EG&G Idaho, Inc.

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Organization: PHYSICAL & BIOLOGICAL SCIENCES DIVISION
EARTH & LIFE SCIENCES BRANCH
GEOSCIENCES SECTION

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RE-PB-83-015

APPENDIX B

HYDROTHERMAL INJECTION PROGRAM
PHASE I TEST DATA INDEX

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Idaho Operations Office
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SUMMARY

The primary objective of the test sequence was to acquire the experimental data necessary to develop a technique for characterizing the fracture dominated Raft River geothermal reservoir. During each test, the geothermal injectant fluid was innoculated with a known concentration of secondary tracers. Tracer concentrations were monitored during the backflow stage. This experimental process has been labeled the "Huff-Puff" technique.

Samples collected at Raft River (Figure 1) were analyzed in the field for the indicated species using the following methods; alkalinity by titration, conductivity by conductance cell; fluorescein by fluorometer; magnesium and calcium by atomic absorption spectrophotometer (AA); boron by colorimetric techniques; chloride, bromide, pH, thiocyanate and iodide by selective ion electrode (SIE).

The multi-element and tracer analyses provided by UURI was analyzed using an inductively coupled plasma emission spectrophotometer (ICP), chloride and bicarbonate by titration, iodide and fluoride by selective ion electode using the standard addition technique, sulfate by gravimetric and total dissolved solids (TDS) by evaporation and weighing.

The surrounding well field (Figure 2) was monitored and the data are presented to allow for interpretation of possible interference effects between the test well and the well field during injection and backflow.

HYDROTHERMAL INJECTION PROGRAM
PHASE I TEST DATA INDEX

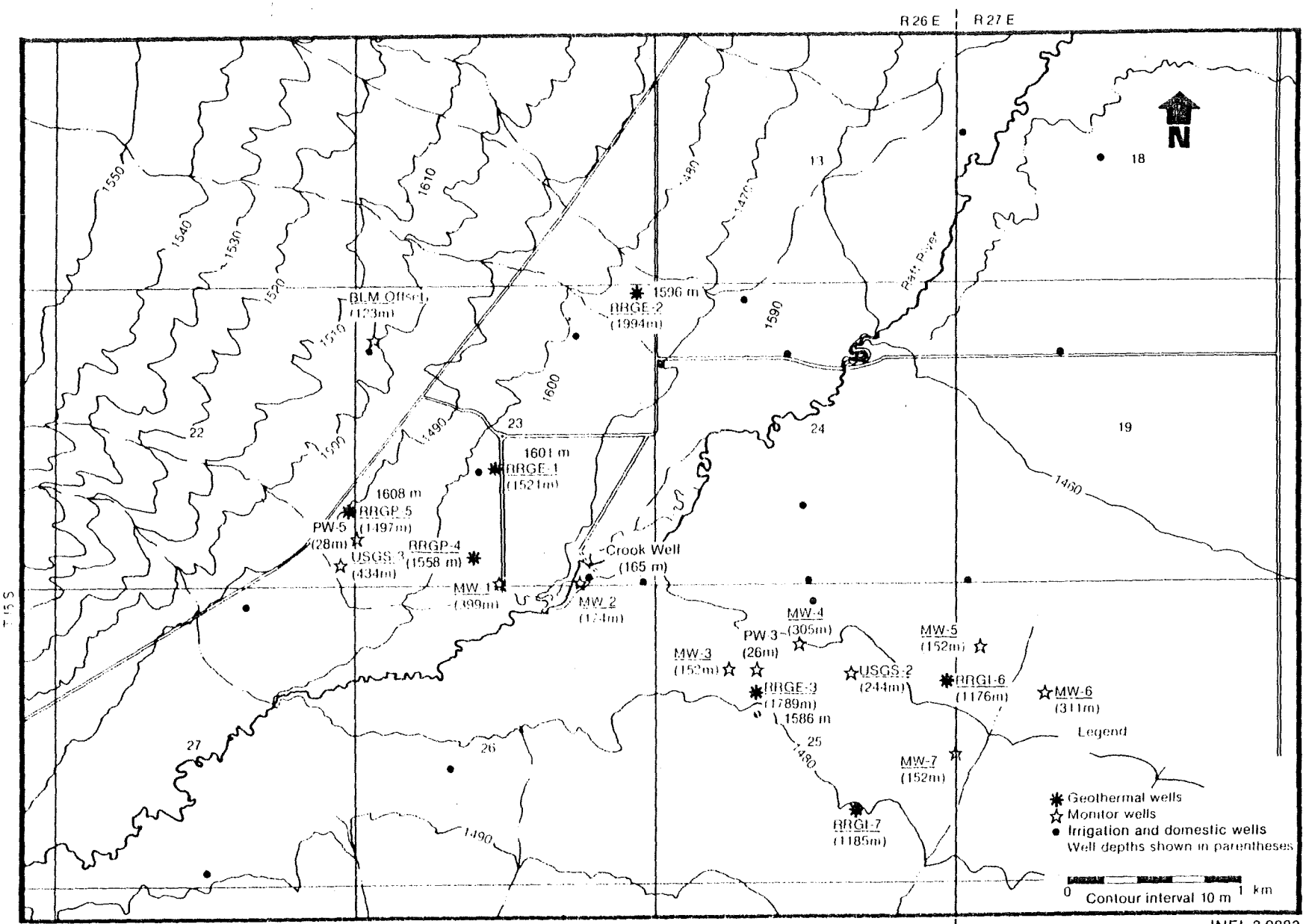
INTRODUCTION

The intent of this Appendix is to supply graphs of the data available for analysis. The format is in table form accompanied by graphs, with information pertaining to data sampled, methods of recording and analytical methods combined with the units in which the data are recorded.

There are nine separate test files, one for each of the tests. The file names consist of location, test number and date. The files are listed in hours, with zero time simultaneous with the injection start time for each test. Each file contains pretest and posttest data as well as actual test time data (Table 1). For example, if there are 20 hours of pretest data, the file start time will be listed as a - (minus) 20. Each graph is also identified at the bottom by file table and record number.

The files on the actual tests contain RRGP-5 well-head pressure, temperature (surface and downhole), injection and backflow rates and duration, tracers used (Table 2), and water analysis, both those performed on site and in the laboratory. Downhole conductivity/temperature logs, spinner and caliper logs run during different phases of the tests are also available. On the final test, data was recorded at RRGE-1 which is incorporated in the file along with data from RRGP-5. However, the well-head pressure was put into the RRMONITOR82 file, as RRGE-1 is included in the monitoring system.

The file on the monitoring system, RRMONITOR82, presents data obtained from RRGE-1, RRMW-1 USGS-3, RRGP-4, RRPW-5 and BLM-OFFSET well. These data are reported in either psia of head pressure or water level below the measuring point. This file has a zero time on 09/01/82 at 00:00 hours.



Raft River Well Locations

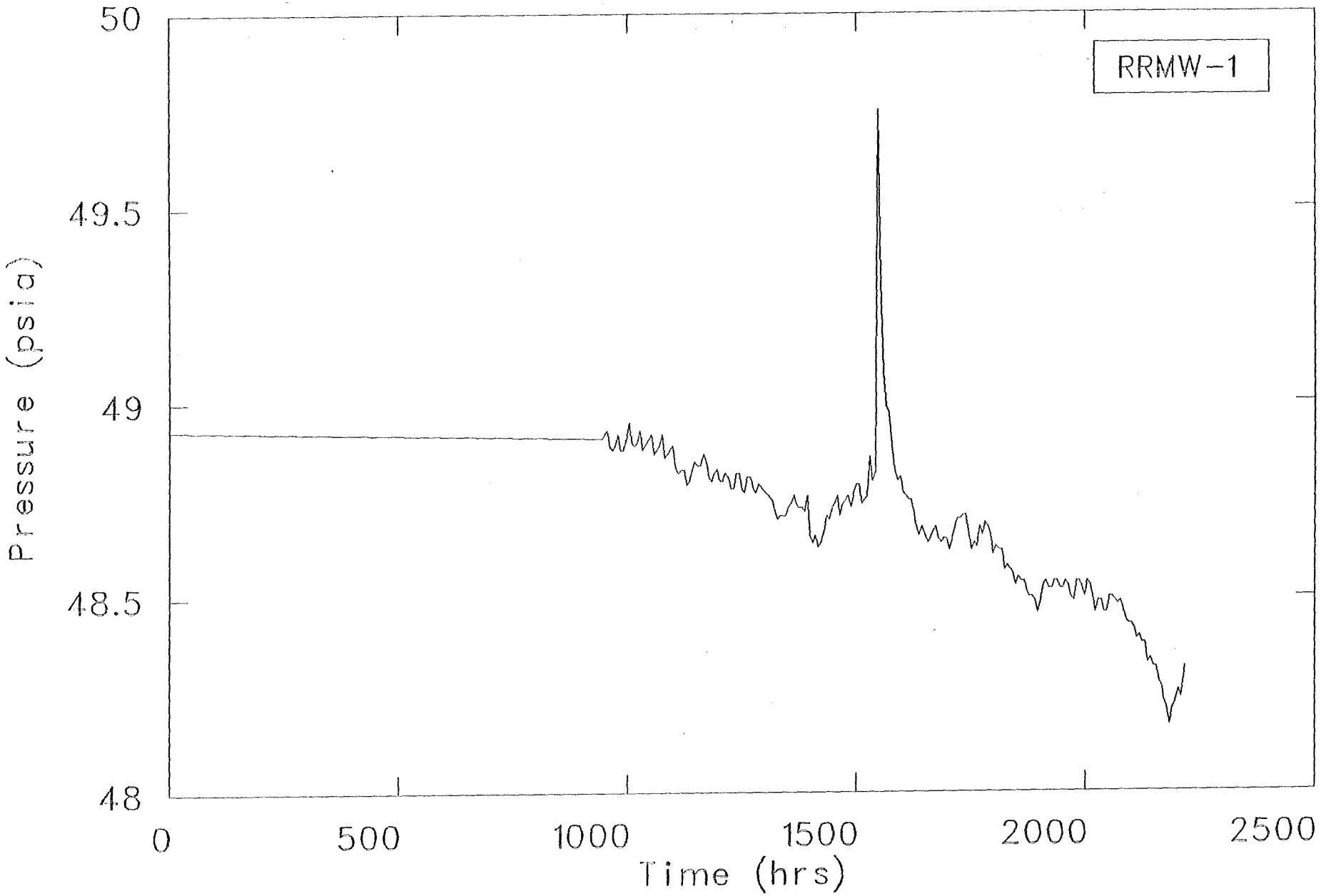
Figure 2

TABLE A. TABLE OF FILES AND START TIME

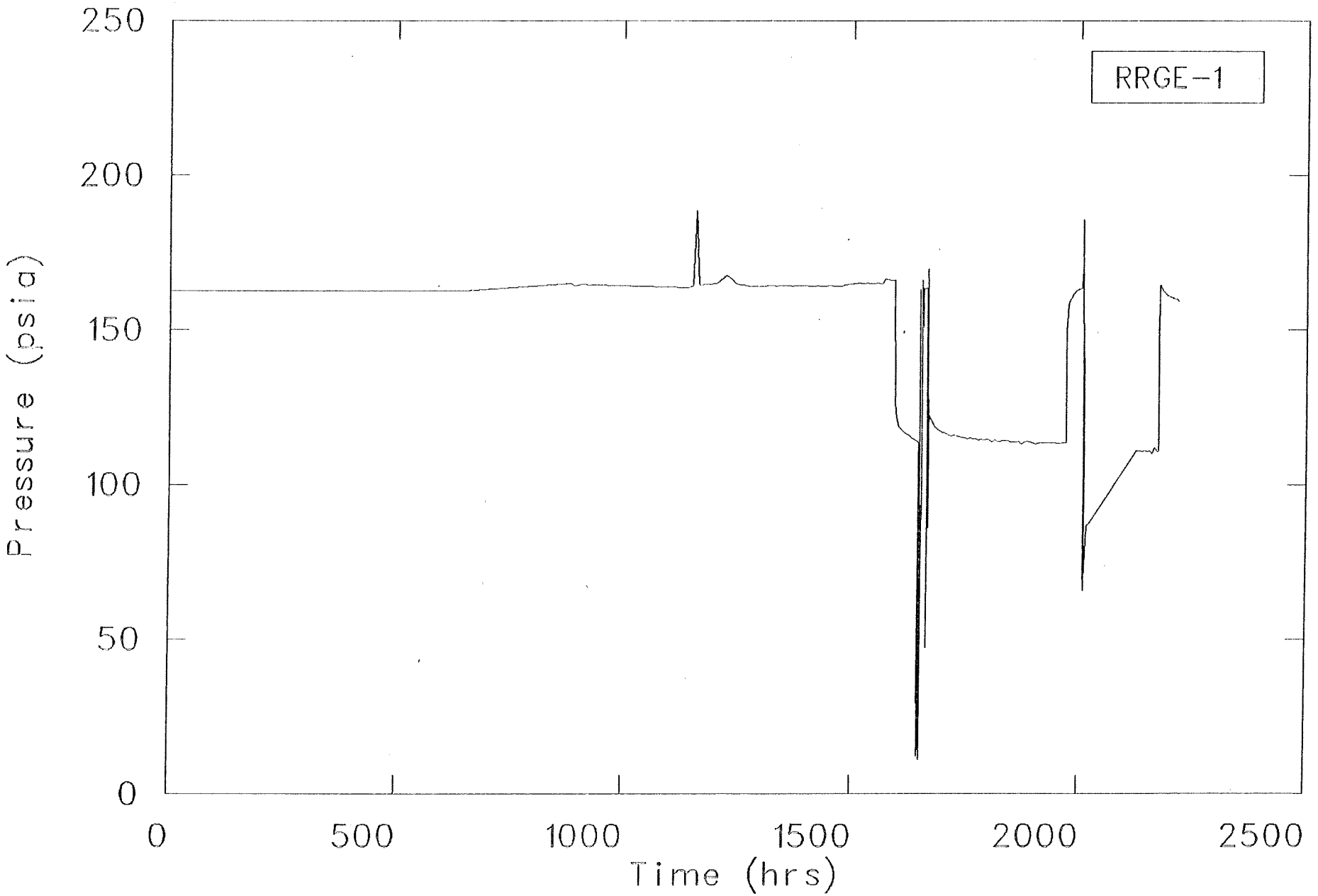
Test Title	File Start Time Name	File Start Time Date	Real	Test Start Time Pretest (Hours)	Test Start Time Injection (Hours)	Test Start Time Backflow (Hours)
2A1	RR2A1820909	Sept 09	09:00	-30.0	0:00	1.18
2A2	RR2A2820913	Sept 13	12:00	-44.94	0:00	4.37
2C	RR2C820921	Sept 21	00:00	-10.0	0:00	48.58
4A	RR4A820928	Sept 28	00:00	-58.58	0:00	29.93
4B	RR4B821003	Oct 03	12:00	-97.0	0:00	4.52
4C	RR4C821008	Oct 08	12:00	-6.00	0:00	14.33
4D	RR4D821013	Oct 13	00:00	-9.05	0:00	51.95
2D	RR2D821018	Oct 18	00:00	-13.5	0:00	98.33
5	RR5821106	Nov 06	00:00	-10.08	0:00	479.92
N/A	RRMONITOR82	Sept 01	00:00	N/A	N/A	N/A

TABLE C. RAFT RIVER MONITORING WELLS
File Name: RRMONITOR82 Date: 09-01-82
Start Time: Real--00:00; File Start Time: 0.0

Record Name	#	Data Sampled	Recorder or Method	Units
RRMW-1	1	Wellhead pressure	digiquartz	psia
RRGP-4	2	Wellhead pressure	digiquartz	pisa
RRGE-1	3	Wellhead pressure	digiquartz	psia
USCS-3	4	Wellhead pressure	digiquartz	psia
BLM-OFFSET	5	Water Level	Stevens recorder	ft.
RRPW-5	6	Water Level	Stevens recorder	ft.


RRMW-1
50
49.5
49
48.5
48
Pressure (psia)
0
500
1000
1500
2000
2500
Time (hrs)

C-1


RRGE-1
250
200
150
100
50
0
Pressure (psia)
0
500
1000
1500
2000
2500
Time (hrs)

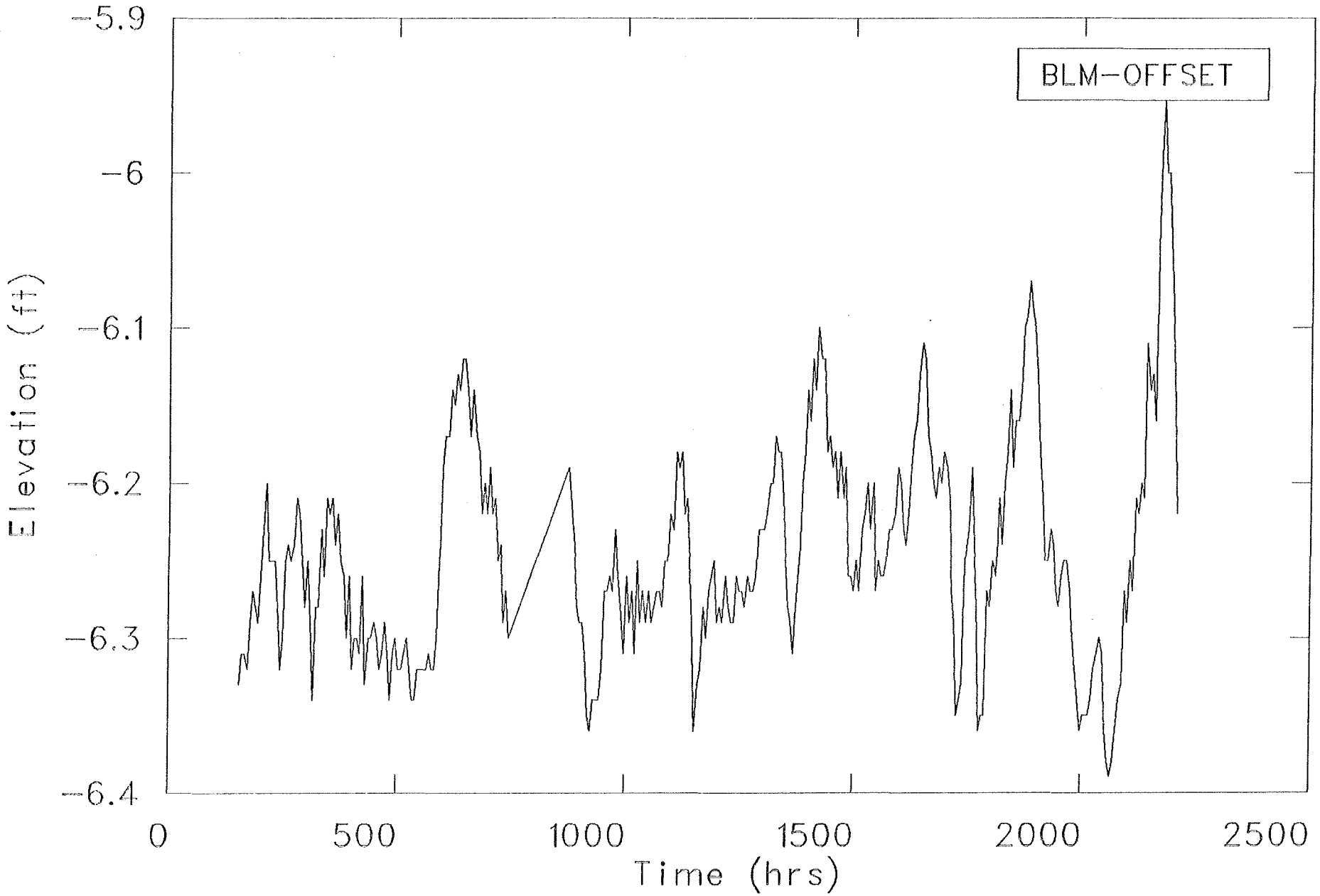
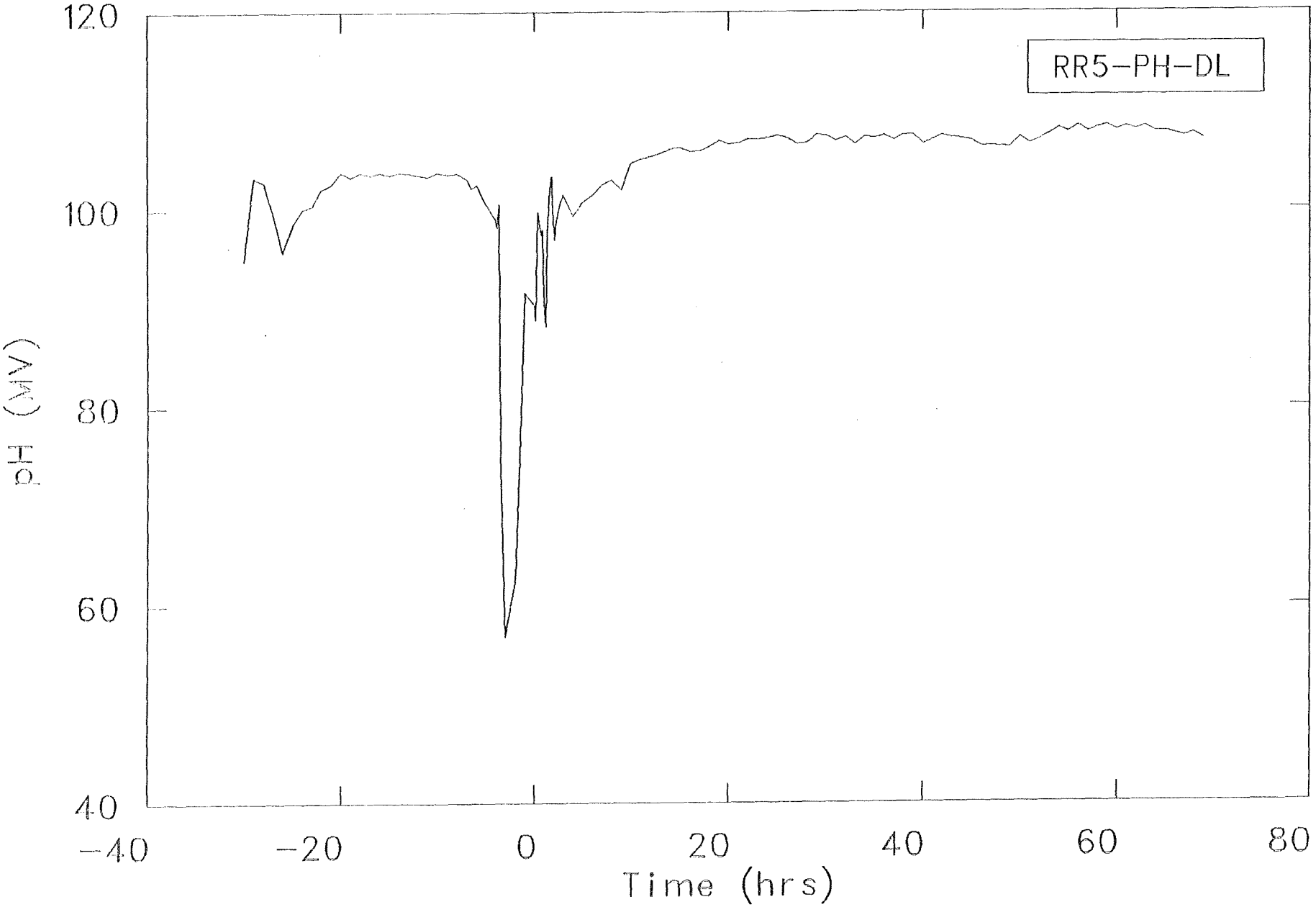
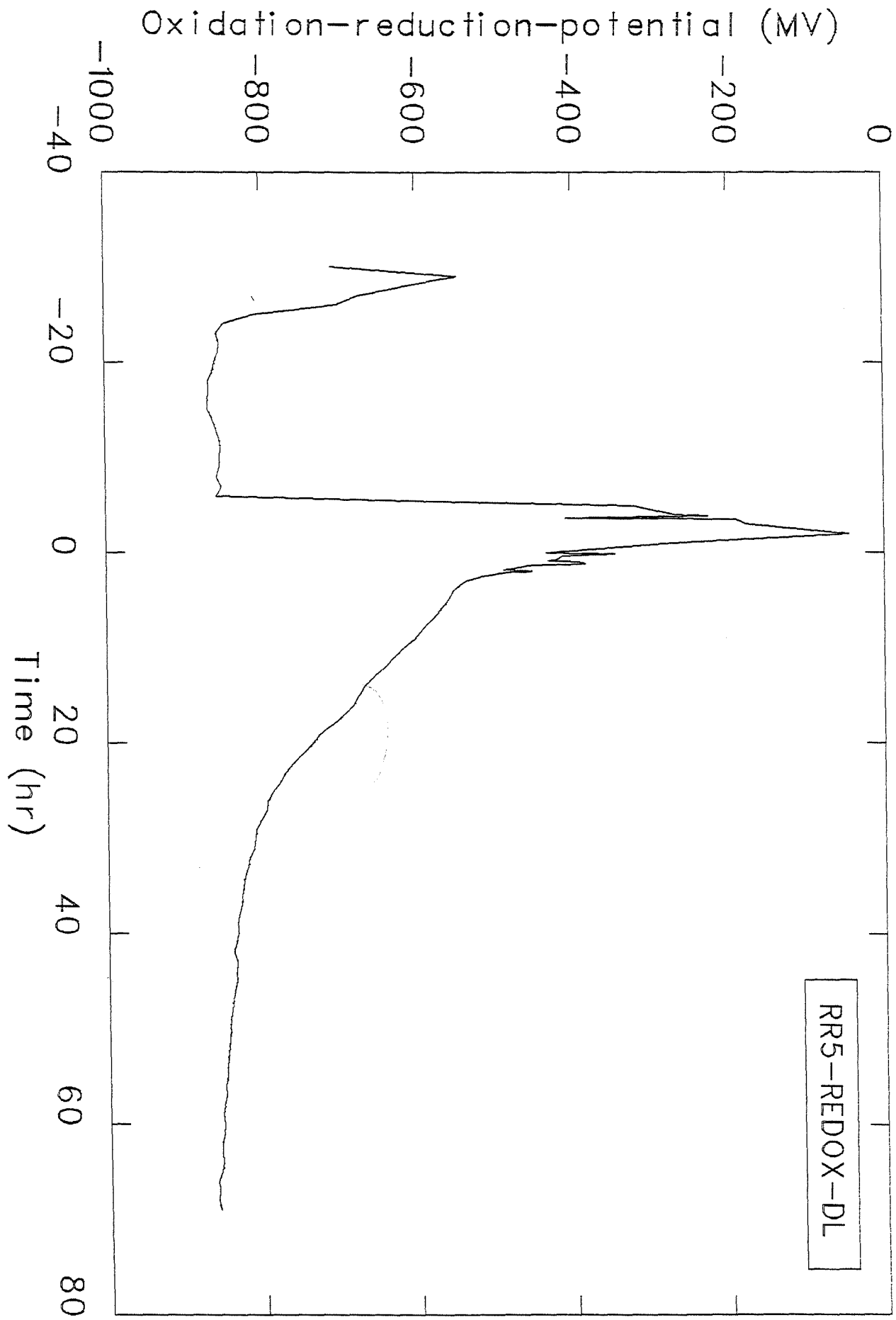
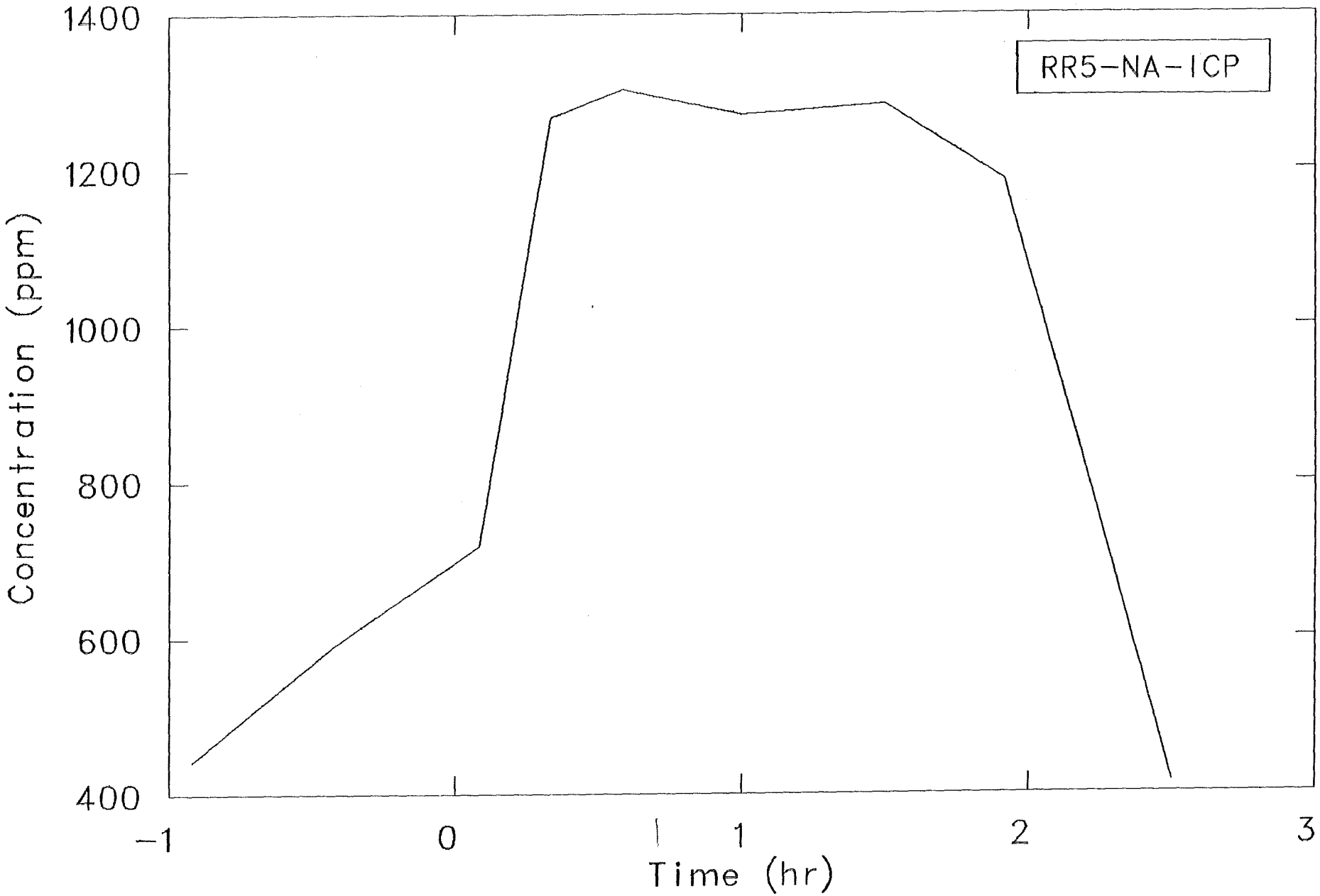

BLM-OFFSET
-5.9
-6
-6.1
-6.2
-6.3
-6.4
Elevation (ft)
0
500
1000
1500
2000
2500
Time (hrs)

