.5, 352 1/8)
17:18			to
17:26	#286		to (46.1/50.2, 352, 3/16 turn)

J. Yang 7/27/01

07/26/01

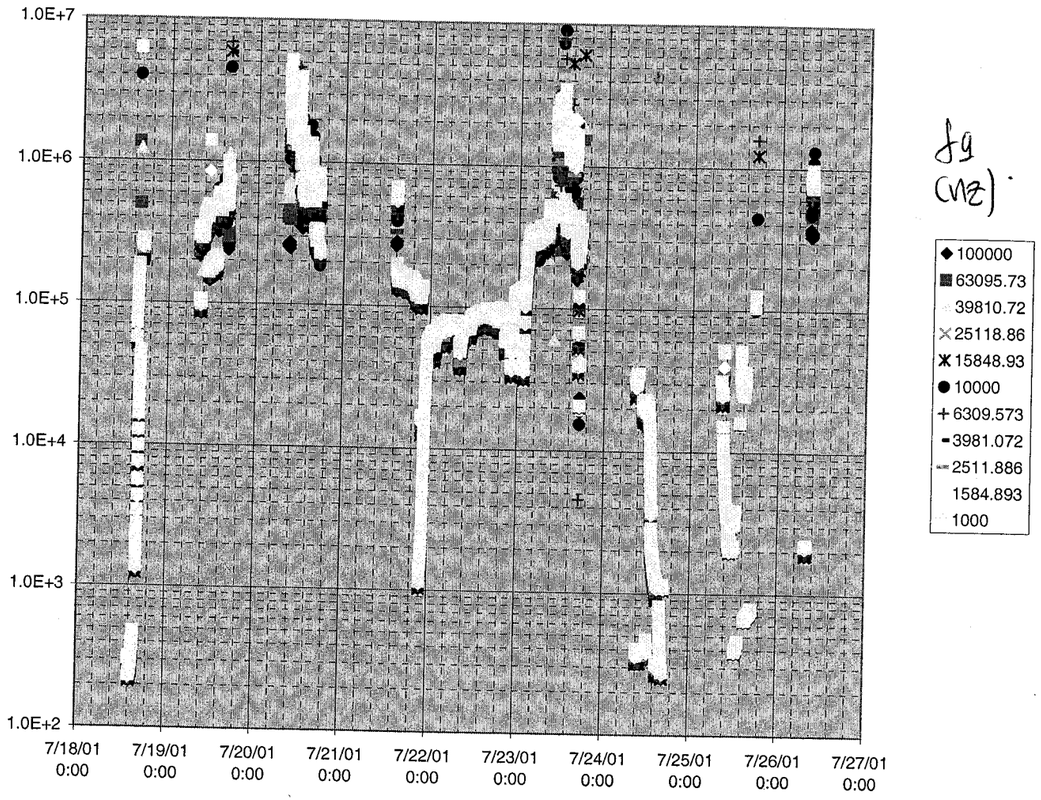
07:07		47/50	
07:34			program started, 0726a, with cell I
08:01	#14,	47/50	to cell II
13:37		47/50.	program restarted (it was stopped at 8:38 by a bug)
13:47	#4		to cell I
16:35	#84	47/50	to cell II
16:40	#92		program was terminated

J. Yang.
07/27/01

Test Results.

0718a_0725a.xls

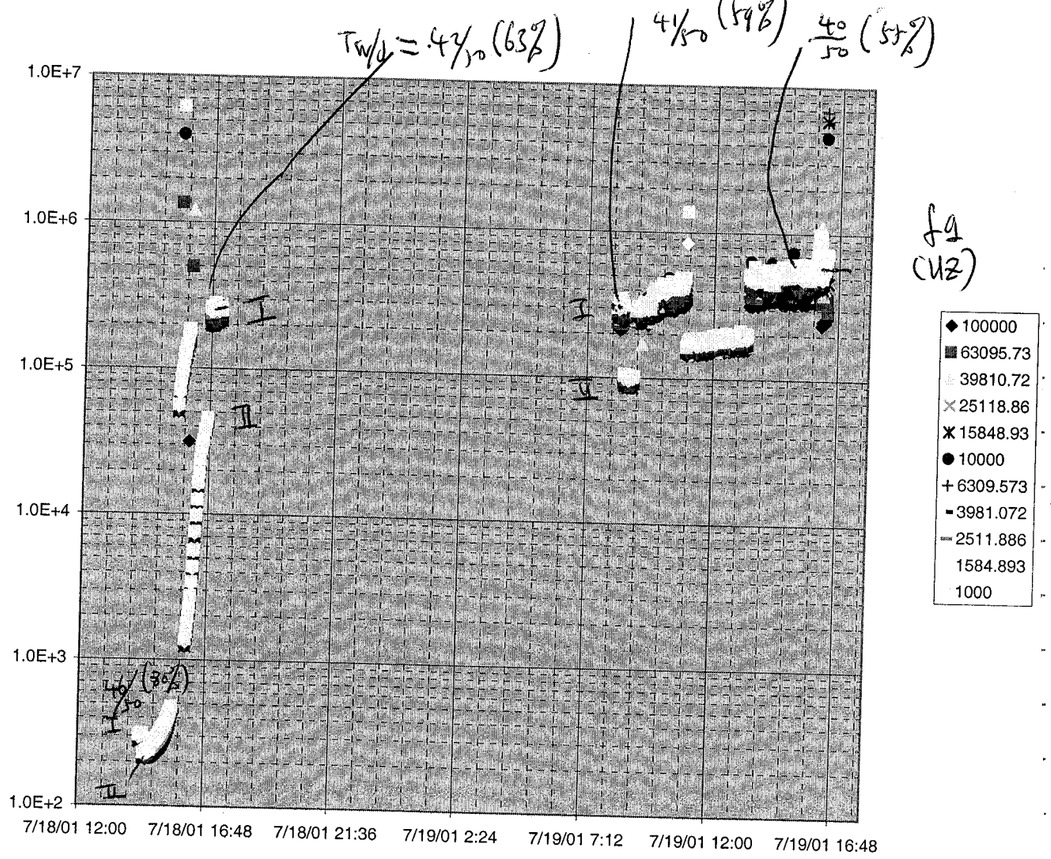
9/4/01



J. Yang
7/18/02

0718a_0725a.xls

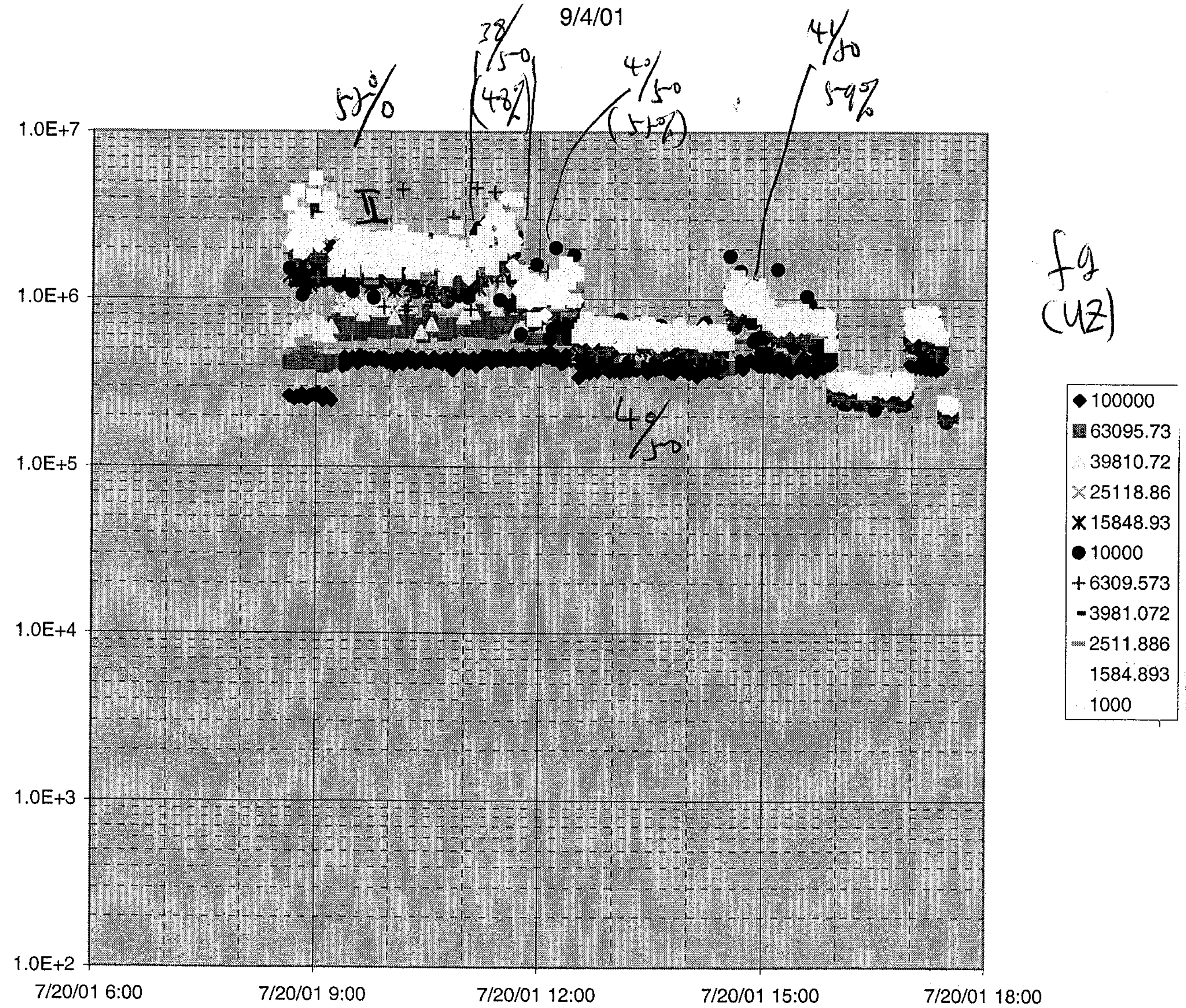
9/4/01



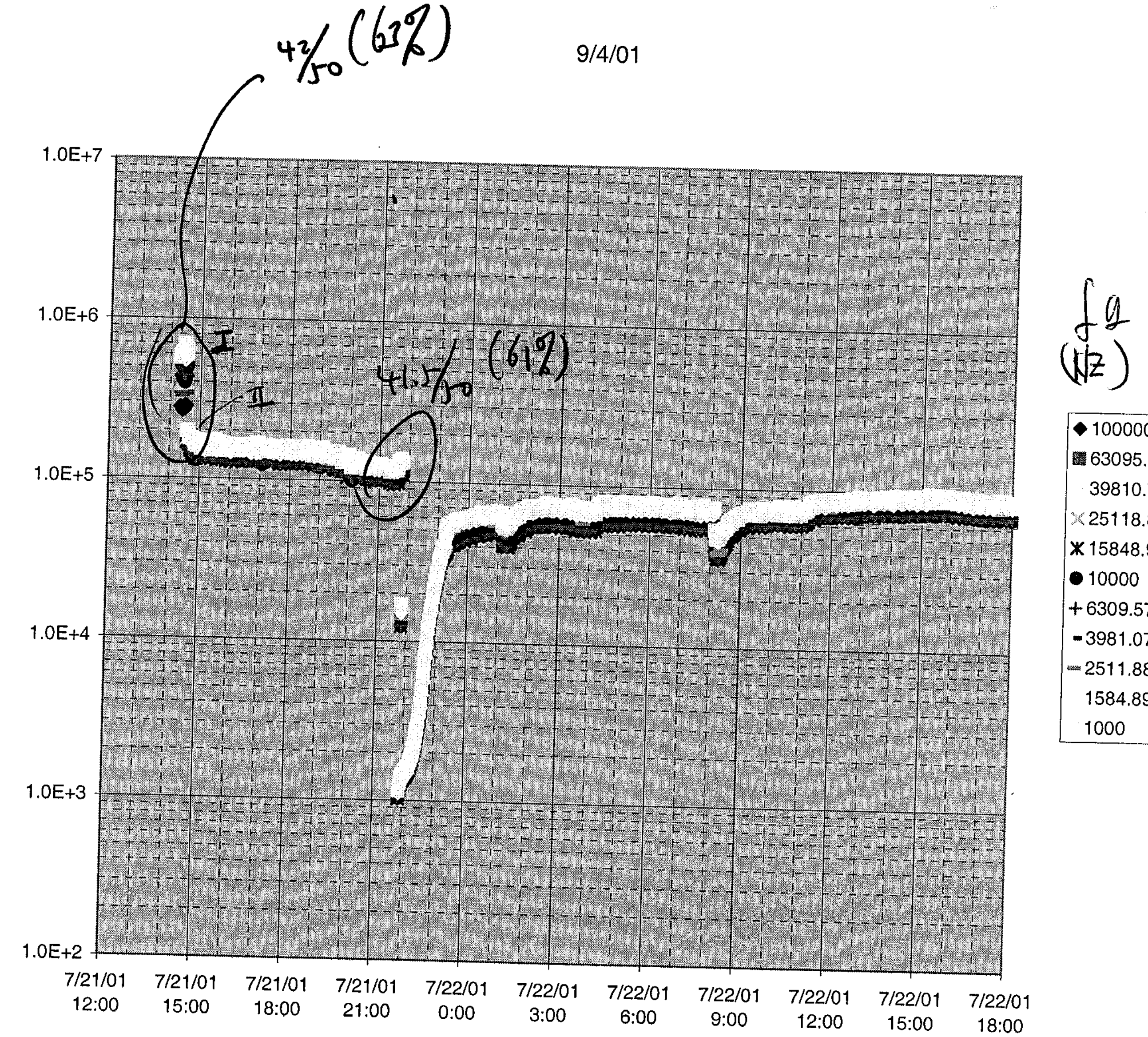
use data of low frequency (1000 ~ 631.0 Hz)
see page 42.

J. Yang
7/15/02

0718a_0725a.xls 9/4/01

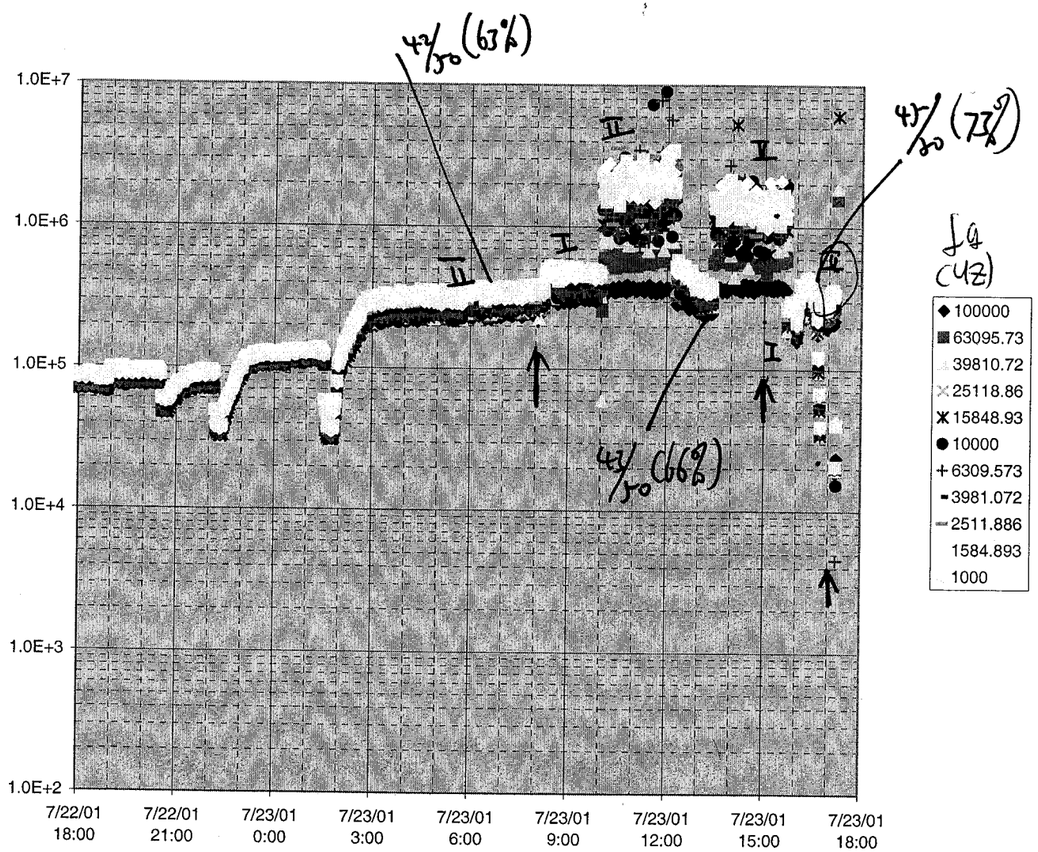


0718a_0725a.xls 9/4/01



0718a_0725a.xls

9/4/01



II has been always lower than I

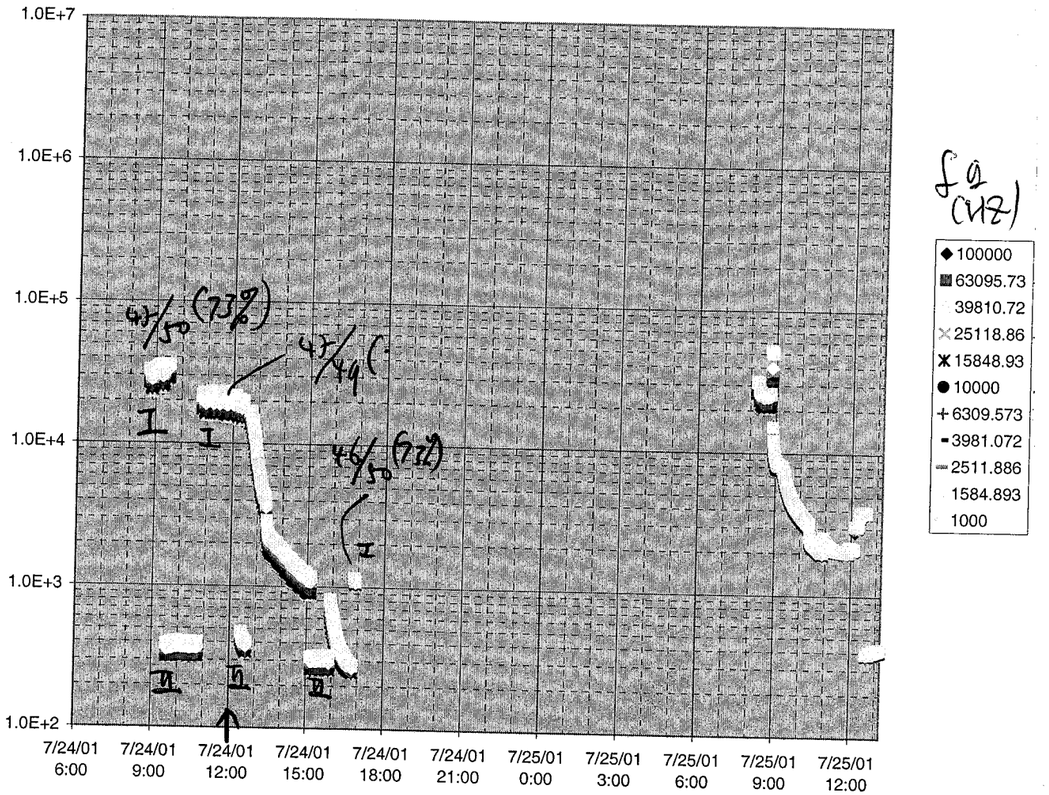
Why it is higher than I this time?

J. Yuyama

9/11/01

0718a_0725a.xls

9/4/01



J. Yuyama

7/12/02

0718a_DP.xls Data

File: 0718a_DP.xls

Data time	RH (%)	KNO3, Cell I Z, ohm	KNO3, Cell I log|Z| KNO3	KCl, Cell II Z, ohm	KCl, Cell II log|Z| KCl
7/18/01 15:00	80	2.70E+02	2.43E+00	2.20E+02	2.34E+00
7/18/01 17:00	63	2.50E+05	5.40E+00		
7/19/01 9:00	59	2.70E+05	5.43E+00	9.50E+04	4.98E+00
7/19/01 15:00	55	6.00E+05	5.78E+00	2.00E+05	5.30E+00
7/20/01 9:00	48	2.00E+06	6.30E+00	1.00E+06	6.00E+00
7/20/01 12:00	55	8.00E+05	5.90E+00	4.50E+05	5.65E+00
7/20/01 15:00	59	5.00E+05	5.70E+00	2.50E+05	5.40E+00
7/21/01 14:00	61	4.00E+05	5.60E+00		
7/21/01 19:00	61			1.20E+05	5.08E+00
7/23/01 8:00	63	4.00E+05	5.60E+00	2.00E+06	6.30E+00
7/23/01 15:00	66	3.00E+05	5.48E+00	1.50E+06	6.18E+00
7/23/01 17:00	73	1.00E+05	5.00E+00		
7/24/01 12:00	73			3.50E+02	2.54E+00
7/24/01 17:00	90	2.80E+02	2.45E+00	1.00E+03	3.00E+00
7/25/01 9:00	71				

why so high. see comments on page 69

From Graph, Page 71:
DH KNO3=77%, Literature*=84.8% Difference= +7.8%
DH KCl=71%, Literature*= 81.2% Diffference= +10.2
Should be corrected by adding (+7.8+10.2)/2= 9 %

Data time	Corrected RH (%) Corrected RH	~~MgCl2-NaCl, Cell I~~ Z, ohm	~~MgCl2-NaCl, Cell I~~ log|Z| KNO3	~~MgCl2.6H2O, Cell II~~ Z, ohm	~~MgCl2.6H2O, Cell II~~ log|Z| KCl
7/18/01 15:00	89	2.70E+02	2.43E+00	2.20E+02	2.34E+00
7/18/01 17:00	72	2.50E+05	5.40E+00		
7/19/01 9:00	68	2.70E+05	5.43E+00	9.50E+04	4.98E+00
7/19/01 15:00	64	6.00E+05	5.78E+00	2.00E+05	5.30E+00
7/20/01 9:00	57	2.00E+06	6.30E+00	1.00E+06	6.00E+00
7/20/01 12:00	64	8.00E+05	5.90E+00	4.50E+05	5.65E+00
7/20/01 15:00	68	5.00E+05	5.70E+00	2.50E+05	5.40E+00
7/21/01 14:00	70	4.00E+05	5.60E+00		
7/21/01 19:00	70			1.20E+05	5.08E+00
7/23/01 8:00	72	4.00E+05	5.60E+00	2.00E+06	6.30E+00
7/23/01 15:00	75	3.00E+05	5.48E+00	1.50E+06	6.18E+00
7/23/01 17:00	82	1.00E+05	5.00E+00		
7/24/01 12:00	82			3.50E+02	2.54E+00
7/24/01 17:00	99	2.80E+02	2.45E+00	1.00E+03	3.00E+00
7/25/01 9:00	80				

J.y, 10/22/01

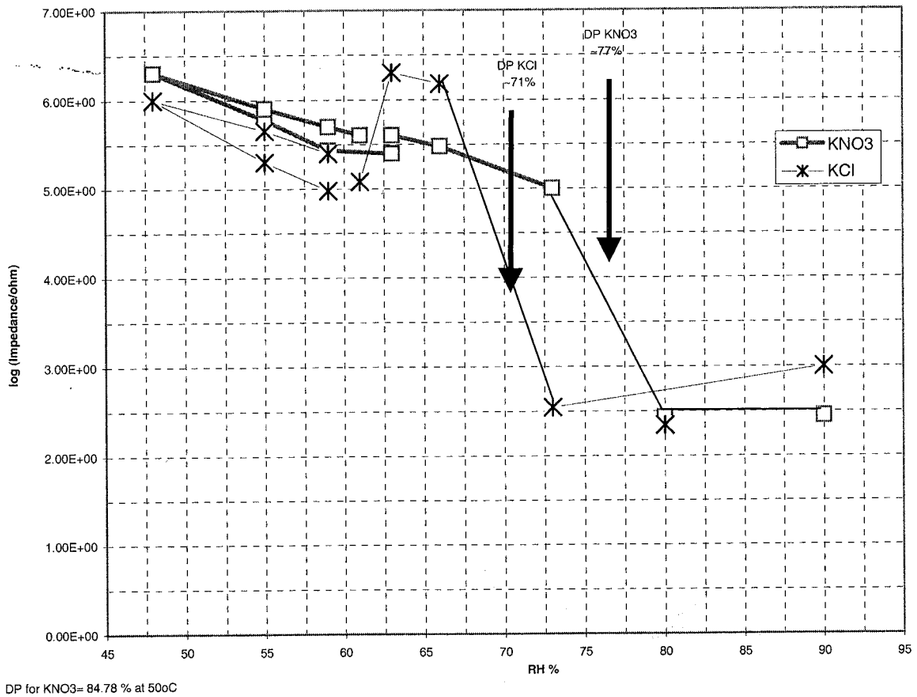
* L. Greenspan, J.Research of N. B. S., Vol 81A, No1, 1977, Page 89-96

File: 0718a-DP.XLS was accidentally deleted. All data in that file are on this page.