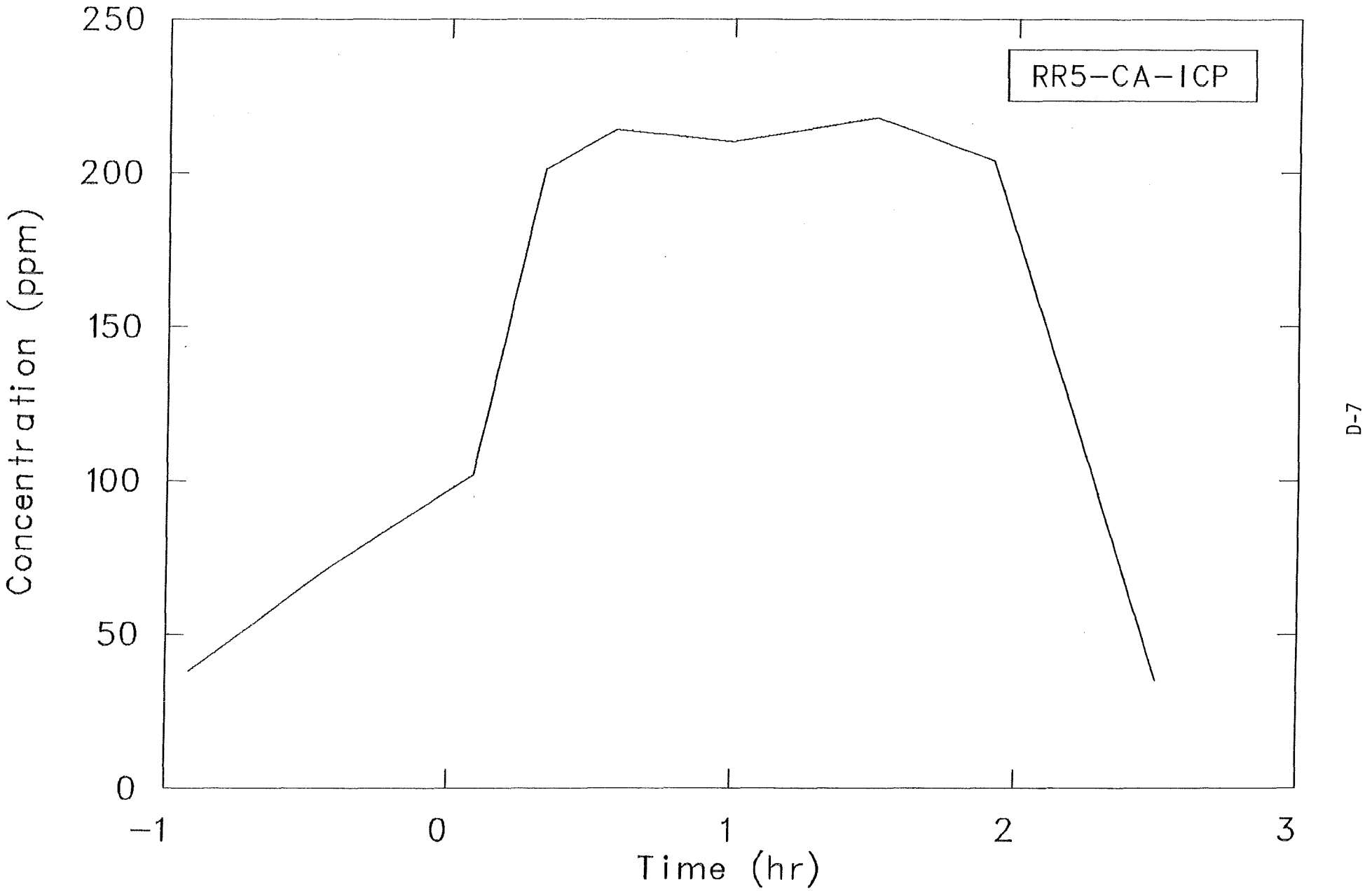
TABLE D. TEST 2A1
File Name: RR2A1820909 Date: 09-09-82
Start Time: Real--09:00; File Start Time: -30.0

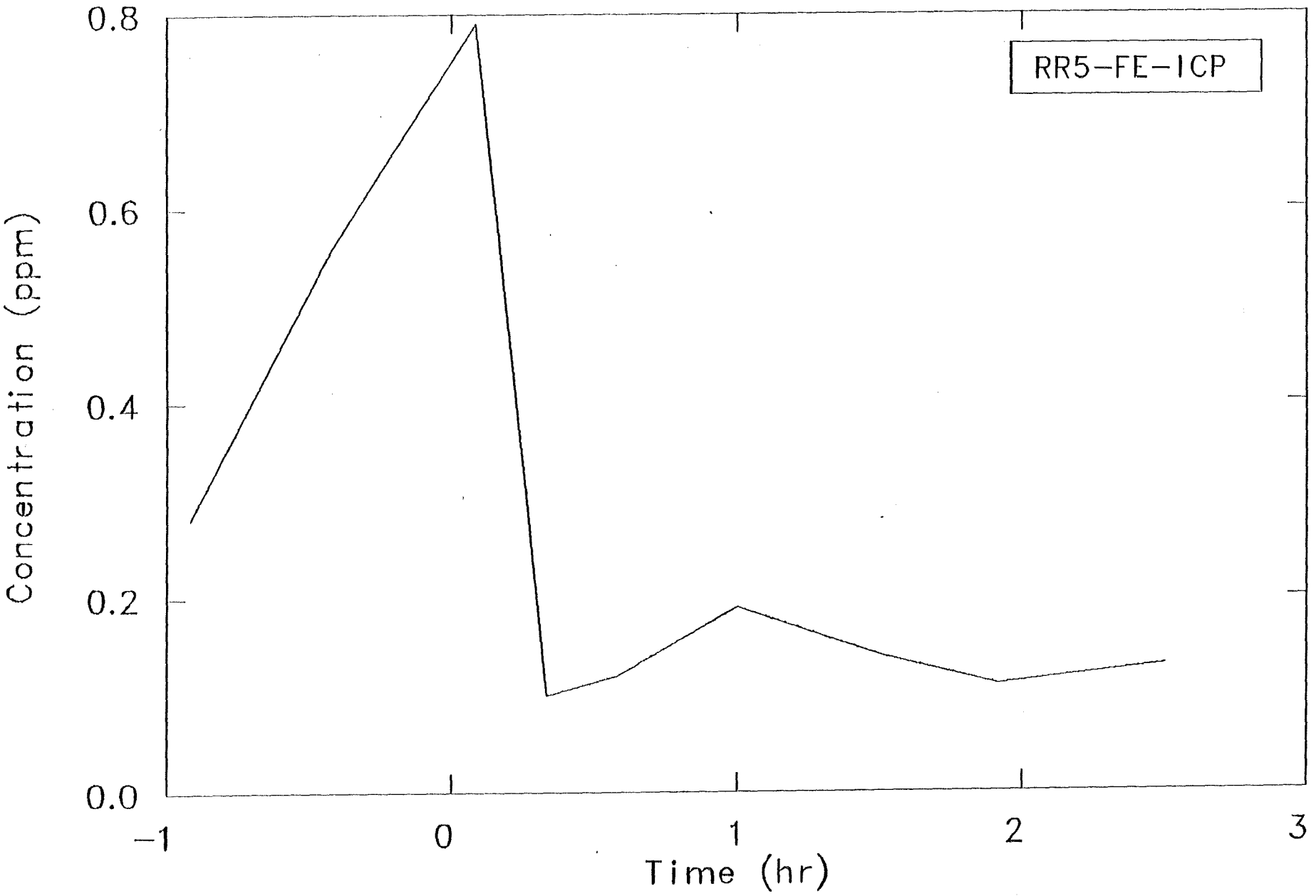
Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	µmho/cm
RR5-Redox-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	°F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR5-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-TDS-ICP	14	TDS	Evaporation and weighing	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	Titration	ppm
RR5-F-ICP	17	Fluoride	SIE	ppm
RR5-WP-D	18	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	19	Well flow	Strip charts	±gpm
RR5-TEMP-M	20	Temperature	Manually recorded	°F
RR5-B-TR	21	Boron	Colorimetrically	ppm
RR5-I-TR	22	Iodide	SIE	ppm
RR5-MG-TR	23	Magnesium	AA	ppm

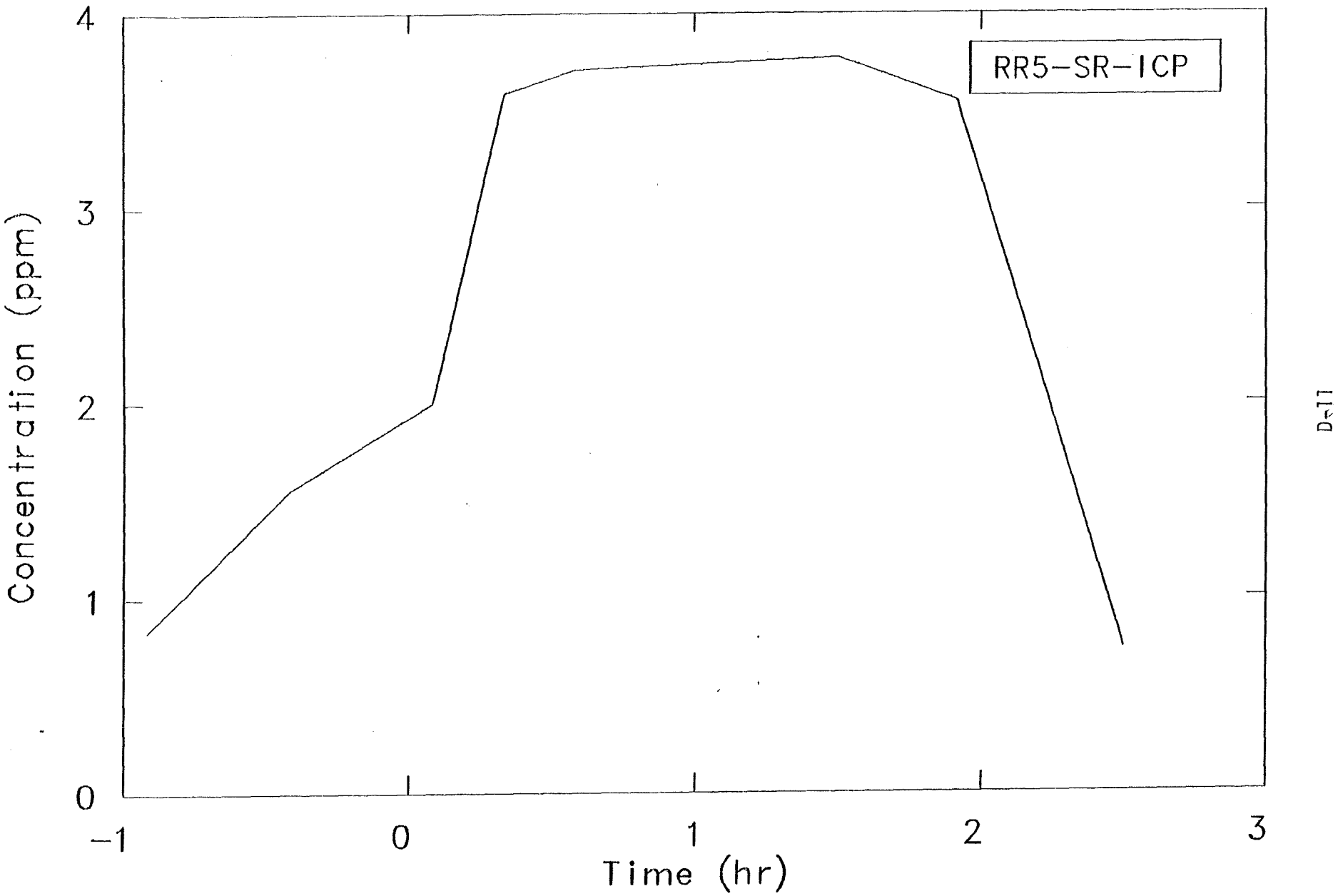

RR5-PH-DL
120
100
80
60
40
pH (MV)
-40
-20
0
20
40
60
80
Time (hrs)


Oxidation-reduction-potential (MV)
-1000
-800
-600
-400
-200
0
-40
-20
0
20
40
60
80
Time (hr)
RR5-REDOX-DL


RR5-NA-ICP
1400
1200
1000
800
600
400
Concentration (ppm)
-1
0
1
2
3
Time (hr)


RR5-CA-ICP
Concentration (ppm)
250
200
150
100
50
0
-1
0
1
2
3
Time (hr)


RR5-FE-ICP
Concentration (ppm)
0.8
0.6
0.4
0.2
0.0
-1
0
1
2
3
Time (hr)



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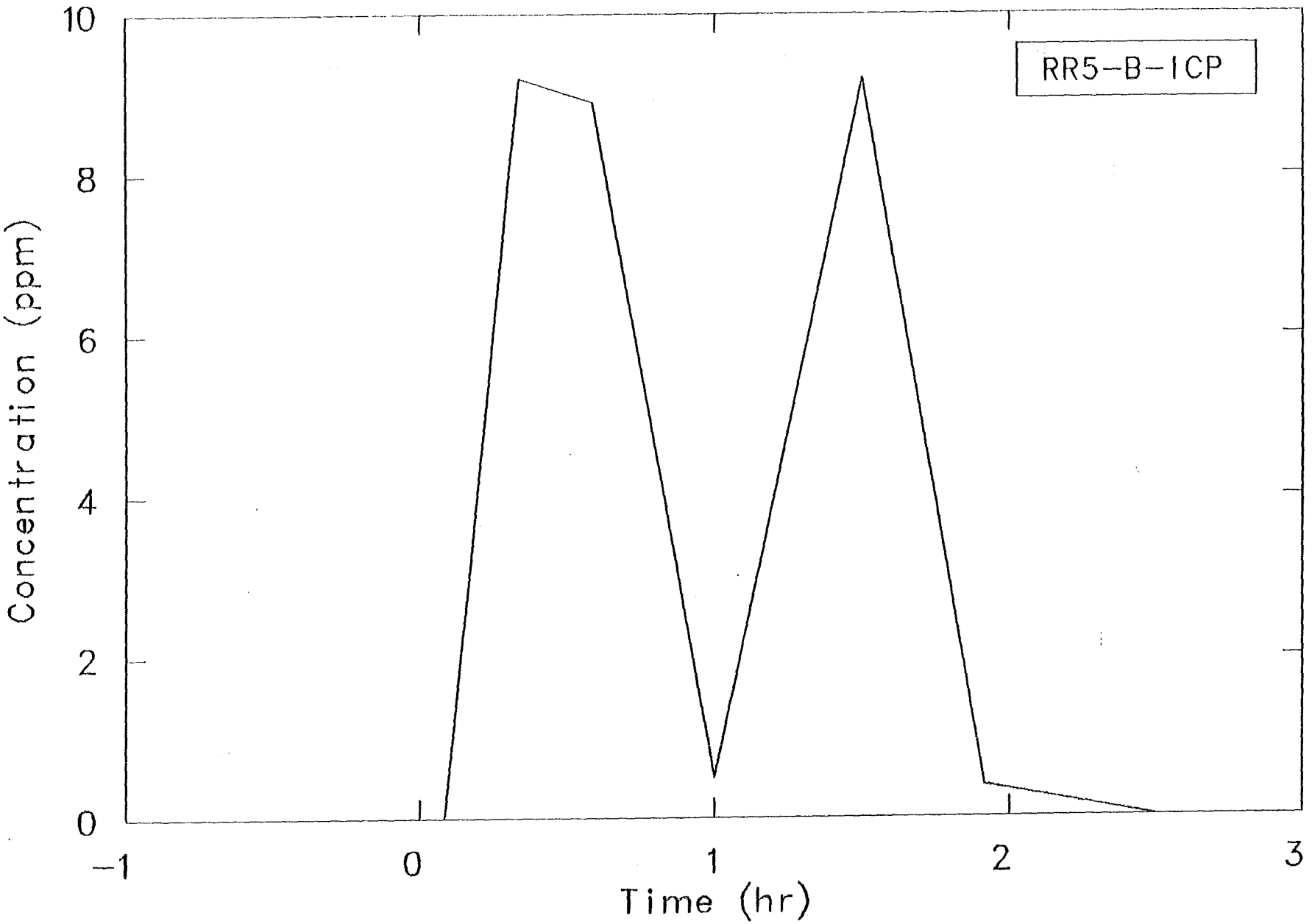
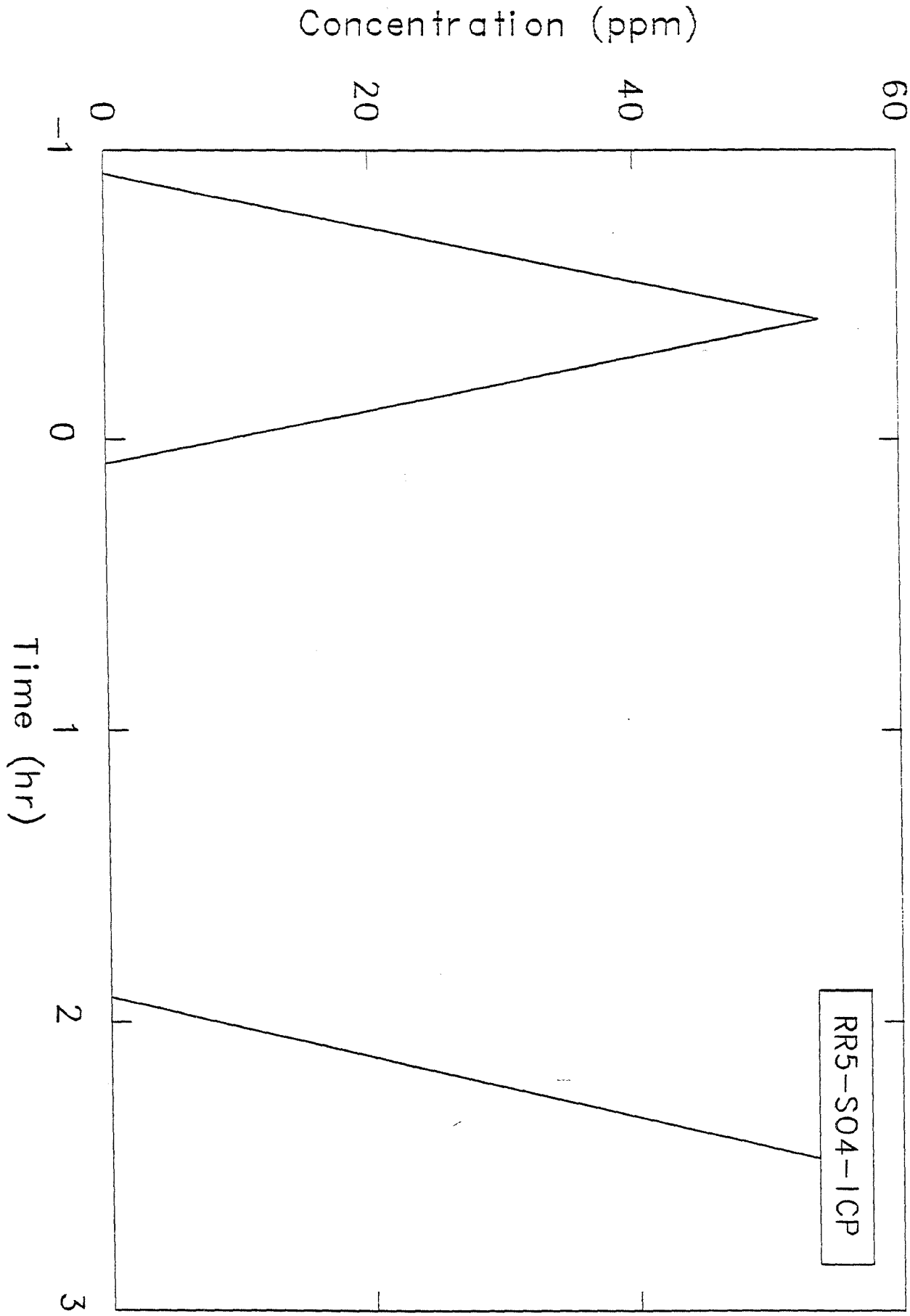
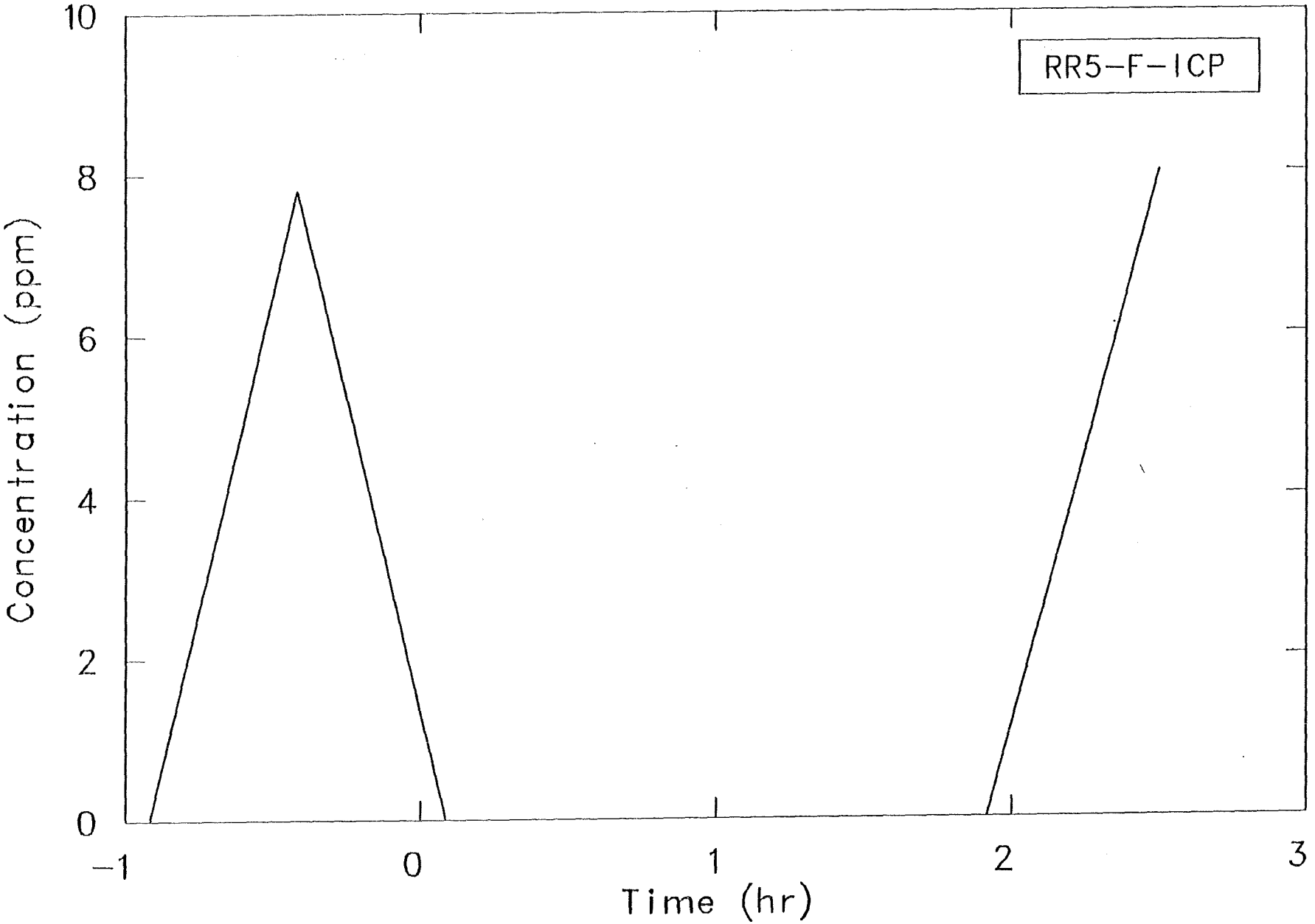
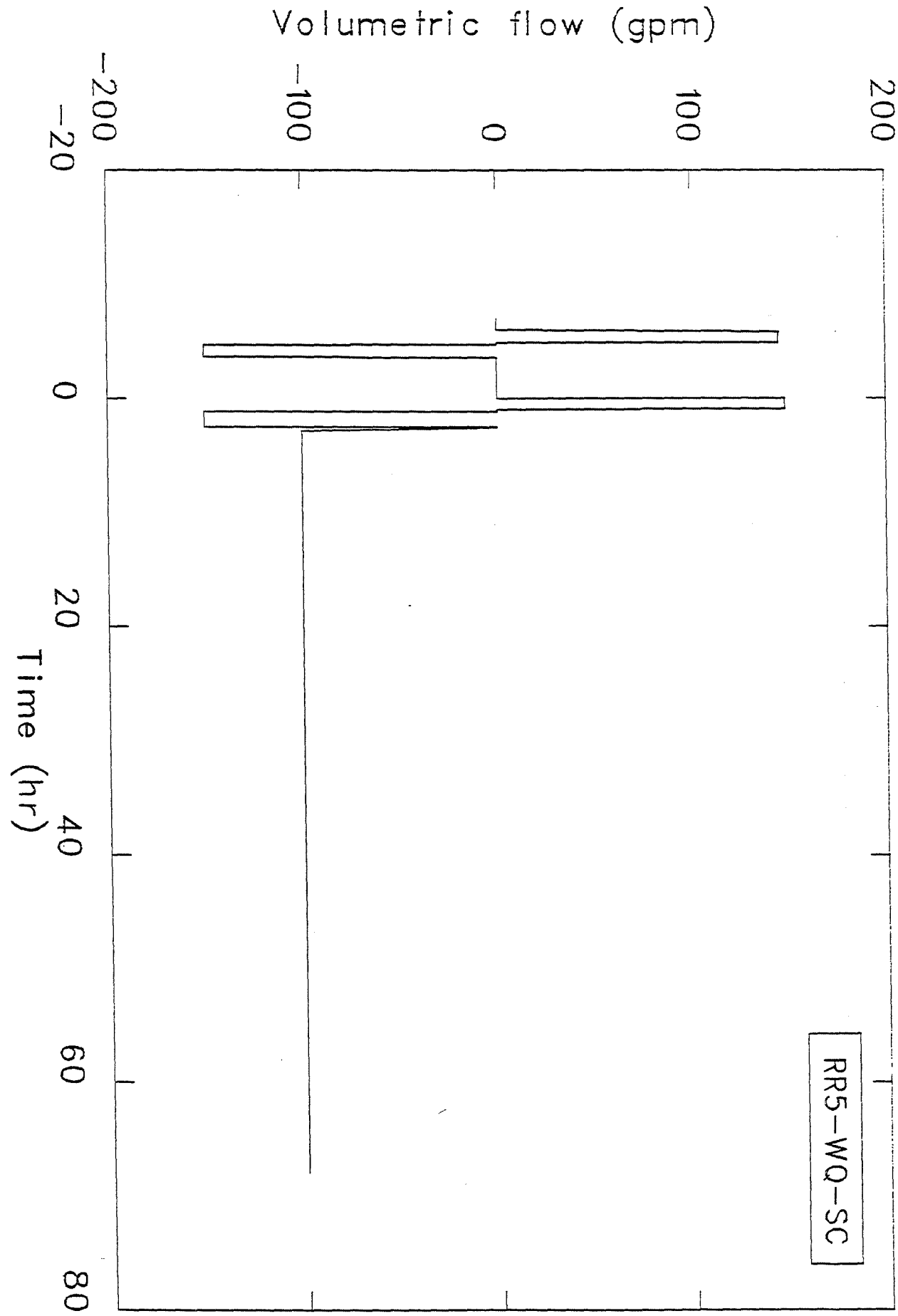
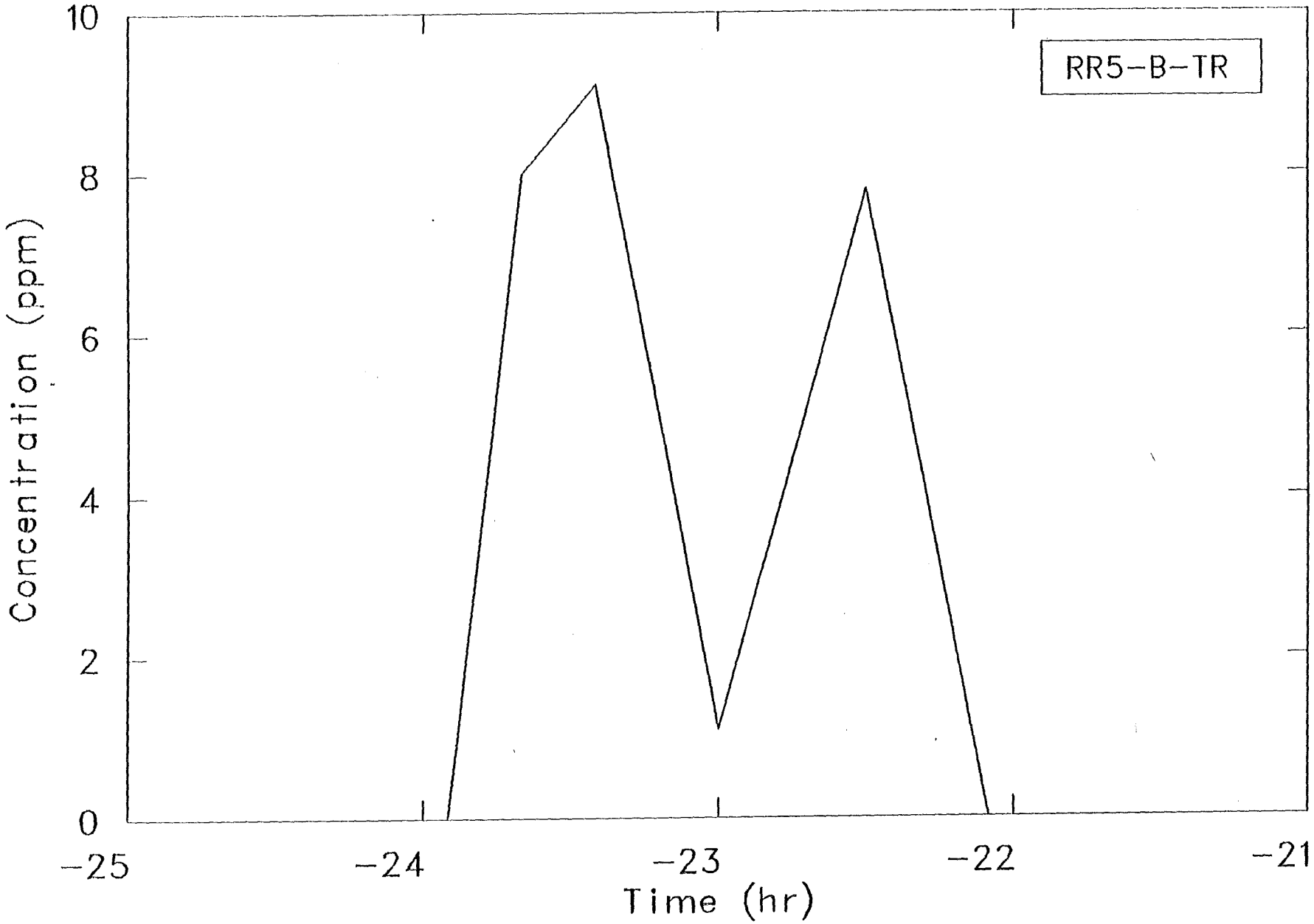

RR5-B-ICP
Concentration (ppm)
Time (hr)
10
8
6
4
2
0
-1
0
1
2
3


Concentration (ppm)
0
20
40
60
-1
0
1
2
3
Time (hr)
RR5-SO4-ICP


RR5-F-ICP
Concentration (ppm)
Time (hr)
10
8
6
4
2
0
-1
0
1
2
3


Volumetric flow (gpm)
-200
-100
0
100
200
-20
0
20
40
60
80
Time (hr)
RR5-WQ-SC


RR5-B-TR
Concentration (ppm)
10
8
6
4
2
0
-25
-24
-23
-22
-21
Time (hr)

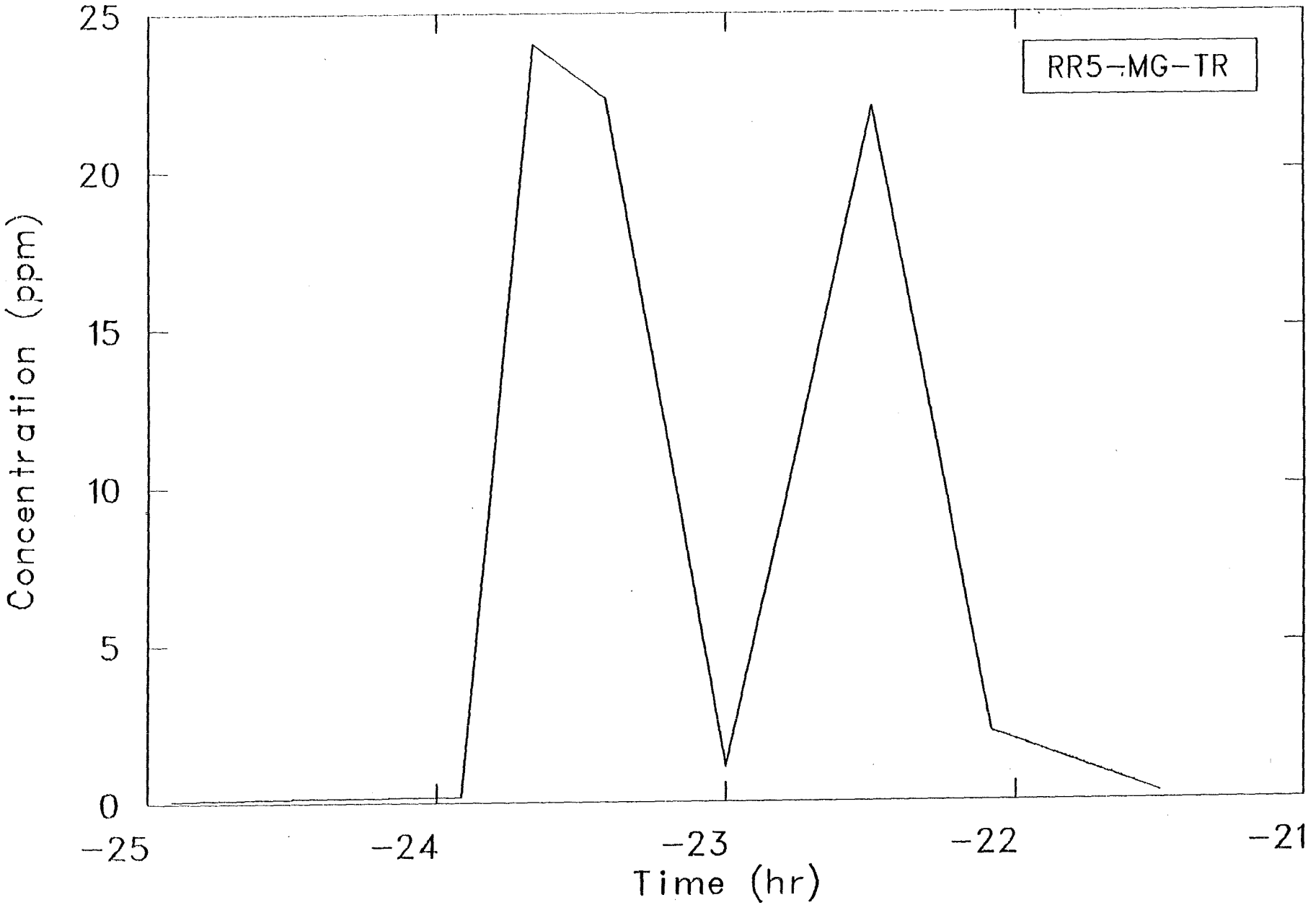


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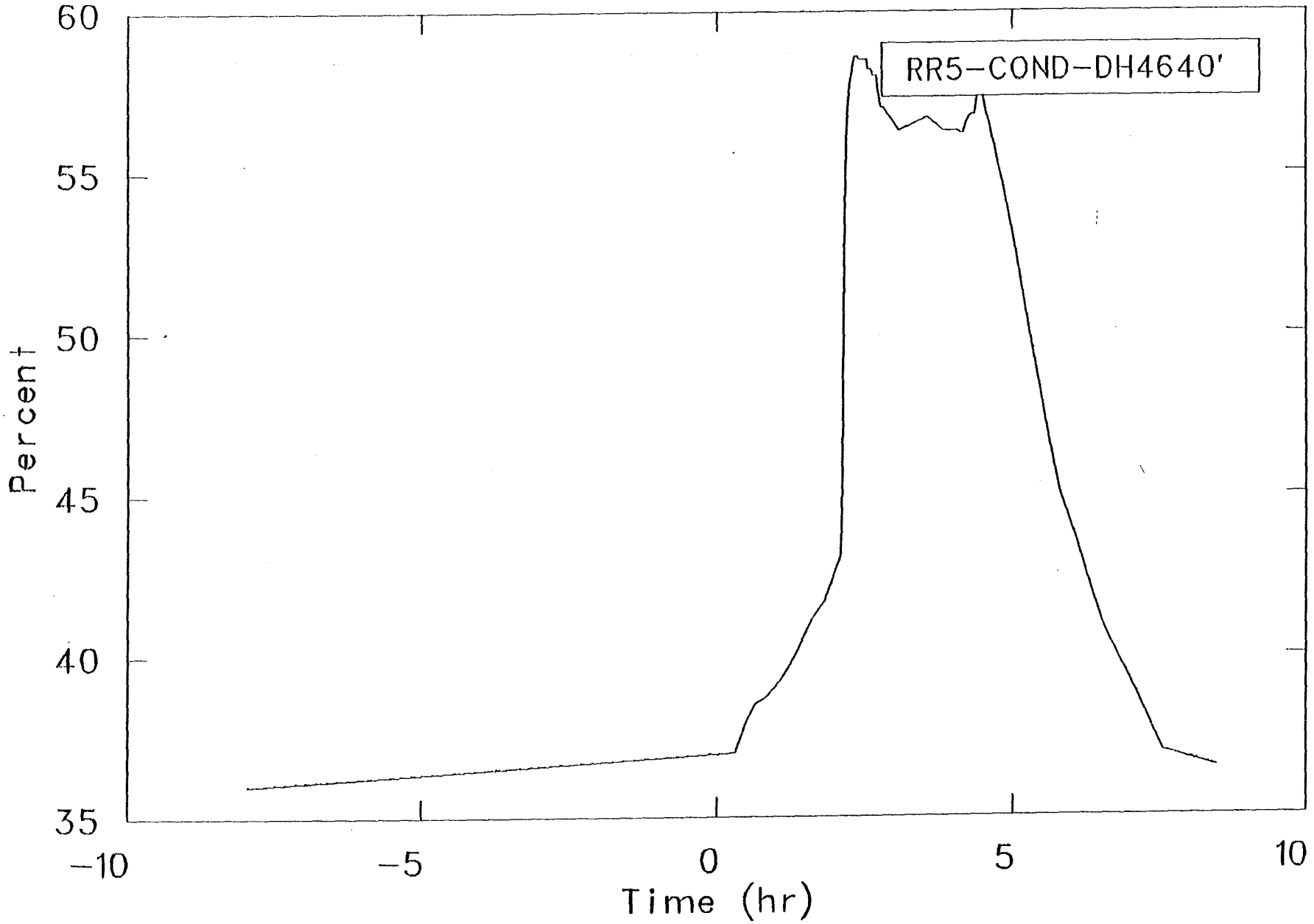
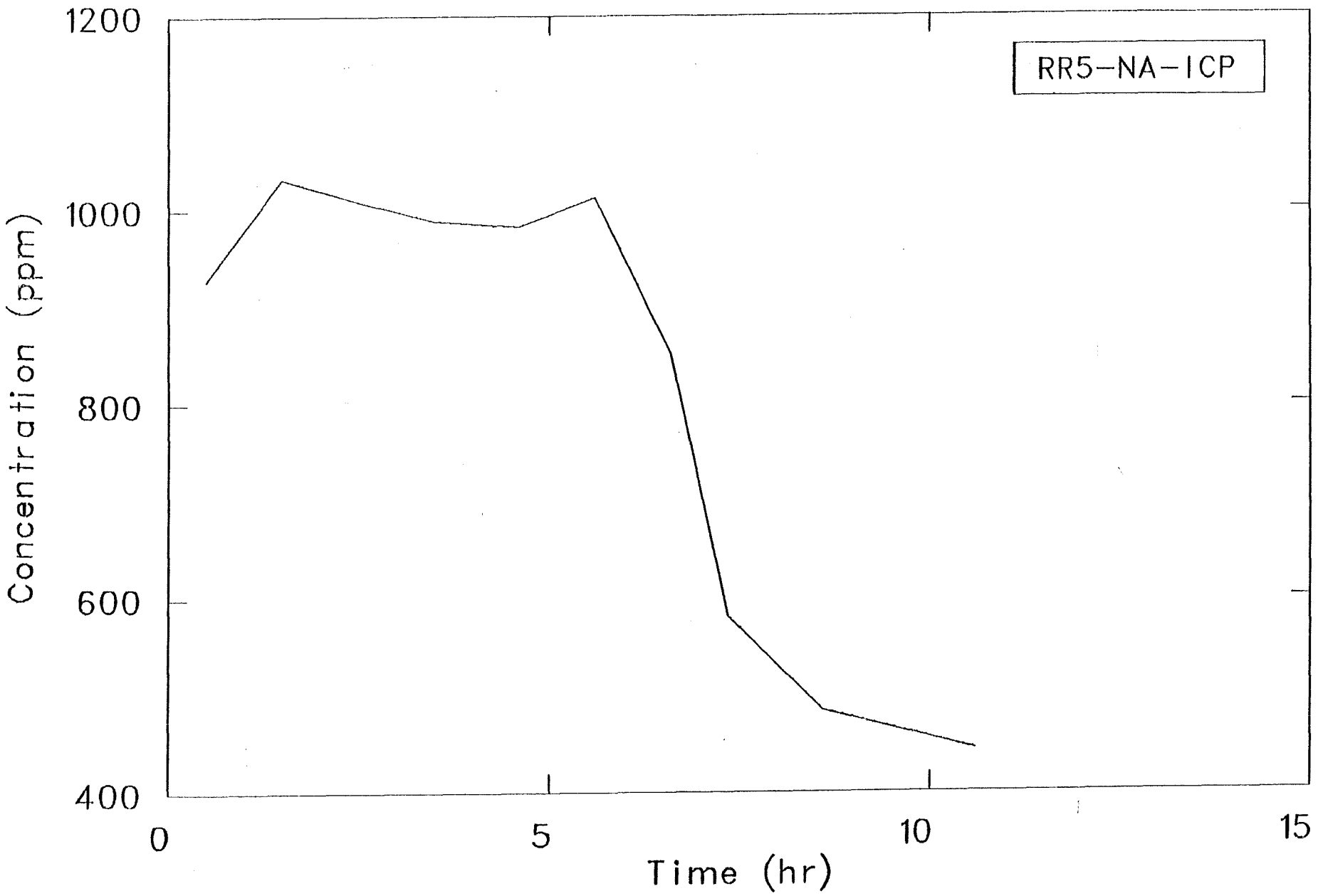
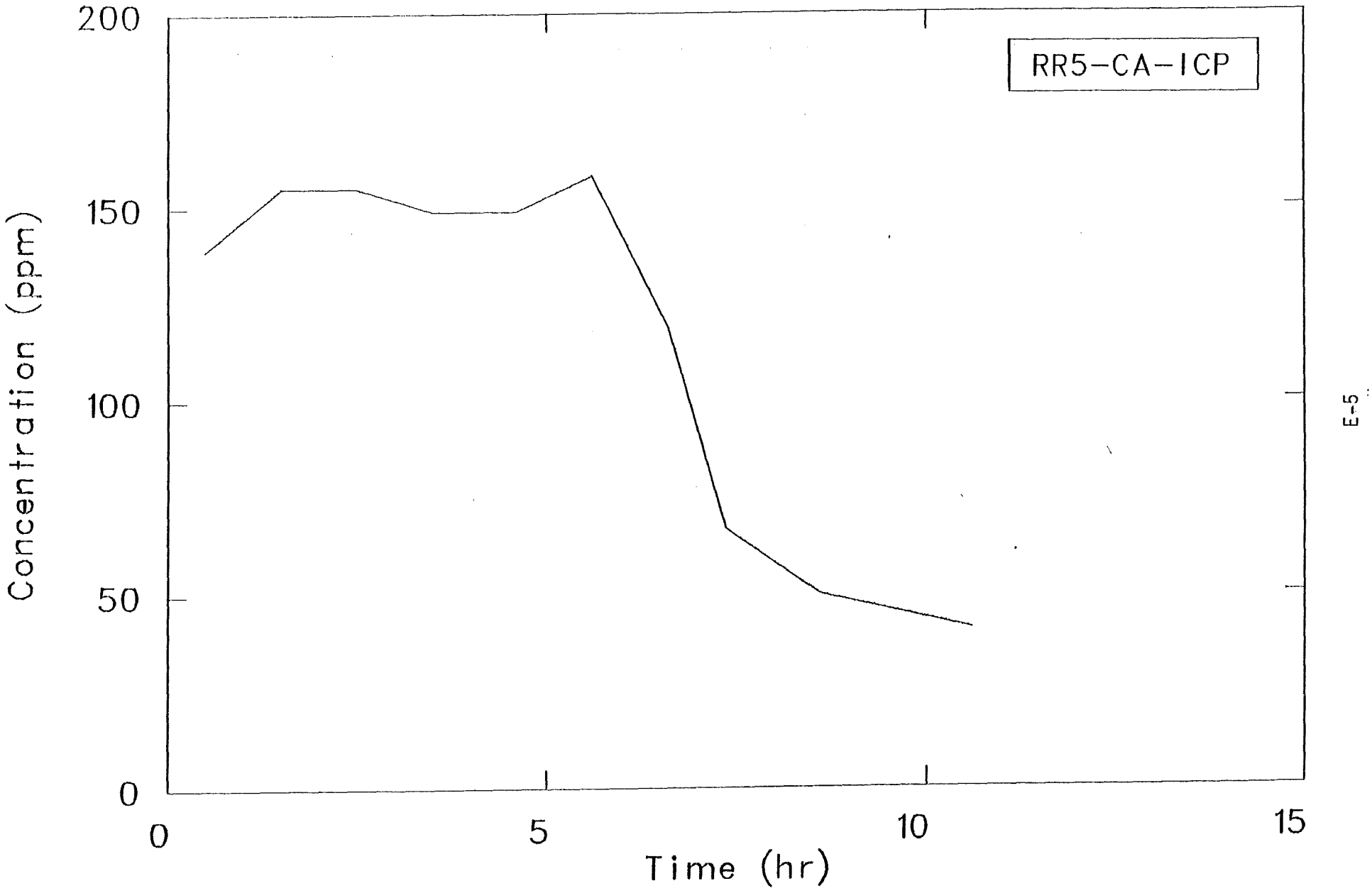
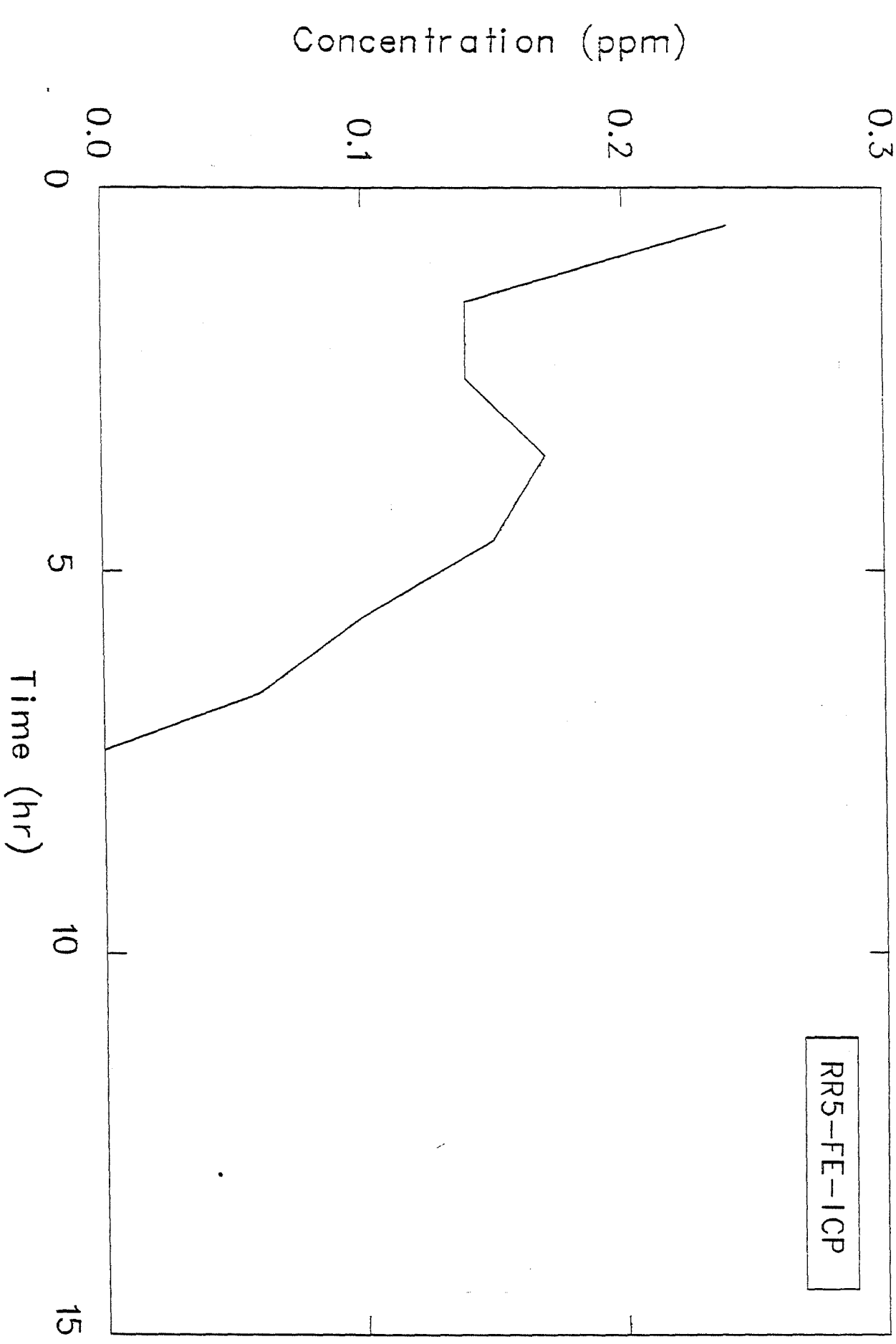
TABLE E. TEST 2A2
File Name: RR2A2820913
Date: 09-13-82
Start Time: Real--12:00; File Test Time: -44.94

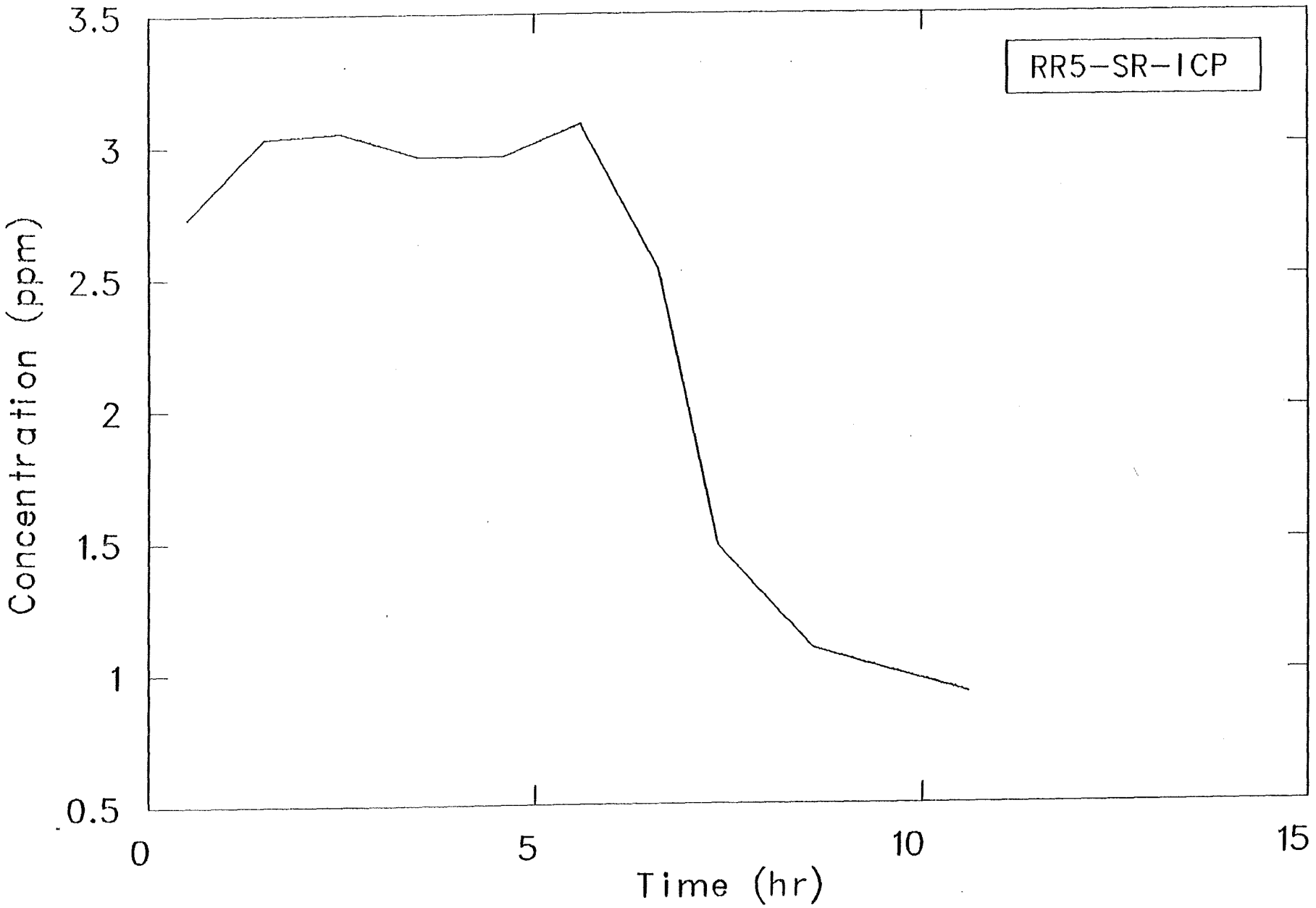
Record Name	#	Data Sampled	Recorder or Method	Units
RR5-COND-DH4640	1	Downhole Conductivity	Stripchart	%
RR5-TEMP-DH4640	2	Downhole Temperature	Stripchart	%
RR5-NA-ICP	3	Sodium	ICP	ppm
RR5-K-ICP	4	Potassium	ICP	ppm
RR5-CA-ICP	5	Calcium	ICP	ppm
RR5-MG-ICP	6	Magnesium	ICP	ppm
RR5-FE-ICP	7	Iron	ICP	ppm
RR5-SI02-ICP	8	Silica	ICP	ppm
RR5-SR-ICP	9	Strontium	ICP	ppm
RR5-LI-ICP	10	Lithium	ICP	ppm
RR5-B-ICP	11	Boron	ICP	ppm
RR5-TDS-ICP	12	TDS	Evaporation and weighing	ppm
RR5-SO4-ICP	13	Sulfate	Gravimetric	ppm
RR5-CL-ICP	14	Chloride	Titration	ppm
RR5-F-ICP	15	Fluoride	SIE	ppm
RR5-TEMP-M	16	Temperature	Manually recorded	°F
RR5-WP-D	17	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	18	Wellflow	Strip chart	±gpm
RR5-TEMP-SC	19	Temperature	Strip chart	°F
RR5-I-TR	20	Iodide	SIE	ppm
RR5-PH-TS	21	pH	SIE	standard
RR5-COND-TS	22	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	23	Alkalinity	Titration	ppm
RR5-PH-DL	24	pH	Data logger	millivolts
RR5-COND-DL	25	Conductivity	Data logger	µmho/cm
RR5-Redox-DL	26	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	27	Temperature	Data logger	°F


RR5-COND-DH4640'
60
55
50
45
40
35
Percent
-10
-5
0
5
10
Time (hr)

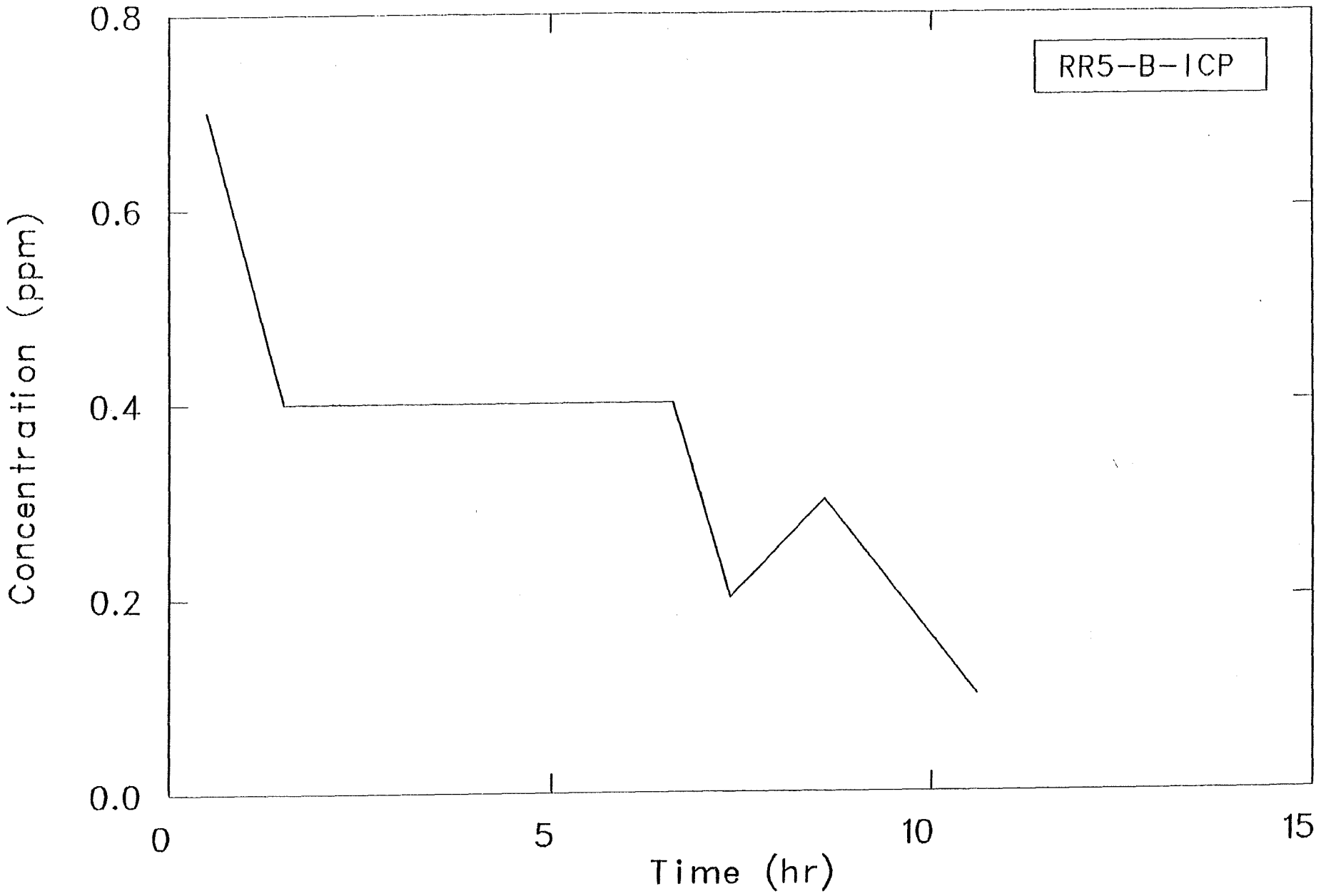

RR5-NA-ICP
1200
1000
800
600
400
Concentration (ppm)
0
5
10
15
Time (hr)

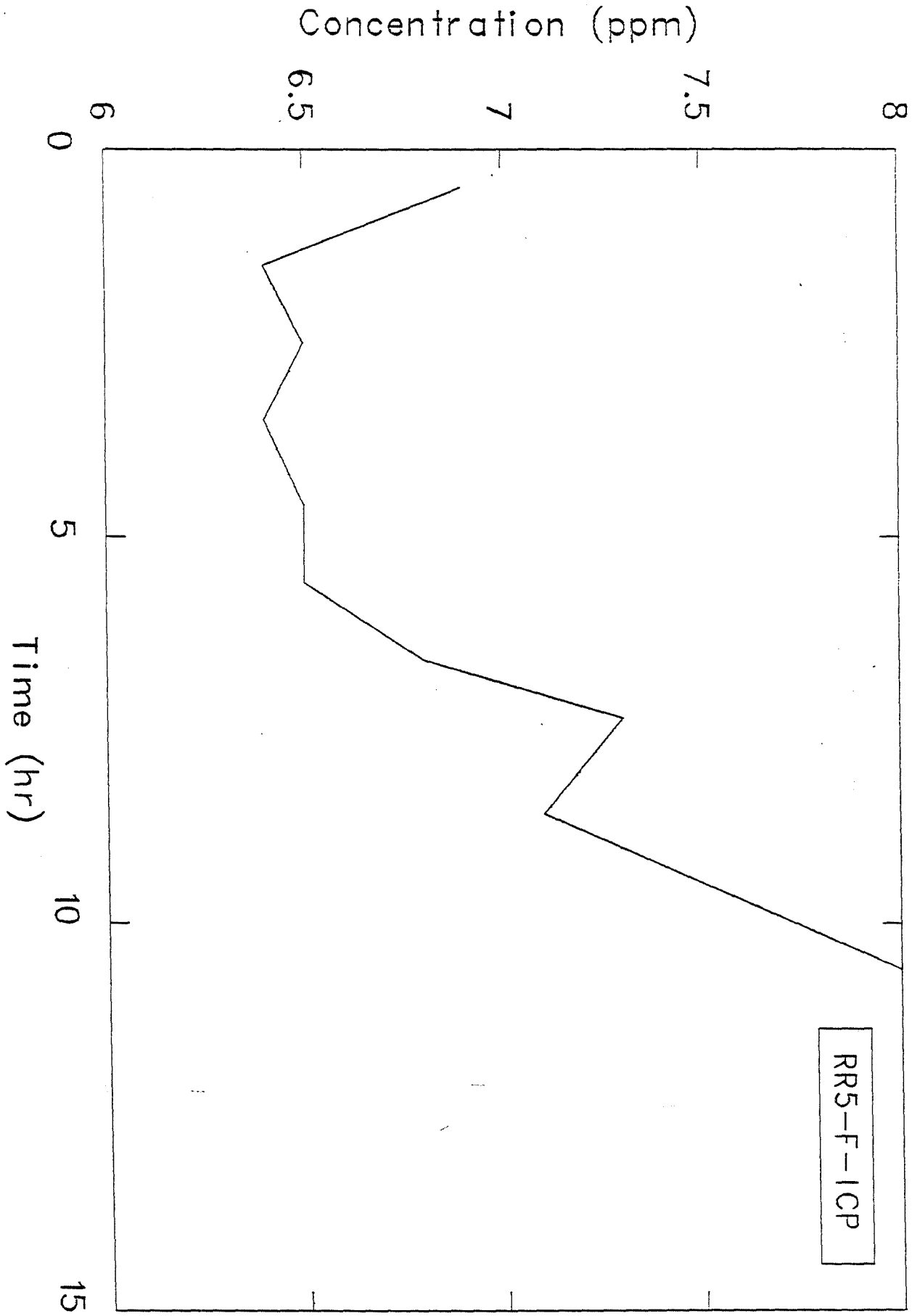

RR5-CA-ICP
Concentration (ppm)
200
150
100
50
0
0
5
10
15
Time (hr)