J. Yang. 10/22/01

0718a_DP.xls Uncorrected_Chart

Data see Page 70

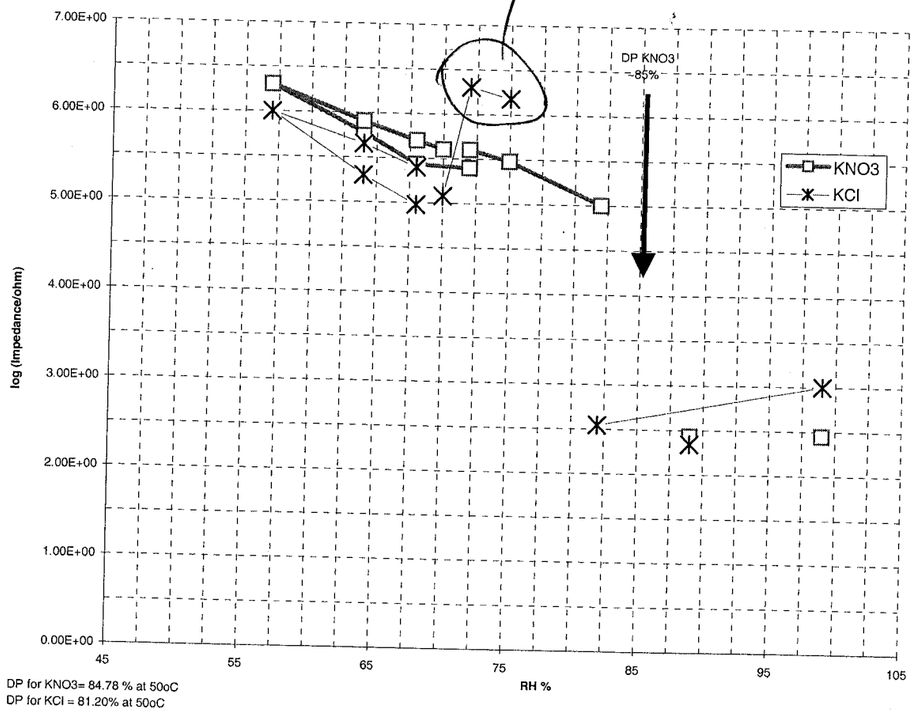


DP for KNO3= 84.78 % at 50oC
DP for KCl = 81.20% at 50oC

J. Yang 7/15/02

0718a_DP.xls Corrected_Chart

? See comment Pg 68.

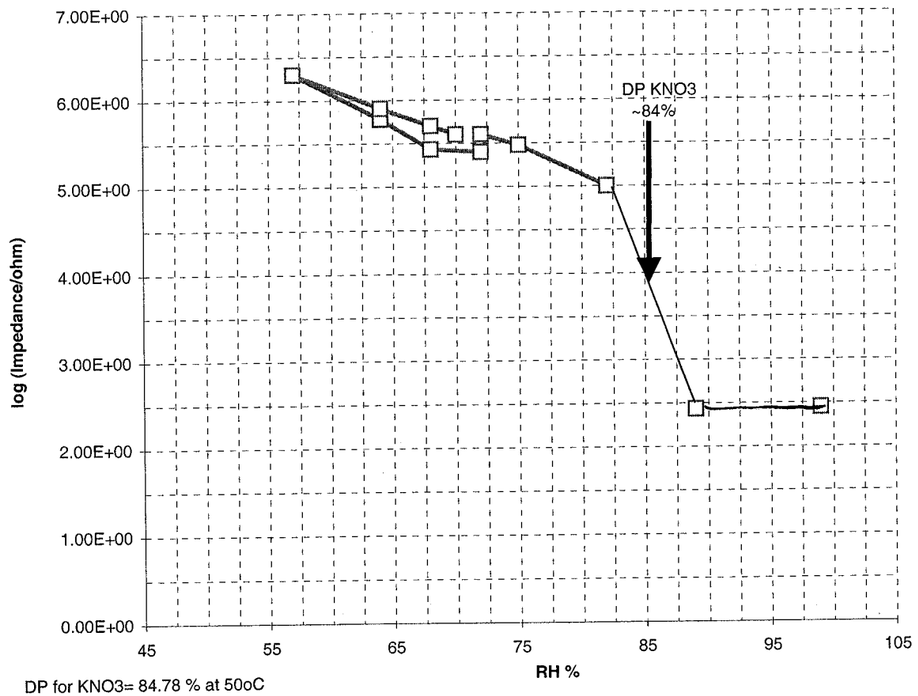


DP for KNO3= 84.78 % at 50oC
DP for KCl = 81.20% at 50oC

Data for KCl are not good.
Reason not known.!
See Comment on page 68.

J. Yang
7/15/02

0718a_DP.xls Corrected_Chart_KNO3



DP for KNO3= 84.78 % at 50oC

J. Yang
7/15/02

07/26/01

NaCl - KNO_3 sat. solution. (30 ml water)

NaCl 12.8 mol/kg → ×30 ml 0.38 mol → ×58.44 22.44 g

KNO_3 6.1 mol/kg → ×30 ml 0.18 mol → ×101.10 18.19 g

solubility of calculated see: page 87

NaCl: lot # 010166 — Fisher

KNO_3: lot # 7028 kDPD by Mallinckrodt.

water → Deionized. 30 ml.

Heated and stirred. then cooled to 22°.

Arc cell

cell I, 2 mm wider than base of PTFE, KNO_3-NaCl soln.

cell II, same as base of PTFE, $NaNO_3$ soln. saturated

$NaNO_3$ solution made from lot # 961772A

17:13 Cells installed in chamber.

program started. File Name: 0726c

set to (36/50, 30°, 1/2)

#13, #14 with cell II

after #16 with cell I

J. Yang

7/27/01

		Z, Ω	Cell #	control T_w/T_d
17:43	#	40/50 (56%)		to (36/50, 30°, 1/1)
17:46		40/50		to (36/50, 45°, 1/1)
18:10		35/44		J. Yang. ~~to II~~ 07/27/01
07/27/01				
8:04	#435	43/50 (wet bulb dried out, water added.)		~~log Z_{II}=6~~ J. Yang. 07/27/01 to cell II
8:43		48/50	Z_{II} = 106 Ω	
10:05	#484	34/50	to cell I.	
11:02	#515	34/50		to (36/50, 2°, 1/1)
11:19		37/50 (47%)		
11:34		37/50	to cell II	
13:06		37/50	to cell I	
13:31	#586	37/50		to (37/50, 2°, 1/1)
13:57		37/50		to (38.5/50, 3°, 1/1)
14:12	#606	39.5/50		to (38.5/50.5, 2°, 1 turn)
14:18		38/50 too low		to (38.5/50.5, 2.5°, 1/1)
14:21		38.5/50		
14:24		38.5/50		
14:38		39/50 (52%)		
14:41			to cell II	
14:46	#623			to (40/50, 2.5°, 1/1)

J. Yang

7/27/02

power of medium

07/27/01

14:48			to cell I	
14:51		39/50		to (40/50, 30s, 1/1)
14:58		40/50		
15:14		40/50	to cell II	
16:11	#665	40/50	to cell I	
16:18				to (41.5/50, 31.5s, 1/1)
16:	#687	40.5/50		to (36/50.5, 1.5s, 1/1)
17:11		38/50	program terminated	

and restarted: File: 07276.

07/30/01

12:04	#1815	43/50, (wet Bulb dried)	to cell II	
		water added.		
12:13		34/50		
12:17				to (42/50.5, 30s, 1/1)
12:26		40.5/50		
12:30			to cell I	
12:46		40/50		
13:01			to cell II	
13:14			to cell I	
13:24	#1855	40/50		to (43/50.5, 34, 1/1)
13:33	#1860	40.5/50		
14:00		41/50	to cell II	
14:27		41/50		to (43/50.5, 34, 1/4)
14:32		43/50		
14:38		43/50	to cell I	
14:58		43/50	to cell II	

J. Yang 7/27/02

15:13		43/50	to cell I	to (45/50, 34, 1/8 turn)
15:26	#1917	46/50	to cell II	
15:40		46/50	to cell I	
15:44		46/50	$Z_{I,lk} = 198\Omega$	to (44/44.5, 34?, 1/16)
15:52	#1930	50/51	to cell II	
15:54			$Z_{II,lk} = 342\Omega$	to (45/50.5, 34, 1/8)
16:08		53/53	to cell I	
16:22	#1947	45/50	$Z_I = 219\Omega$	
16:33		41.5/50	to cell II	
16:38				to (43/50.5, 34?, 1/4)
16:48		43/50	to cell I	
16:51		43/50		
16:59		43/50	to cell II	to (42/50.5, 30?, 1/1)
17:09			to cell I	
17:22		43/50		
17:24		43/50	to cell II	
17:41		41/50		
17:47			to cell I	

7/31/01

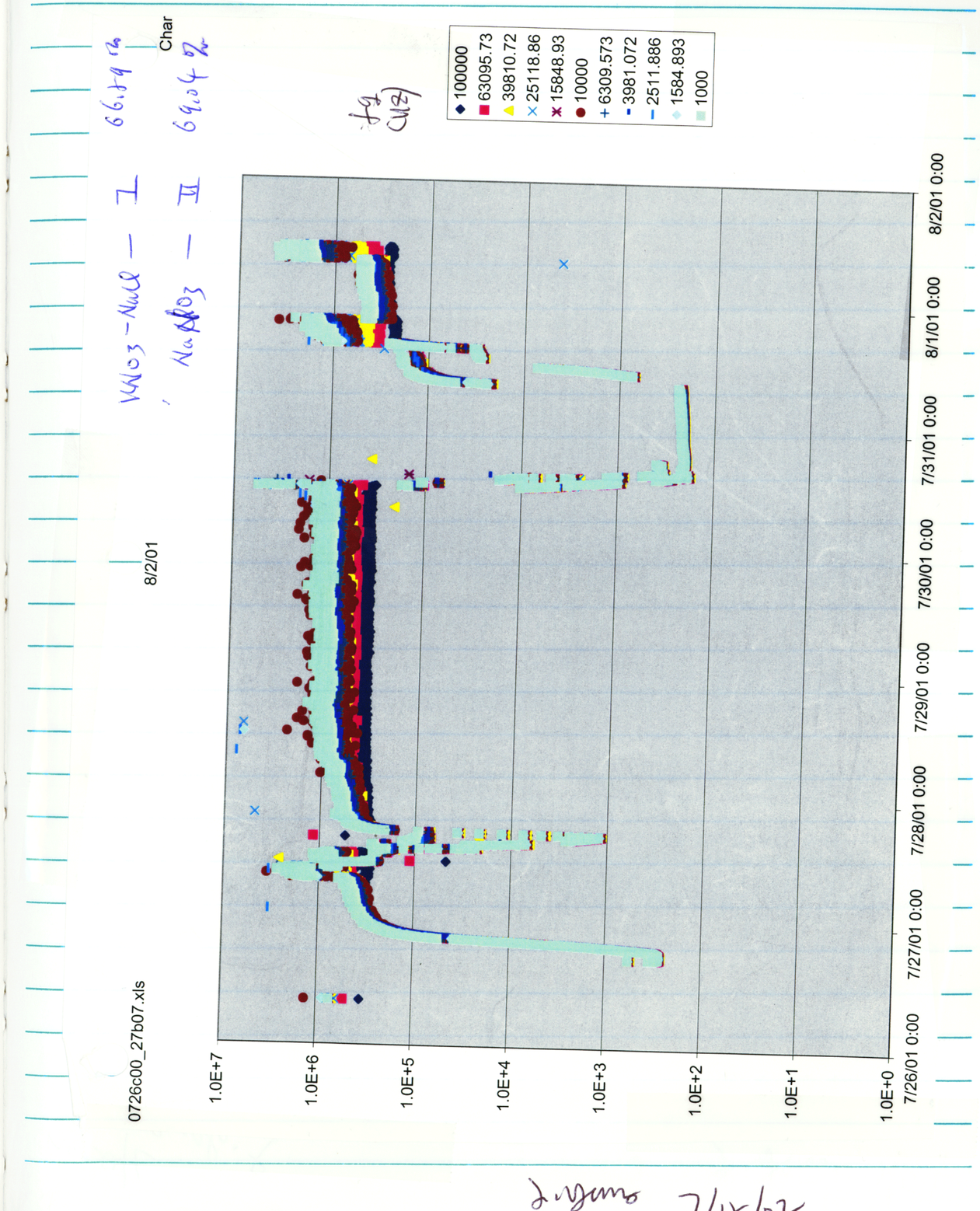
8:31	#2452	40.5/50.5	$Z_{I,lk} = 240\Omega$	to cell II
			$Z_{II,lk} = 2470\Omega$	
8:45	#2459			to (38.5/50.5, 2.5?, 1/1)
8:53		37/50		
10:47		37/50		
10:47		38/50	to cell I	
11:56		37/50	to cell II.	
13:33		37/50	to cell I	
18:01		36/50	to cell II	

J. Yang 7/27/02

15:25	33/50	to cell I	to (36/50, 1+2, 1+)
16:04	37/50		
16:07		to cell II	
20:43 #2802	37/50	to cell I	
08/01/01			
8:20 #3117	37/50–44	to cell II	
10:22	34/50–44	Chamber opened.	

J. Yang

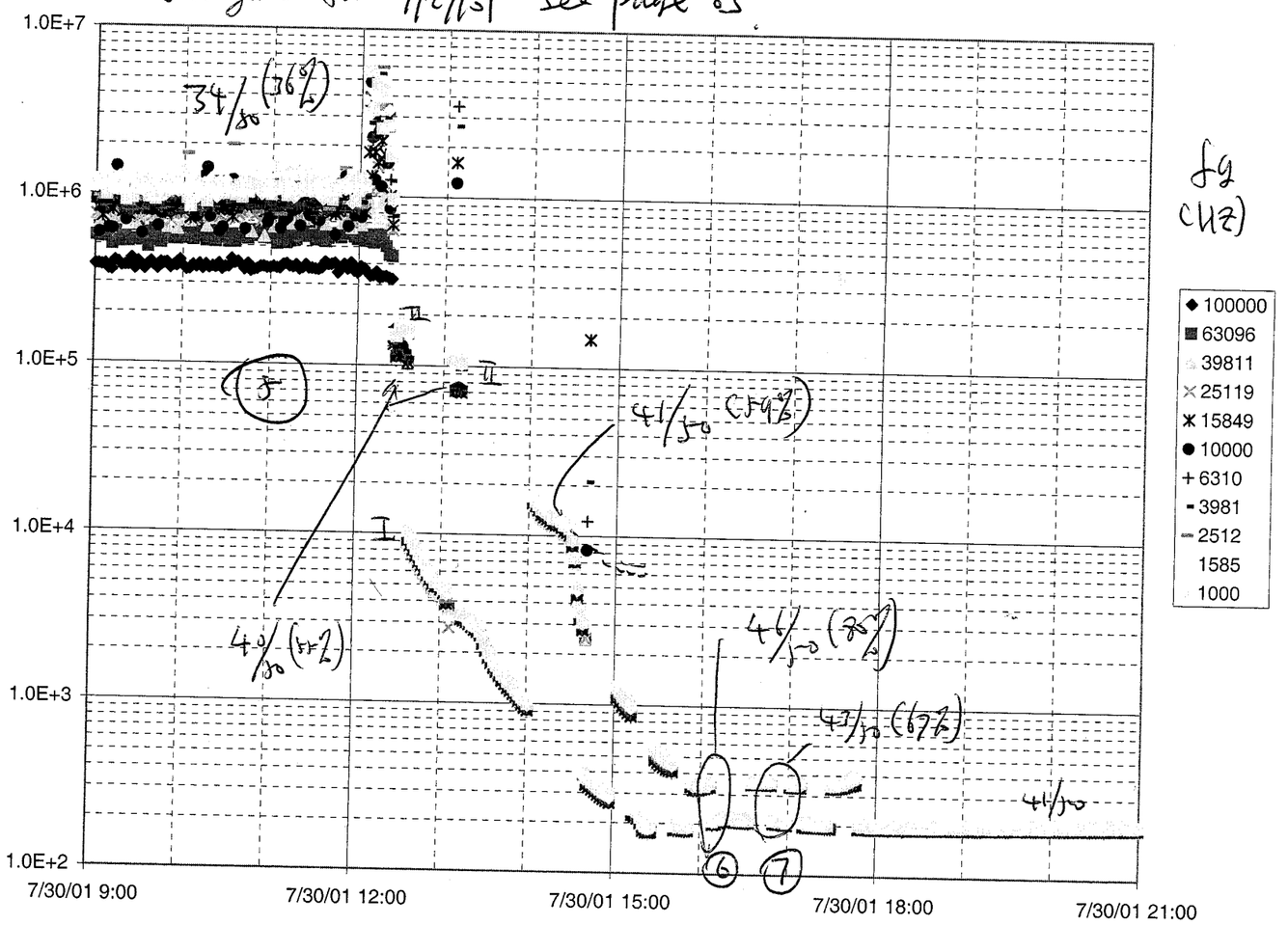
7/17/02



J. Yang 7/17/02

0726c00_27b07.xls Chart1

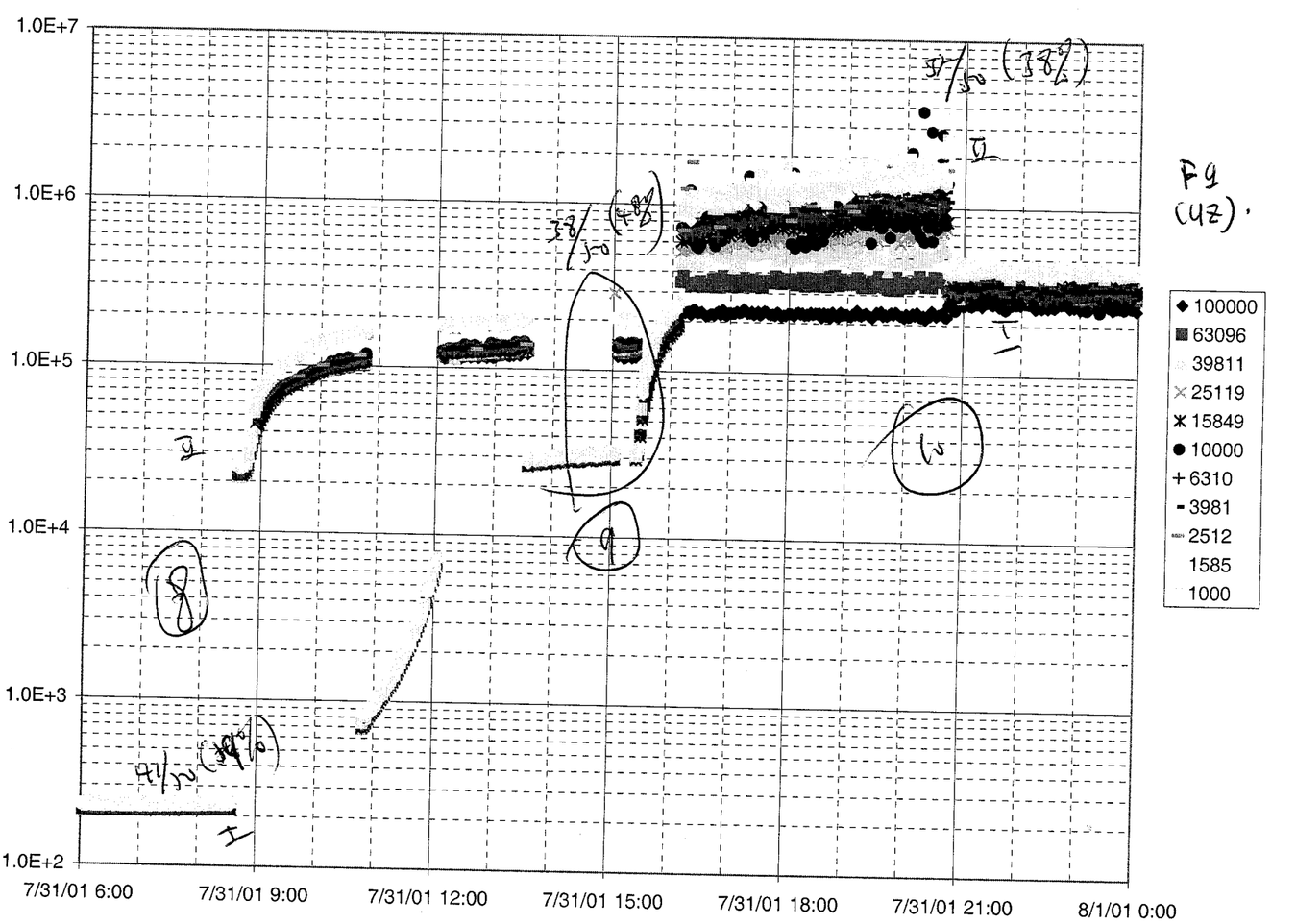
Enlarged Figure for 7/27/01 see page 83



fg (Hz)

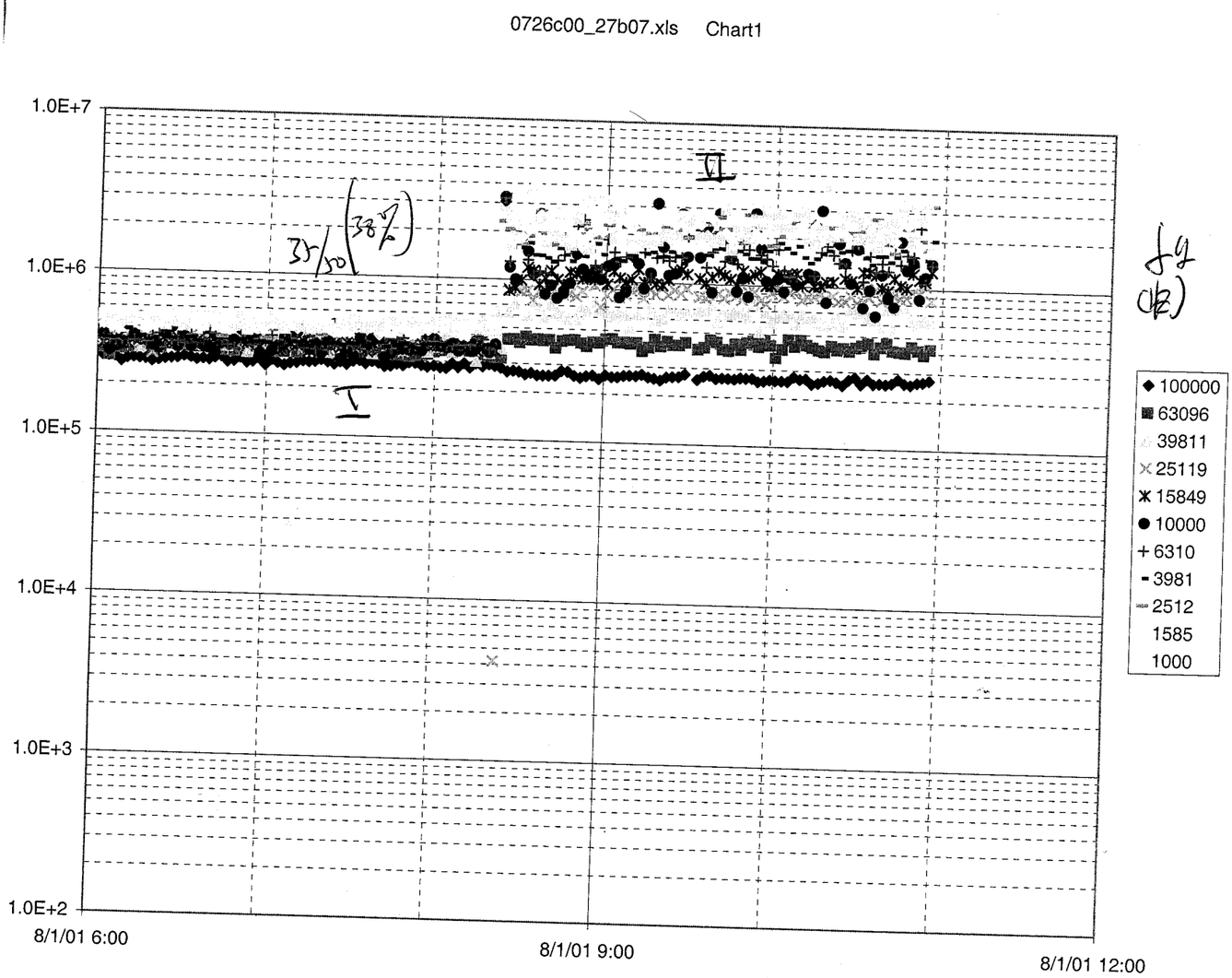
20/11/2 amplitude

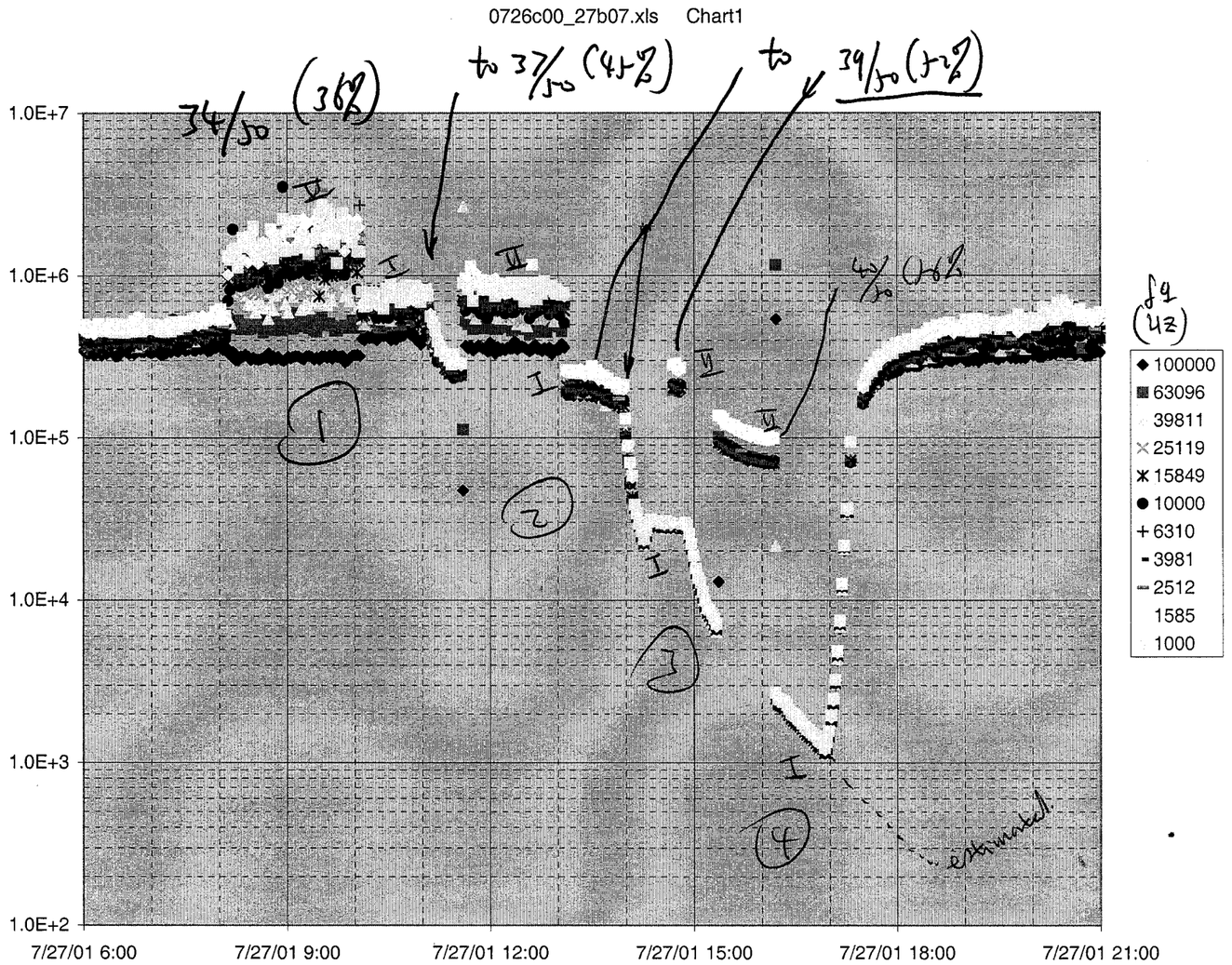
0726c00_27b07.xls Chart1



fg (Hz).

20/11/2 amplitude


0726c00_27b07.xls Chart1
1.0E+7
1.0E+6
1.0E+5
1.0E+4
1.0E+3
1.0E+2
8/1/01 6:00
8/1/01 9:00
8/1/01 12:00
35/50 (38%)
II
I
fg (Hz)
100000
63096
39811
25119
15849
10000
6310
3981
2512
1585
1000


0726c00_27b07.xls Chart1
34/50 (36%)
to 37/50 (41%)
to 39/50 (42%)
4/50 (06%)
1.0E+7
1.0E+6
1.0E+5
1.0E+4
1.0E+3
1.0E+2
7/27/01 6:00
7/27/01 9:00
7/27/01 12:00
7/27/01 15:00
7/27/01 18:00
7/27/01 21:00
II
I
(1)
(2)
(3)
(4)
estimated
fg (Hz)
100000
63096
39811
25119
15849
10000
6310
3981
2512
1585
1000

0726c_DP.xls Data

L.y. 08/29/01

0726c_DP

Point #	Data time	RH (%)	~~KNO3, Cell I~~ Z, ohm	~~KNO3, Cell I~~ log|Z| KNO3-NaCl	~~NaNO3, Cell II~~ Z, ohm	~~NaNO3, Cell II~~ log|Z| NaNO3
6	7/30/01 15:30	80	2.50E+02	2.40E+00	3.50E+02	2.54E+00
7	7/30/01 16:30	67	2.20E+02	2.34E+00	3.50E+02	2.54E+00
8	7/31/01 8:20	59	2.10E+02	2.32E+00	2.50E+04	4.40E+00
9	7/31/01 15:20	48	3.50E+04	4.54E+00	2.00E+05	5.30E+00
10	7/31/01 20:00	38	3.50E+05	5.54E+00	1.80E+06	6.26E+00
5	7/30/01 12:00	36	1.00E+06	6.00E+00	5.00E+06	6.70E+00
	7/30/01 13:00	55			1.00E+05	5.00E+00
1	7/27/01 10:00	36	8.00E+05	5.90E+00	1.80E+06	6.26E+00
2	7/27/01 13:00	45	2.50E+05	5.40E+00	8.00E+05	5.90E+00
3	7/27/01 14:50	52	2.50E+04	4.40E+00	1.50E+05	5.18E+00
4*	7/27/01 17:10	56	2.50E+02	2.40E+00	8.00E+04	4.90E+00

* 4 estimated

Correction

From Graph, Page 85:
DH NaNO3=63%, Literature*=69.04% Difference= +6%

L.y. 8/29/01

Should be corrected by adding 6 %

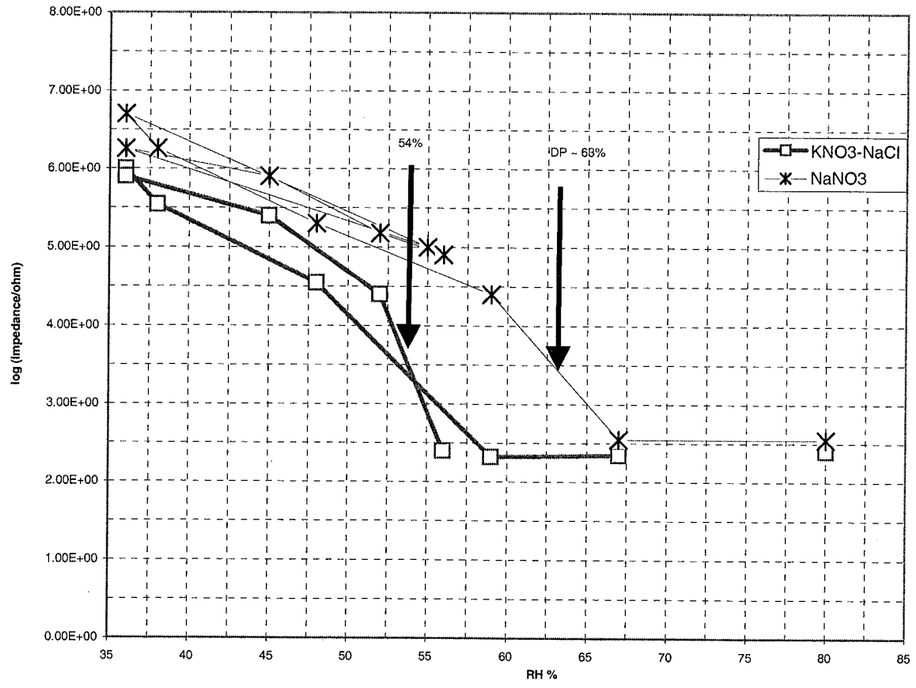
Data time	Corrected RH (%)	~~KNO3, Cell I~~ Z, ohm	~~KNO3, Cell I~~ log|Z| KNO3-NaCl	NaNO3, Cell II Z, ohm	NaNO3, Cell II log|Z| NaNO3
7/30/01 15:30	86	2.50E+02	2.40E+00	3.50E+02	2.54E+00
7/30/01 16:30	73	2.20E+02	2.34E+00	3.50E+02	2.54E+00
7/31/01 8:20	65	2.10E+02	2.32E+00	2.50E+04	4.40E+00
7/31/01 15:20	54	3.50E+04	4.54E+00	2.00E+05	5.30E+00
7/31/01 20:00	44	3.50E+05	5.54E+00	1.80E+06	6.26E+00
7/30/01 12:00	42	1.00E+06	6.00E+00	5.00E+06	6.70E+00
7/30/01 13:00	61			1.00E+05	5.00E+00
7/27/01 10:00	42	8.00E+05	5.90E+00	1.80E+06	6.26E+00
7/27/01 13:00	51	2.50E+05	5.40E+00	8.00E+05	5.90E+00
7/27/01 14:50	58	2.50E+04	4.40E+00	1.50E+05	5.18E+00
7/27/01 17:10	62	2.50E+02	2.40E+00	8.00E+04	4.90E+00

* L. Greenspan, J.Research of N. B. S., Vol 81A, No1, 1977, Page 89-96

This correction is close to 9% in page 70

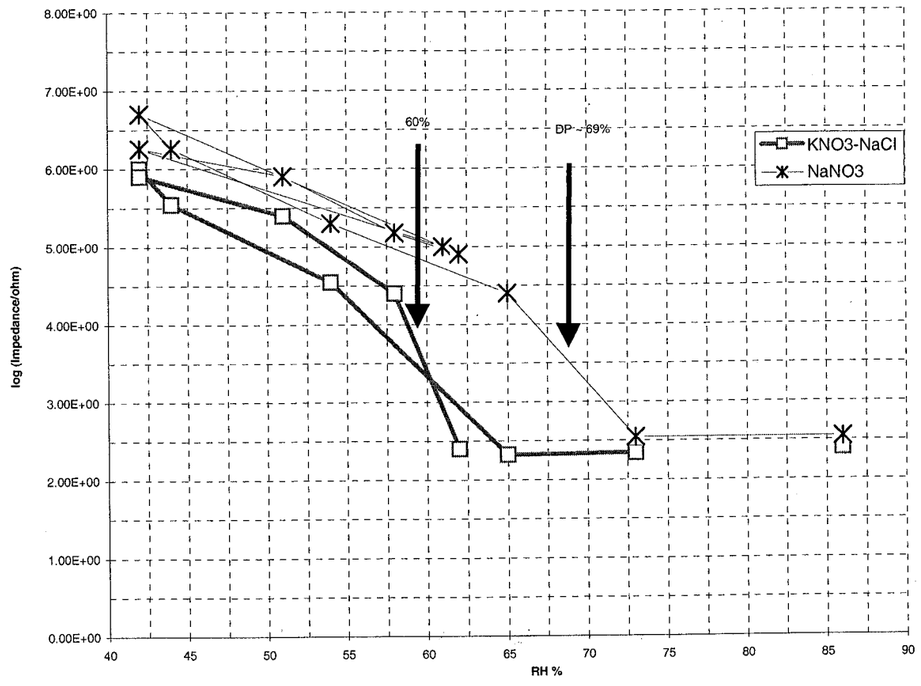
L.yang
7/17/02

0726c_DP.xls Uncorrected_Chart



L.yang
7/17/02

0726c_DP.xls Corrected_Chart



Dp of KNO3 - NaCl is 65%

J. Yang 7/17/02

Calculation of solubility and activity of water (R4) of salt mixture. using OLI 6.5 — Esp.

Calculation method same as that described in Page 69 of Scientific Note book #430 dtd 2.y. 07/31/01

	H2O	KCl	KNO3	NANO3	NACl
	55.55		10		10

← input (mol/hr)

Stream	In	In	out	out	out
Phase	Aqueous	Solid	Aqueous	Solid	Vapor
Temperatu	25	25	50	50	50
Pressure, ε	1	1	0.081288	0.081288	0.081288
pH	6.94875		6.58556		
Total mol/h	74.41866	10.5463	77.8098	8.84085	7.56E-04
Flow Units	mol/hr	mol/hr	mol/hr	mol/hr	mol/hr
H2O	55.55		55.5492		7.56E-04
HCL	1.20E-13		1.21E-12		1.02E-13
HNO3	5.03E-10		3.01E-09		3.99E-14
KCL	0.01487		0.03059		
NANO3	0.023849		0.027113		
OHION	2.03E-08		4.84E-08		
HION	1.98E-08		4.54E-08		
KION	3.06917		4.53978		
NAION	6.3458		6.56167		
NO3ION	3.06013		5.54326		
CLION	6.35478		6.55819		
NACL		3.630347		3.41122	
KNO3		6.915953		5.42963	
KOH.1H2C					
KOH.2H2C					
KOH					
NAOH.1H2					
NAOH					
Total g/hr	1684.82	911.394	1847.89	748.315	0.013611
Volume, L/l	1.26718	0.429607	1.37928	0.352433	0.246216
Enthalpy, c	-4.75E+06	-1.17E+06	-4.92E+06	-9.72E+05	-43.5155
Density, g/l	1329.59	2121.46	1339.75	2123.28	0.055279
Vapor fract					1
Solid fracti		1		1	
Organic fra					
Osmotic Pr	529.757		607.38		
Redox Pot,					
E-Con, 1/ol	0.343559		0.520565		
E-Con, cm	21.7675		27.3113		
Abs Visc, c	2.05076		1.38261		
Rel Visc	2.30236		2.52663		
Ionic Stren	9.40797		11.0933		
RH			0.665953		

← solubility. mol/kg water.

Calculated RH = 66.6 %

higher than 65%, measured.

J. Yang 7/15/02

Calculation for Pure NaNO3, Next page

Continued from page 87.

	H2O 55.55	KCl	KNO3	NANO3 15	NACl
Stream	In	In	out	out	out
Phase	Aqueous	Solid	Aqueous	Solid	Vapor
Temperatu	25	25	50	50	50
Pressure, a	1	1	0.079427	0.079427	0.079427
pH	7.139		6.735		
Total mol/h	77.23457	4.08411	82.99731	1.18782	7.06E-04
Flow Units	mol/hr	mol/hr	mol/hr	mol/hr	mol/hr
H2O	55.55		55.5493		7.06E-04
HCL					
HNO3	1.50E-09		6.82E-09		1.34E-13
KCL					
NANO3	0.147172	4.08411	0.176412	1.18782	
OHION	2.27E-08		4.77E-08		
HION	2.12E-08		4.09E-08		
KION					
NAION	10.7687		13.6358		
NO3ION	10.7687		13.6358		
CLION					
NACL					
KNO3					
KOH.1H2C					
KOH.2H2C					
KOH					
NAOH.1H2					
NAOH					
Total g/hr	1928.55	347.128	2174.7	100.959	0.01271
Volume, L/l	1.36768	0.153807	1.53019	0.044733	0.235314
Enthalpy, c	-4.96E+06	-4.57E+05	-5.25E+06	-1.32E+05	-40.6356
Density, g/l	1410.09	2256.9	1421.2	2256.9	0.054012
Vapor fract					1
Solid fracti		1		1	
Organic fra					
Osmotic Pr	459.309		617.253		
Redox Pot,					
E-Con, 1/o	0.193679		0.275214		
E-Con, cm	17.6594		18.9457		
Abs Visc, c	2.63048		2.06255		
Rel Visc	2.95321		3.76916		
Ionic Stren	10.7607		13.6258		
			0.650707		

solubility

RH

DP of $NaNO_3$ = 67.1% which is lower than published data by 4% (see page 34).

J. Yang

7/18/02

8/01/01

Test with $NaNO_3$ - NaCl, $NaNO_3$ - NaCl - KNO_3

Solution preparation.

	sol*	double sol	in 30 ml H2O	FW g	g	lot #
I: $NaNO_3$	6.8	13.6	0.408 mol	84.99	34.68 g	96.1772A
NaCl	3.8	7.6	0.228	58.4	13.3 g	006924
II $NaNO_3$	7.0	14	0.42	84.99	31.7 g	96.1772A
NaCl	3.8	8	0.24	58.44	14.0 g	006924
~~KNO_3~~	2.1	5	0.15	101.1	15.16 g	7028KDPD Mallinckrodt

Fisher

* — solubility at 27°C, calculated, see page 90.

Solution was well mixed, heated, then cooled to 27°C.

J. Yang

7/18/02

File:
knaclno3_b.xls

See page 37.

Chemistry Model: KNaClNO3

Input (mol/kg) — mol/kg water

Input	H2O 55.55	KCl	KNO3 10	NANO3 10	NACl 10
Stream	In	In	out	out	out
Phase	Aqueous	Solid	Aqueous	Solid	Vapor
Temperature, C	25	25	50	50	50
Pressure, atm	1	1	0.071613	0.071613	0.071613
pH	7.05619		6.69067		
Total mol/hr	80.97702	17.2391	88.04159	13.6949	8.56E-04
Flow Units	mol/hr	mol/hr	mol/hr	mol/hr	mol/hr
H2O	55.55		55.5491		8.56E-04
HCL	8.57E-14		7.56E-13		8.43E-14
HNO3	7.28E-10		3.81E-09		1.39E-13
KCL	0.004038		0.00702		
NANO3	0.090808	3.014599	0.110546		
OHION	1.32E-08		2.81E-08		
HION	1.25E-08		2.42E-08		
KION	1.99957		3.15586		
NAION	10.6665		13.0316		
NO3ION	8.89821		13.0523		
CLION	3.76789		3.13516		
NACL		6.228088		6.8578	
KNO3		7.996413		6.8371	
KOH.1H2O					
KOH.2H2O					
KOH					
NAOH.1H2O					
NAOH					
Total g/hr	2017.49	1428.67	2354.1	1092.05	0.015412
Volume, L/hr	1.40793	0.665097	1.62524	0.513001	0.316508
Enthalpy, cal/hr	-5.13E+06	-1.89E+06	-5.50E+06	-1.48E+06	-49.2752
Density, g/L	1432.95	2148.07	1448.47	2128.74	0.048694
Vapor fraction					1
Solid fraction		1		1	
Organic fraction					
Osmotic Pres, atm	631.531		765.088		
Redox Pot, volts					
E-Con, 1/ohm-cm	0.259518		0.360716		
E-Con, cm2/ohm-	12.1795		15.2369		
Abs Visc, cP	2.96375		2.29093		
Rel Visc	3.32737		4.18652		
Ionic Strength	12.6567		16.1757		
Activity of Water:			0.586695		

solubility (KION/NAION/NO3ION/CLION values circled); RH (activity of water circled)

knaclno3

	H2O 55.55	KCl	KNO3	NANO3 10	NACl 10
Stream	In	In	out	out	out
Phase	Aqueous	Solid	Aqueous	Solid	Vapor
Temperature, C	25	25	50	50	50
Pressure, atm	1	1	0.075628	0.075628	0.075628
pH	7.05736		6.67905		
Total mol/hr	76.5806	9.43681	81.38682	7.01728	7.56E-04
Flow Units	mol/hr	mol/hr	mol/hr	mol/hr	mol/hr
H2O	55.55		55.5492		7.56E-04
HCL	8.85E-14		8.32E-13		7.14E-14
HNO3	7.74E-10		4.55E-09		1.25E-13
KCL					
NANO3	0.095749	3.16263	0.12783		
OHION	1.84E-08		4.41E-08		
HION	1.76E-08		3.95E-08		
KION					
NAION	10.4074		12.8549		
NO3ION	6.74163		9.87217		
CLION	3.72582		2.98272		
NACL		6.27418		7.01728	
KNO3					
KOH.1H2O					
KOH.2H2O					
KOH					
NAOH.1H2O					
NAOH					
Total g/hr	1799.64	635.489	2025.01	410.111	0.013611
Volume, L/hr	1.31301	0.28857	1.46192	0.189537	0.264661
Enthalpy, cal/hr	-4.89E+06	-9.70E+05	-5.13E+06	-6.88E+05	-43.5154
Density, g/L	1370.62	2202.2	1385.17	2163.75	0.051427
Vapor fraction					1
Solid fraction		1		1	
Organic fraction					
Osmotic Pres, atm	582.353		705.82		
Redox Pot, volts					
E-Con, 1/ohm-cm	0.232308		0.324058		
E-Con, cm2/ohm-	15.2512		17.5395		
Abs Visc, cP	2.66827		1.97554		
Rel Visc	2.99563		3.61016		
Ionic Strength	10.4597		12.8455		
Activity of Water:			0.619585		

solubility. RH.