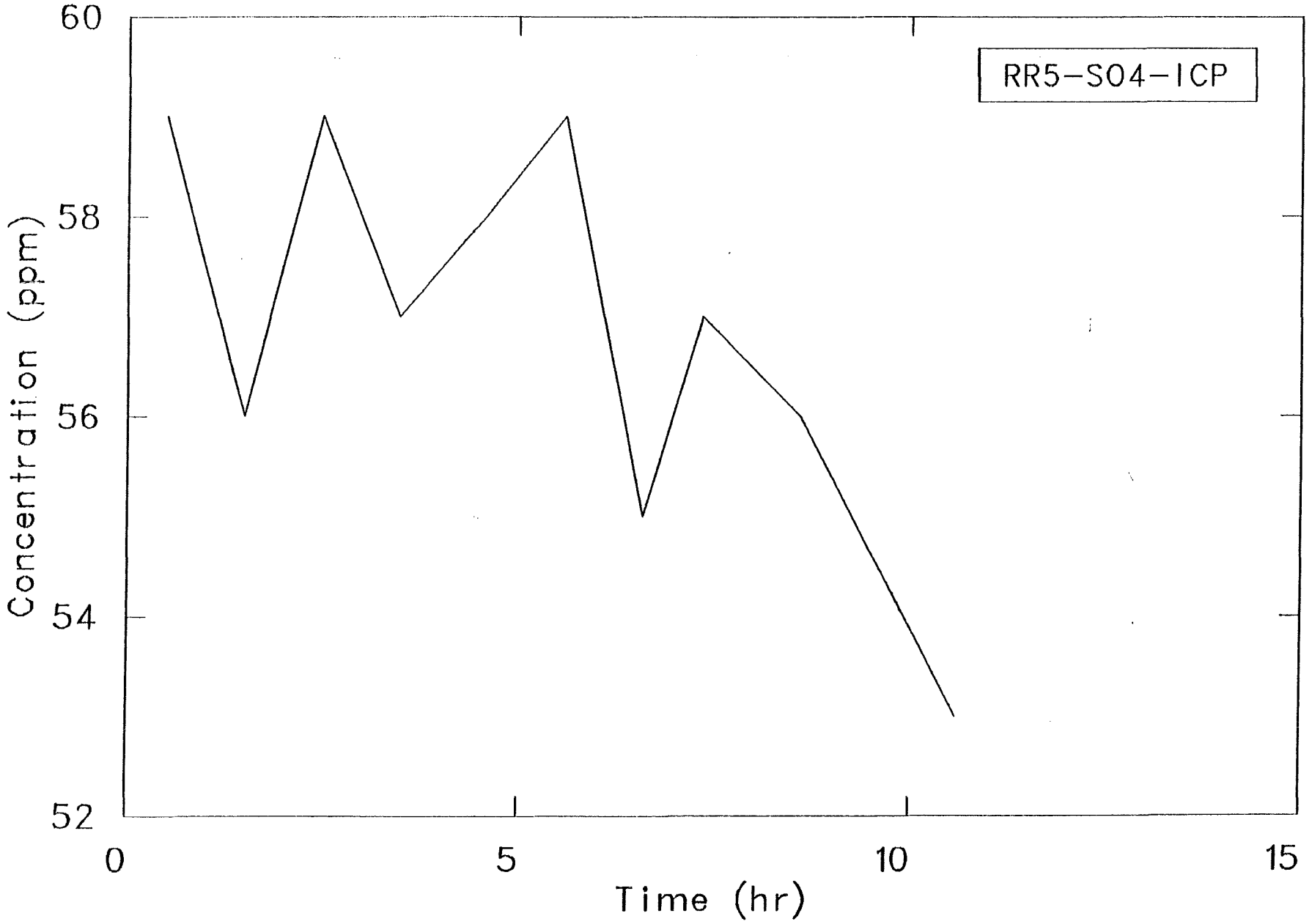

Concentration (ppm)
0.0
0.1
0.2
0.3
0
5
10
15
Time (hr)
RR5-FE-ICP

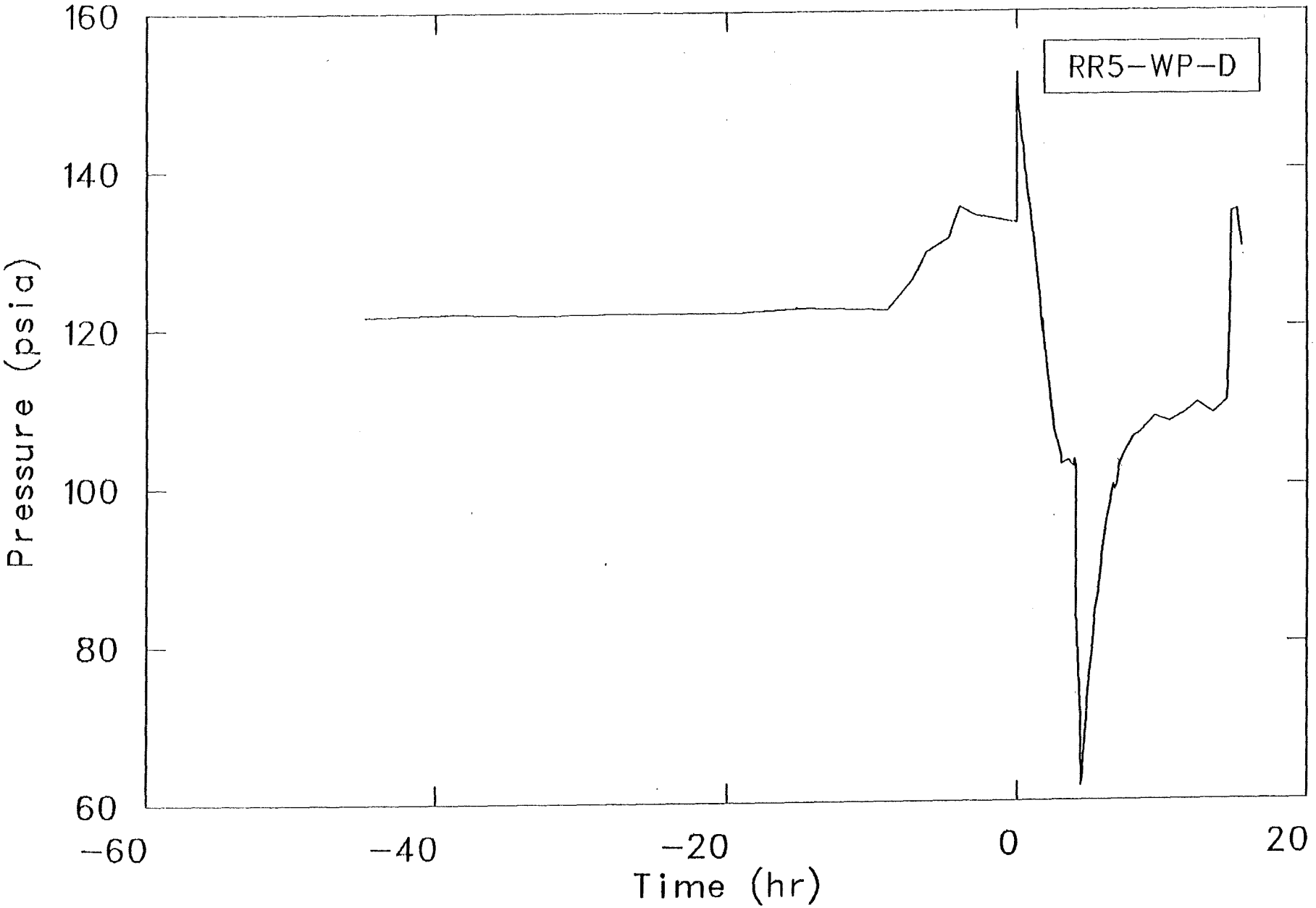


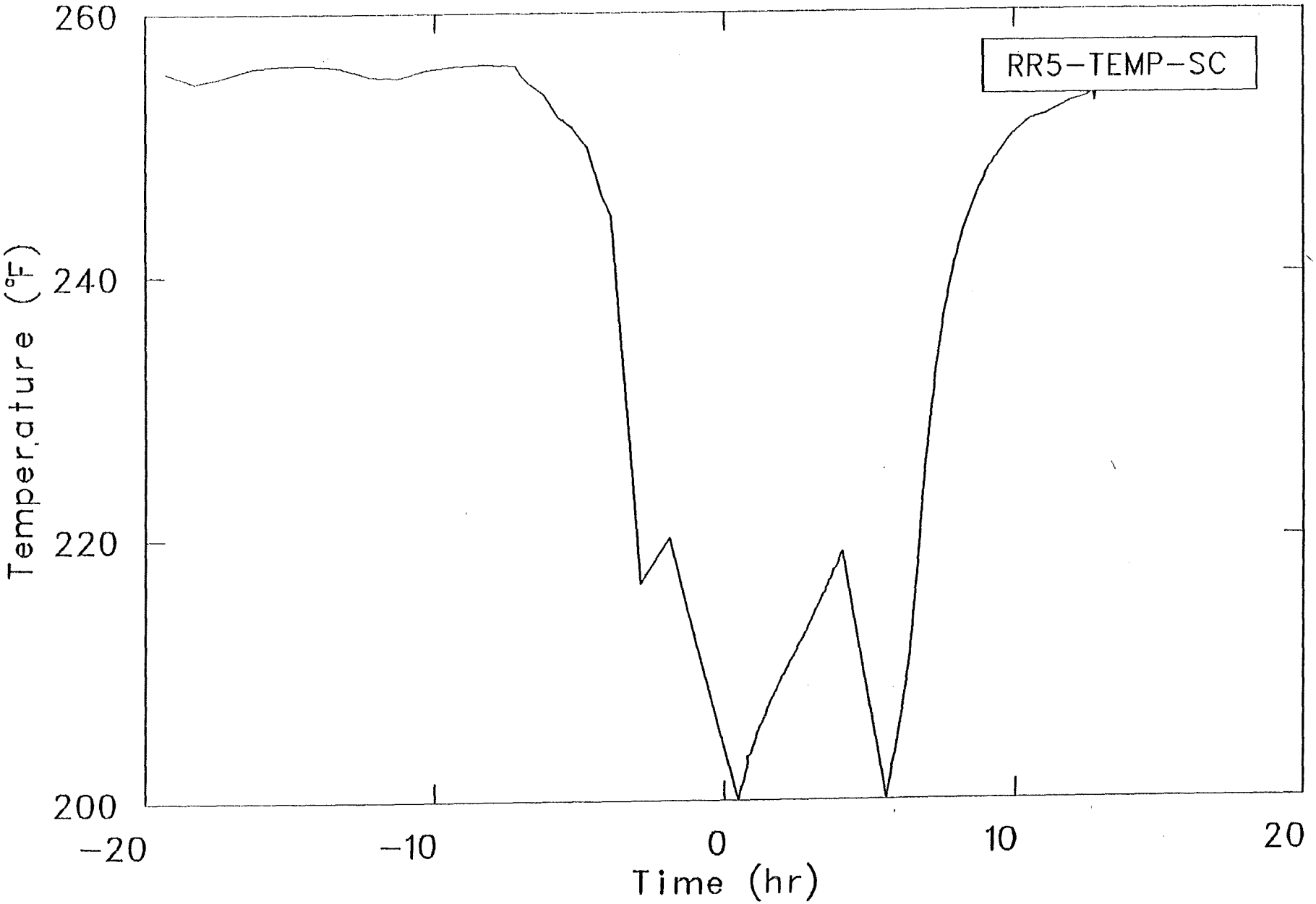
Fig

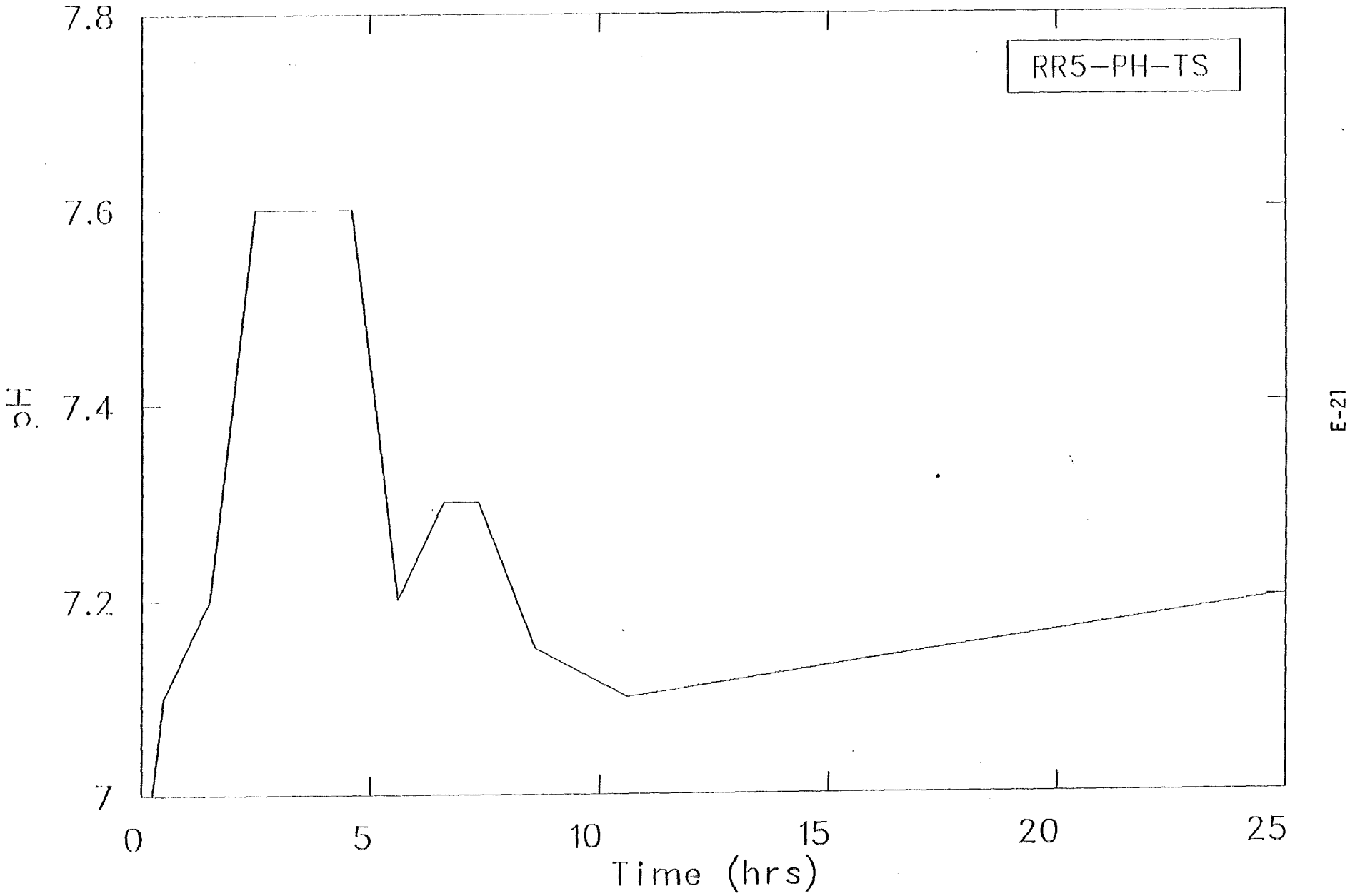

RR5-B-ICP
0.8
0.6
0.4
0.2
0.0
Concentration (ppm)
0
5
10
15
Time (hr)

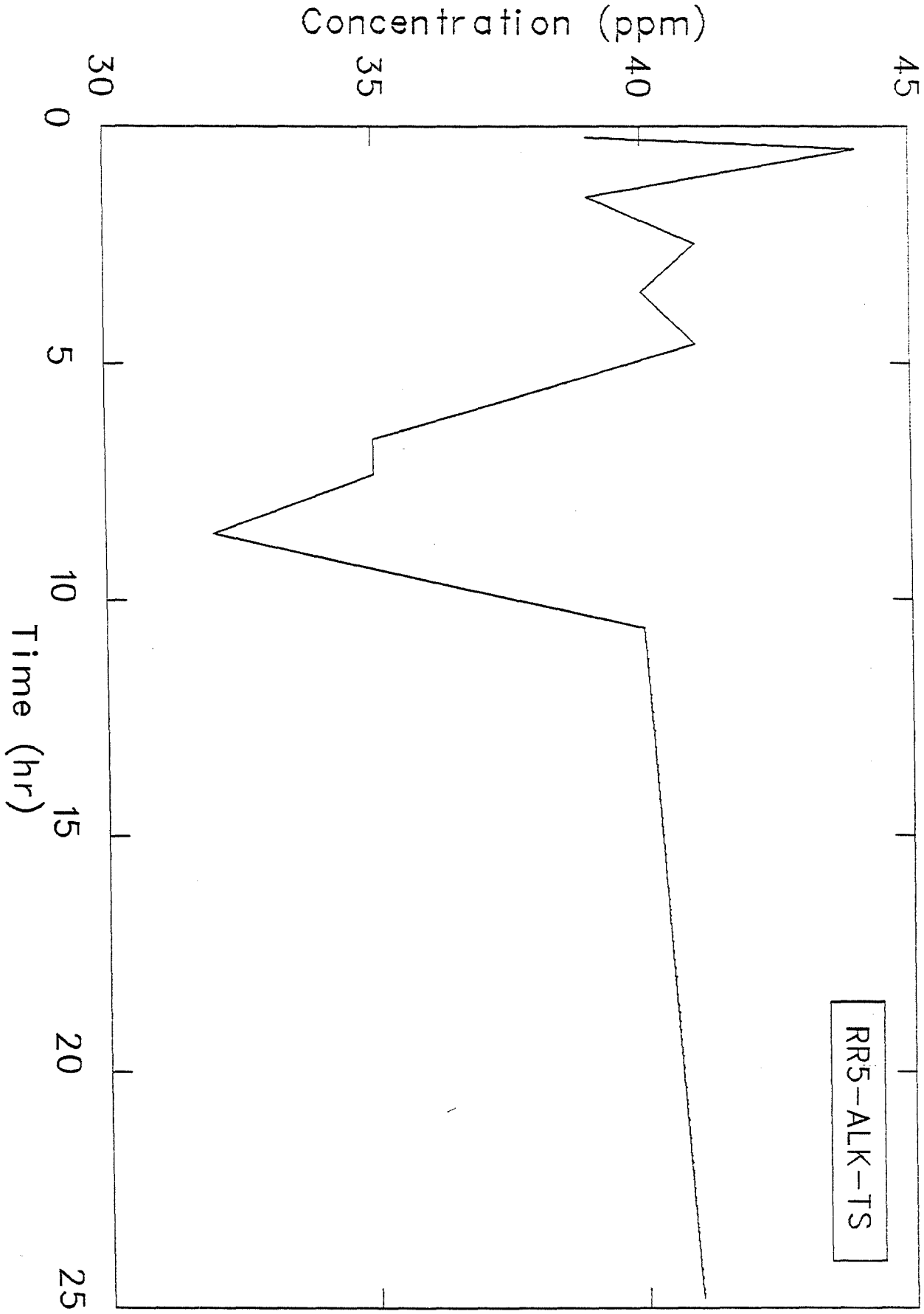

Concentration (ppm)
6
6.5
7
7.5
8
0
5
10
15
Time (hr)
RR5-F-ICP

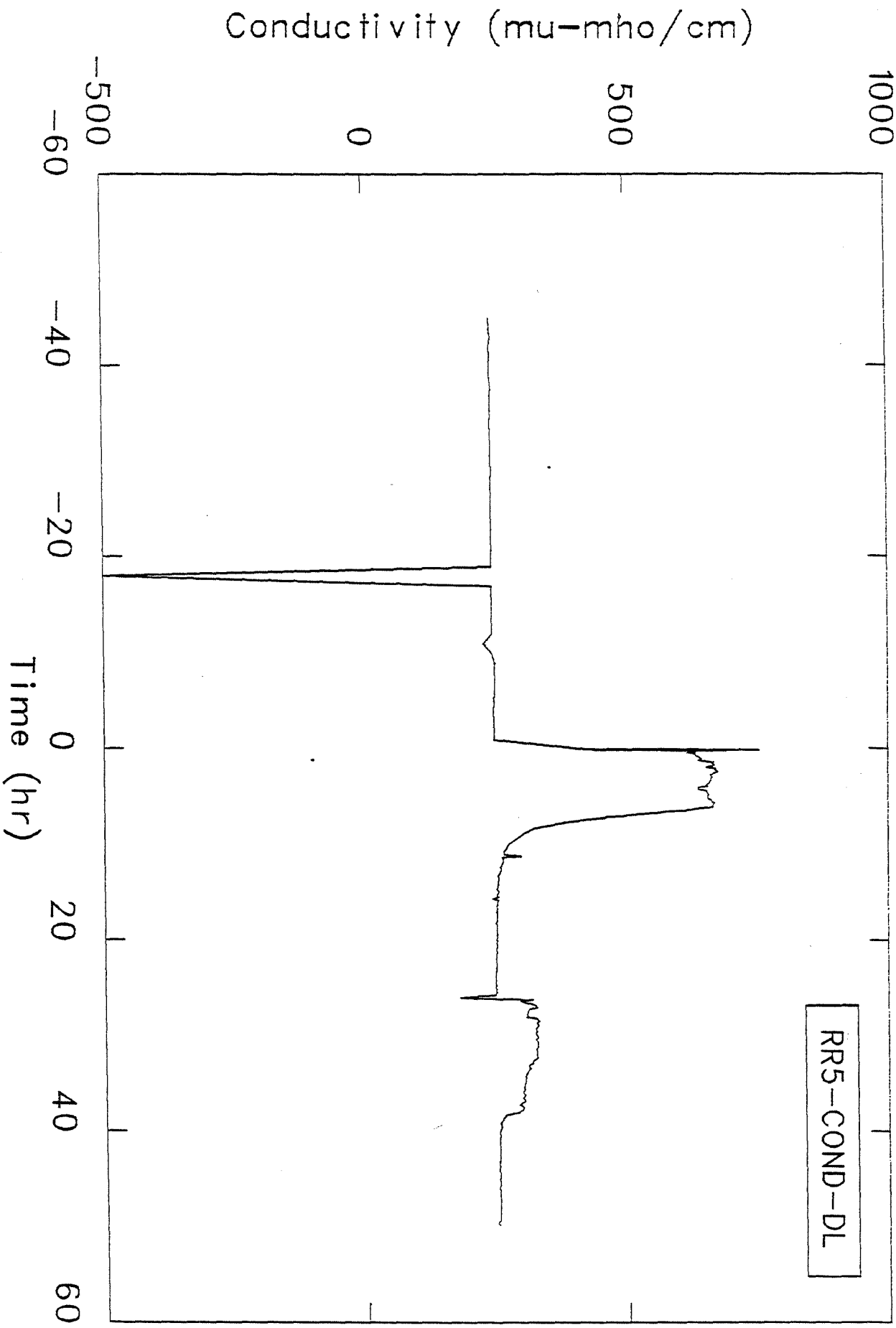

RR5-SO4-ICP
60
58
56
54
52
Concentration (ppm)
0
5
10
15
Time (hr)


RR5-WP-D
160
140
120
100
80
60
Pressure (psia)
-60
-40
-20
0
20
Time (hr)


RR5-TEMP-SC
260
240
220
200
Temperature (°F)
-20
-10
0
10
20
Time (hr)


RR5-PH-TS
7.8
7.6
7.4
7.2
7
pH
0
5
10
15
20
25
Time (hrs)


Concentration (ppm)
30
35
40
45
0
5
10
15
20
25
Time (hr)
RR5-ALK-TS


Conductivity (mu-mho/cm)
-500
0
500
1000
-60
-40
-20
0
20
40
60
Time (hr)
RR5-COND-DL

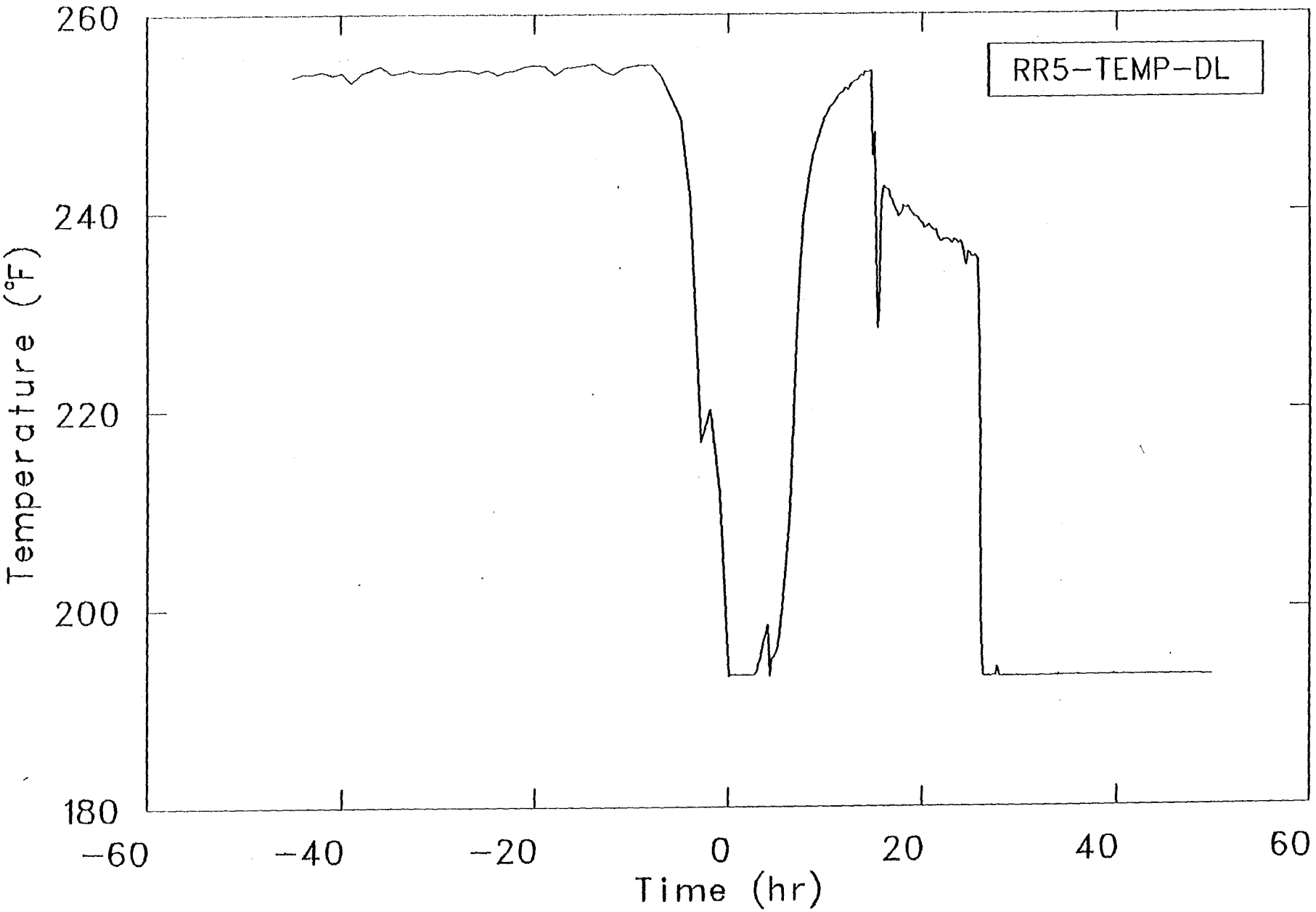
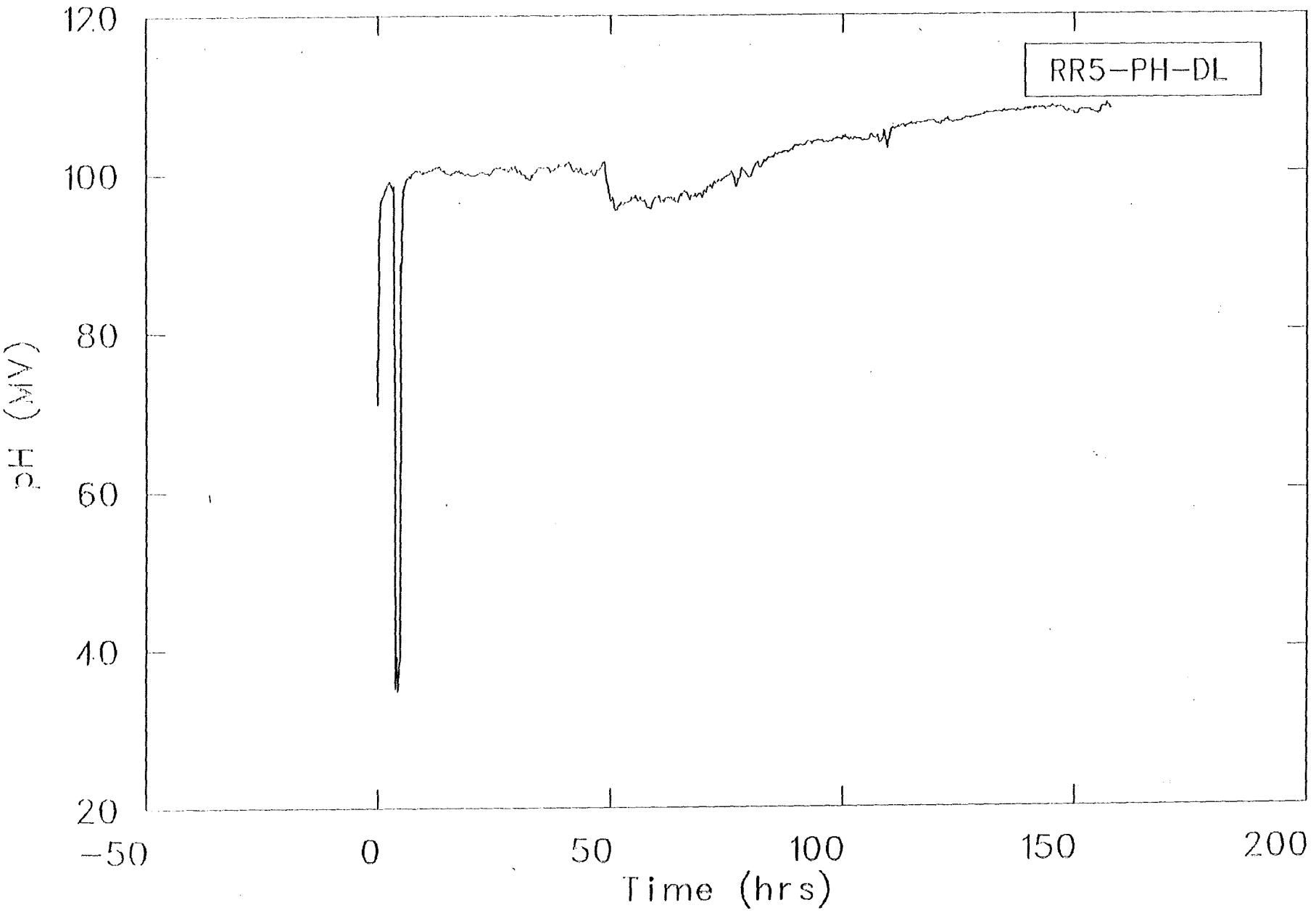

RR5-TEMP-DL
260
240
220
200
180
Temperature (°F)
-60
-40
-20
0
20
40
60
Time (hr)

TABLE F. TEST 2C
File Name: RR2C820921 Date: 09-21-82
Start Time: Real--00:00; File Start Time: -10.0

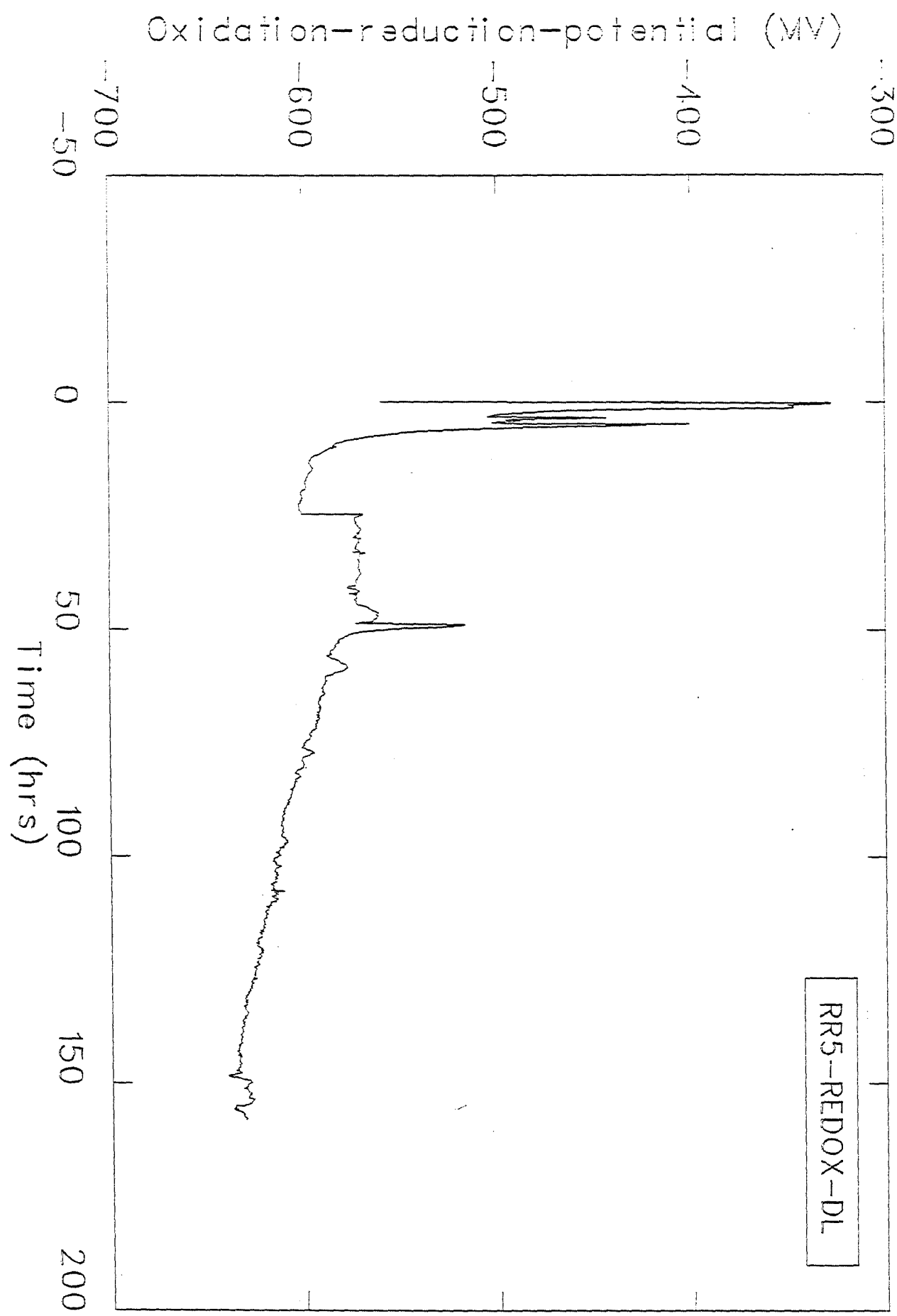
Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	µmho/cm
RR5-Redox-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	°F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR5-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-TDS-ICP	14	TDS	Evaporation and weighing	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	Titration	ppm
RR5-F-ICP	17	Fluoride	SIE	ppm
RR5-I-TR	18	Iodide	SIE	ppm
RR5-TEMP-M	19	Temperature	Manually recorded	°F
RR5-WP-D	20	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	21	Well flow	Stripchart	± gpm
RR5-TEMP-SC	22	Temperature	Stripchart	°F
RR5-FLUOR-TR	23	Fluorescein	Fluorometer	ppm
RR5-MG-TR	24	Magnesium	AA	ppm
RR5-PH-TS	25	pH	SIE	standard
RR5-COND-TS	26	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	27	Alkalinity	Titration	ppm

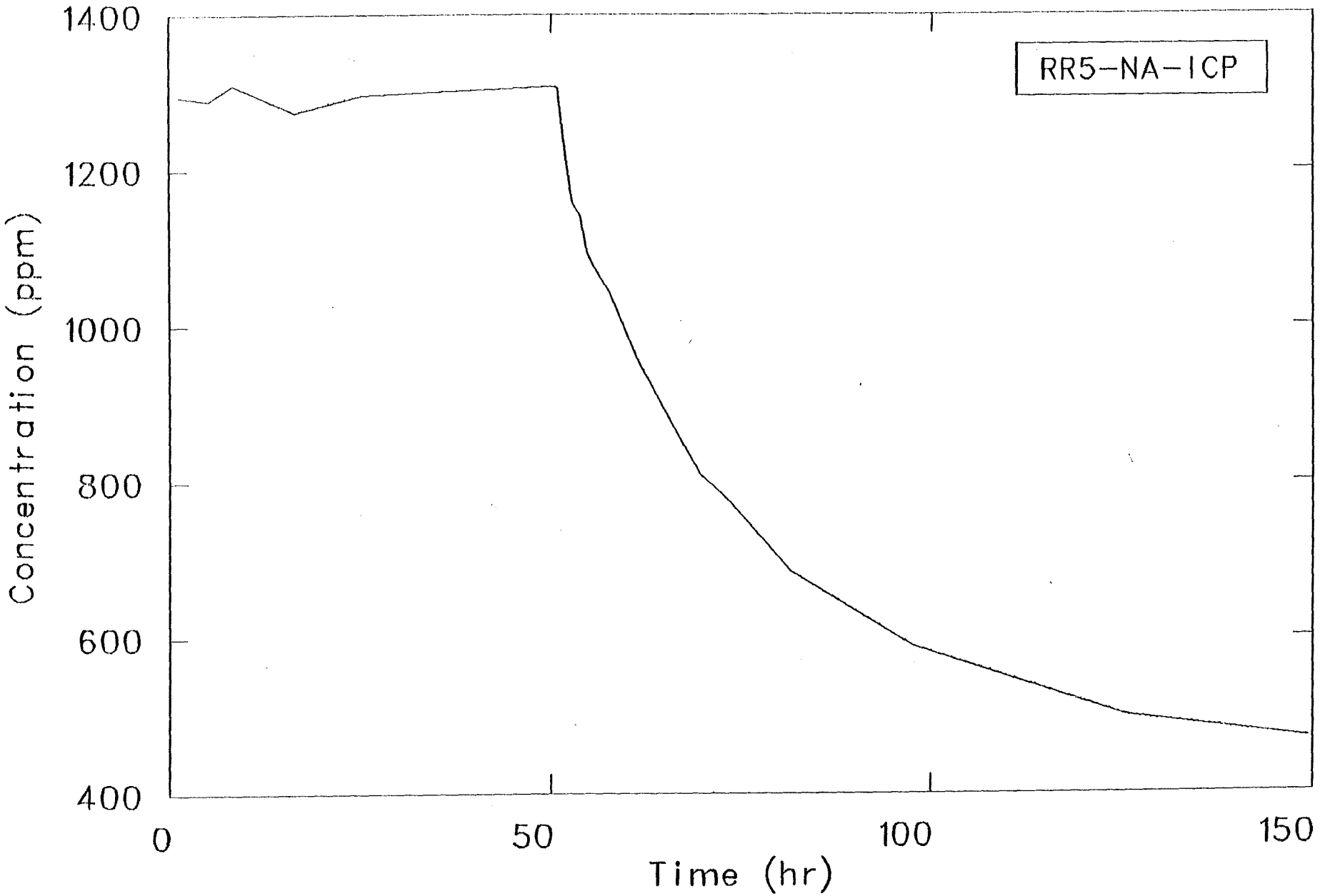
DOWNHOLE LOGS VERSUS DEPTH--TEST 2C

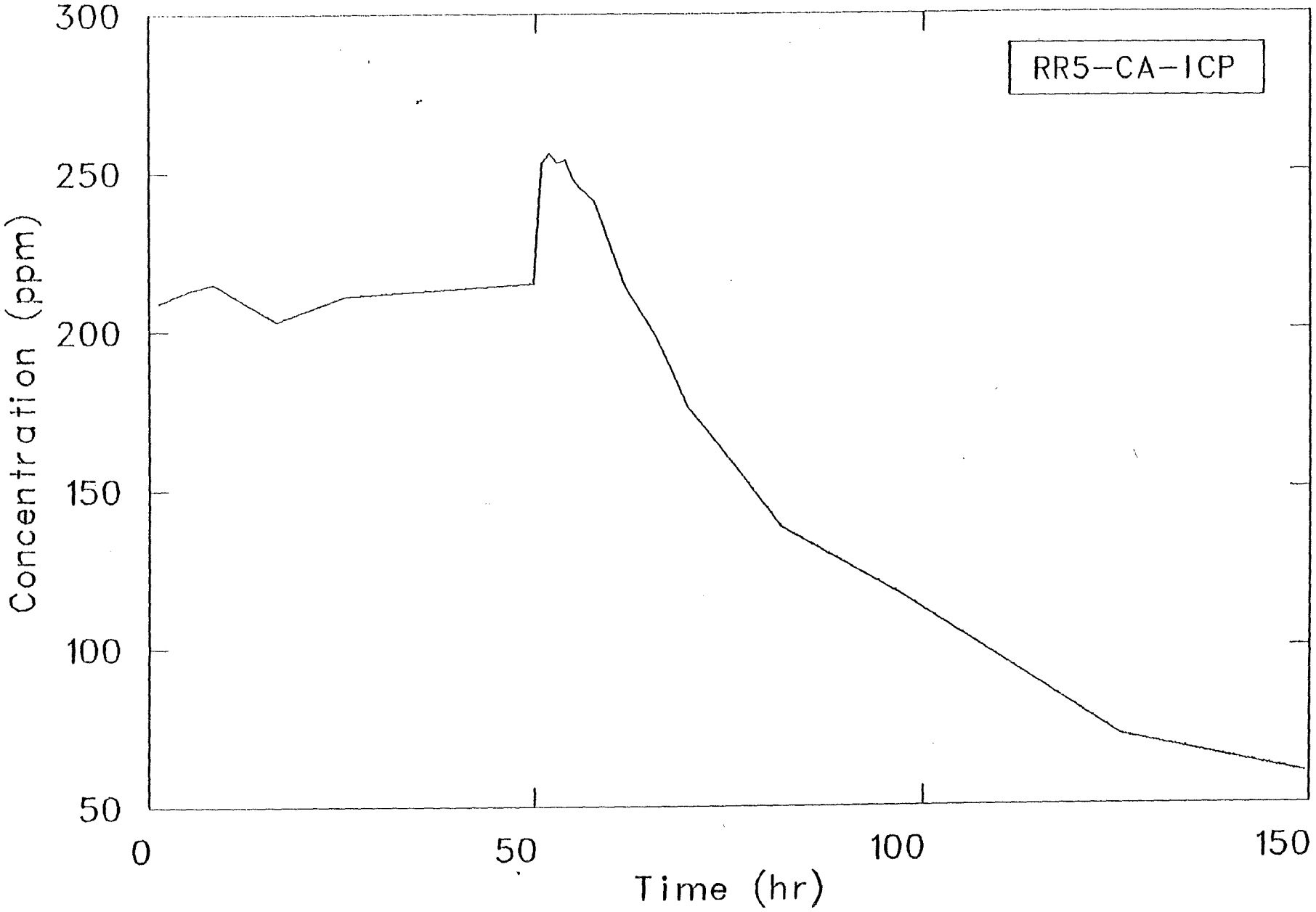
Record Name	#	Time	Data	Depth Logged	Units
0921 CON DHT-25D	28	12:32	Conductivity	4740' to 4830'	%
0921 TEM DHT-25D	29	12:32	Temperature	4740' to 4830'	°F
0921 CON DHT-25U	30	12:36	Conductivity	4830' to 4740'	%
0921 TEM DHT-25U	31	12:36	Temperature	4830' to 4740'	°F
0921 CON DHT-25U	32	12:20	Conductivity	4830' to 4765'	%
0921 TEM DHT-25U	33	12:20	Temperature	4830' to 4765'	°F
0921 CON DHT-75D	34	12:12	Conductivity	4637' to 4820'	%
0921 TEM DHT-75D	35	12:12	Temperature	4637' to 4820'	°F
0921 CON DHT-25U	36	12:14	Conductivity	4820' to 4750'	%
0921 TEM DHT-25U	37	12:14	Temperature	4820' to 4750'	°F
0921 CON DHT-50D	38	12:17	Conductivity	4750' to 4830'	%
0921 TEM DHT-50D	39	12:17	Temperature	4750' to 4830'	°F
0921 CON DHT-25D	40	12:23	Conductivity	4770' to 4820'	%
0921 TEM DHT-25D	41	12:23	Temperature	4770' to 4820'	°F
0921 CON DHT-25U	42	12:26	Conductivity	4820' to 4770'	%
0921 TEM DHT-25U	43	12:26	Temperature	4820' to 4770'	°F
0922 TEM DHT-30U	44	17:00	Temperature	4835' to 0'	°F
0927 TEM DHT-20D	45	15:30	Temperature	4600' to 4838'	°F

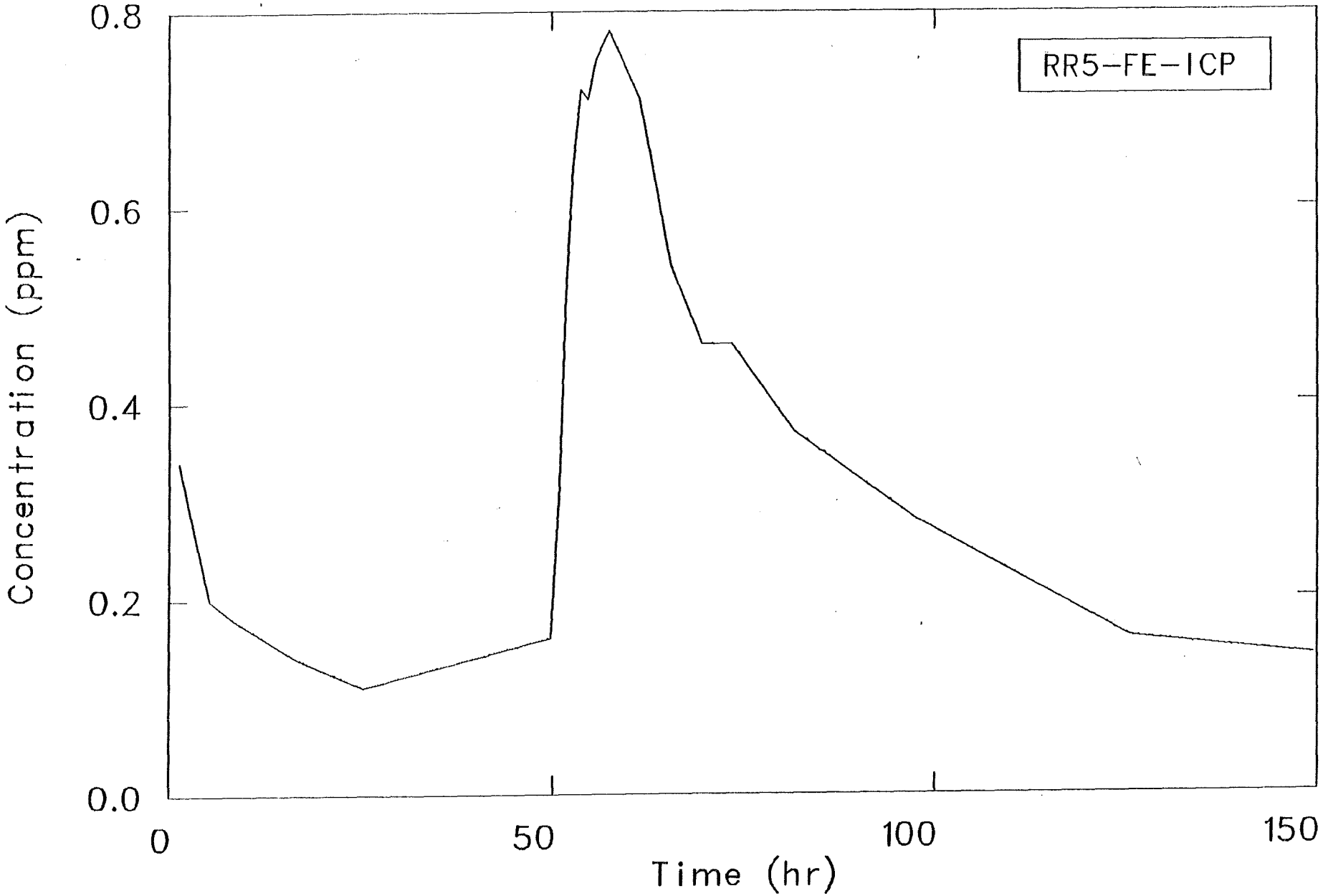


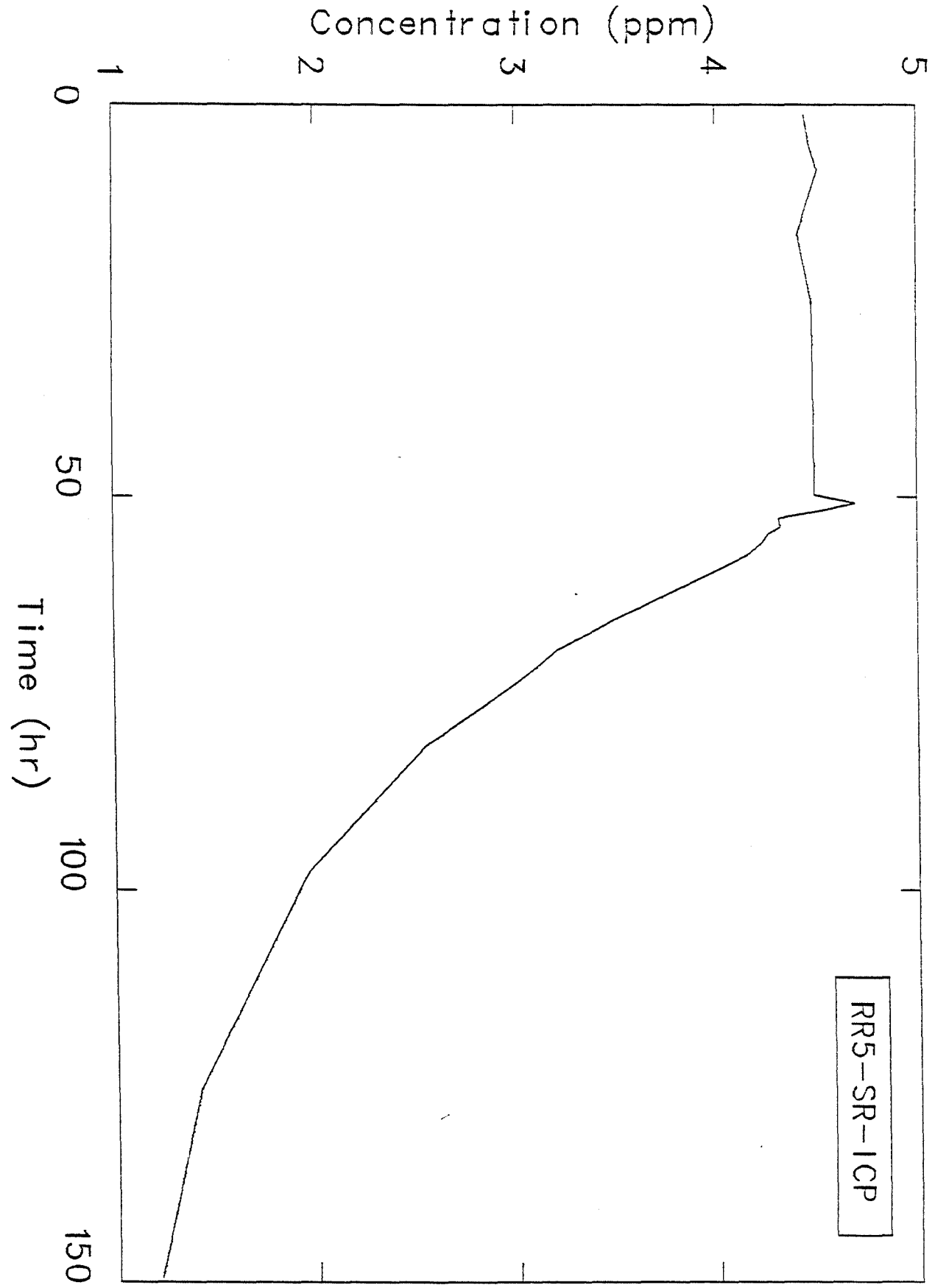
F-1

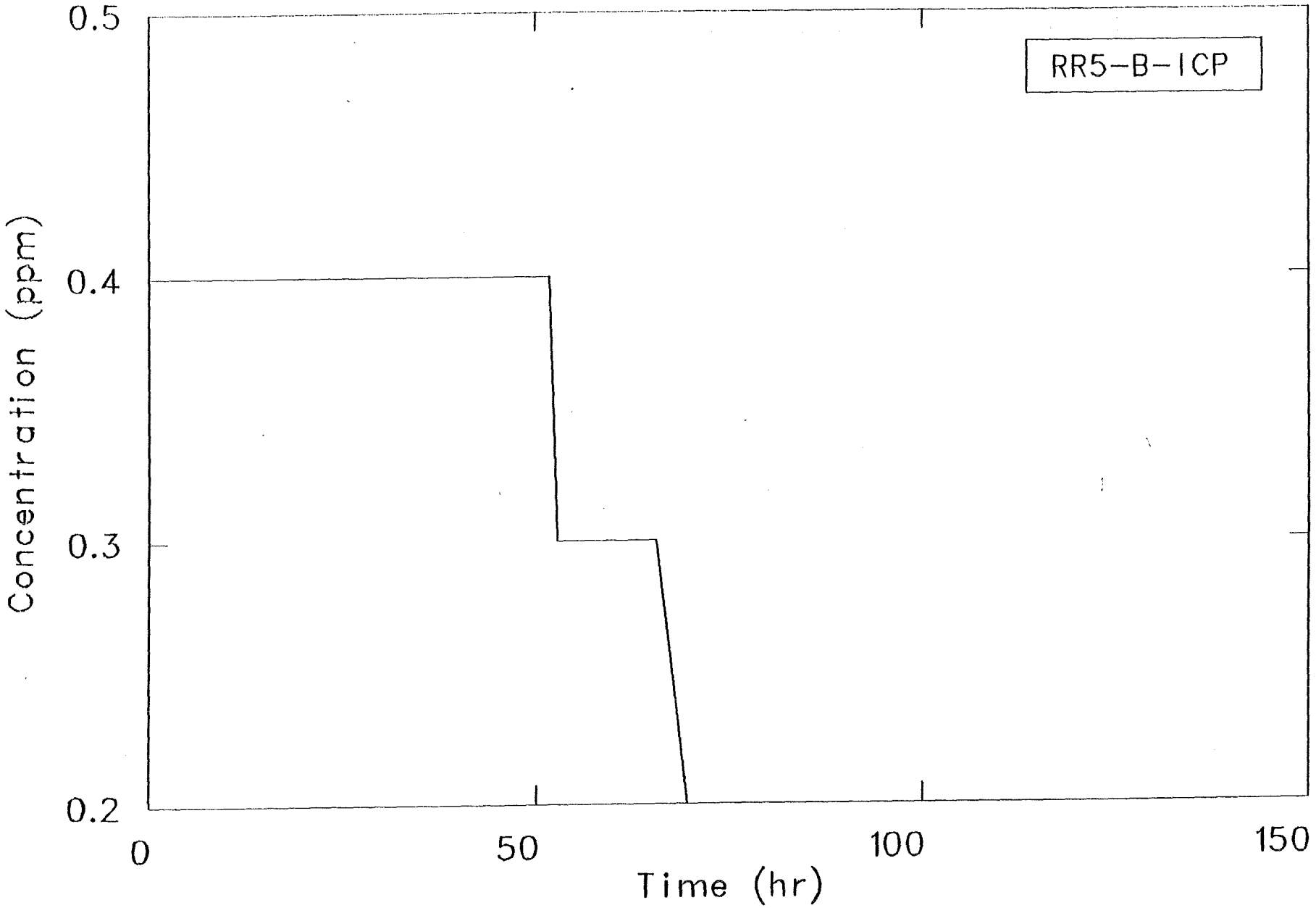

Oxidation-reduction-potential (MV)
-700
-600
-500
-400
-300
-50
0
50
100
150
200
Time (hrs)
RR5-REDOX-DL


RR5-NA-ICP
1400
1200
1000
800
600
400
Concentration (ppm)
0
50
100
150
Time (hr)

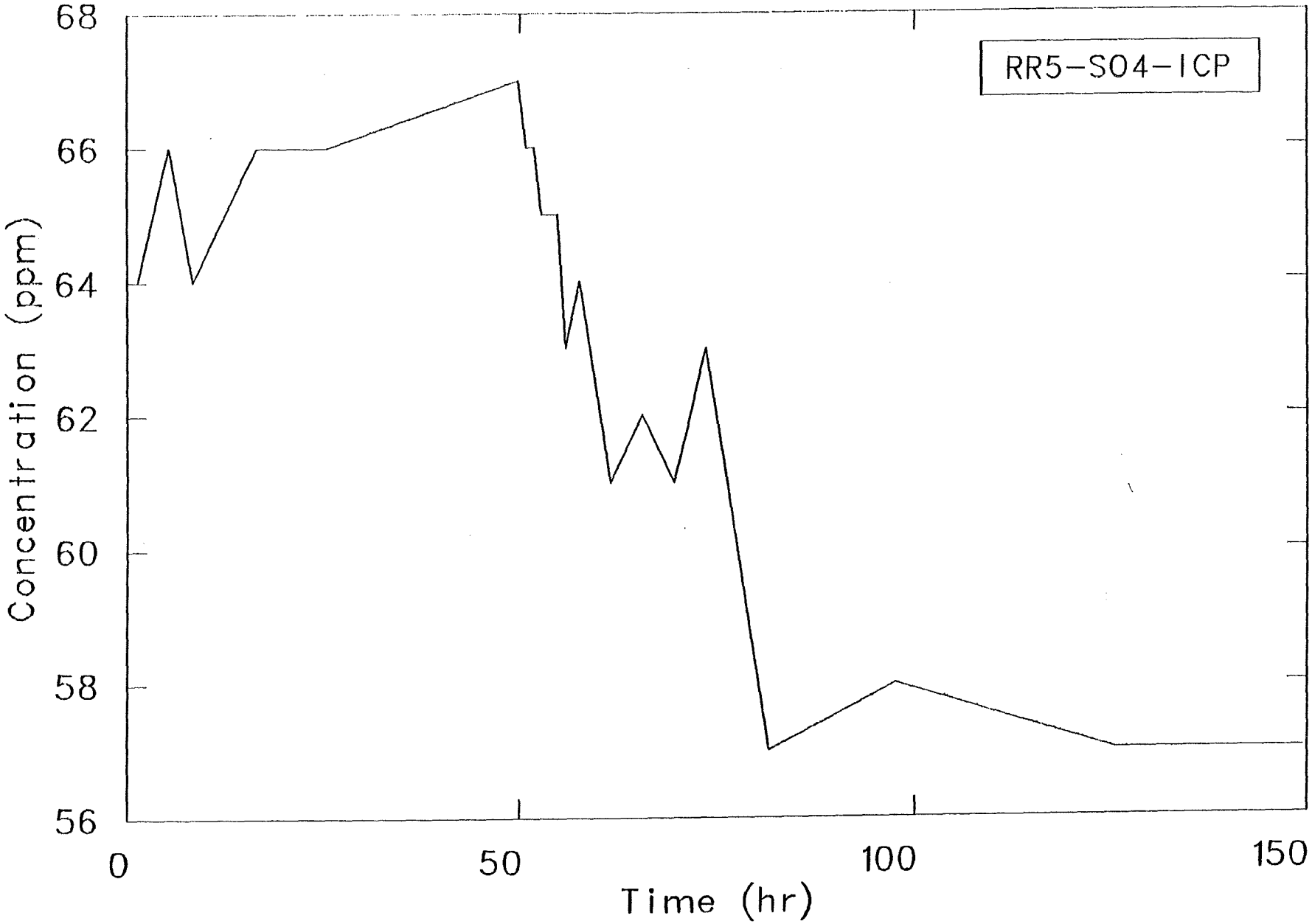

RR5-CA-ICP
300
250
200
150
100
50
Concentration (ppm)
0
50
100
150
Time (hr)


RR5-FE-ICP
Concentration (ppm)
0.0
0.2
0.4
0.6
0.8
0
50
100
150
Time (hr)