Pure water		
Stream	In	out
Phase	Aqueous	Aqueous
Temperatu	25	50
Pressure, ε	1	0.122062
pH	6.9969	6.63553
Total mol/h	55.55	55.5494
Flow Units	mol/hr	mol/hr
H2O	55.55	55.5494
HCL		
HNO3		
KCL		
NANO3		
OHION	1.01E-07	2.32E-07
HION	1.01E-07	2.32E-07
KION		
NAION		
NO3ION		
CLION		
NACL		
KNO3		
KOH.1H2C		
KOH.2H2C		
KOH		
NAOH.1H2		
NAOH		
Total g/hr	1000.75	1000.74
Volume, L/	1.00392	1.01296
Enthalpy, c	-3.79E+06	-3.77E+06
Density, g/l	996.847	987.94
Vapor fract		
Solid fracti		
Organic fra		
Osmotic Pr		
Redox Pot,		
E-Con, 1/o	5.49E-08	1.69E-07
E-Con, cm:		
Abs Visc, c	0.89072	0.547218
Rel Visc	1	1
Ionic Stren	1.01E-07	2.32E-07
		1

J. Yang 7/15/02

08/02/01 Program started, File: 0802a. cell II.

8:29 13°C/12 (Room) $Z_{II} = 10^{5.3}\,\Omega$ in air

8:32 13°C/12 (Room) $Z_{I} = 10^{4.3}\,\Omega$ Changed to cell I in air

9:03 Installed in Chamber. to (50/50.5, 35.2°, 1/8)

9:09 31/39 to cell II

9:22 #11 50/51 $Z_{II} = 357\,\Omega$ to cell I

9:27 $Z_{I} = 339\,\Omega$ to (44/50.5, 25.4, 1/8)

9:29 45/51 to cell II

9:36 41/50 to (44/50.5, 34.9, 3/16)

9:42 → to cell I

9:53 43/50

9:53 to cell II

10:19 #41 44/50 to cell I

12:21 #104 44/50 to cell II to (42/50.5, 32.5, 1/1)

13:59 41/50 to cell I

15:12 to cell II

15:16 41/50 (58%) to (39/50.5, 27.2°, 1/1)

15:55 39/50 (52%) to cell I

17:20 39/50 to cell II

8/03/01

8:17 #728 39/50 (52%) $Z_{II} = 314\,\Omega$ to cell I

8:20 33/49.5 $Z_{I} = 35651\,\Omega$

9:22 39/50 to (36.5/50.5, 27.2°, 1/1)

8:27 to (36.5/50.5, 20.2°, 1/1)

8:40 33/50

9:54 36/50 to cell II

10:10 36/50.2 (42%) J. Yang

11:04 #811 36/50 to cell I 7/15/02

12:20 to cell II

08/30/01

14:07 #849 to cell I

14:21 36/50 to (37.5/50.5, 23°, 1/4)

14:24 37/50

14:37 37/50

16:03 #934 37/50

16:58 37/50 to II

17:06 37/50 to (42/50.5, 32.5, 1/1)

17:30 #997 41/50 to I

17:45 41/50 to (32.5/50.5, 17°, 1/1)

17:46 to II

17:48 #1006 37/50

08/06/01

8:06 #2752 43/50 (dried) $z_{II} = 10^{5.1}\,\Omega$ to I

8:10 $z_I = 10^{6.2}$ add water, to II

8:20 37/50

10:49 34/50 to (42/50.5, 32.5, 1/1)

11:24 34/50 to I

11:40 41/50

16:37 41/50 to II

16:39 41/50 to (~~50~~ 41/50.5, 30°, 1/1)

08/07/01

9:02 40/50 to I

16:15 40/50 to II to (34/50, 21°, 1/1)

16:42 37/50

16:55 37/50

17:17 37/50

J. Yang 7/15/02

07/08/01

8:27 33/50 (48%) $z_{II} = 10^{4}\,\Omega$ to I

10:49 38/50 $z_I = 10^{5}\,\Omega$

11:01 inserted Cole parmer probe to II.
just calibrated. see page 94.

11:08 38/50 – 37/50 51.36% – 48.72%* , 47.68%
11:08 37.7 (47%) Ave: 50%

* —— Hygrometer – coparmer.

11:20 Experiment terminated. open circuit.

Data processing go to page 103

J. Yang 7/15/02

It was noticed that the cole-parmer Humidity Probe not good!

SOUTHWEST RESEARCH INSTITUTE

6220 CULEBRA ROAD • POST OFFICE DRAWER 28510 • SAN ANTONIO, TEXAS, 78228-0510 • TEL (210) 522-5215 • FAX (210) 522-3692

To: Lietai Yang, Div 20, Bld 189

From: Walt Hill, Institute Calibration Laboratory Supervisor

CC: Rodney Weber, Institute Quality Assurance Manager

Date: Aug. 6, 01

Subject: Out-of-tolerance Notice

The purpose of this notice is to alert you of a condition, which could have caused erroneous measurements. The as-found readings are provided for your evaluation to determine if the instrument had any impact on your operations and if further action is required. If we can be of assistance, please contact the Calibration Laboratory at 522-5215.

Manufacturer: Cole Parmer **Model:** 03313-66

Description: Thermohygrometer **Serial Number:** 21189381

Asset Number: 008788 **User ID Number:**

Last Calibration: 7/03/01

Date Received for Service: Aug. 3, 01 Work Order Number: 444044659

Service Requested: Calibrate before use

Remarks: TI probe was contaminated. Cleaned and recalibrated TI. E-mail was sent to Mr. Yang on 8/3/01.

AS-FOUND DATA

PARAMETER OR FUNCTION	APPLIED OR NOMINAL VALUE	INSTRUMENT READING	INSTRUMENT ERROR	INSTRUMENT TOLERANCE
Humidity	39.95 % RH	46.9 % RH	6.9 % RH	0.5 % RH
	55.05 % RH	65.8 % RH	10.8 % RH	0.5 % RH
	70.07 % RH	85.1 % Rh	15.1 % RH	0.5 % RH
	77.39 % RH	94.7 % RH	17.3 % RH	0.5 % RH

J. Yang 7/17/02

OUT OF TOLERANCE

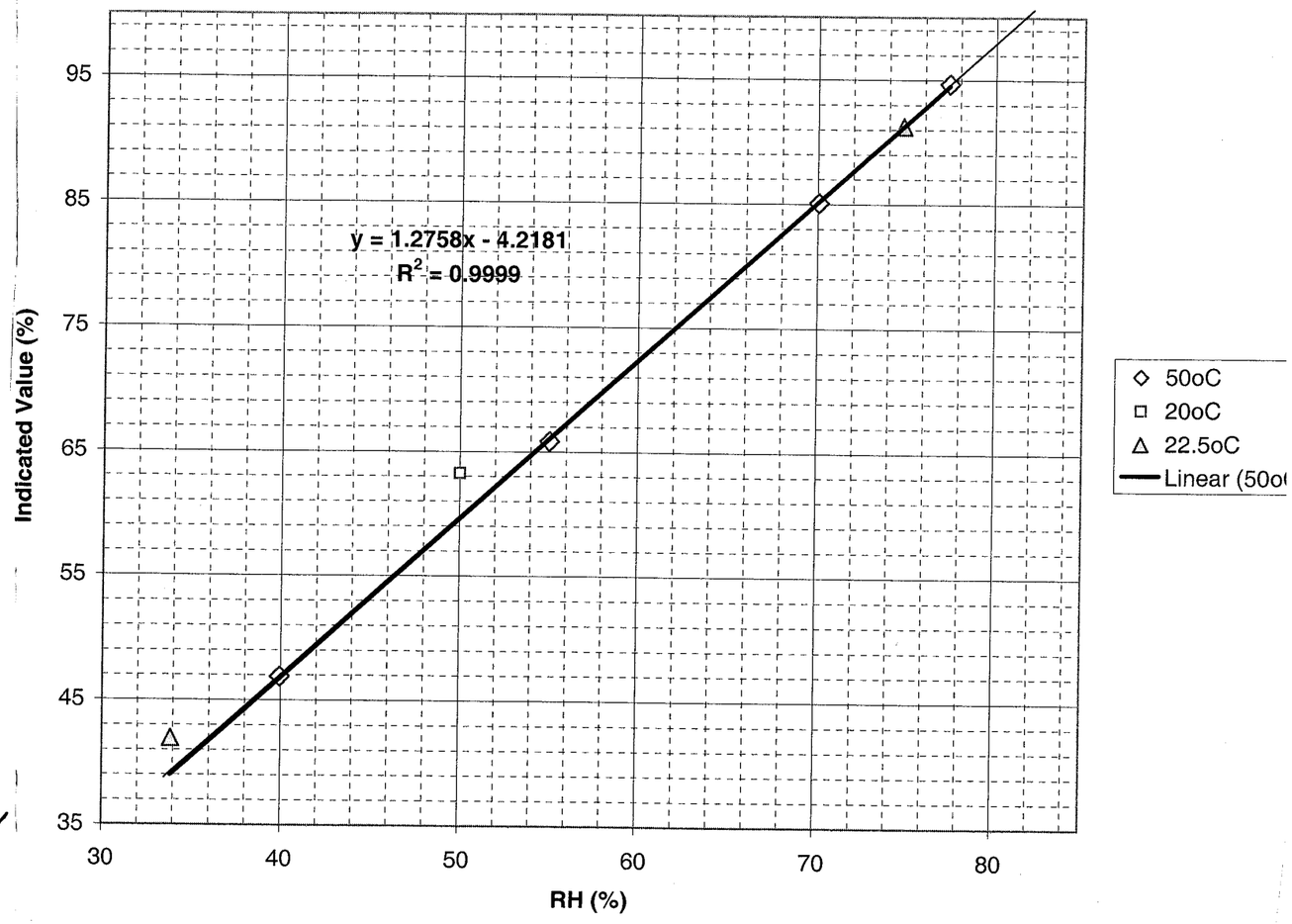
Reviewed by [signature]

Cole_Parmer_Calibration.xls Data

Data from Calibration Lab
Standard reading

Standard	50oC	20oC	22.5oC
39.95		46.88	
55.05		65.83	
70.07		85.08	
77.39		94.67	
50			63.24
33.85			41.93
74.8			91.25

Cole_Parmer_Calibration.xls Chart1



J. Yang 7/17/02

Southwest Research Institute
Calibration Laboratory
Calibration Data Sheet

8.8. 1-18-02

Work Order 444044659	**Mfr.** Cole-Parmer	**Technician** R Dykstra	
Asset No. 008788	**Model** 03313-66	**Procedure** CL-13	
Serial No. 21189381	**Type** Thermohygrometer	**Cal Date** 8/6/01	

Remarks: The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of ***k=2***, which provides a level of confidence of approximately 95%. The test limits are specified in meter instructions. As found humidity out of tolerance. Probe was contaminated. Cleaned probe and recalibrated.

Parameter	Test Point	As Found	Error	Test Limits	Uncertainty
Humidity	39.95 % RH	46.88 % RH	6.93 % RH	1.5 % RH	0.5 % RH
	55.05 % RH	65.83 % RH	10.78 % RH	1.5 % RH	0.5 % RH
	70.07 % RH	85.08 % RH	15.01 ~~14.69~~ % RH	1.5 % RH	0.5 % RH
	77.39 % RH	94.67 % RH	17.28 % RH	1.5 % RH	0.5 % RH
Parameter	**Test Point**	**As Left**	**Error**	**Test Limits**	**Uncertainty**
Humidity	24.99 % RH	24.43 % RH	0.56 % RH	1.5 % RH	0.5 % RH
	50.1 % RH	50.86 % RH	0.76 % RH	1.5 % RH	0.5 % RH
	75.22 % RH	75.92 % RH	0.70 % RH	1.5 % RH	0.5 % RH
Parameter	**Test Point**	**As Found**	**Error**	**Test Limits**	**Uncertainty**
Temperature	50.0 °C	50.01 °C	.01 °C	0.2 °C	0.2 °C
Parameter	**Test Point**	**As Left**	**Error**	**Test Limits**	**Uncertainty**
Temperature	25.03 °C	25.09 °C	.06 °C	0.2 °C	0.2 °C

OOT?

T=?

C:\WINNT\Profiles\RDykstra\data sheets\008788-8-6-01.doc

Probe was contaminated and was cleaned, recalibrated.

J. Dykstra 7/17/02

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate #
0972-01

Certificate of Calibration

7 August 2001

Issued to: DARRELL DUNN DIV20 B57
Manufacturer/Model: COLE-PARMER 03313-66
Description: THERMOHYGROMETER
Serial Number: 21189381
Asset Number: 008788
Work Order Number: 444044659

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. The results of this calibration relate only to the individual item as described above. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results of this calibration certificate were determined in accordance with the terms of accreditation unless stated otherwise below.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 76.0 Degrees Fahrenheit Humidity: 49 % RH

Calibration Date: 6 Aug 01 **Calibration Procedure:**

Condition as Received: OUT OF TOLERANCE

Condition as Released: IN TOLERANCE

Remarks:

Approved by:

Walt Hill, Supervisor
Institute Calibration Laboratory
m:\a2la.rpt Rev date 8 Jan 01

Measurements performed by:

Roger Dykstra, Technician

J. Dykstra, 7/17/02

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238
(210) 522-5215
Department of Quality Assurance
Calibration Laboratory

Certificate #
0972-01

Certificate of Calibration

7 August 2001

Issued to: STEVE MACLEOD DIV03 B151
Manufacturer/Model: ROTRONIC HT205R
Description: HYGROMETER
Serial Number: R37096
Asset Number: 006989
Work Order Number: 444044678

Borrowed from Division 03.

This certifies the above item was calibrated in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. The results of this calibration relate only to the individual item as described above. Standards used in this calibration, described in the referenced calibration procedure with associated uncertainties or tolerances, are traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to traceability is on file and available for examination upon request. This certificate is not to be reproduced, except in full, without the written approval of the Southwest Research Institute Department of Quality Assurance Calibration Laboratory.

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results of this calibration certificate were determined in accordance with the terms of accreditation unless stated otherwise below.

The uncertainty of the calibration was sufficient to determine that the item met the manufacturer's published specifications unless stated otherwise below.

Ambient Conditions: Temperature: 77.0 Degrees Fahrenheit Humidity: 46 % RH

Calibration Date: 7 Aug 01 **Calibration Procedure:** CL-19, 5/99

Condition as Received: IN TOLERANCE

Condition as Released: IN TOLERANCE

Remarks:

Approved by:
Walt Hill, Supervisor
Institute Calibration Laboratory

Measurements performed by:
for Walt Hill
Roger Dykstra, Technician

m:\a2la.rpt Rev date 8 Jan 01

J. Flynn 7/17/02

Date Calibrated 8.7.01
Technician R Dykstra Work Order 444044678
Unit Under Test Humidity/Temperature Transmitter Calibration Procedure HT200-03/30/95
Manufacturer Rotronic Model HT205R SN R3709[illegible]6 ASN 6989

STEP	FUNCTION OR RANGE	APPLIED	TOLERANCE MIN - MAX	MEASURED VALUES AS FOUND	MEASURED VALUES RELEASED	P/F
	NOTE: Manufacturer state tolerance of 1.0 to 1.5 % is based on less that a 4:1 Test Uncertainty Raito.					
	Limit all calibrations of this unit to ≥ +/-2%RH.					
	Standards: Thunder Scientific 2500 Humidity 10 to 95%RH +/- 0.5%					
	Azonic A1011/wA12001 Temperature -183 to 480 °C +/- 0.02 °C					
	Tektronix DM50X DMM (2ea) 0-20V, +/- 0.01% + 2 counts					
	Power Supply (10 to 35 VDC), Uncertainty N/A Set power supply to ≅18 V					
	See page 14 of Mfg. manual for conversion formula for voltage to %RH and Temperature.					
	Humidity	35 % RH	33%RH to 37%RH	34.5	Same	P
	Temperature	20 °C	19.7°C to 20.3°C	19.9	as Found	P
	Humidity	50%	48%RH to 52%RH	50.6		P
	Temperature	25 °C	24.7°C to 25.3°C	24.8		P
	Humidity	80%RH	78%RH to 82%RH	78.6		P
	Temperature	20 °C	19.7°C to 20.3°C	20.1		P
	Humidity	20 %RH	18%RH to 22%RH	19.4		P
	Temperature	20 °C	19.7°C to 20.3°C	20.0		P

SwRI Form QA-178 Mar 99

CL 17

J. Flynn 7/17/02

Aug. 7, 2001

Attached is what you will need to operate the TI you borrowed from Div 03. Both instruments the Cole-Parmer and the Rotronic are ready to be picked up on 8/8/01.

Roger Dykstra Calibration Lab.

Equipment needed to operate Rotronic Hygromer series 1200.
DC Power Supply- 18 vdc
DVM 0-5 VDC –should have a good accuracy on 20 VDC scale or less

The TI needs to be hooked up to a DC Power supply set to approximately 18 VDC.
Connect positive to the red wire terminal and negative to the black wire terminal on the 4-wire connector.

Humidity output is monitored at the 2-wire terminal. 0-5 VDC is equal to 0 to 100 % RH.
Positive is clear wire, negative is black (2 wire terminal.)
(Voltage reading / 5)*100 = % RH.

Temperature output is monitored at the 4-wire terminal. 0-5 VDC is equal to 0 to 200 Degree F.
Positive is the white wire, negative is the green wire (4-wire terminal.)
(Voltage reading / 5)*200 = Degree F.

Lyons
8/8/01

ordered KNO3

08/10/01 04:02 Fisher Scien p 2/2

AUG 10, 2001	F I S H E R S C I E N T I F I C O R D E R A C K N O W L E D G E M E N T	PAGE: 1

THANK YOU FOR YOUR ORDER... ANY QUESTIONS REGARDING THIS ORDER,
CALL 1-(800) 766-7000 TO SPEAK TO A CUSTOMER SERVICE REPRESENTATIVE

ORDER NBR: H12220574 ACCT NBR: 784214-001 ORDER DATE: AUG 10, 2001
CUST PURCH NBR: 1.20.01402.561 REL NBR: 50578
CALLER: LEITAL YANG PHONE NBR: (210)522-2483

SHIP TO: SOUTHWEST RES INSTITUTE
BLDG- 189
5704 BUSINESS PARK
SEND C OF A W/CHEMICAL
SAN ANTONIO TX 78218
ATTN: LEITAL YANG BL. 189

SOLD TO: SOUTHWEST RES INSTITUTE
P O DRAWER 28510
SAN ANTONIO TX 78228

LN	QTY	UN	CATALOG NBR	DESCRIPTION	UNIT PRC	TOTAL AMT
				SEND C OF A WITH CHEMICALS		
001	3	EA	P263500	POT NITRATE CERTIF ACS 500G 3 SHIPPING FROM CHS	29.31	87.93
				MERCHANDISE TOTAL:		87.93
				THE INVOICE AMOUNT MAY INCLUDE TRANSPORTATION, TAX, AND OTHER MISC ORDER CHARGES AS DETERMINED BY YOUR CONTRACT.		

Certificate see page 102

Lyons 08/20/01

Entry made to Chemical Inventory and certs.

FROM: Fisher Scientific TO: Extension PAGES: 3

Fisher Scientific Company
Chemical Manufacturing Division

Certificate of Analysis

Fisher Scientific's Quality System is Certified to ISO9002 (1994) standard by DNV Cert. # 96-HOU-AQ-8052

1 Reagent Lane
Fairlawn, NJ 07410
Phone: (201) 796-7100 Fax: (201) 796-1329

Catalog Number	P263	**Report Date** 5/1/2001	**Mfg. Date** 12/7/2000
Lot Number	010186	**Sample ID**	P263..010186.B1.
Description	POTASSIUM NITRATE, A.C.S.		