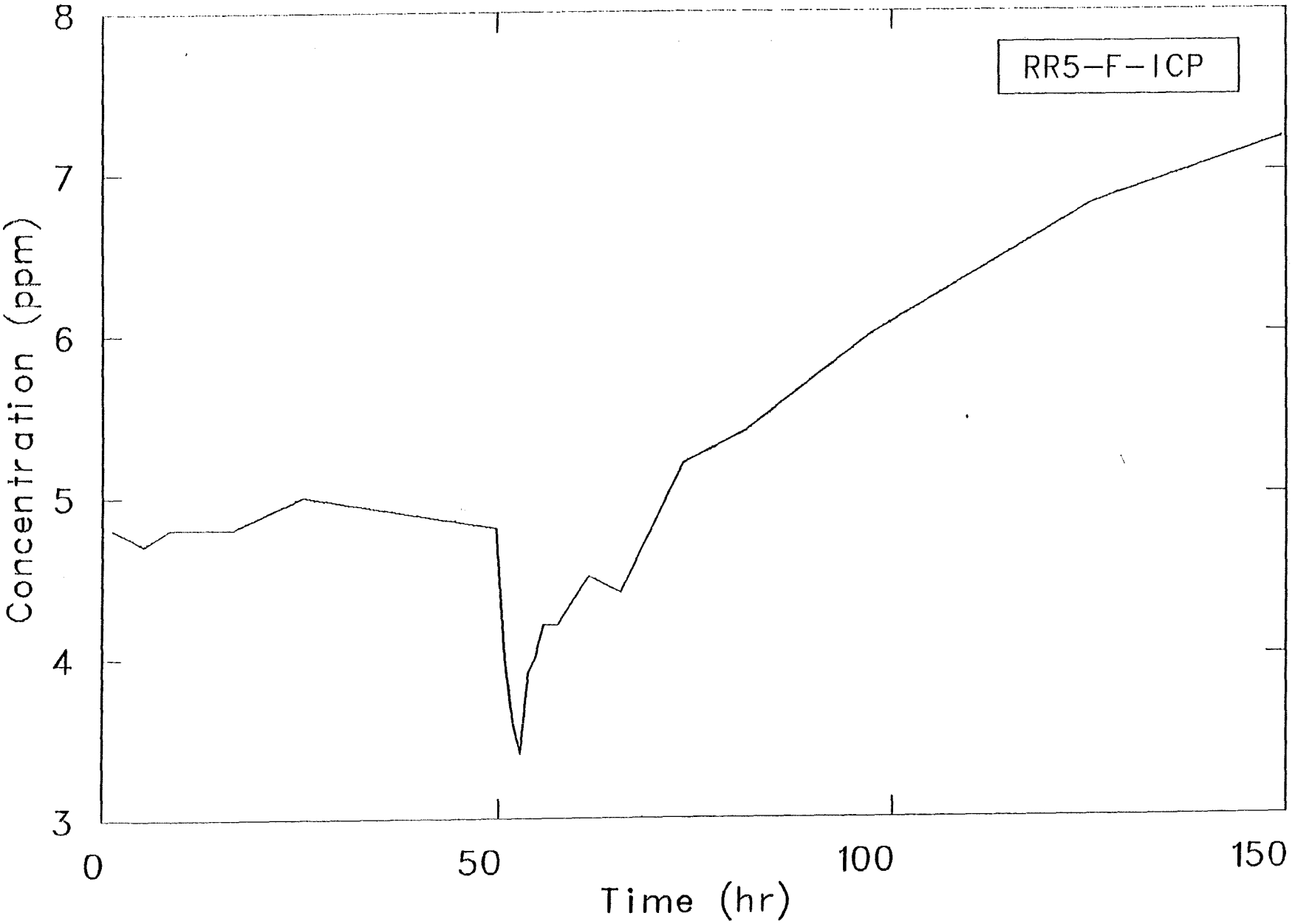

Concentration (ppm)
1
2
3
4
5
0
50
100
150
Time (hr)
RR5-SR-ICP

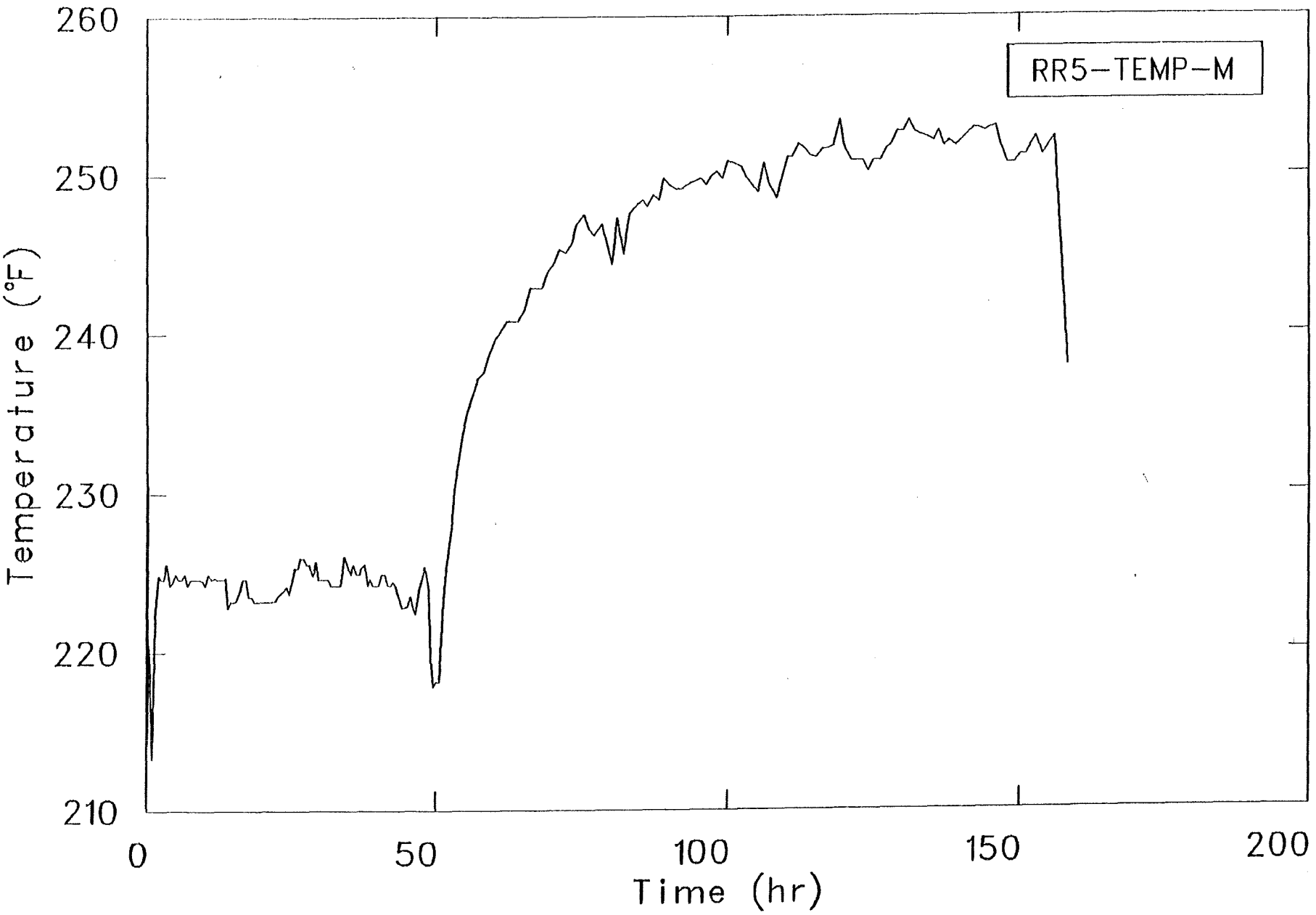


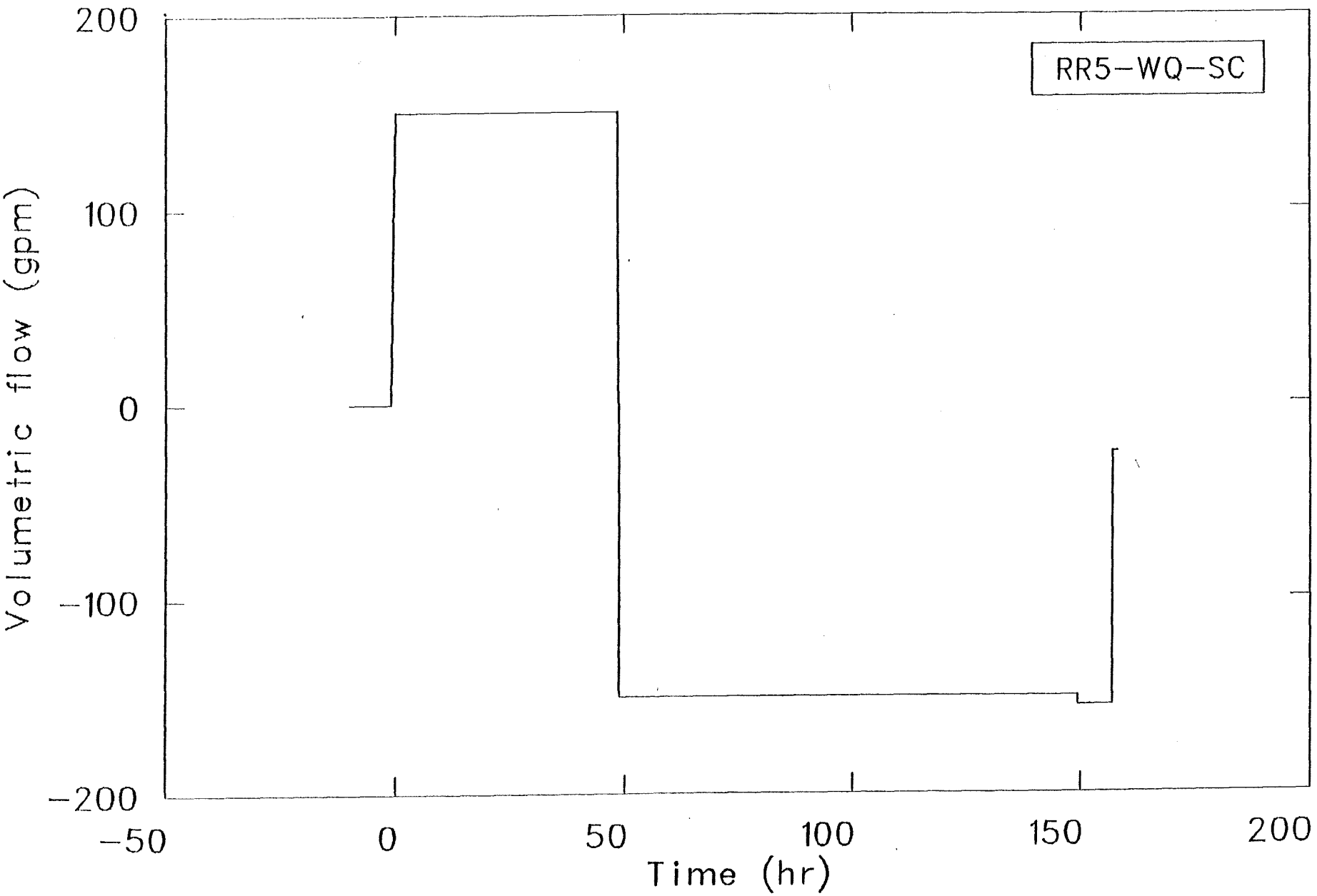
F-13

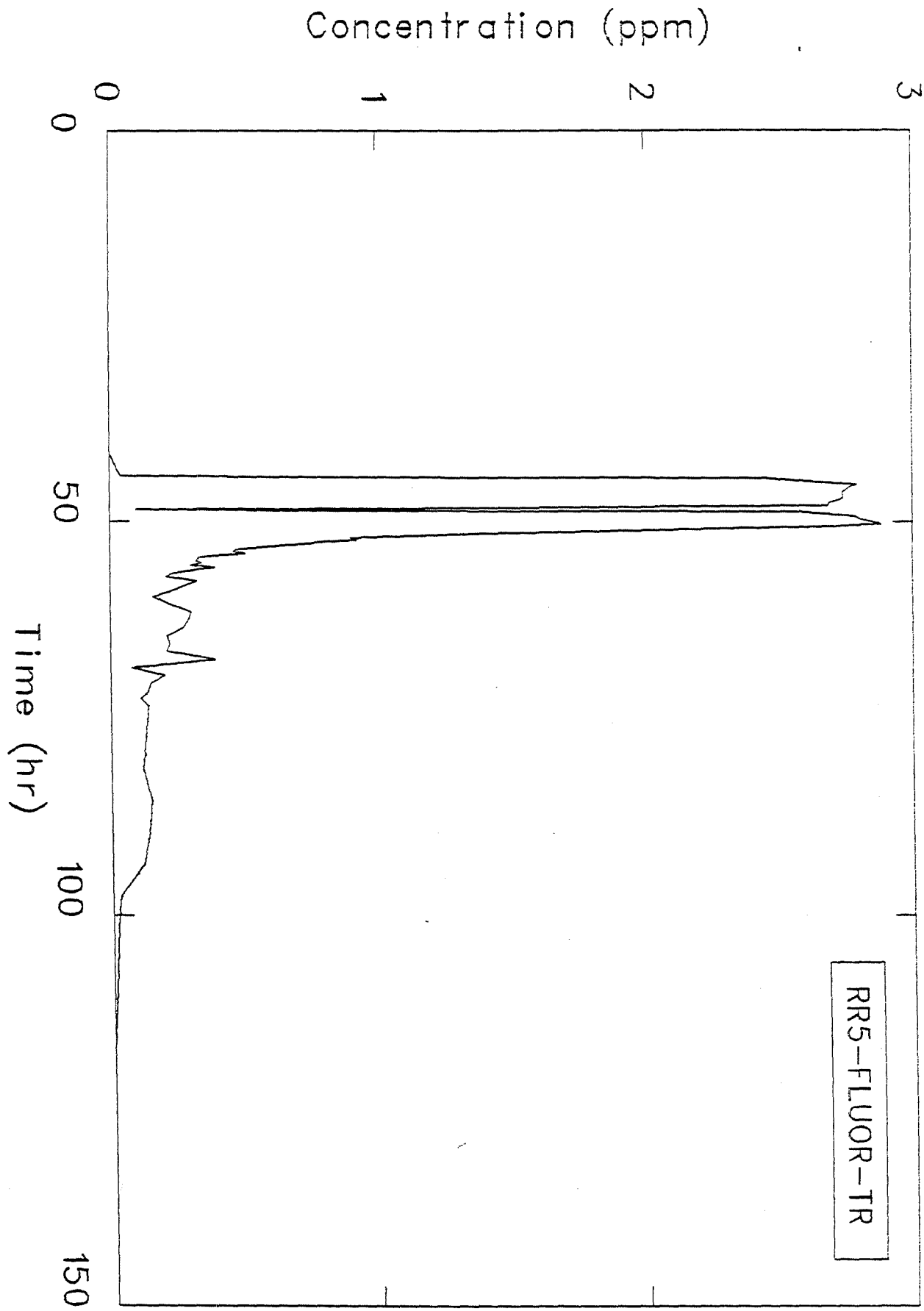

RR5-SO4-ICP
Concentration (ppm)
68
66
64
62
60
58
56
0
50
100
150
Time (hr)

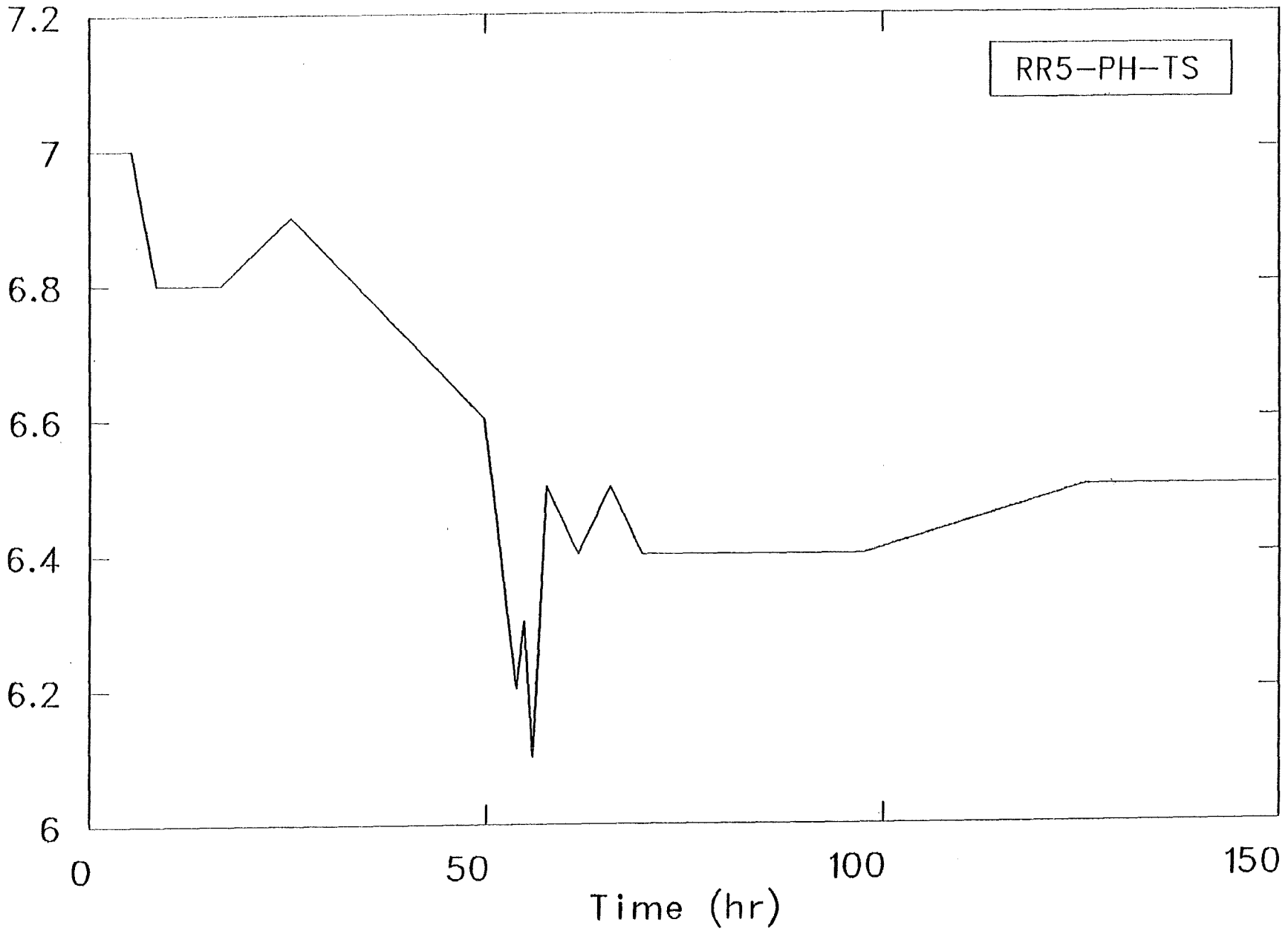
F-15

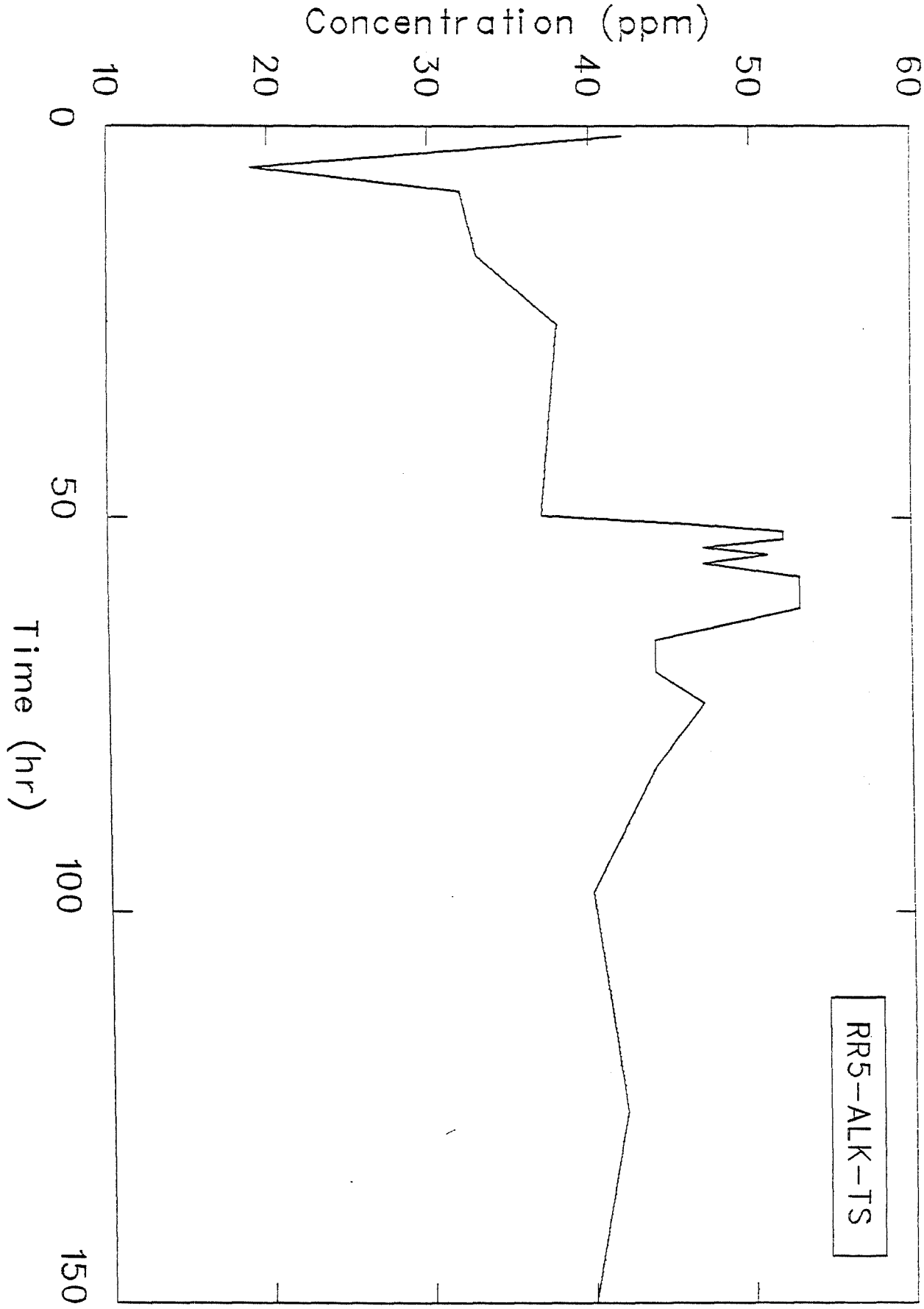

RR5-F-ICP
Concentration (ppm)
8
7
6
5
4
3
0
50
100
150
Time (hr)

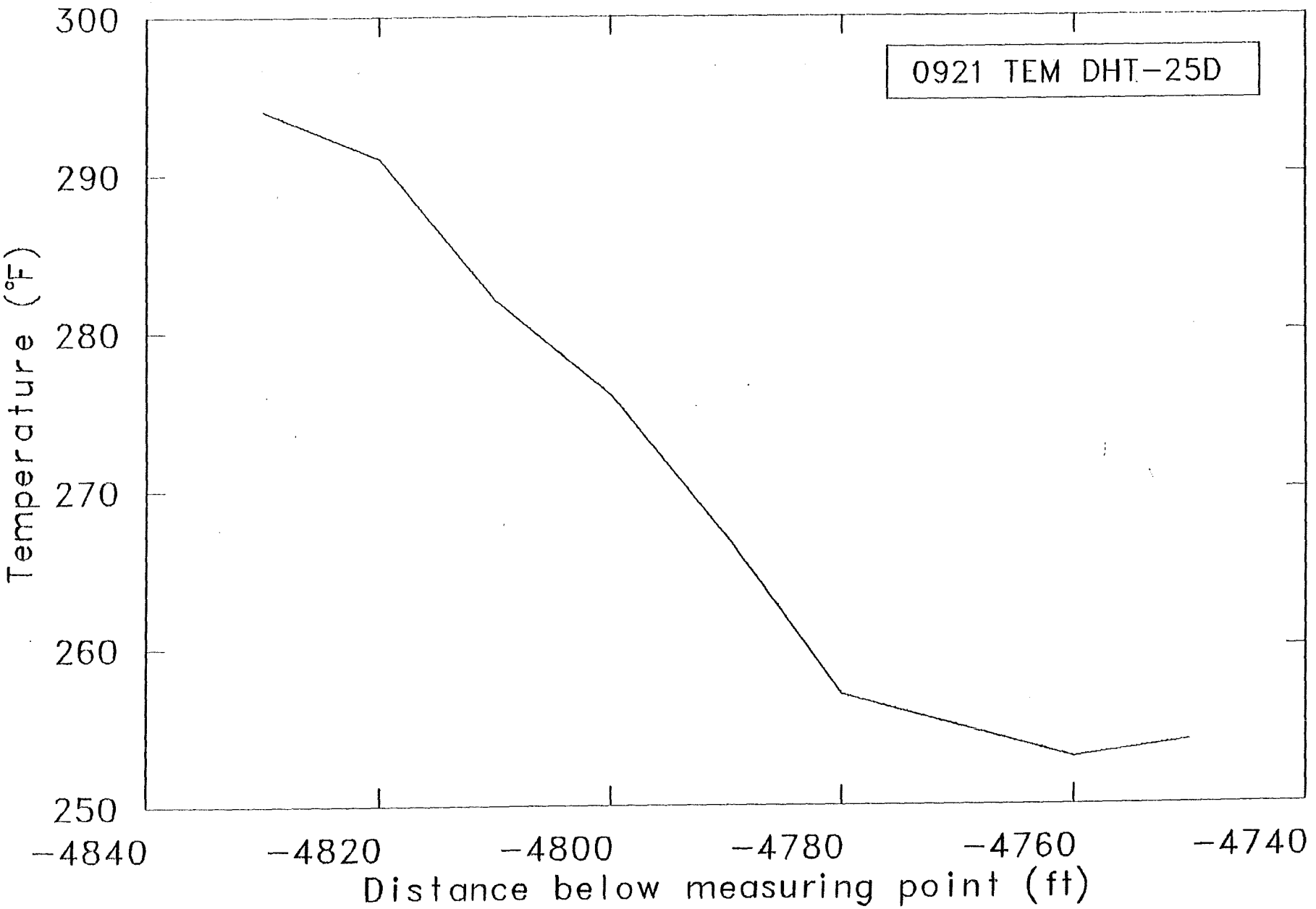

RR5-TEMP-M
260
250
240
230
220
210
Temperature (°F)
0
50
100
150
200
Time (hr)

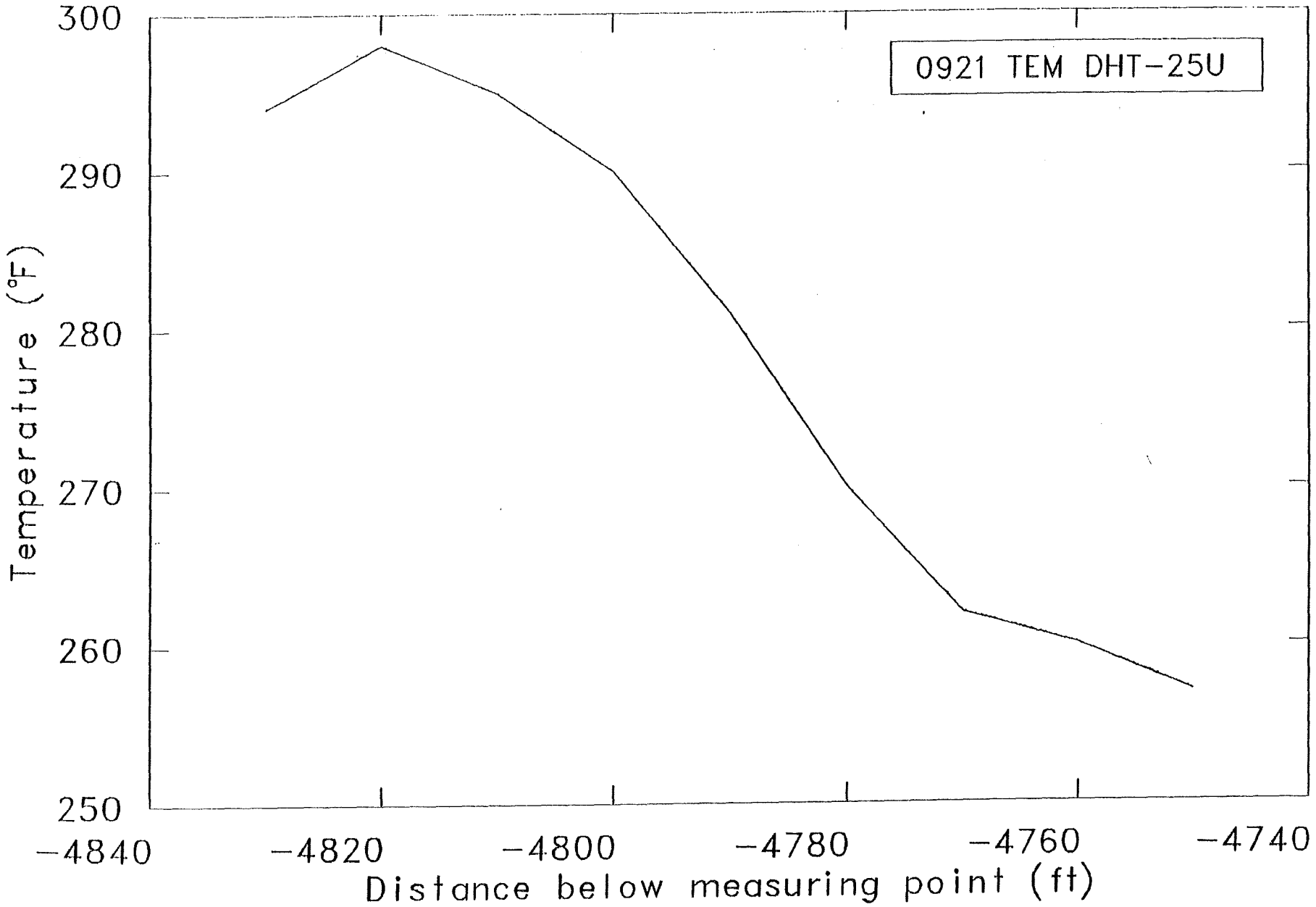

RR5-WQ-SC
Volumetric flow (gpm)
200
100
0
-100
-200
-50
0
50
100
150
200
Time (hr)

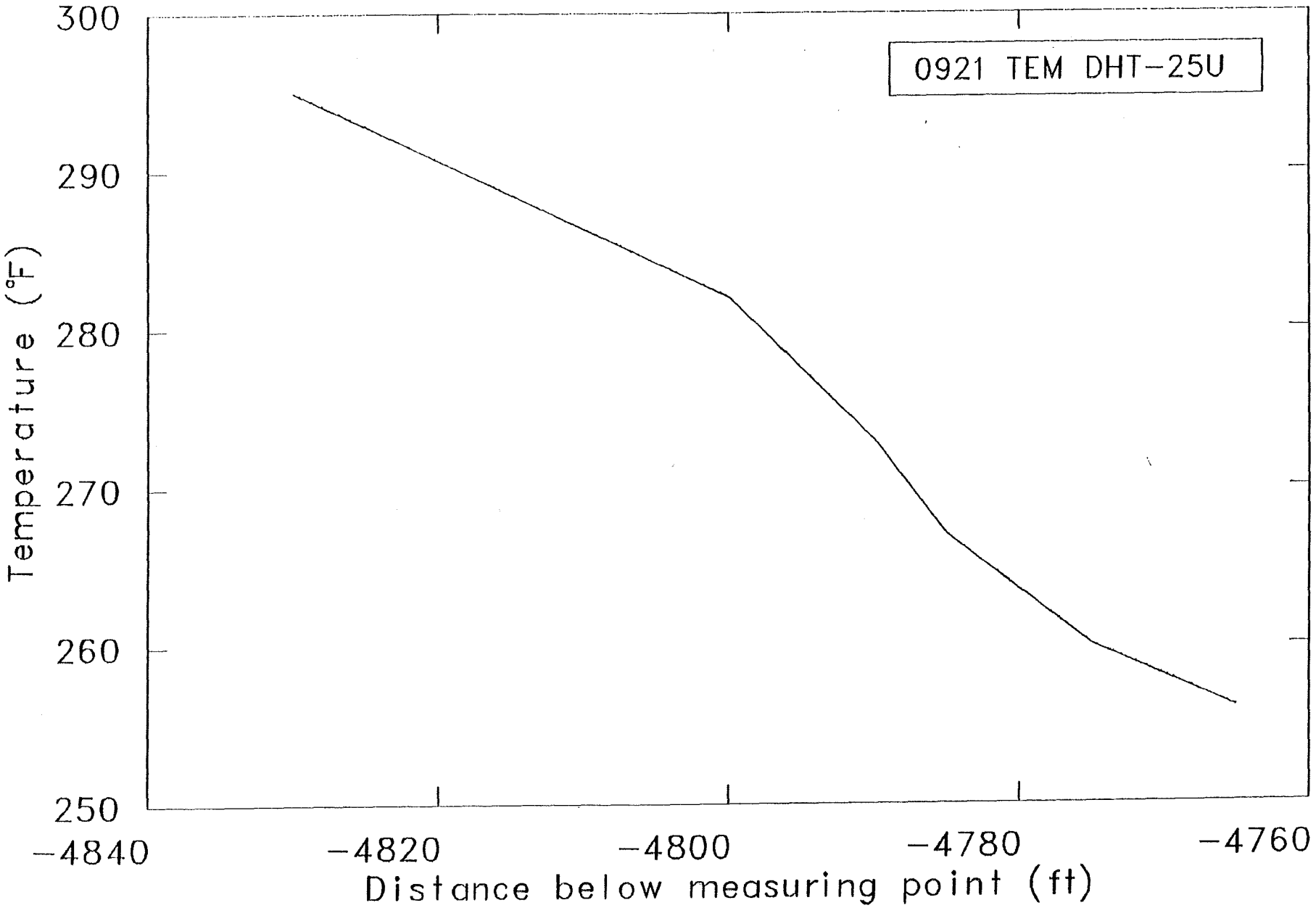

Concentration (ppm)
0
1
2
3
0
50
100
150
Time (hr)
RR5-FLUOR-TR

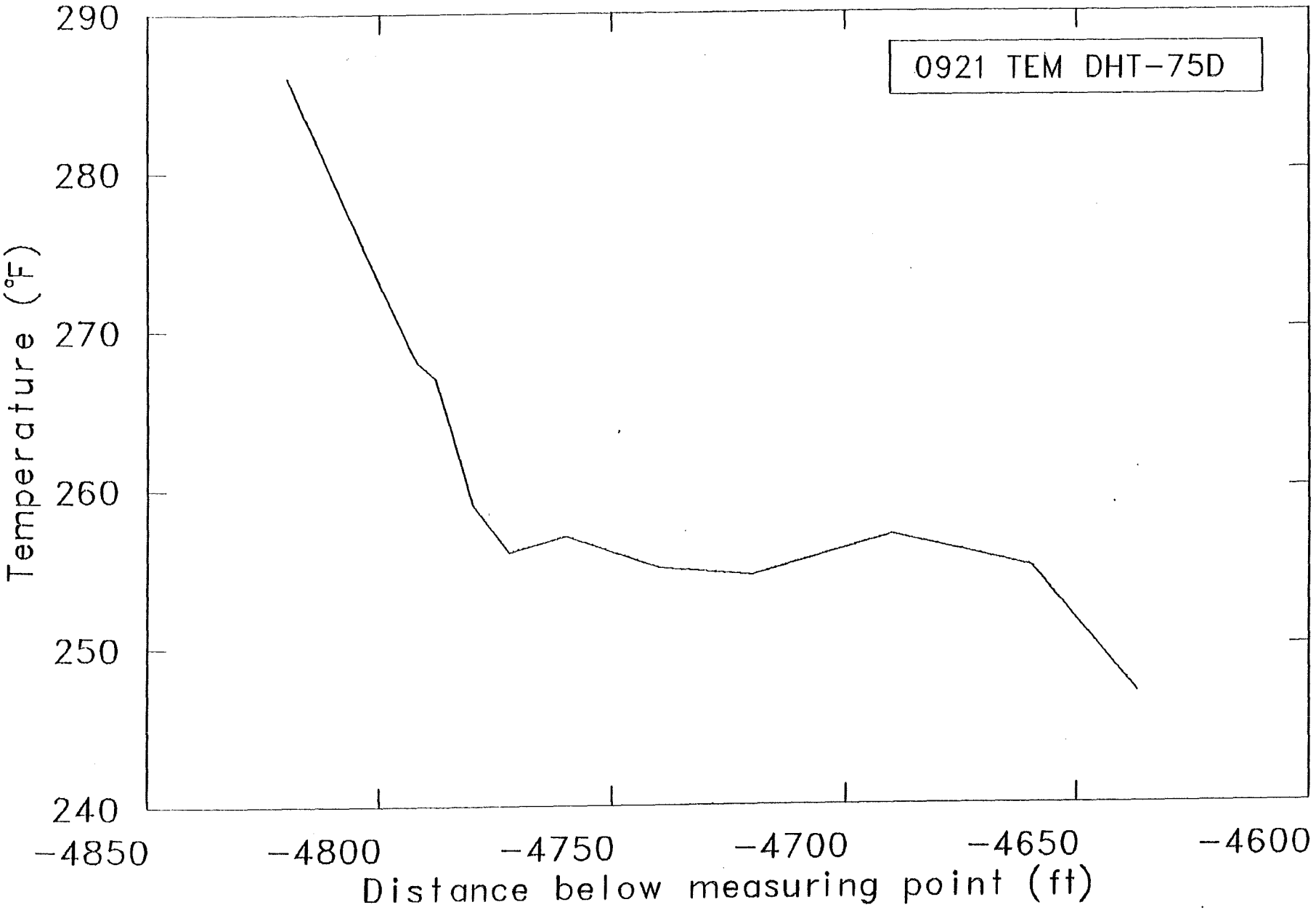

RR5-PH-TS
7.2
7
6.8
6.6
6.4
6.2
6
0
50
100
150
Time (hr)