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. The following are the actual analytical results obtained:

Result Name	Units	Specifications	Test Value
APPEARANCE	REPORT	colorless to white crystals not wet	FINE WHITE CRYSTALS
ASSAY	%	99.0 Minimum	99.2000
CALCIUM IN %	%	0.005 Maximum	0.0005
CHLORIDE	%	0.002 Maximum	0.0010
HEAVY METALS(AS Pb)	PPM	3 Maximum	0.30
INSOLUBLE MATTER	%	0.005 Maximum	0.0020
IODATE (IO3) IN PPM	PPM	5 Maximum	5.0000
IRON (Fe)	PPM	3 Maximum	0.300
MAGNESIUM IN %	%	0.002 Maximum	0.0002
NITRITE	%	0.001 Maximum	0.00050
PH 5% SOLN @ 25DEG C		4.5 to 8.5	5.70
PHOSPHATE (PO4)	PPM	5 Maximum	0.500
SODIUM (Na) IN %	%	0.005 Maximum	0.00100
SULFATE (SO4)	%	0.003 Maximum	0.0003

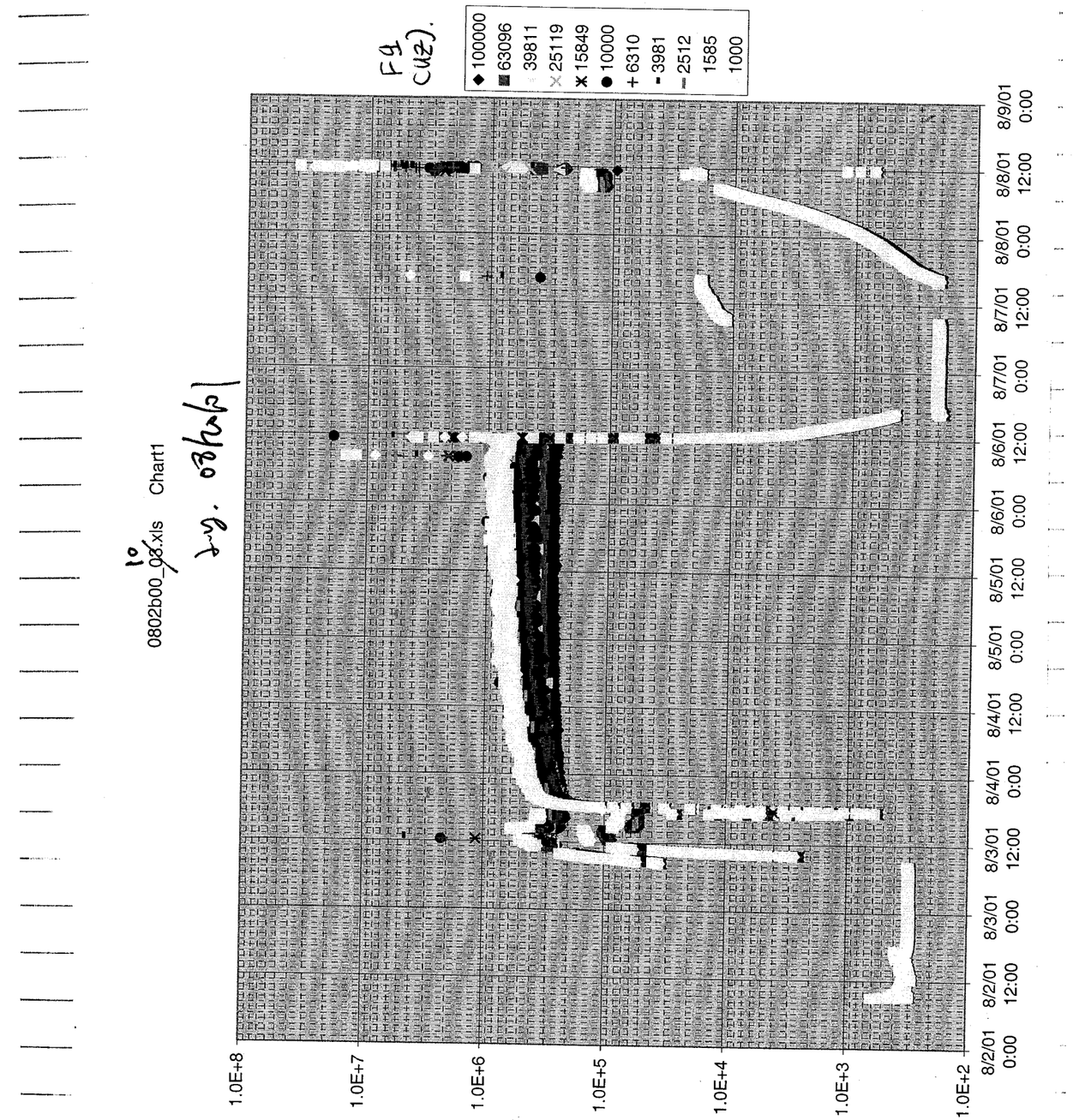
CERTIFIED BY

Lab Mahager Fair Lawn — Lab Manager BPF

Note: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701

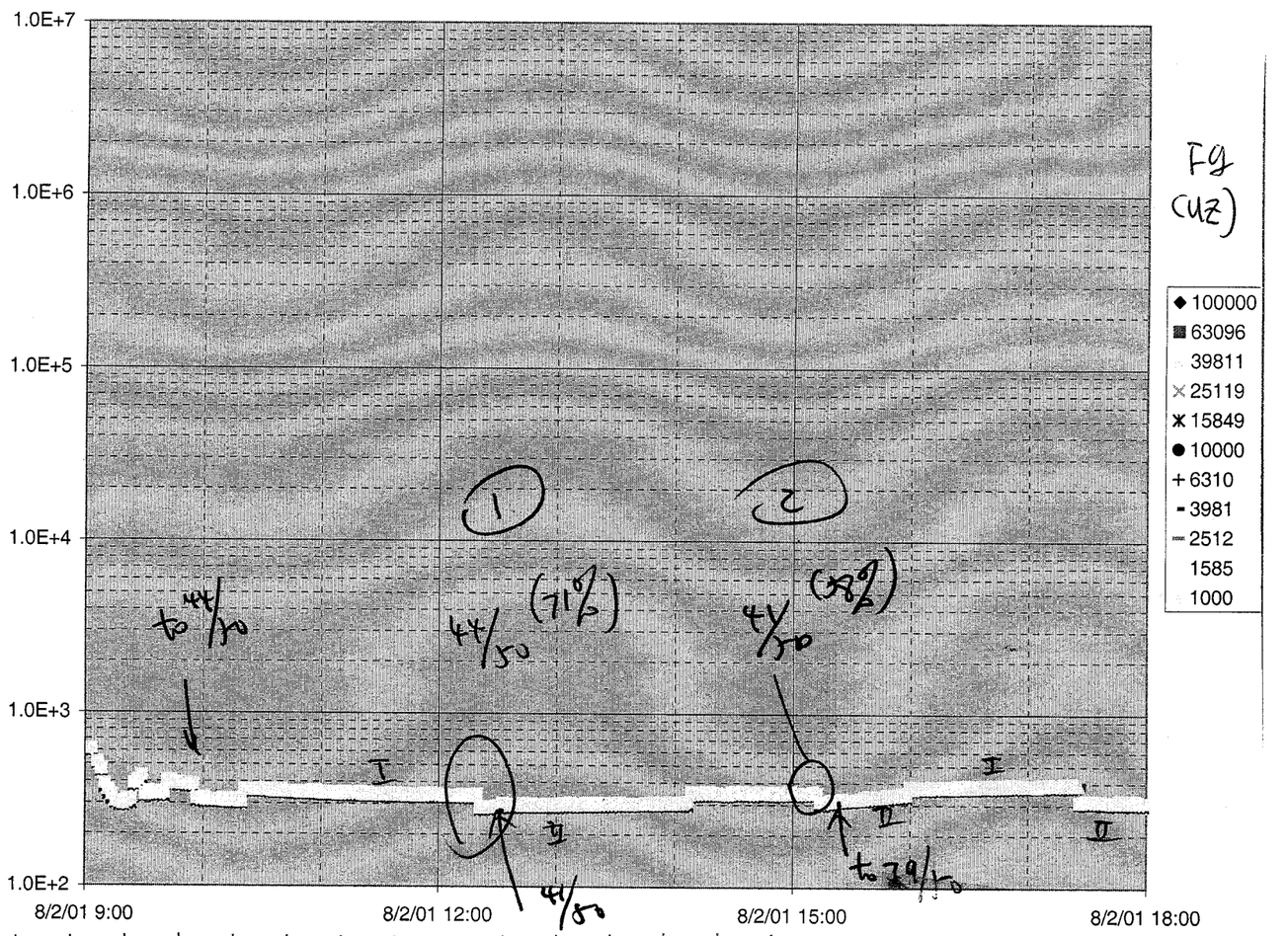
08/10/01

Continued from page 93.

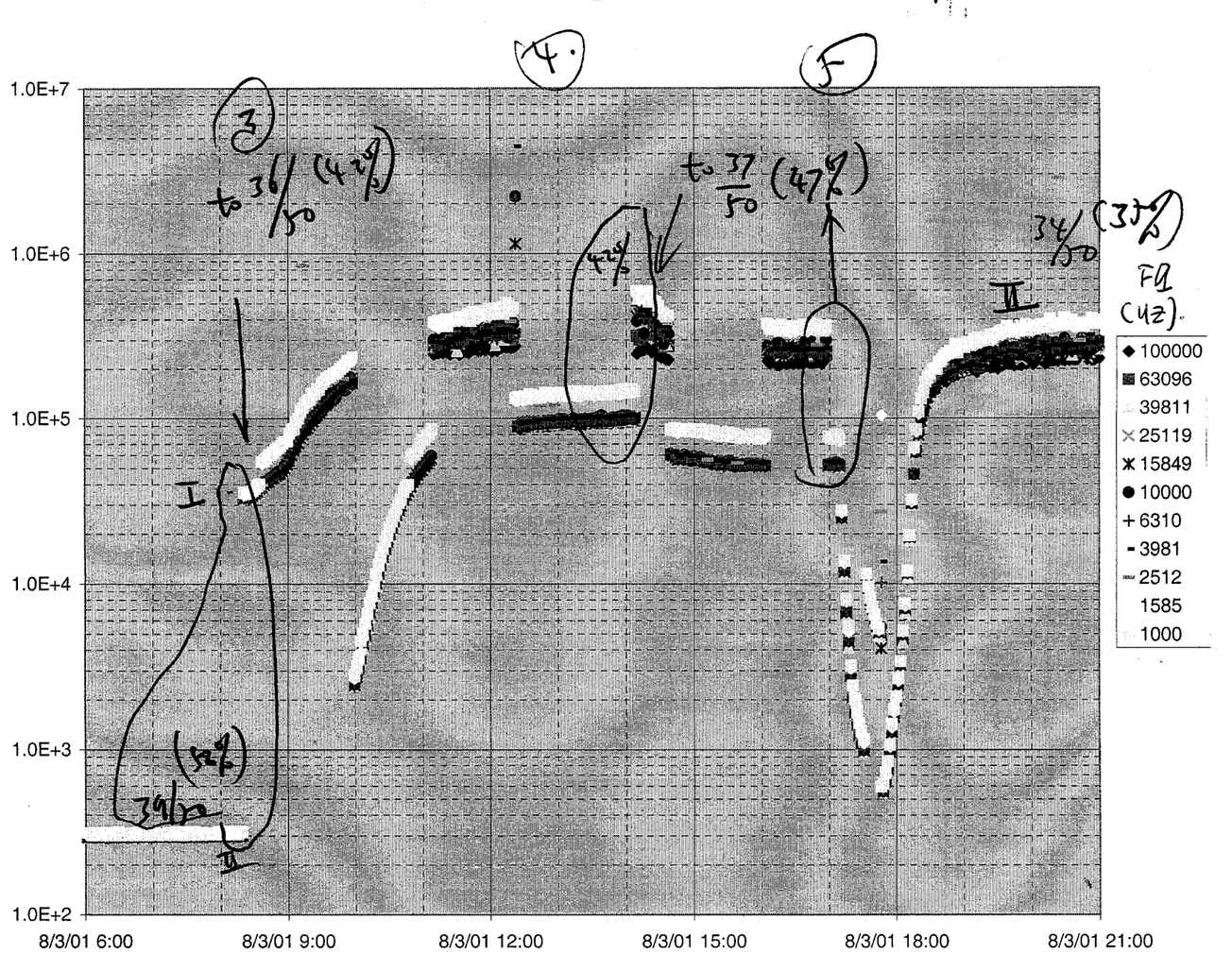


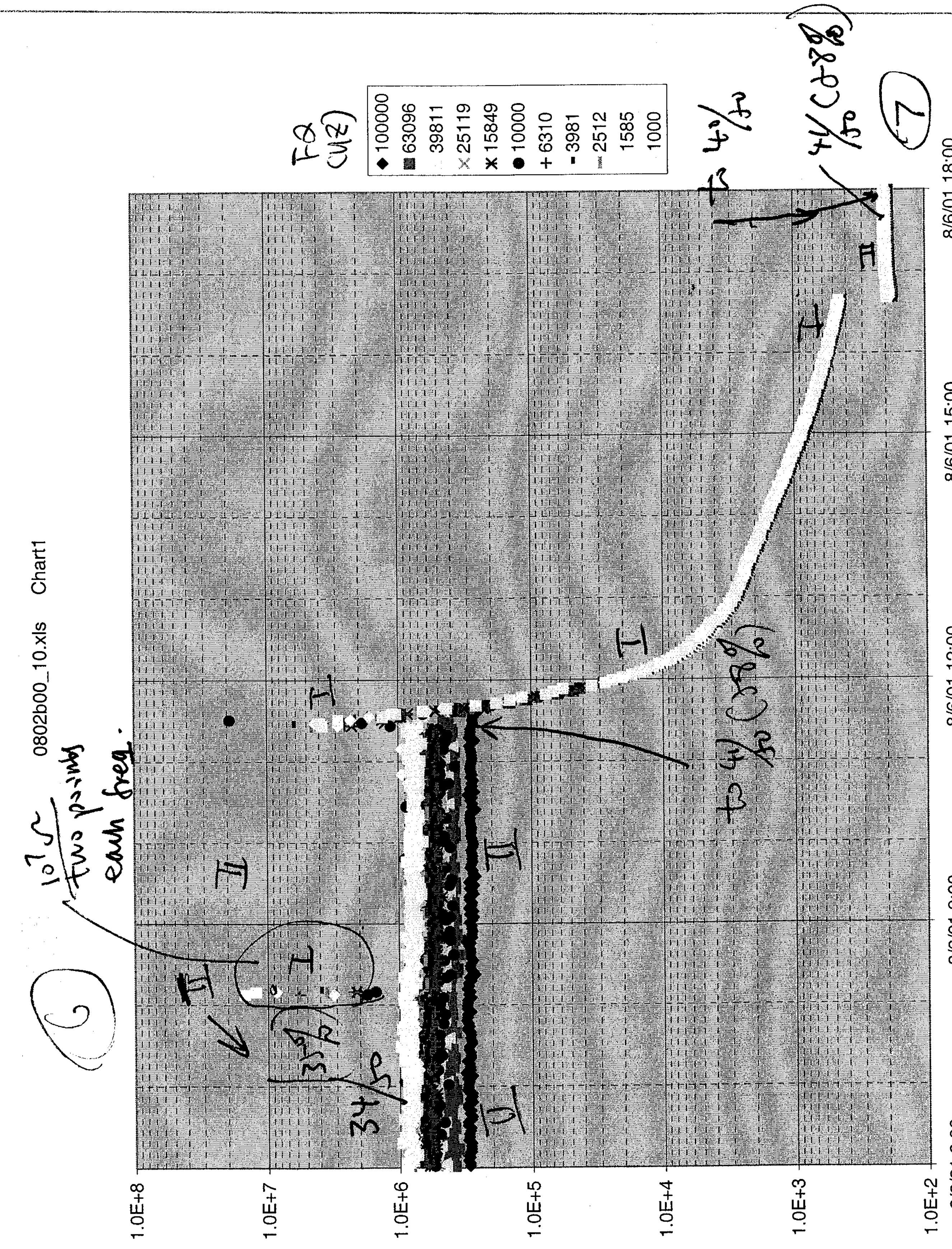
7/17/02

0802b00_03.xls Chart1

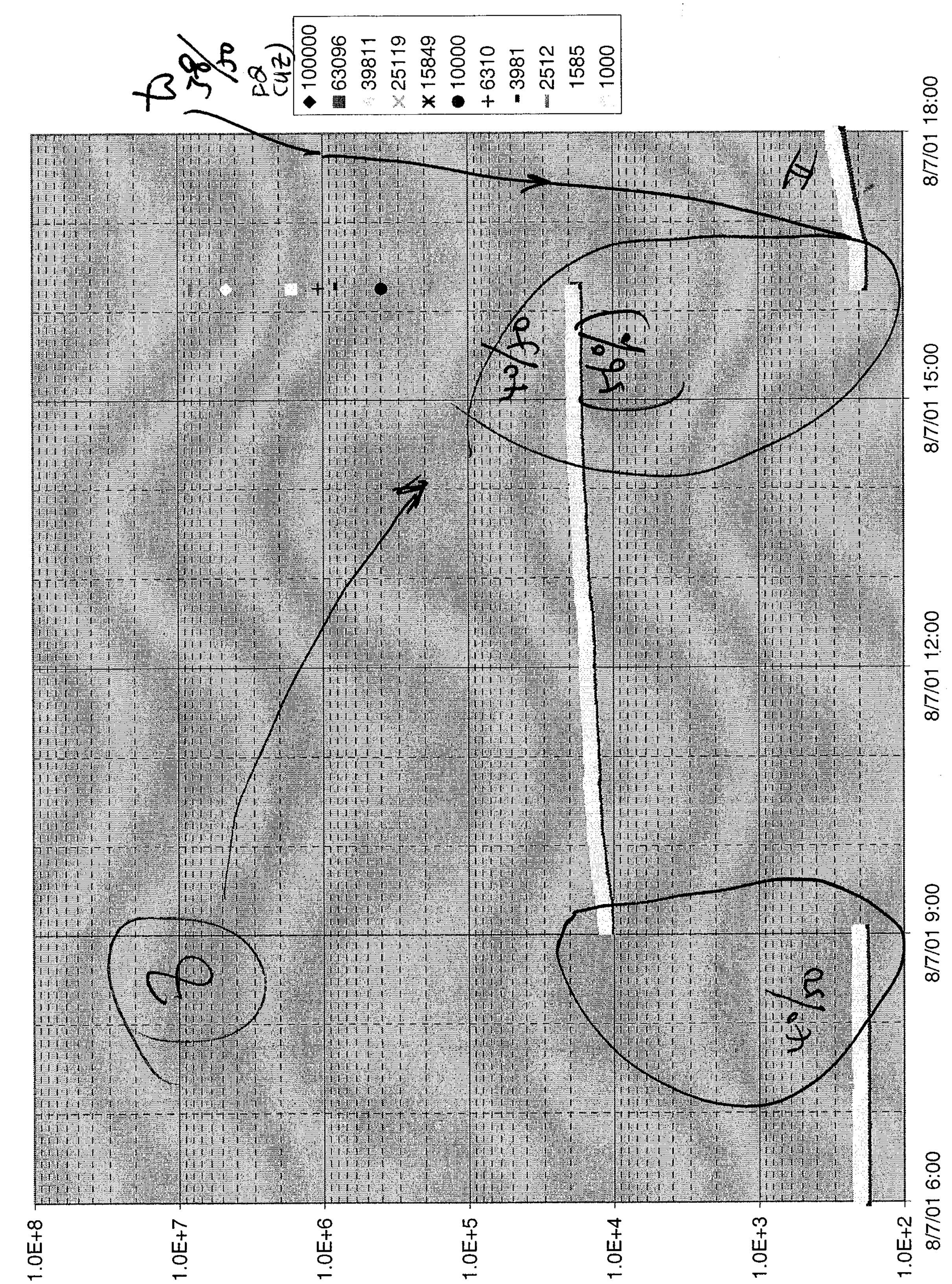


0802b00_03.xls Chart1

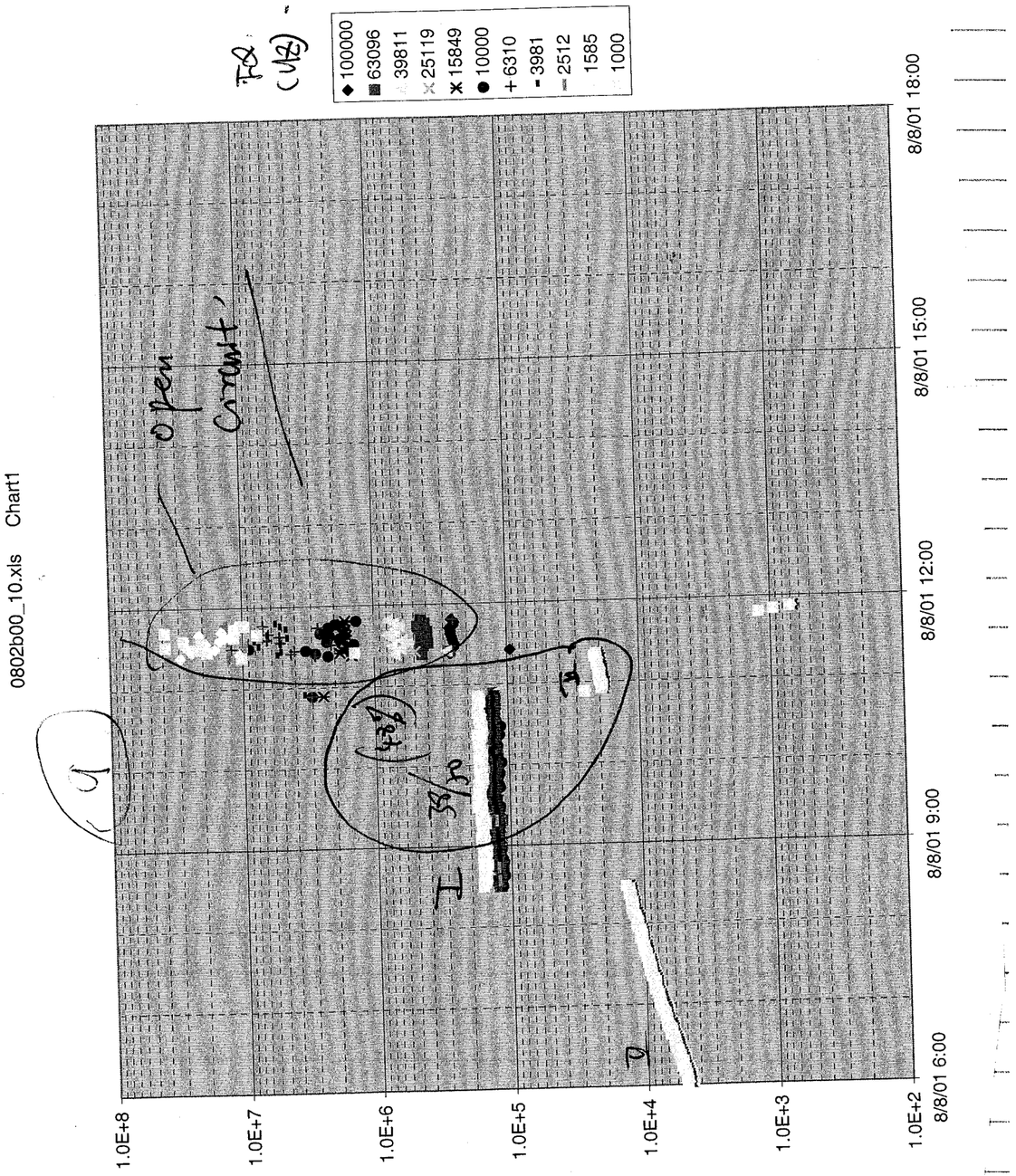




J. Yang
7/15/02



J. Yang
7/15/02



J. Yang 7/17/02

0802b_DP_b.xls Data

Uncorrected. J.Y. 4/7/06 08/24/01 Lyons.

#	Data time	RH (%)	~~KNO3, Cell 1~~ Z, ohm	~~KNO3, Cell 1~~ log|Z| NaNO3-NaCl	~~NaNO3, Cell II~~ Z, ohm	~~NaNO3, Cell II~~ log|Z| NaNO3-KNO3-NaCl
1	8/2/01 12:00	71	3.20E+02	2.51E+00	2.50E+02	2.40E+00
2	8/2/01 15:00	58	3.20E+02	2.51E+00	2.50E+02	2.40E+00
3	8/3/01 8:00	52	3.50E+04	4.54E+00	3.00E+02	2.48E+00
5	8/3/01 17:00	47	3.50E+05	5.54E+00	7.50E+04	4.88E+00
4	8/3/01 14:00	42	7.30E+05	5.86E+00	2.00E+05	5.30E+00
6	8/6/01 8:00	35	1.00E+07	7.00E+00	9.00E+05	5.95E+00
7	8/6/01 17:00	58			2.00E+02	2.30E+00
8	8/7/01 15:00	55	2.00E+04	4.30E+00	2.00E+02	2.30E+00
9	8/8/01 11:00	48	1.50E+05	5.18E+00		

Corrected RH.

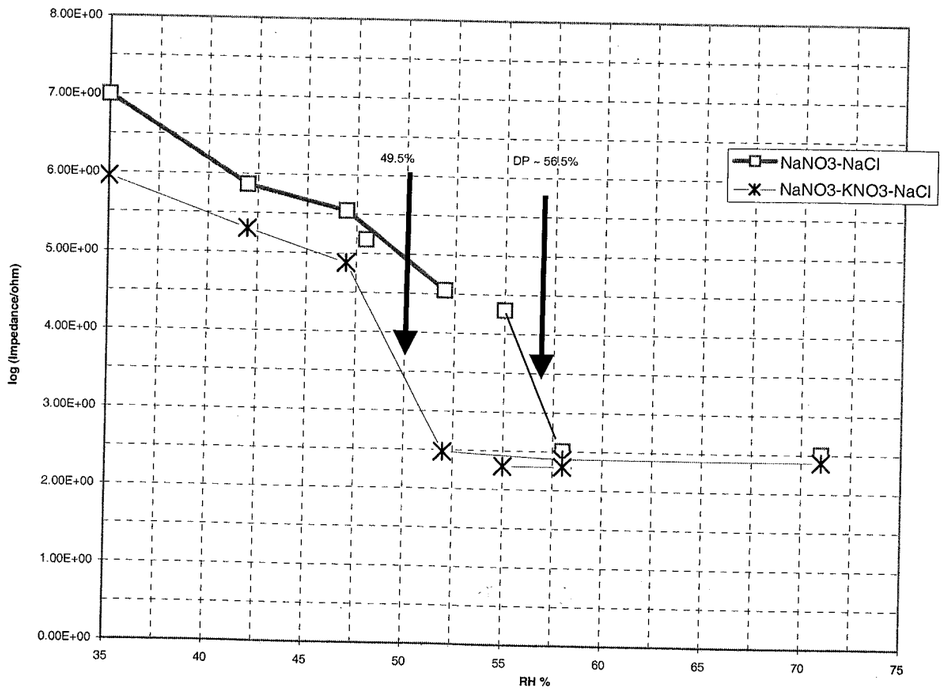
Should be corrected by average of previous test page 70: 7.8%, 10.2%, Page 84: 6% J.Y. 4/7/06 J.Y. 08/24/01 8 %

#	Data time	Corrected RH (%)	~~KNO3, Cell 1~~ Z, ohm	~~KNO3, Cell 1~~ log|Z| NaNO3-NaCl	~~NaNO3, Cell II~~ Z, ohm	~~NaNO3, Cell II~~ log|Z| NaNO3-KNO3-NaCl
1	8/2/01 12:00	79	3.20E+02	2.51E+00	2.50E+02	2.40E+00
2	8/2/01 15:00	66	3.20E+02	2.51E+00	2.50E+02	2.40E+00
3	8/3/01 8:00	60	3.50E+04	4.54E+00	3.00E+02	2.48E+00
5	8/3/01 17:00	55	3.50E+05	5.54E+00	7.50E+04	4.88E+00
4	8/3/01 14:00	50	7.30E+05	5.86E+00	2.00E+05	5.30E+00
6	8/6/01 8:00	43	1.00E+07	7.00E+00	9.00E+05	5.95E+00
7	8/6/01 17:00	66			2.00E+02	2.30E+00
8	8/7/01 15:00	63	2.00E+04	4.30E+00	2.00E+02	2.30E+00
9	8/8/01 11:00	56	1.50E+05	5.18E+00		

* L. Greenspan, J.Research of N. B. S., Vol 81A, No1, 1977, Page 89-96

J. Yang 7/17/02

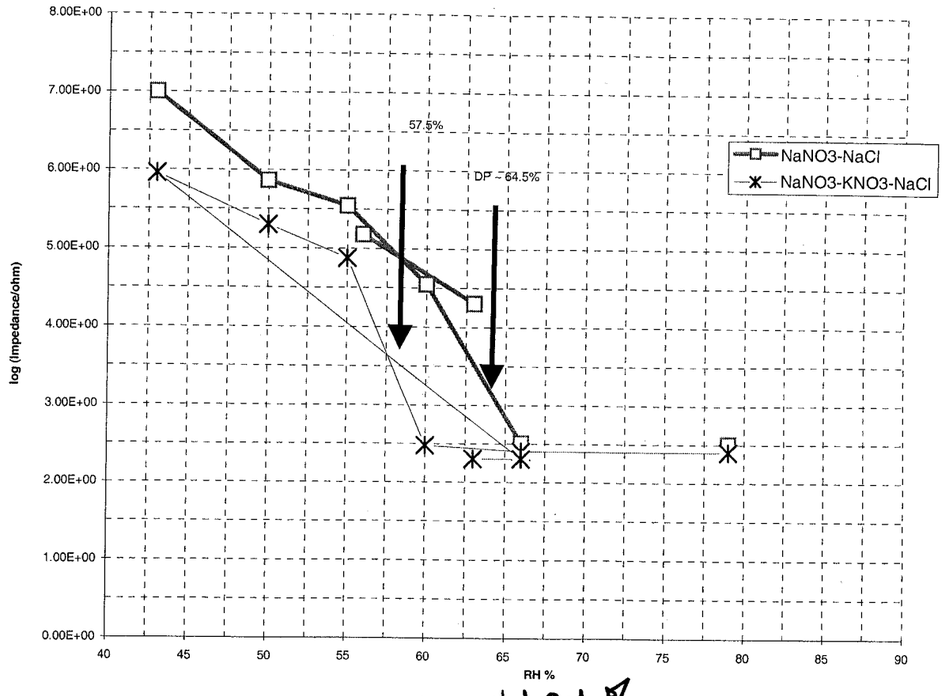
0802b_DP_b.xls Uncorrected_Chart



J. Yang

7/17/02

0802b_DP_b.xls Corrected_Chart



corrected RH.%

Modeled Result: (page 90)

KNO_3-$NaNO_3$ NaCl: 58.7%

$NaNO_3$ - NaCl : 62%

Close to the above measured.

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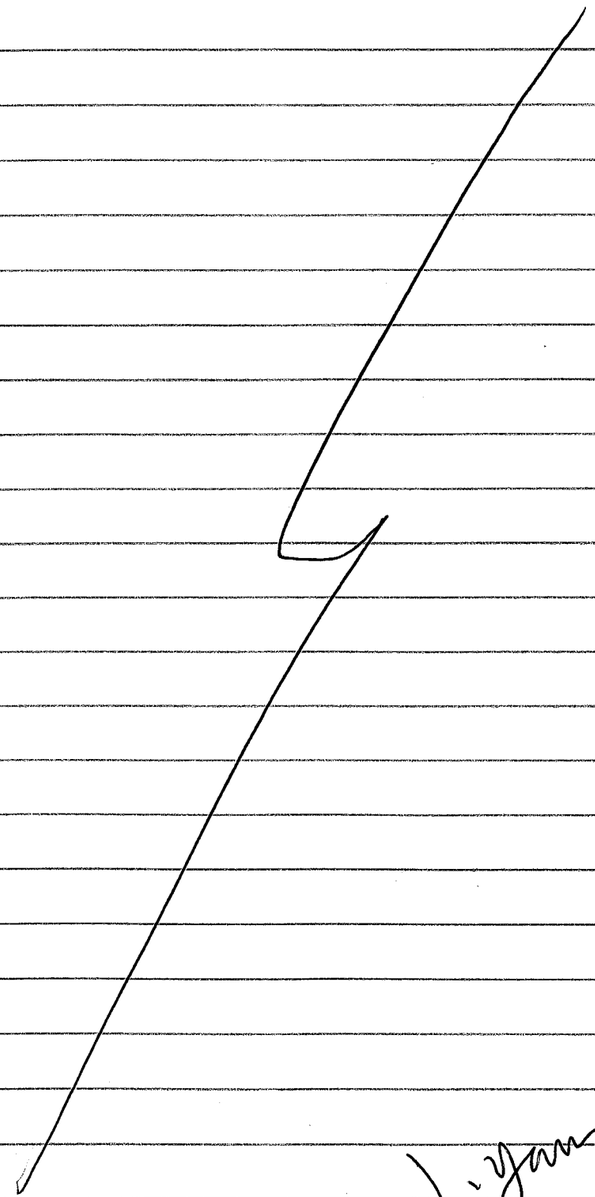
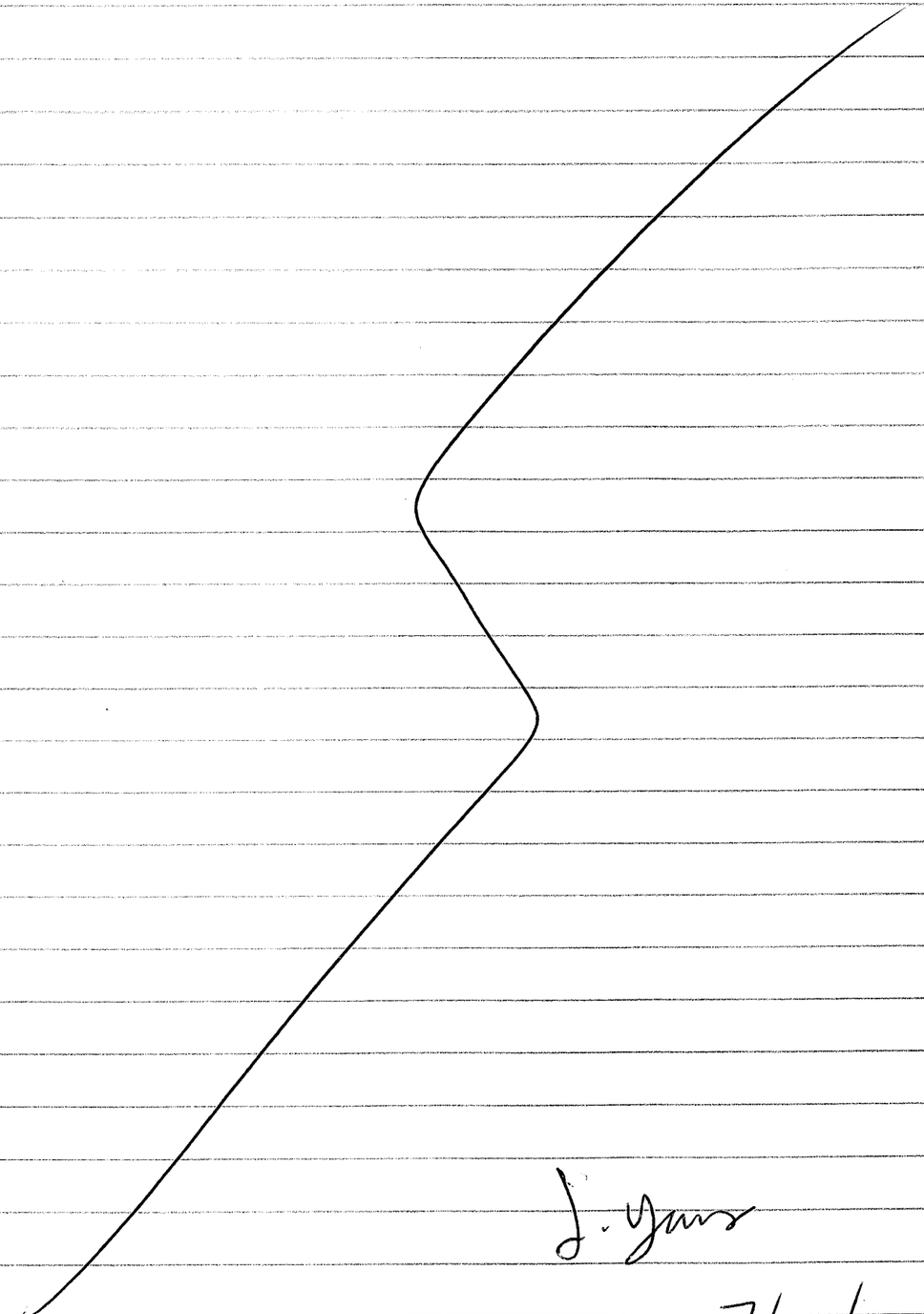
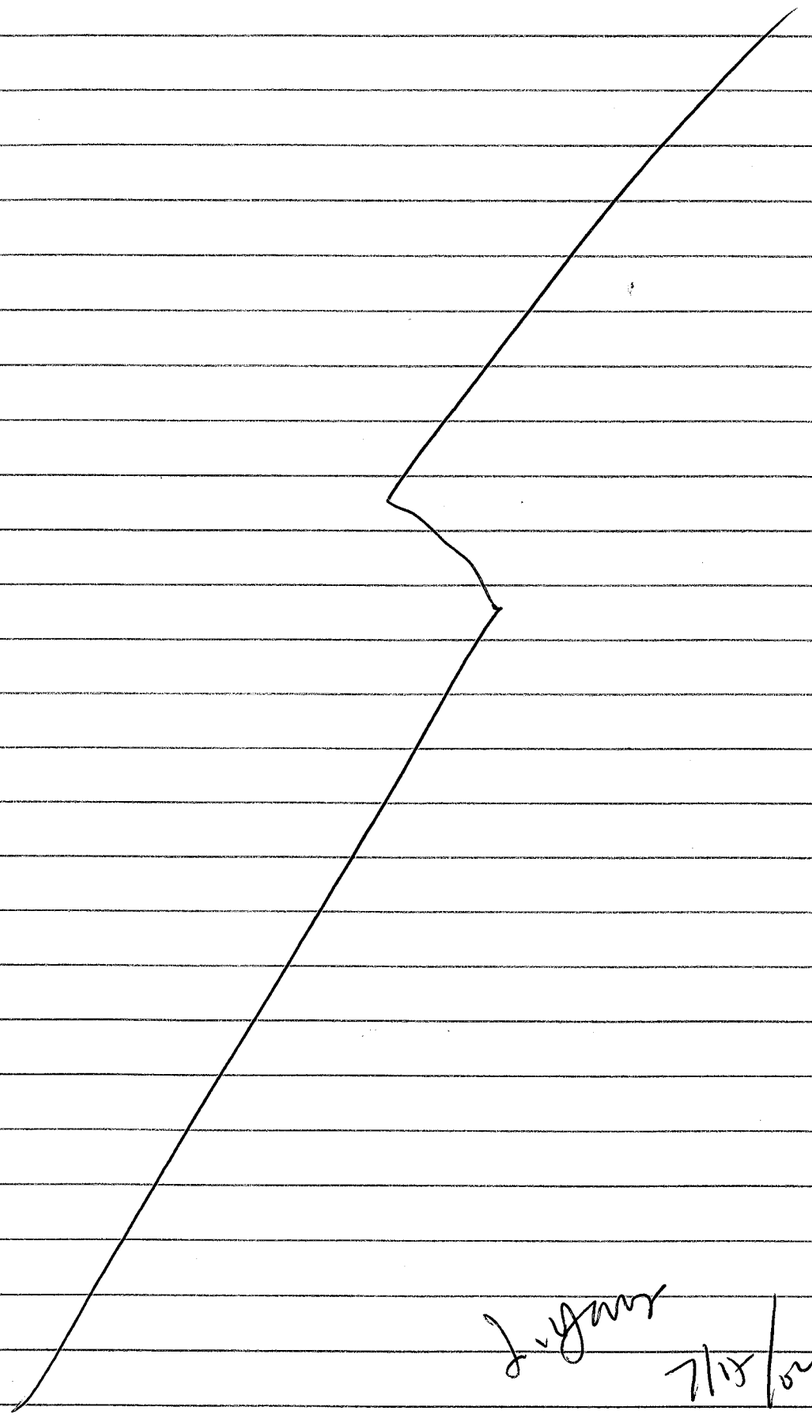


J. Yans
7/17/02



J. Yans
7/17/02



J. Yang 7/17/02

08/08/01

Measurement for

I — $MgCl_2 + NaCl$

II — $MgCl_2 \cdot 6H_2O$.

I — Added excess of $MgCl_2 \cdot 6H_2O$, lot # 00036.
heated and cooled, added NaCl. lot # 006q24
cooled at room Temp. overnight.

II Saturated $MgCl_2 \cdot 6H_2O$ lot # 00036
Cooled at room Temp. for many days.

I — Paper 1.5 mm narrower than the PTFE base

II — Paper 1 mm narrower than the PTFE base.

11:41		Cells I and II installed in chamber	
11:55		program started. File: 0808a with cell II.	to (35.1/50, 17Ω, 1/1).
11:56			to (32.1/50, 17Ω, 1/1)
12:26 #18	34/50	$Z_{II} = 10^{2.6} = 501\Omega$	to cell #I
12:38	34/50	$Z_I = 10^{2.4} = 413\Omega$	
13:48	34/50	to II	to (31.1/50, 15Ω, 1 turn)
14:15	33/50	to	
16:22	33/50	to I	

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08/08/01

8:35 #624 48/50 dried out $Z_I = 10^{2.7}$ to II

8:38 Z_{II} 2584

8:43 to I

8:46 water added to wet bulb $Z_I = 533$

8:47 33/50 to (30/50.5, 13.5, 1/4)

10:21 #677 32/50 $Z_I = 560$ to II

10:53 $Z_{II} = 628$ to (29/50.5, 11.5, 1turn)

12:14 32/50 to (28.0/50.5, 11, 1/4)

12:41 31/50

17:04 31.3/49.8 (28%) $Z_{II} = 612$ to I to (28/51.0, 0, 2turn)

17:26 31/50 to high power.

8/10/01

9:08 #1362 49/51 (dried out) $Z_I = 10^{2.75}$ to II.

9:15 $Z_{II} = 720\,\Omega$ to I

added water to wet bulb. $Z_I = 671\,\Omega$

9:19 #1367 31/51

13:24 32/51 to (28/51.0, 0, Full)*

* — Fully Open the Valve of cooling

17:00 32/51

08/13/01

8:58 #3513 49/51 (dried out) $Z_I = 10^5$ to II

9:13 $Z_{II} = 1523\,\Omega$ to I

$Z_I = 14624\,\Omega$

9:15 water added.

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9:40 30/51

11:11 30.5/51

13:26 31/51 to (0/512, 0, Full)

15:36 28/51 to II to (15/512, 0, Full)

17:21 27/51 $Z_{II} = 1047\,\Omega$ to I

17:23 $Z_I = 40.8416\,\Omega$ to (22/512, 0, Full)

8/14/01

8:34 #4205 49/51 (dried out) $Z_I = 1.96$ (at 1k) to II

8:44 49/51 $Z_{II} = 730.92\,\Omega$ (at 1k) water added.

8:46 28/51

8:55 38/44 ——— System was Flooded. $Z_{II} = 629\,\Omega$!

by raising the reservior water.

8:57 37/492. (4)%

13:06 29/51 $Z_{II} = 10^{3.0}\,\Omega$ to I

17:07 29/51

8/15/01

8:18 49/51 (dried out) $Z_I = 10^{3.5}$ to II

8:28 $Z_{II} = 10^{3.9}\,\Omega$

11:48 49/51 $Z_{II} = 10^{3.2}$ to I

$Z_{I,1K} = 51746\,\Omega$

11:59 to (26/51, 0, Full)