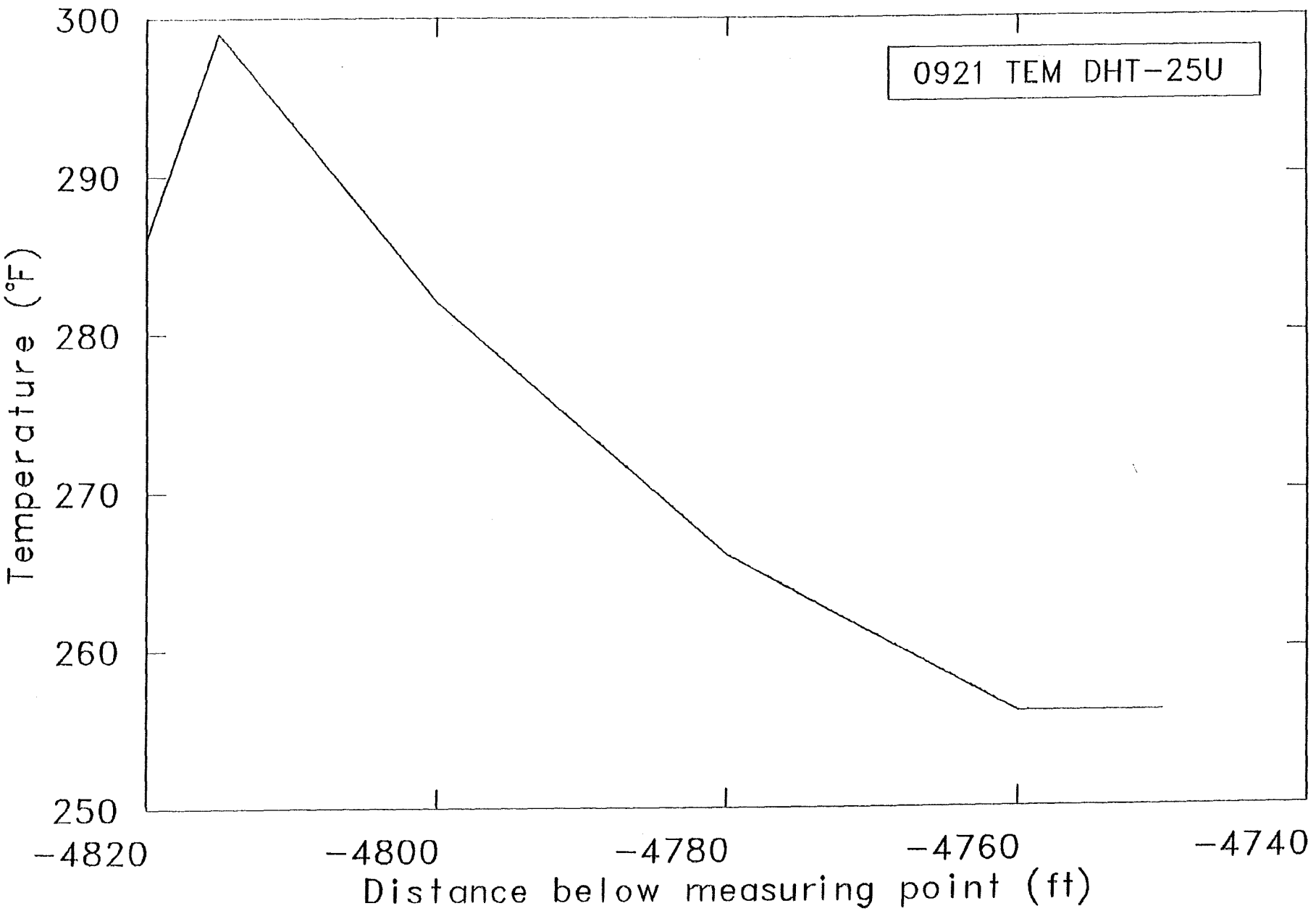

Concentration (ppm)
10
20
30
40
50
60
0
50
100
150
Time (hr)
RR5-ALK-TS

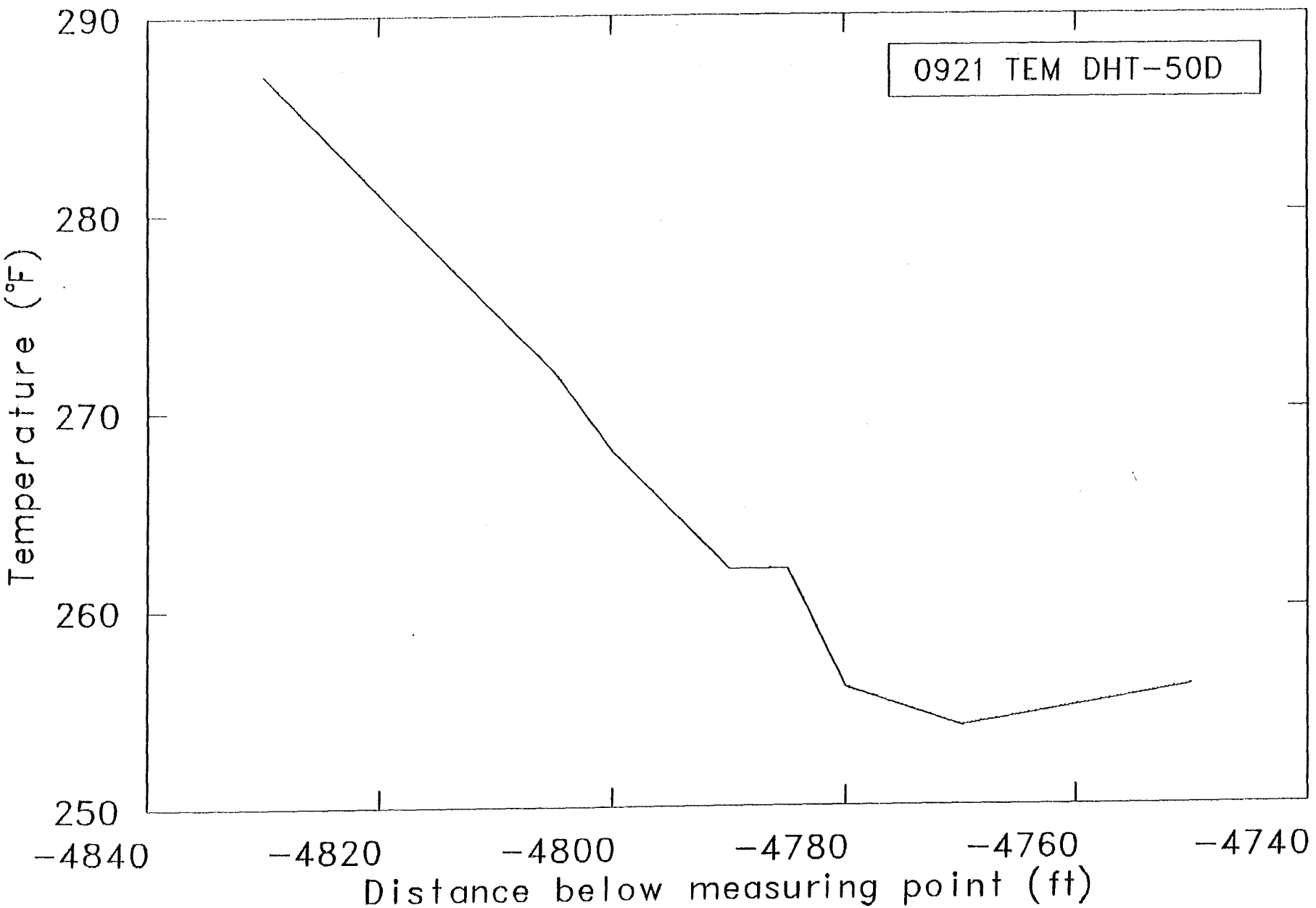

0921 TEM DHT-25D
300
290
280
270
260
250
Temperature (°F)
-4840
-4820
-4800
-4780
-4760
-4740
Distance below measuring point (ft)

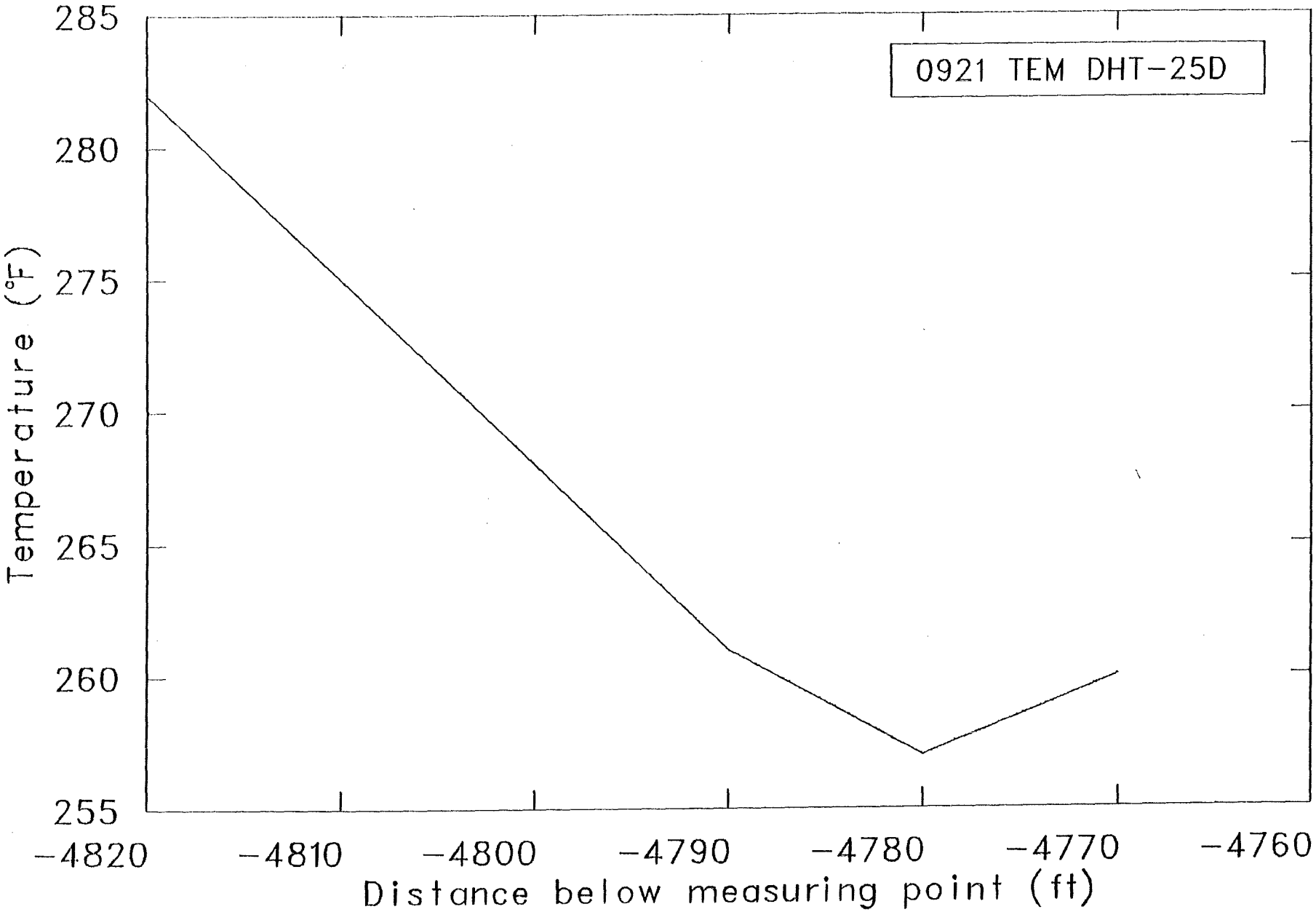

0921 TEM DHT-25U
300
290
280
270
260
250
Temperature (°F)
-4840
-4820
-4800
-4780
-4760
-4740
Distance below measuring point (ft)

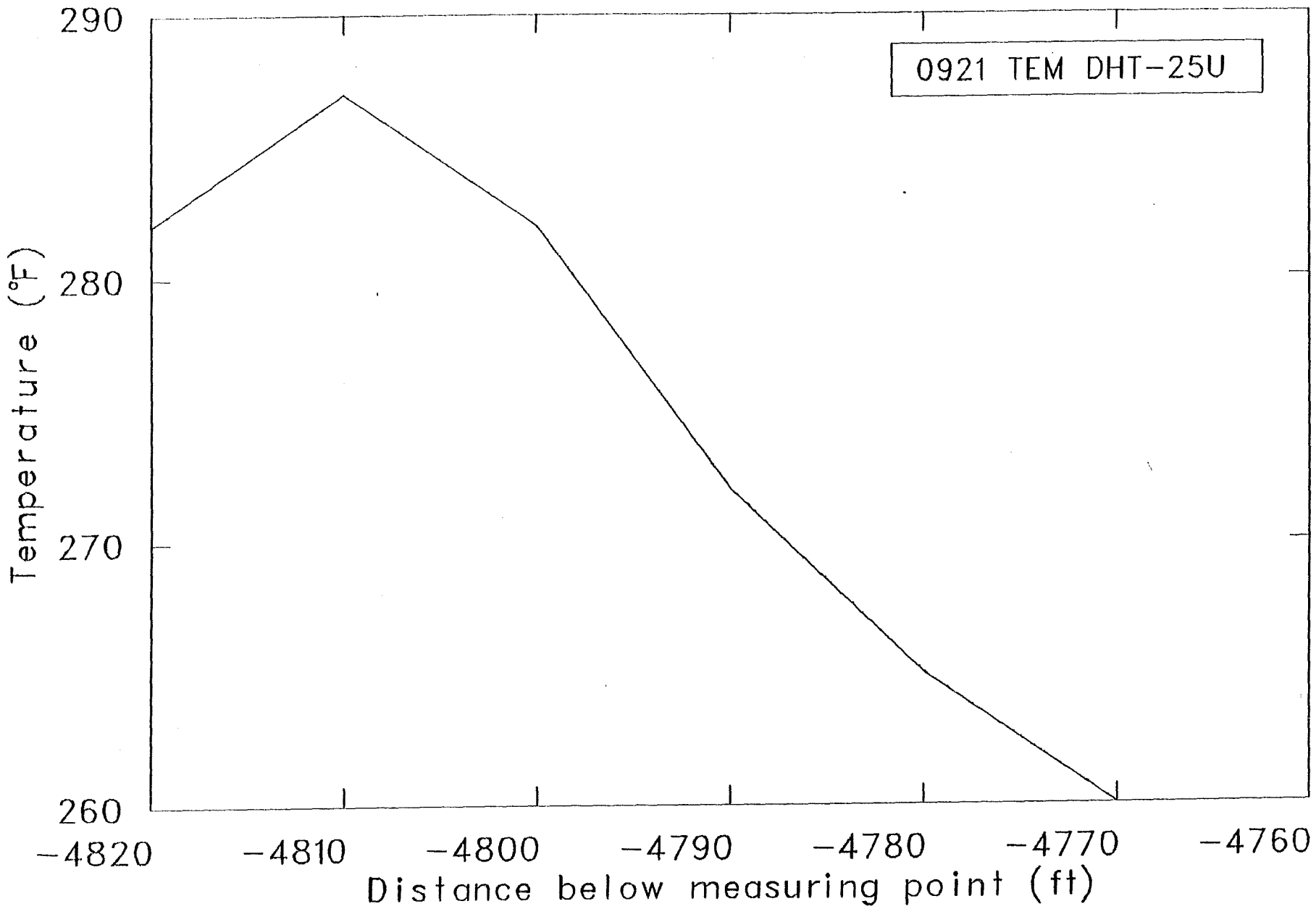

0921 TEM DHT-25U
300
290
280
270
260
250
Temperature (°F)
-4840
-4820
-4800
-4780
-4760
Distance below measuring point (ft)


0921 TEM DHT-75D
290
280
270
260
250
240
Temperature (°F)
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)


0921 TEM DHT-25U
300
290
280
270
260
250
Temperature (°F)
-4820
-4800
-4780
-4760
-4740
Distance below measuring point (ft)


0921 TEM DHT-50D
290
280
270
260
250
Temperature (°F)
-4840
-4820
-4800
-4780
-4760
-4740
Distance below measuring point (ft)


0921 TEM DHT-25D
285
280
275
270
265
260
255
Temperature (°F)
-4820
-4810
-4800
-4790
-4780
-4770
-4760
Distance below measuring point (ft)


0921 TEM DHT-25U
290
280
270
260
Temperature (°F)
-4820
-4810
-4800
-4790
-4780
-4770
-4760
Distance below measuring point (ft)

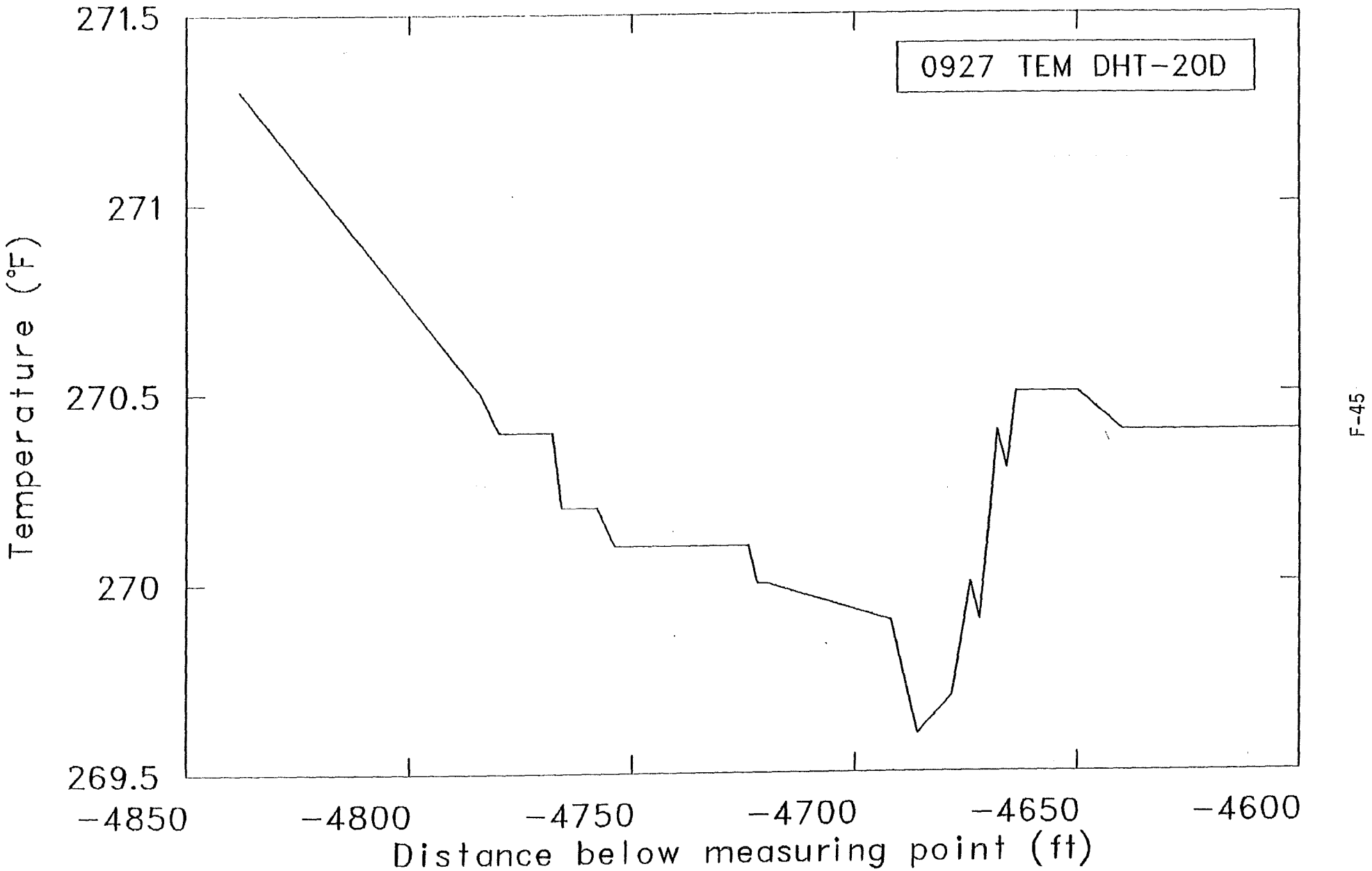
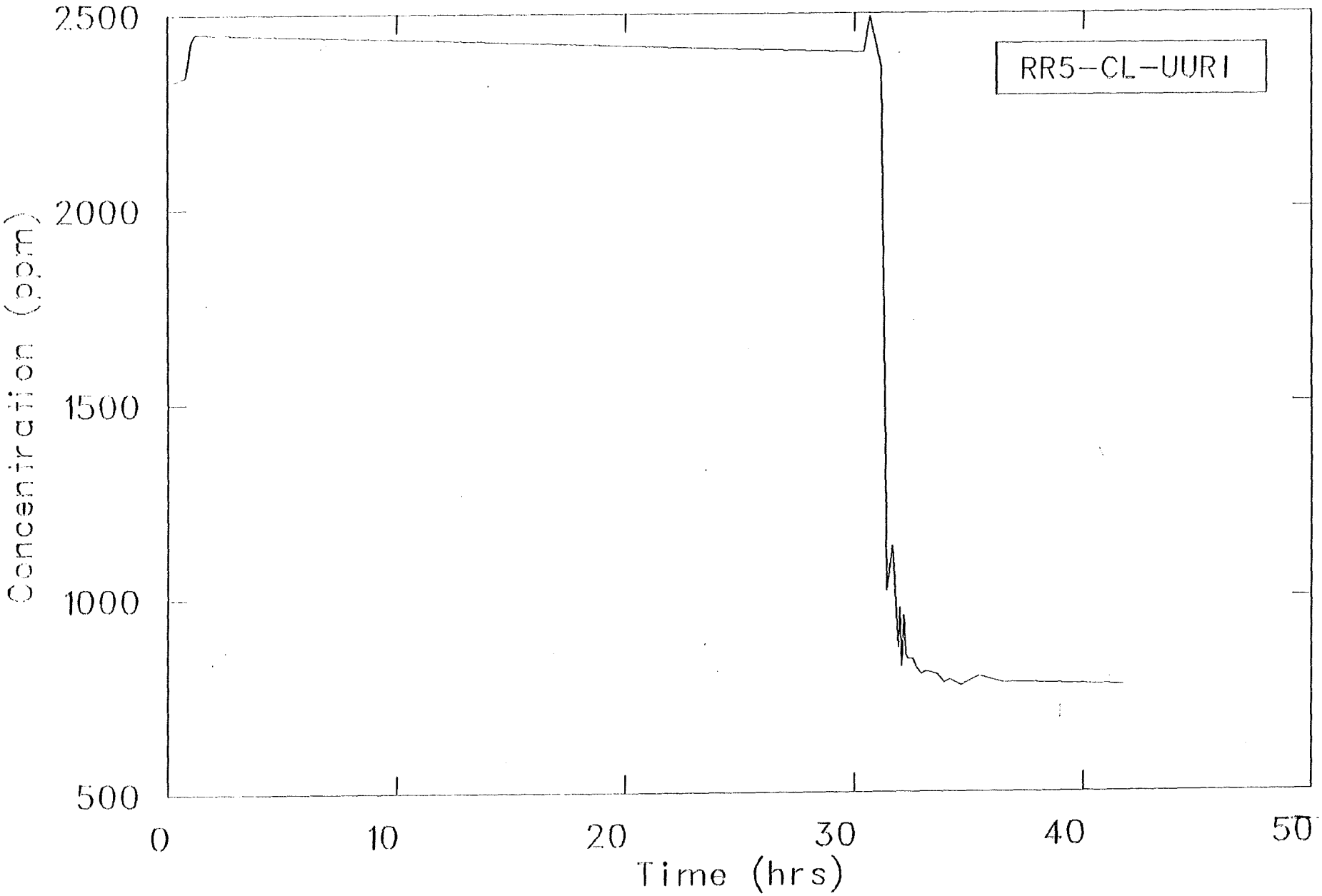
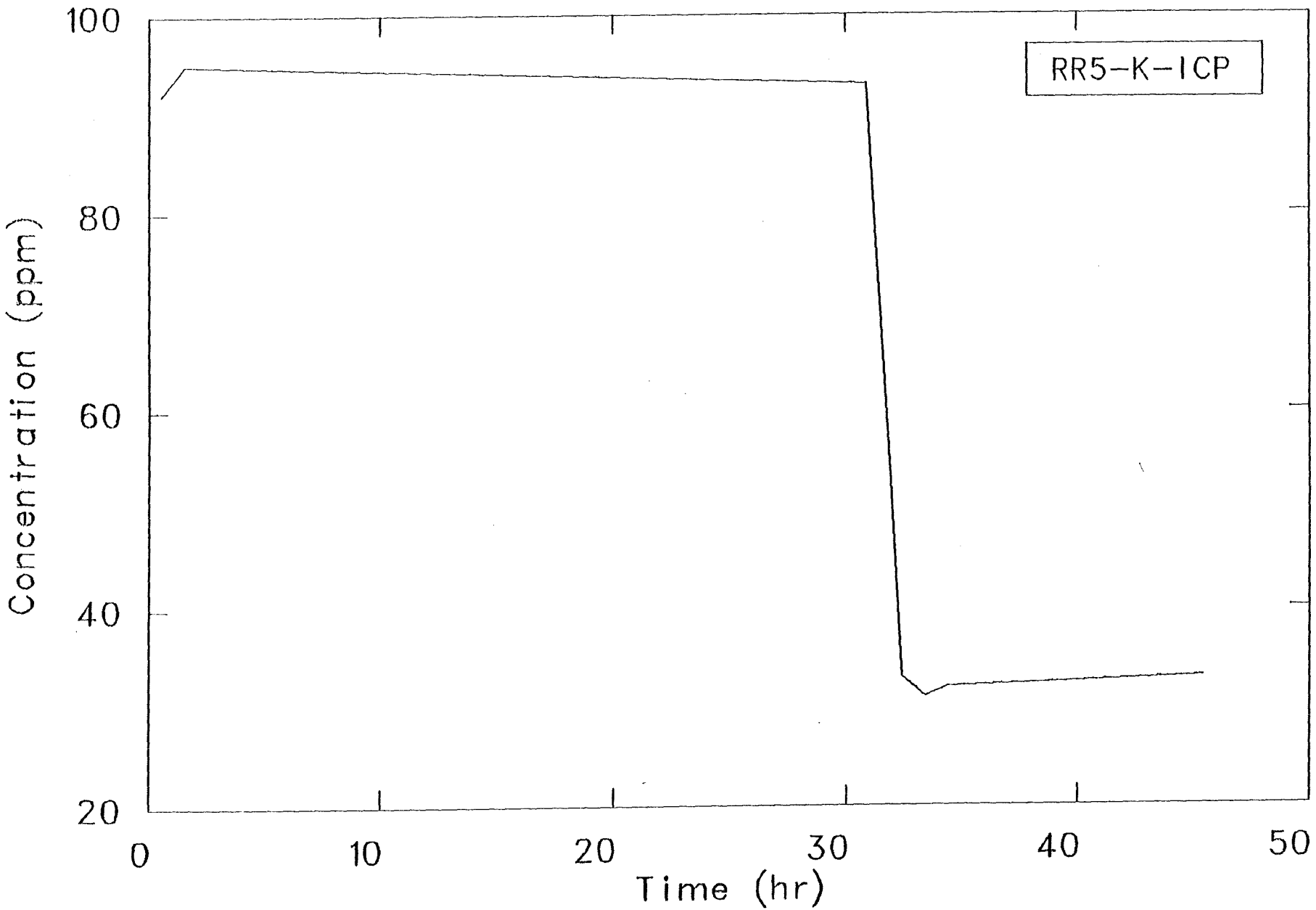

0927 TEM DHT-20D
271.5
271
270.5
270
269.5
Temperature (°F)
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)

TABLE G. TEST 4A
File Name: RR4A820928 Date: 09-28-82
Start Time: Real--00:00; File Start Time: -58.58

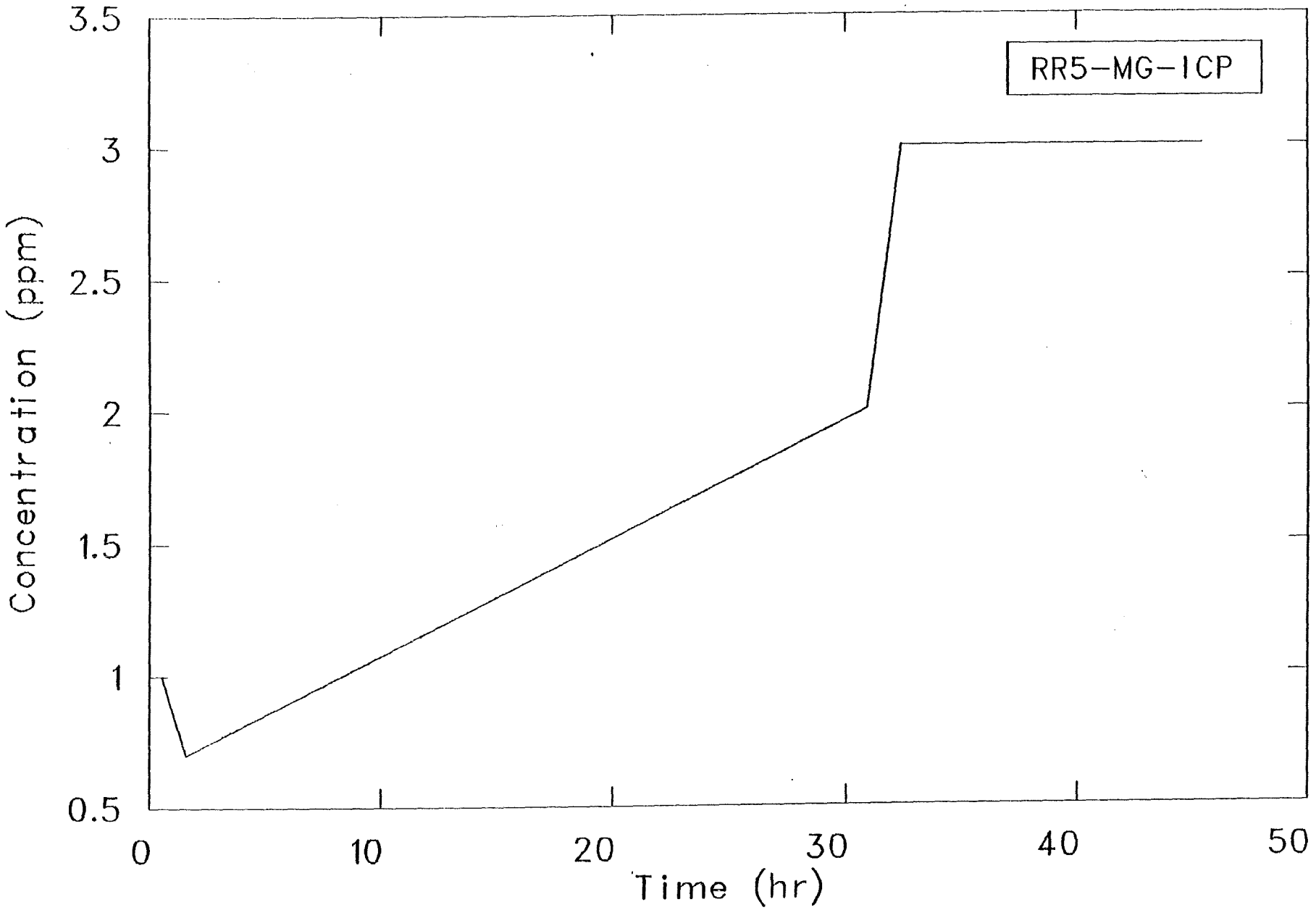
Record Name	#	Data Sampled	Recorder or Method	Units
RR5-CL-UURI	1	Chloride	SIE	ppm
RR5-NA-ICP	2	Sodium	ICP	ppm
RR5-K-ICP	3	Potassium	ICP	ppm
RR5-CA-ICP	4	Calcium	ICP	ppm
RR5-MG-ICP	5	Magnesium	ICP	ppm
RR5-SI02-ICP	6	Silica	ICP	ppm
RR5-SR-ICP	7	Strontium	ICP	ppm
RR5-LI-ICP	8	Lithium	ICP	ppm
RR5-B-ICP	9	Boron	ICP	ppm
RR5-HCO3-ICP	10	Bicarbonate	Titration	ppm
RR5-SO4-ICP	11	Sulfate	Gravimetric	ppm
RR5-CL-ICP	12	Chloride	Titration	ppm
RR5-F-ICP	13	Fluoride	SIE	ppm
RR5-TDS-ICP	14	TDS	evaporation and weighing	ppm
RR5-PH-ICP	15	pH	SIE	standard
RR5-FE-ICP	16	Iron	ICP	ppm
RR5-TEMP-M	17	Temperature	Manually recorded	°F
RR5-WP-D	18	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	19	Well flow	Stripcharts	±gpm
RR5-TEMP-SC	20	Temperature	Stripcharts	°F
RR5-I-TR	21	Iodide	SIE	ppm
RR5-PH-TS	22	pH	SIE	ppm
RR5-COND-TS	23	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	24	Alkalinity	Titration	ppm
RR5-PH-DL	25	pH	Data logger	millivolts
RR5-COND-DL	26	Conductivity	Data logger	µmho/cm
RR5-REDOX-DL	27	Oxidation-reduction	Data logger	millivolts
RR5-TEMP DL	28	Temperature	Data logger	°F