12:09 3/51 $Z_{I,1K}$** $= 50630\Omega$

** all resistance values given more than two digits are obtained at 1k Hz frequency.

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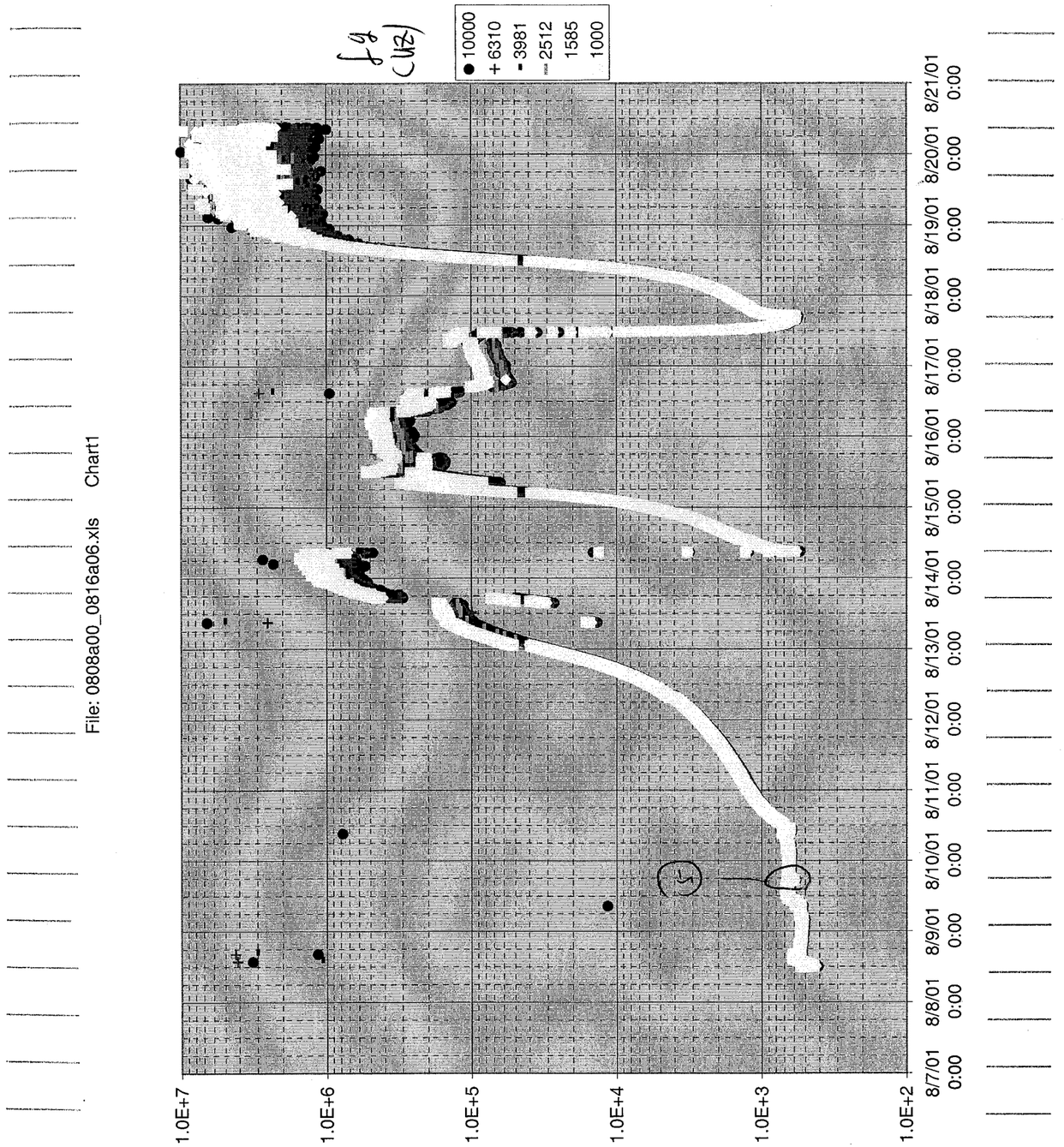
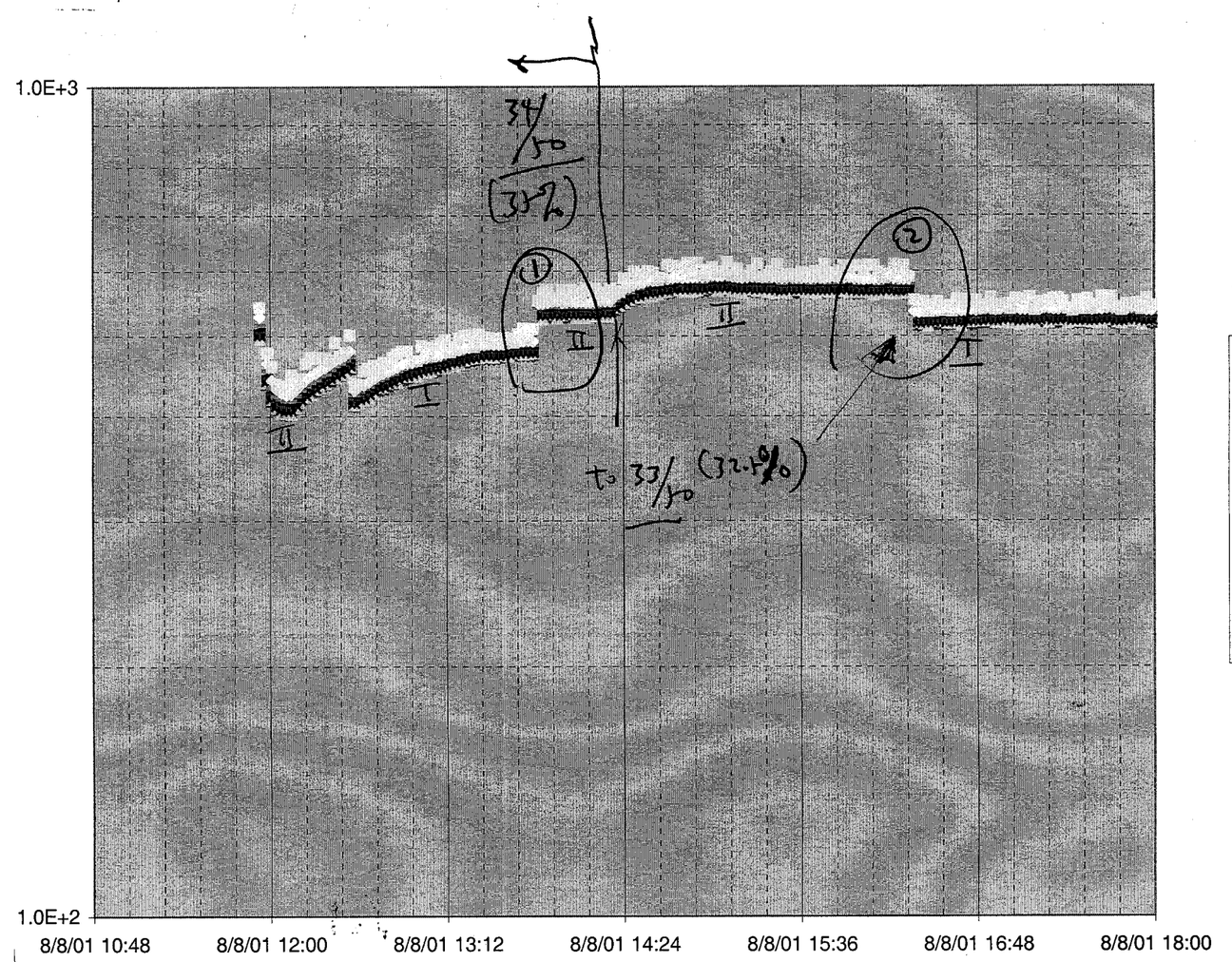
08/15/01				
13:54	30/51	$Z_{I,HF}$ =	to	Cell II
16:45	30/51		to	I
8/16/01				
8:25		$Z_I = 10^{5.4}$	to	II
8:32	water added to inlet bottle			
8:37	30/51			to (27.5, 02, Full)
11:49	31/51	$Z_{II} = 10^{4.3}$ (dropping)	to	I
14:54			to	II to (24/51, 02, Full)
17:11	32/51			
16:47		program stopped !		
16:49		program restarted 0816a (Filename)		
08/17/01				
8:02	49/51 (drained out)	$Z_{II} = 10^{4.7}$	to	I
8:27	water added.	$Z_I = 10^5$		
11:20	32/51	$Z_I = 10^5$	to	II to (30.5/51, 02, Full)
11:45	33/51	Z_I dropping quickly		
12:37	33/51		to	I
15:38	33/51	$Z_I = 10^{2.6}$	to	II
17:00	33/51		to	I
17:09	33/51			to (9/51.0, 02, Full)
17:29	28/51			
17:37	28/51			
08/20/01	(Monday).	$Z_I = 10^6$	to	II
7:13	water added to inlet bottle	$Z_I = 2.2 \times 10^6$		
8:35	27/51			
9:06	27/51	test terminated.		

7/17/02

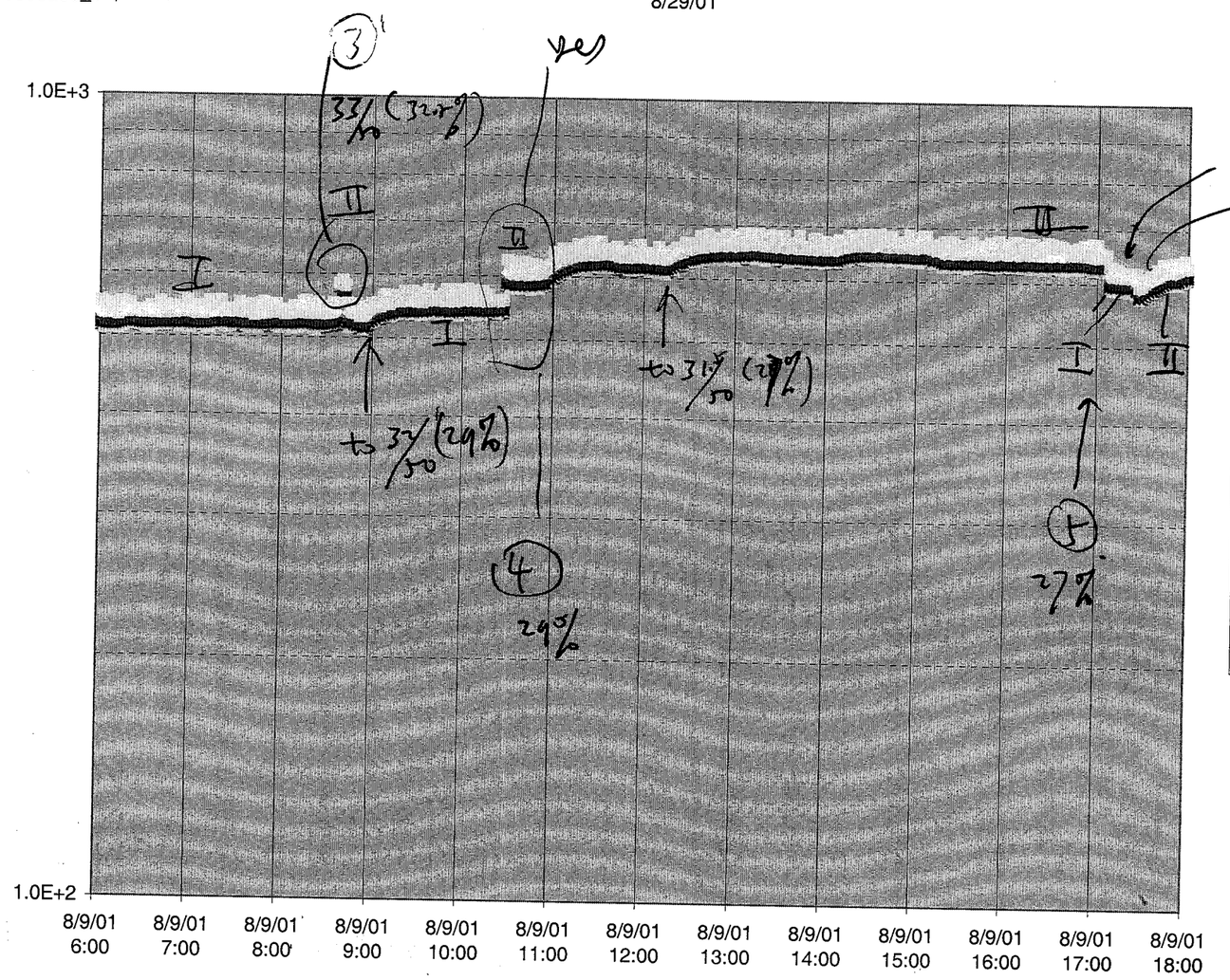


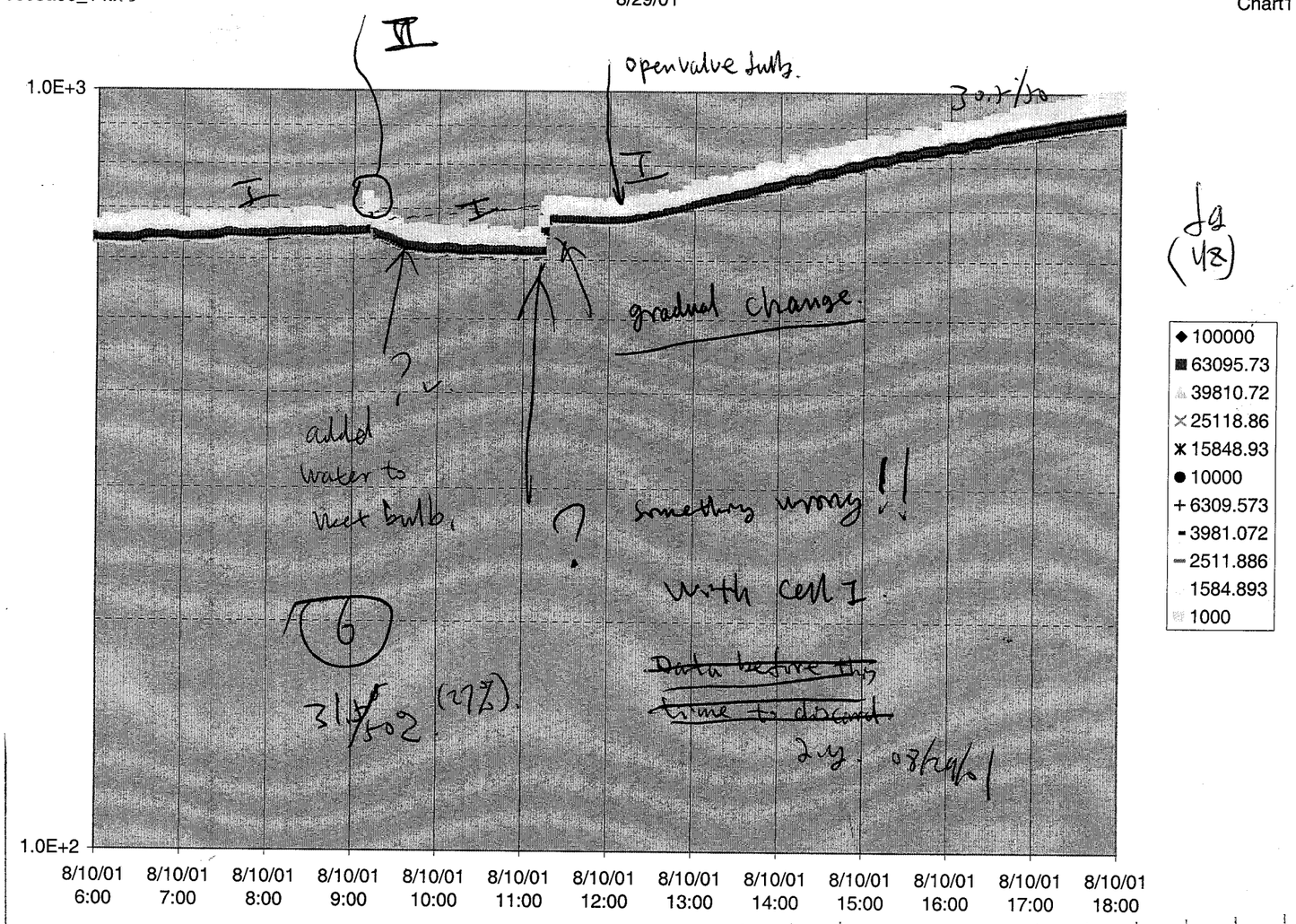
7/17/02

0808a00_ 8/29/01 Chart1

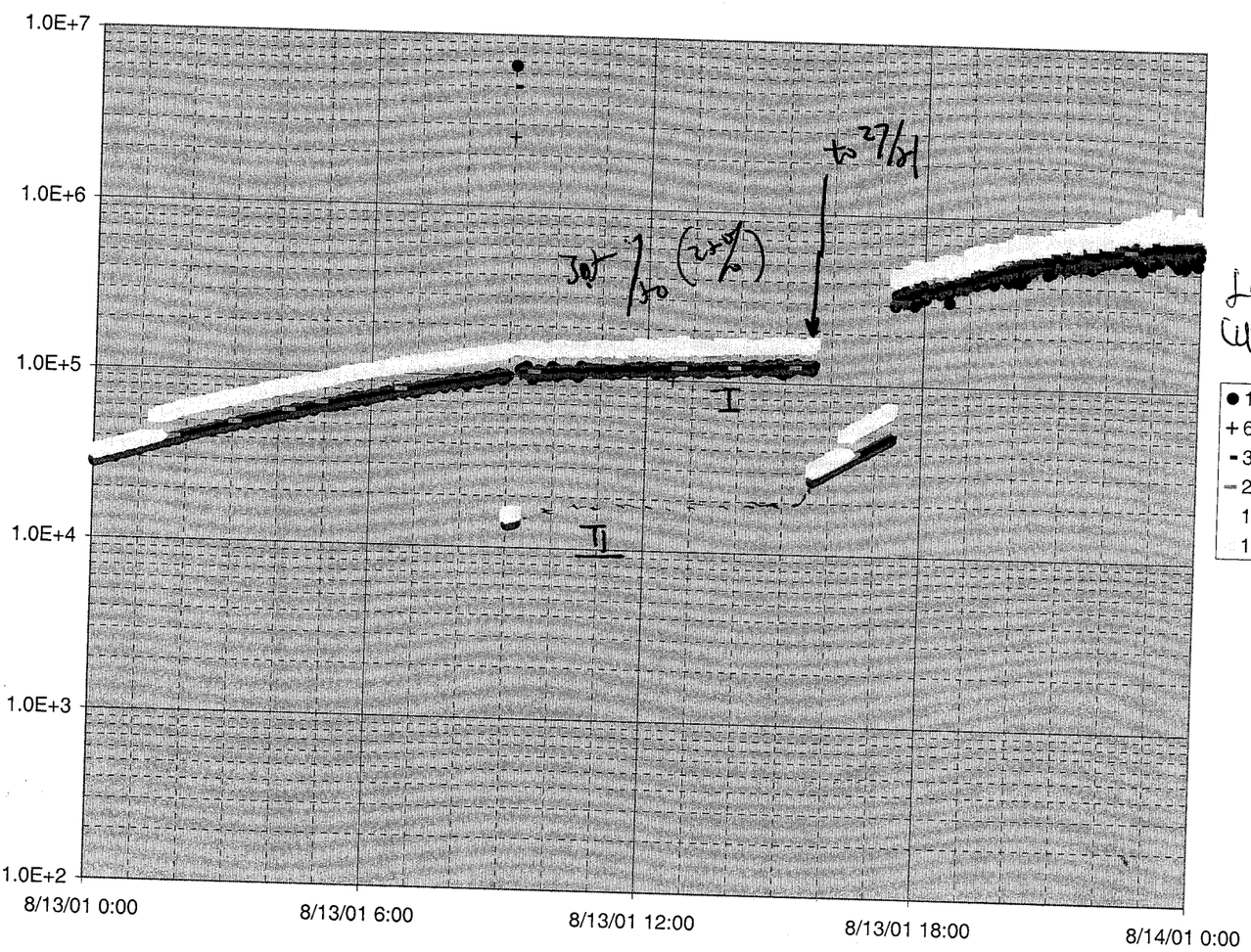


0808a00_. 8/29/01 Chart1



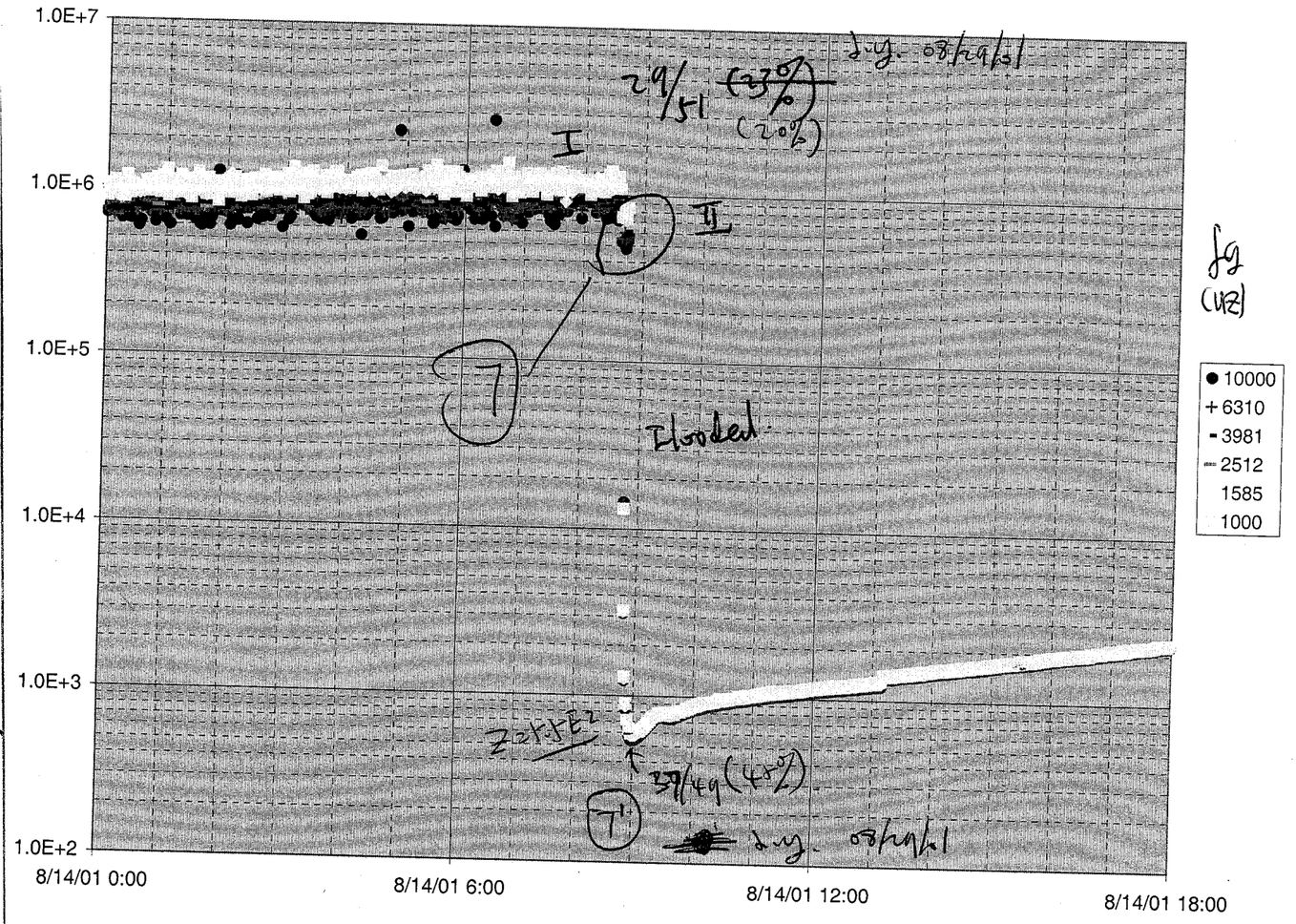

0808a00_
8/29/01
Chart1
1.0E+3
1.0E+2
8/10/01 6:00
8/10/01 7:00
8/10/01 8:00
8/10/01 9:00
8/10/01 10:00
8/10/01 11:00
8/10/01 12:00
8/10/01 13:00
8/10/01 14:00
8/10/01 15:00
8/10/01 16:00
8/10/01 17:00
8/10/01 18:00
100000
63095.73
39810.72
25118.86
15848.93
10000
6309.573
3981.072
2511.886
1584.893
1000

II
open valve bulb.
I
I
I
gradual change
added water to wet bulb.
?
?
something wrong!!
with cell I
6
Data before this time to discard
2y. 08/29/01


File: 0808a00_
1.0E+7
1.0E+6
1.0E+5
1.0E+4
1.0E+3
1.0E+2
8/13/01 0:00
8/13/01 6:00
8/13/01 12:00
8/13/01 18:00
8/14/01 0:00
10000
6310
3981
2512
1585
1000

to 27/hr
I
II

File: 0808a00_1



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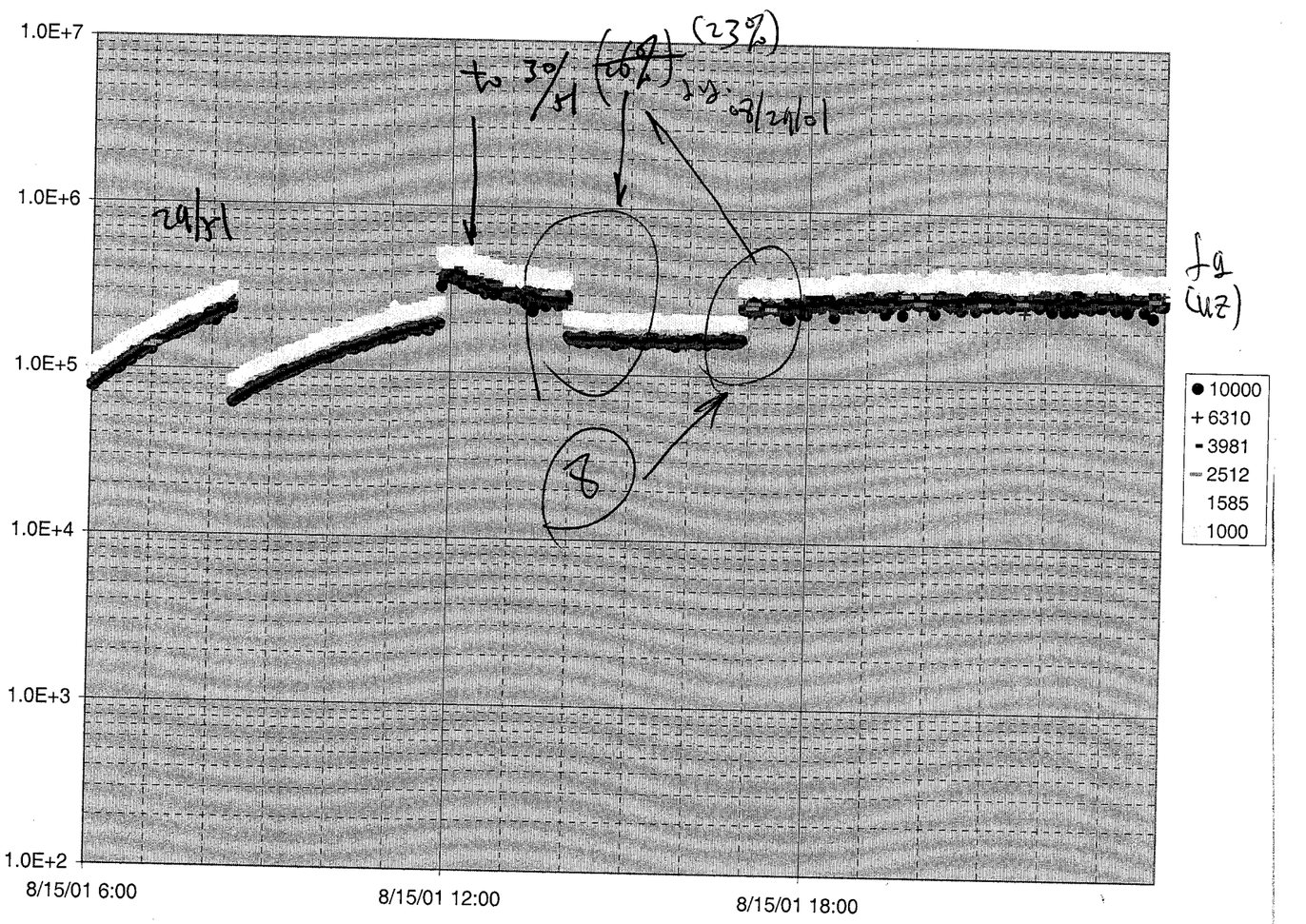

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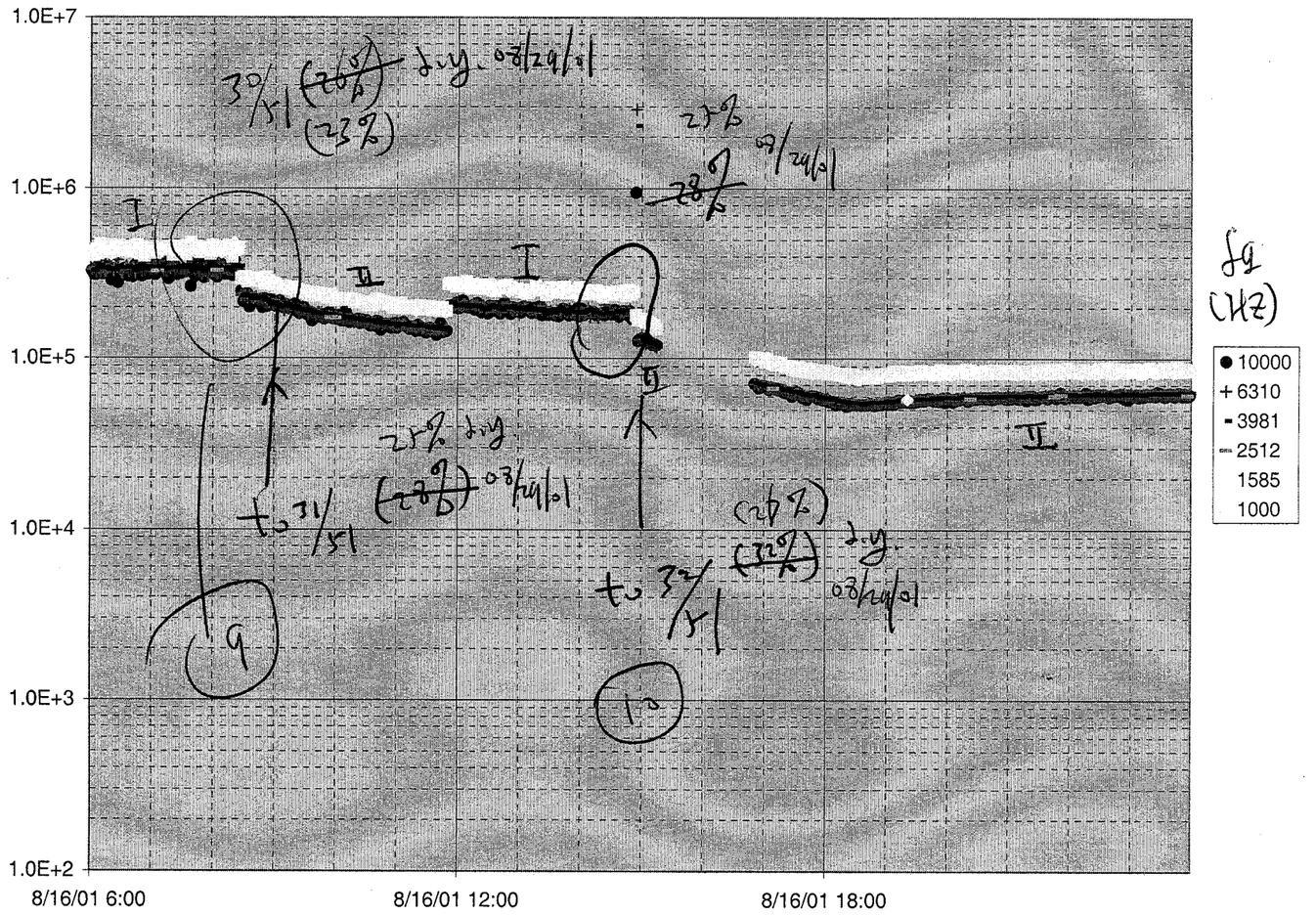

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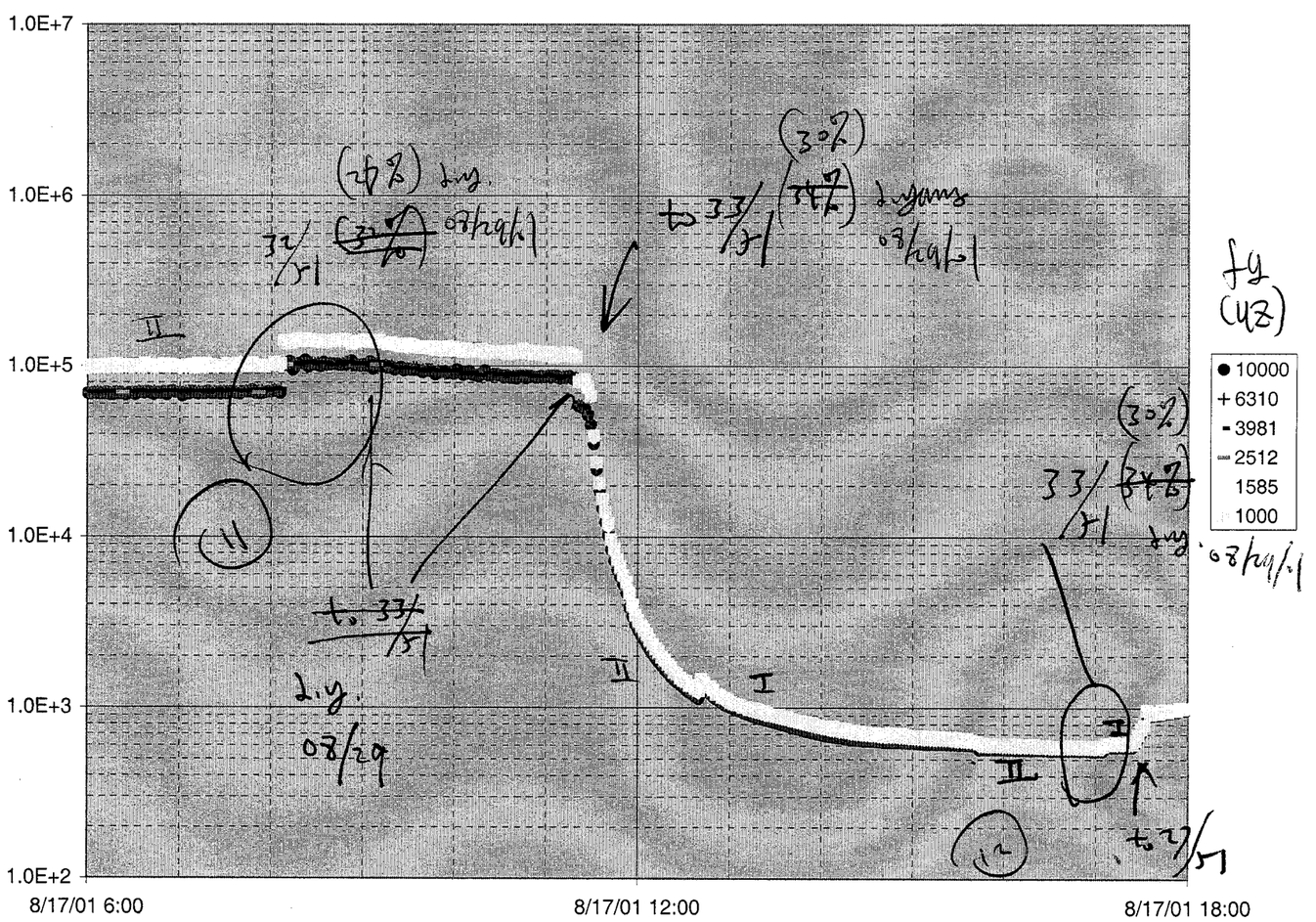
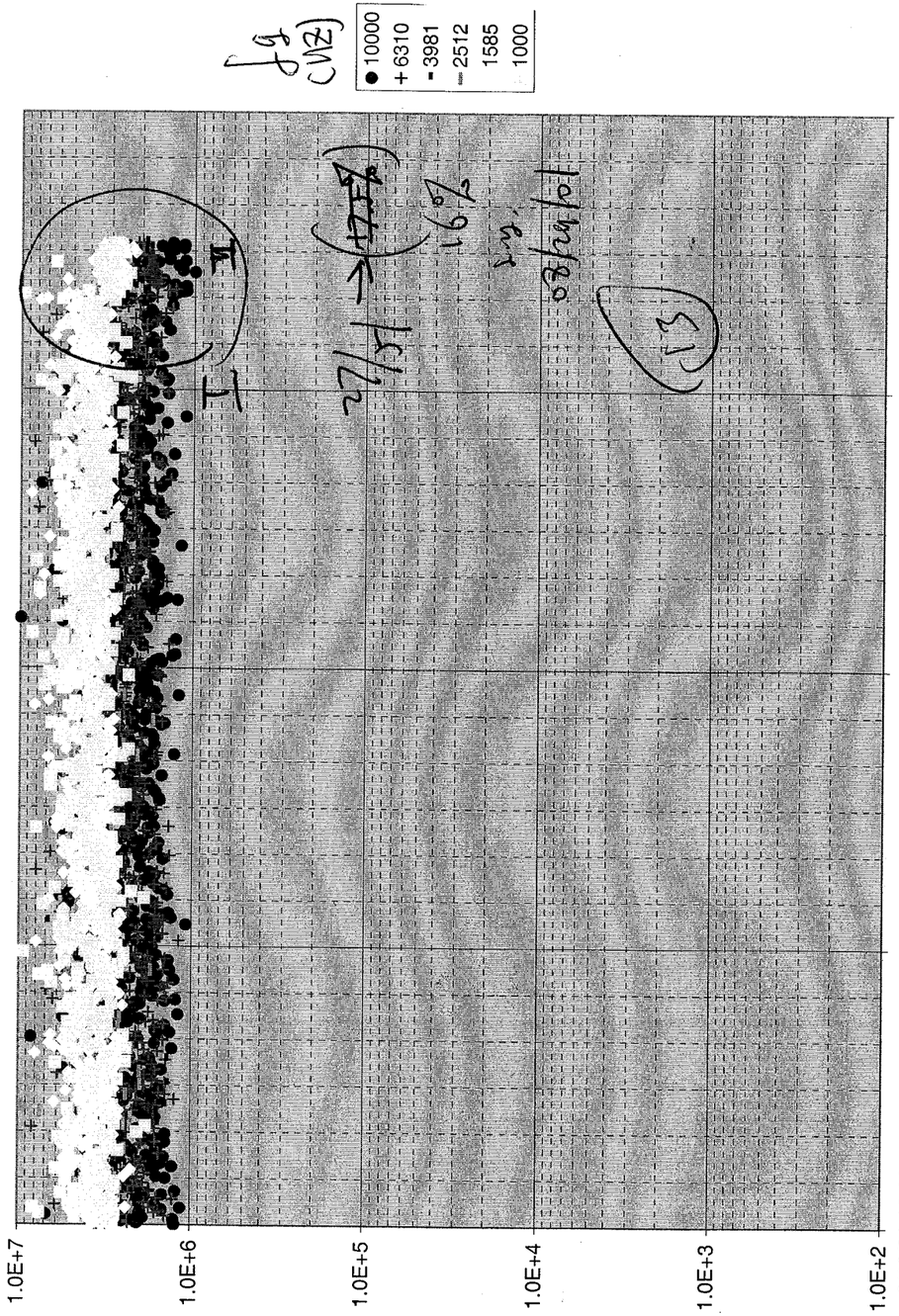




0808a_DP_b.xls Data

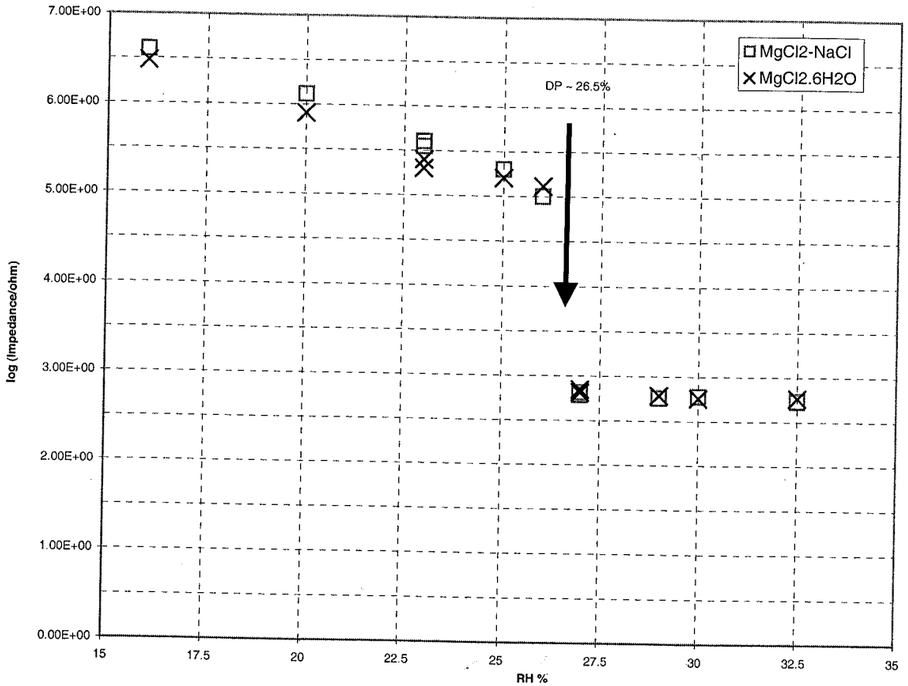
	Data time	RH (%)	MgCl2-NaCl, Cell I Z, ohm	log|Z| MgCl2-NaCl	MgCl2.6H2O, Cell II Z, ohm	log|Z| MgCl2.6H2O
2	8/8/01 15:00	32.5	5.40E+02	2.73E+00	5.80E+02	2.76E+00
3	8/9/01 9:00	32.5	5.30E+02	2.72E+00	5.80E+02	2.76E+00
4	8/9/01 11:00	29	5.70E+02	2.76E+00	6.10E+02	2.79E+00
5	8/9/01 17:00	27	6.10E+02	2.79E+00	6.50E+02	2.81E+00
6	8/10/01 9:00	27	6.50E+02	2.81E+00	7.00E+02	2.85E+00
7	8/14/01 9:00	20	1.30E+06	6.11E+00	8.00E+05	5.90E+00
8	8/15/01 15:00	23	3.50E+05	5.54E+00	2.00E+05	5.30E+00
9	8/16/01 9:00	23	4.00E+05	5.60E+00	2.50E+05	5.40E+00
10	8/16/01 15:00	25	2.00E+05	5.30E+00	1.60E+05	5.20E+00
11	8/17/01 8:00	26	1.00E+05	5.00E+00	1.30E+05	5.11E+00
12	8/17/01 17:00	30	6.00E+02	2.78E+00	5.70E+02	2.76E+00
13	8/20/01 8:00	16	4.00E+06	6.60E+00	3.00E+06	6.48E+00

From Fig in Page 130, DP of the MgCl2.6H2O is 26.5%
Literature value is 30.54*
Correction by 30.54-26.5 = 4.04 %

	Data time	Corrected RH (%)	MgCl2-NaCl, Cell I Z, ohm	log|Z| MgCl2-NaCl	MgCl2.6H2O, Cell II Z, ohm	log|Z| MgCl2.6H2O
2	8/8/01 15:00	36.54	5.40E+02	2.73E+00	5.80E+02	2.76E+00
3	8/9/01 9:00	36.54	5.30E+02	2.72E+00	5.80E+02	2.76E+00
4	8/9/01 11:00	33.04	5.70E+02	2.76E+00	6.10E+02	2.79E+00
5	8/9/01 17:00	31.04	6.10E+02	2.79E+00	6.50E+02	2.81E+00
6	8/10/01 9:00	31.04	6.50E+02	2.81E+00	7.00E+02	2.85E+00
7	8/14/01 9:00	24.04	1.30E+06	6.11E+00	8.00E+05	5.90E+00
8	8/15/01 15:00	27.04	3.50E+05	5.54E+00	2.00E+05	5.30E+00
9	8/16/01 9:00	27.04	4.00E+05	5.60E+00	2.50E+05	5.40E+00
10	8/16/01 15:00	29.04	2.00E+05	5.30E+00	1.60E+05	5.20E+00
11	8/17/01 8:00	30.04	1.00E+05	5.00E+00	1.30E+05	5.11E+00
12	8/17/01 17:00	34.04	6.00E+02	2.78E+00	5.70E+02	2.76E+00
13	8/20/01 8:00	20.04	4.00E+06	6.60E+00	3.00E+06	6.48E+00

* L. Greenspan, J.Research of N. B. S., Vol 81A, No1, 1977, Page 89-96

0808a_DP_b.xls Uncorrected_Chart

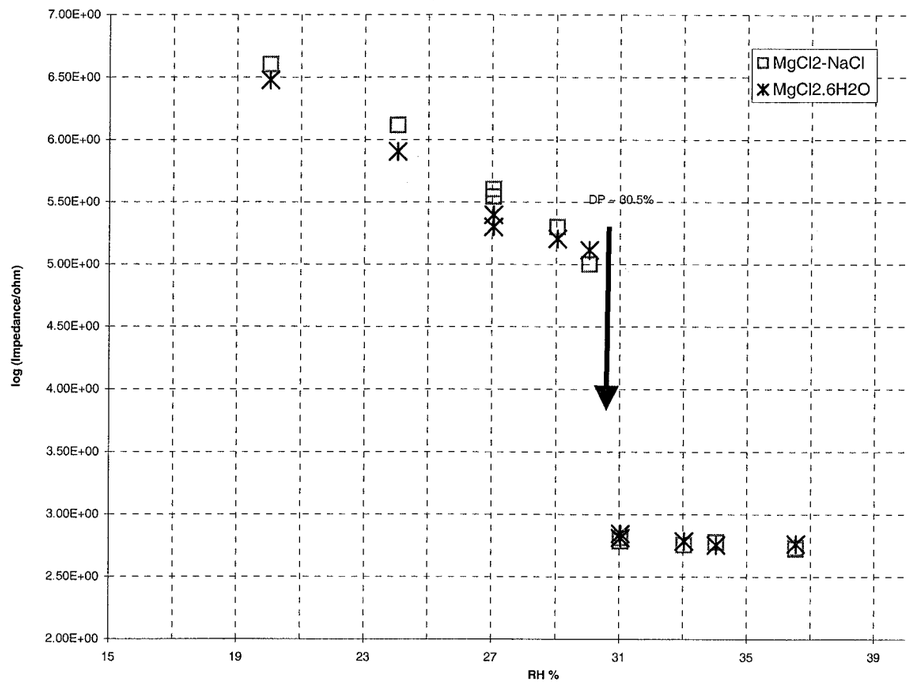


I $MgCl_2 \cdot 6H_2O$

I $MgCl_2 \cdot 6H_2O$ – Hard. have the same DP.

J-Yang 7/15/02

0808a_DP_b.xls Corrected_Chart



L.Yang. 7/29/02

Pages 1 – 132 copied and given to QA for record.

L. Yuns

10/09/01

L. Yuns

7/IX/02

J. Yfantis 7/18/02

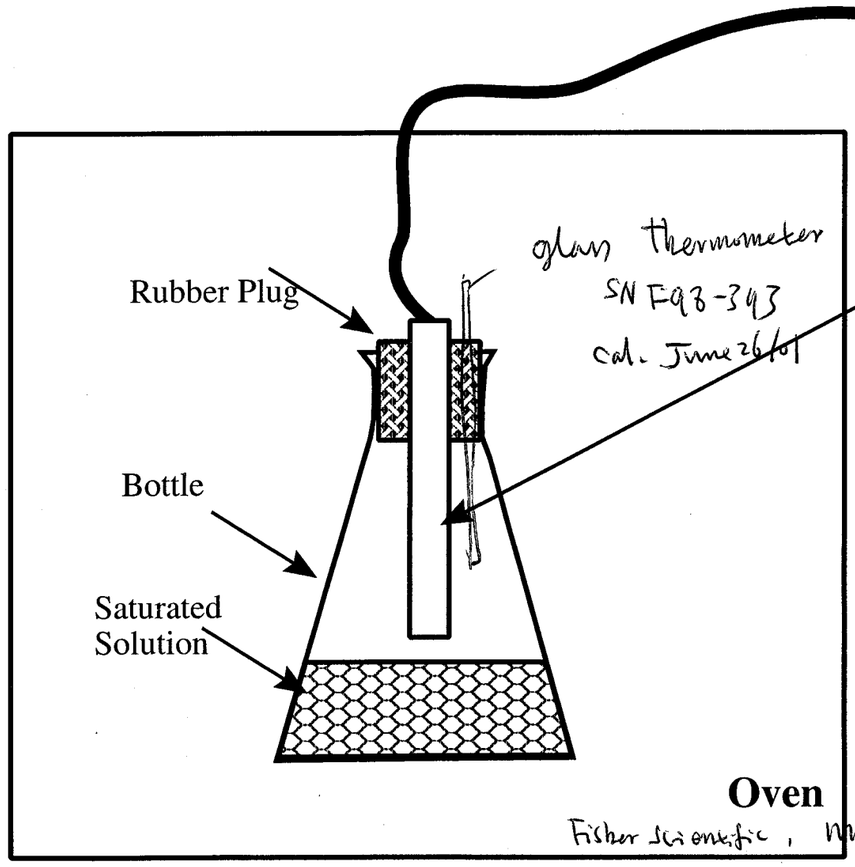
Deliquescence Point Measurement.

Objective: To determine the deliquescence points of salts experimentally.

The experimental set-up is shown below:

Several bottles are placed in the oven. the bottles with pure salts are used as controls for the method and water.

File: DP_Hyfrometer



J. Yfantis 2/14/06

08/08/01 J.Yf.
J.Yf.