RR5-CL-UUR1
Concentration (ppm)
2500
2000
1500
1000
500
0
10
20
30
40
50
Time (hrs)

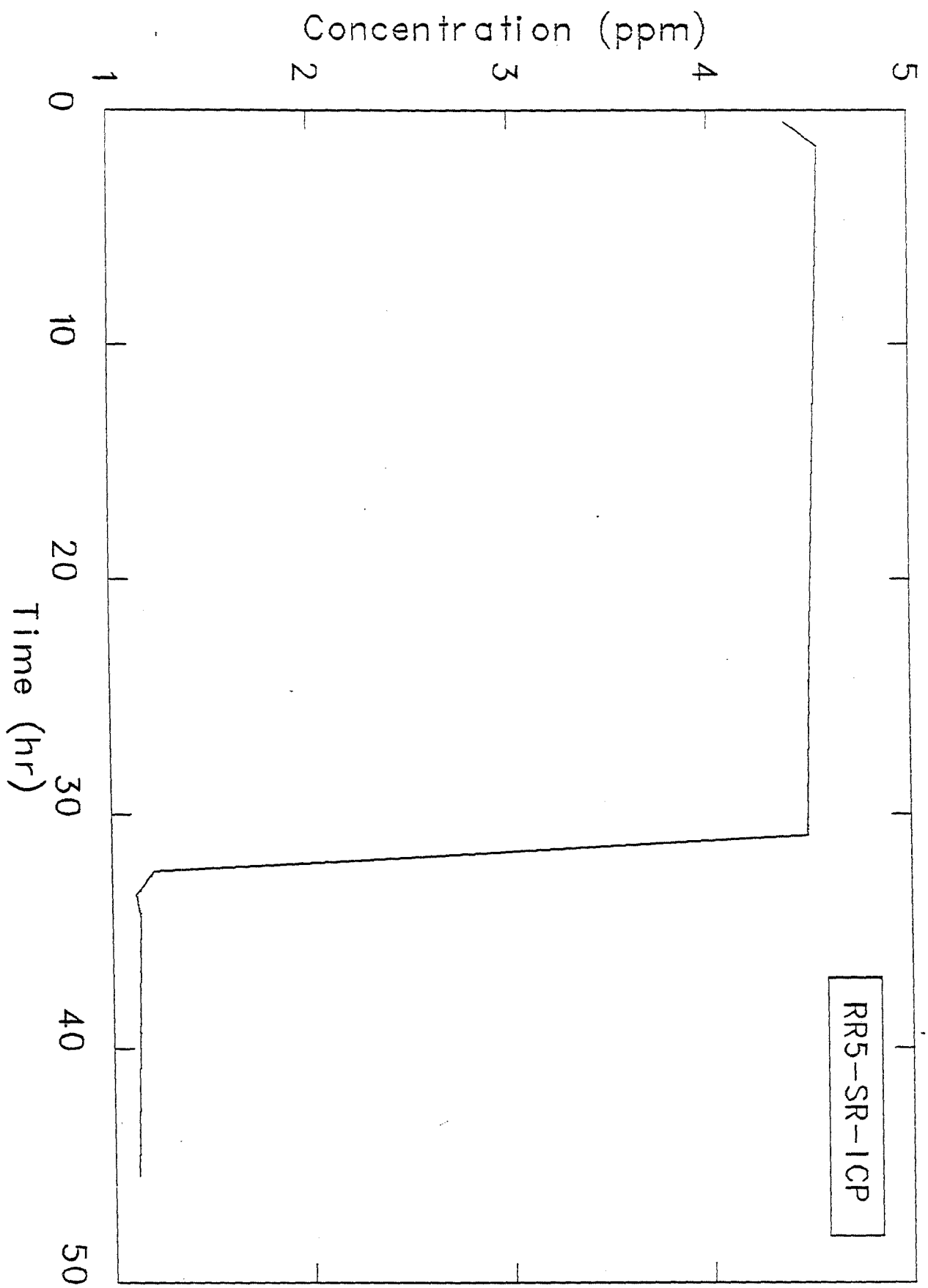
G-1

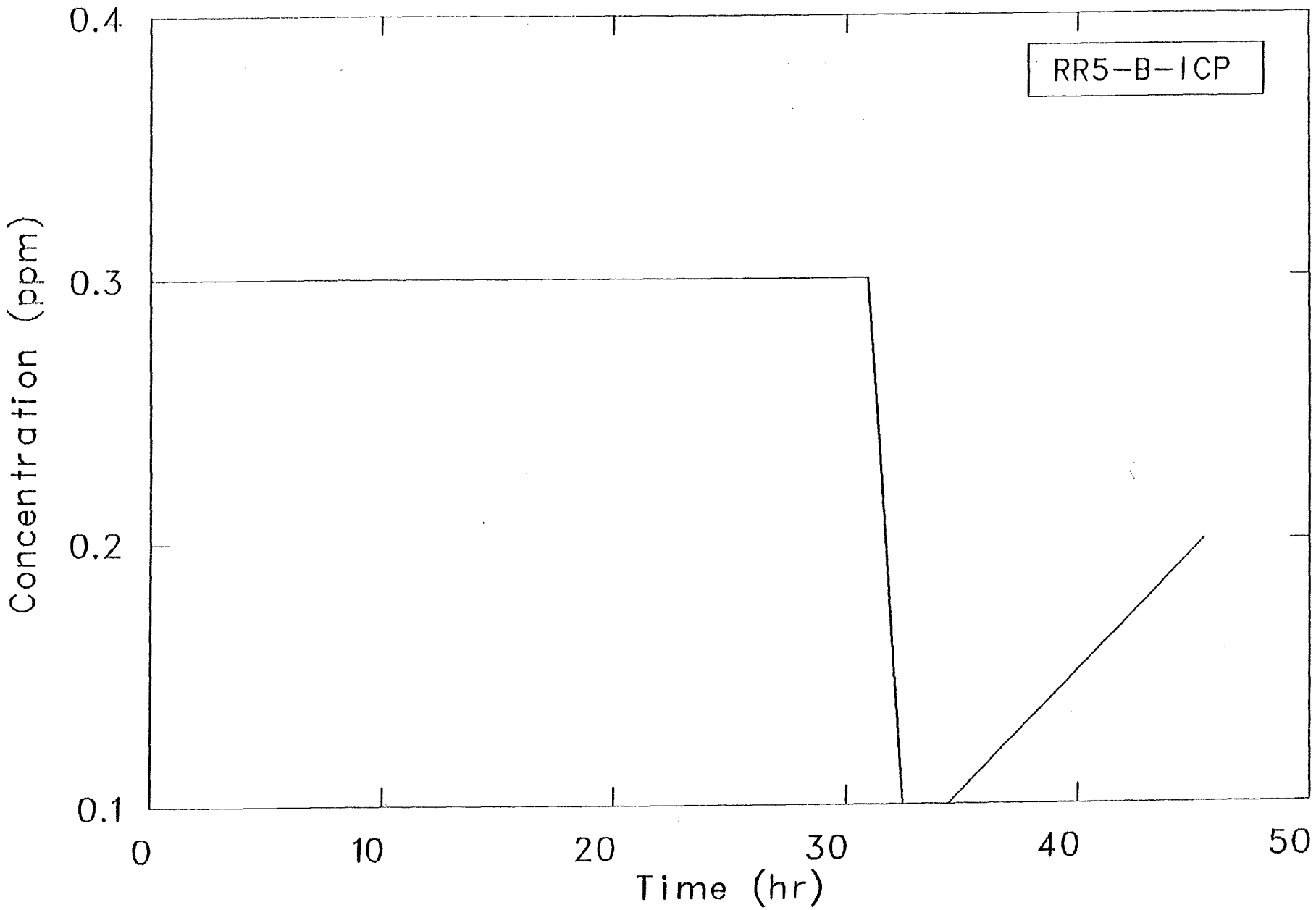

RR5-K-ICP
Concentration (ppm)
100
80
60
40
20
0
10
20
30
40
50
Time (hr)

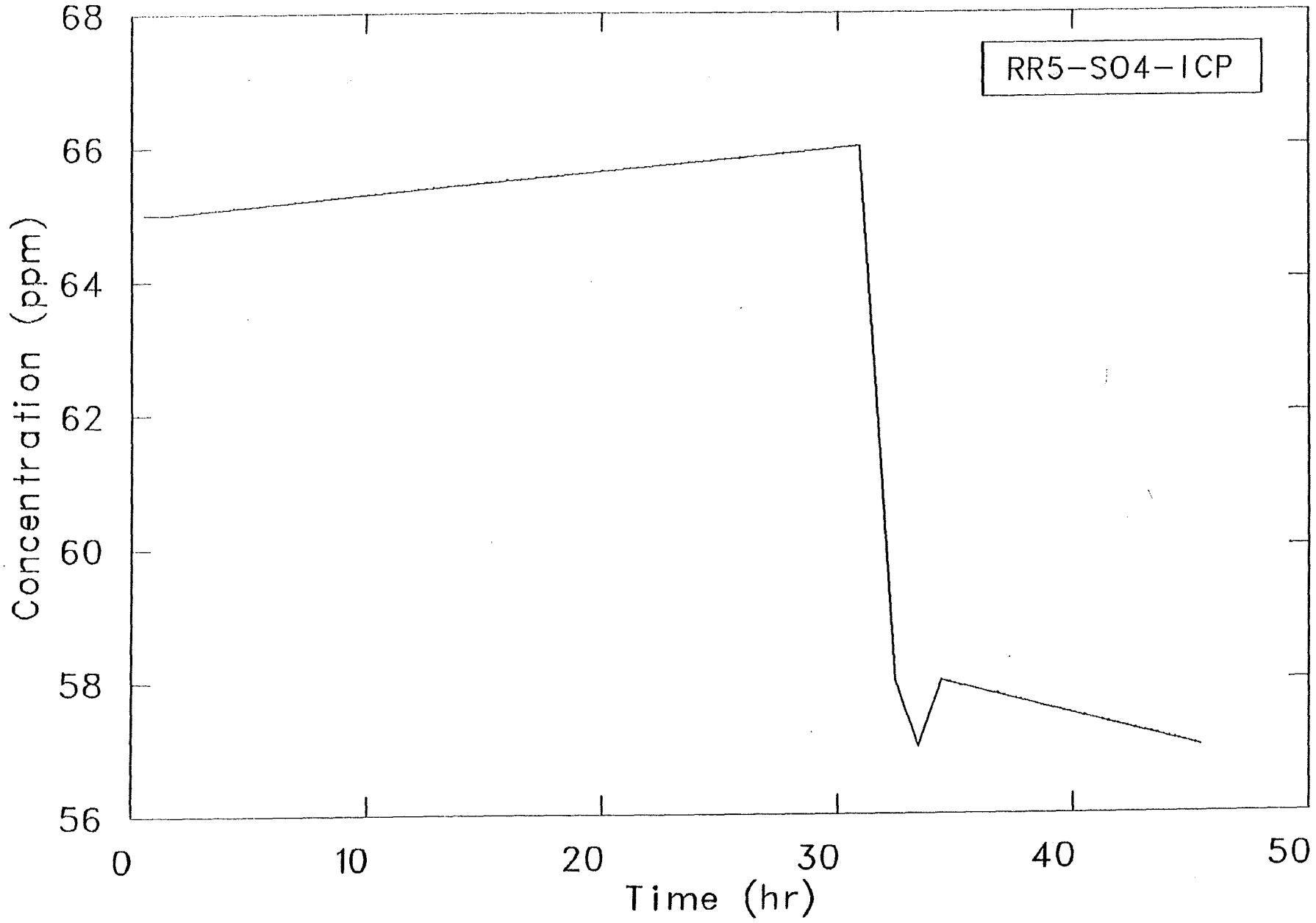
G-3


RR5-MG-ICP
Concentration (ppm)
3.5
3
2.5
2
1.5
1
0.5
0
10
20
30
40
50
Time (hr)

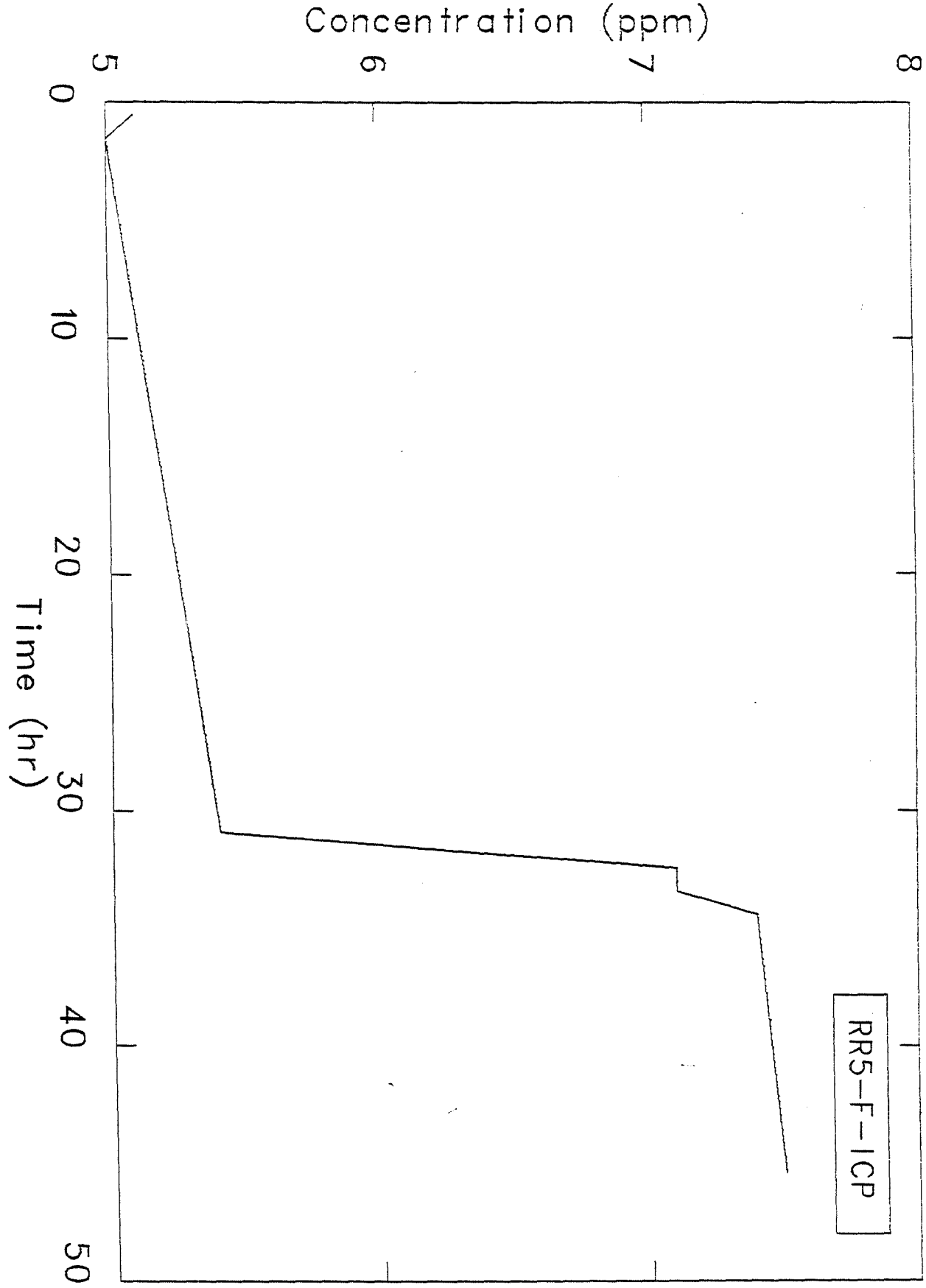
G-5

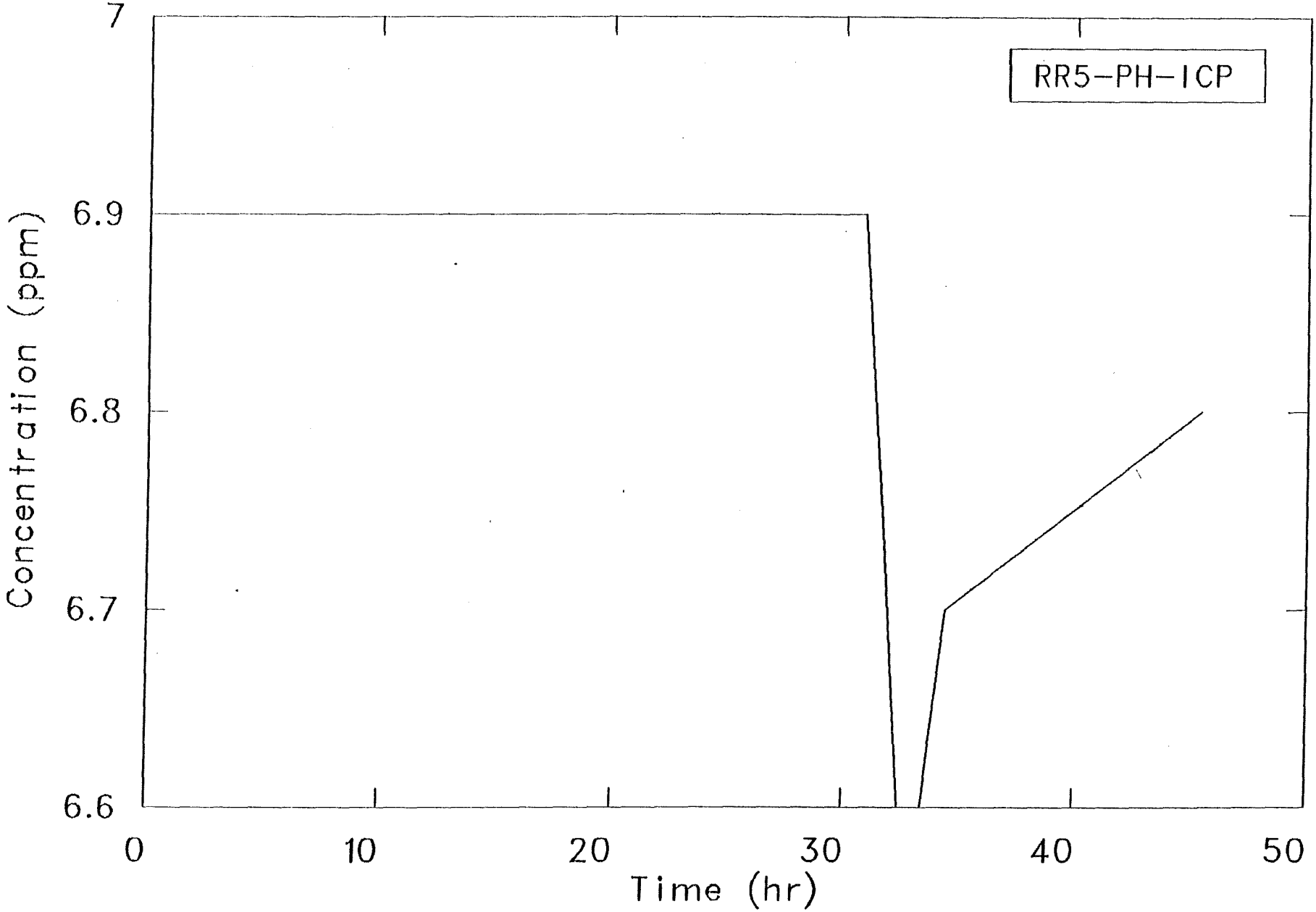

Concentration (ppm)
1
2
3
4
5
0
10
20
30
40
50
Time (hr)
RR5-SR-ICP

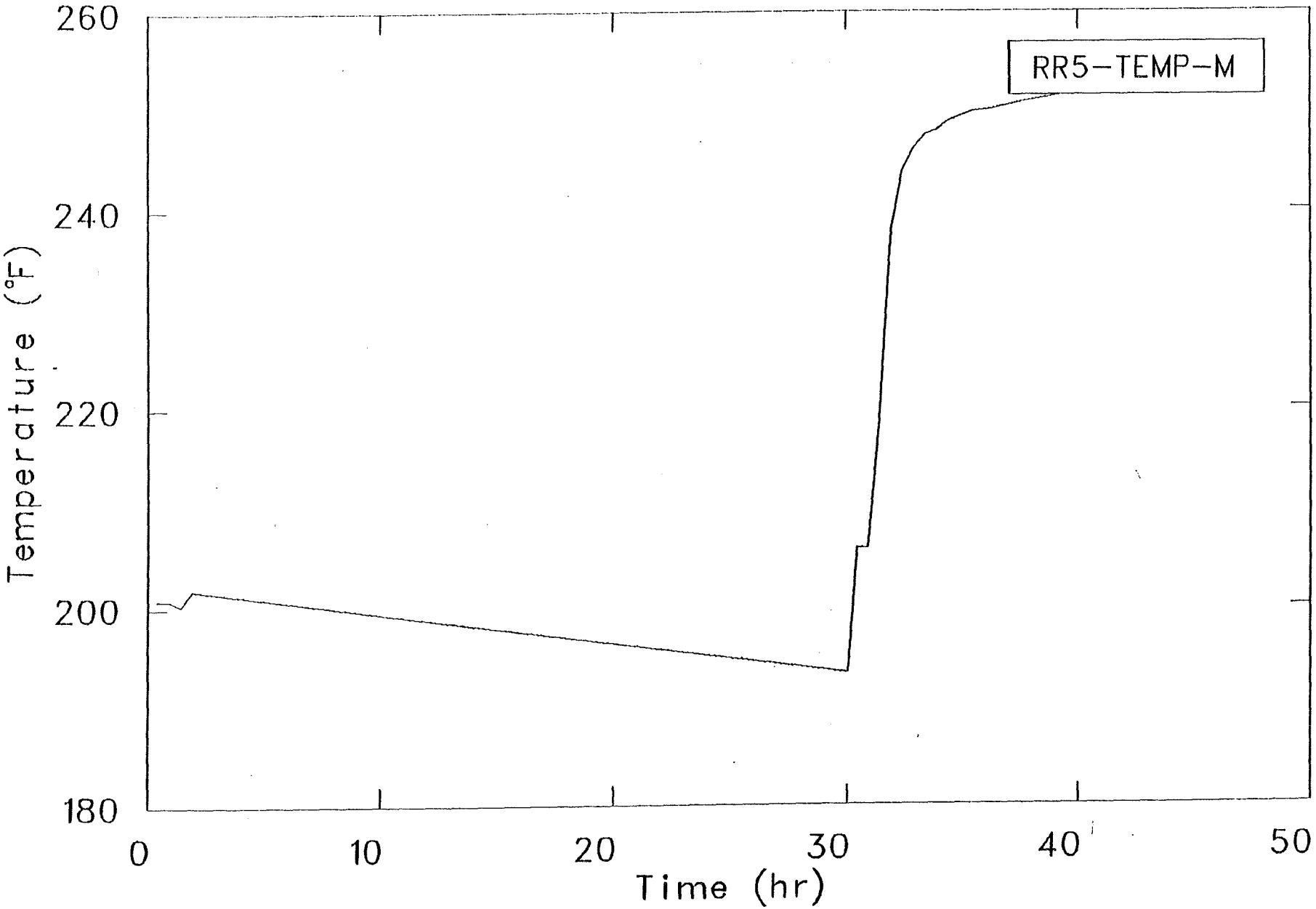

RR5-B-ICP
0.4
0.3
0.2
0.1
Concentration (ppm)
0
10
20
30
40
50
Time (hr)

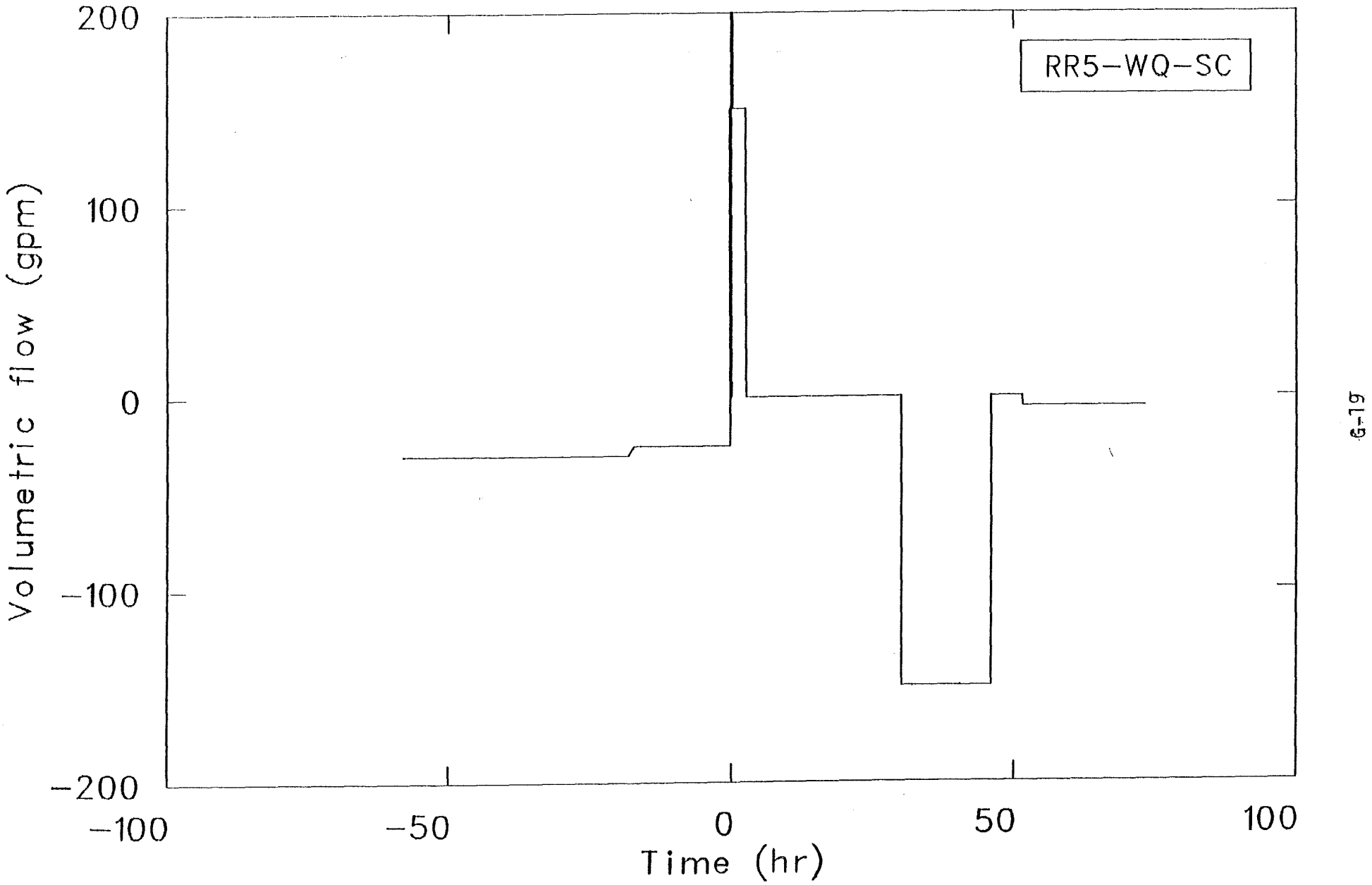

RR5-SO4-ICP
Concentration (ppm)
68
66
64
62
60
58
56
0
10
20
30
40
50
Time (hr)

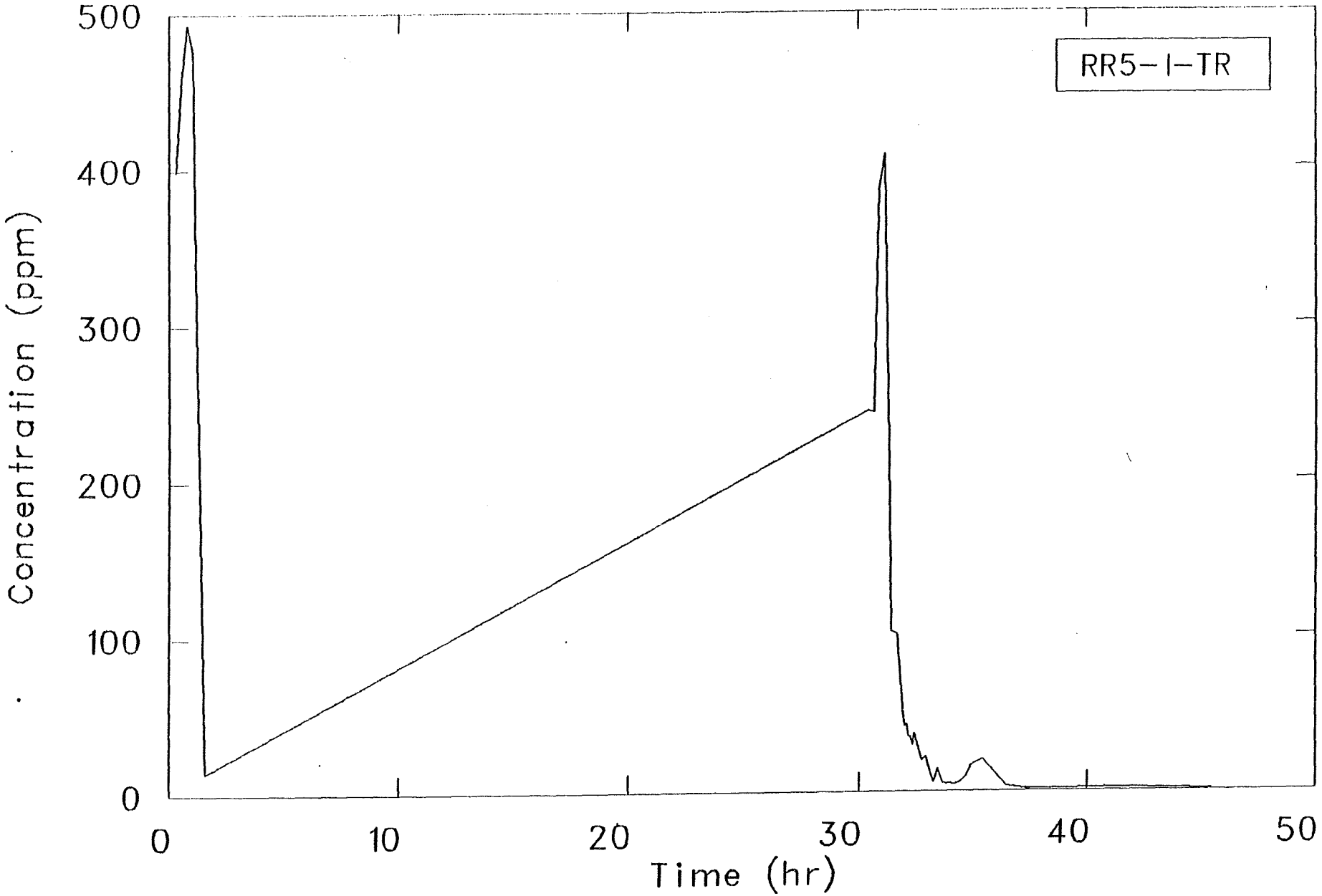
G-11

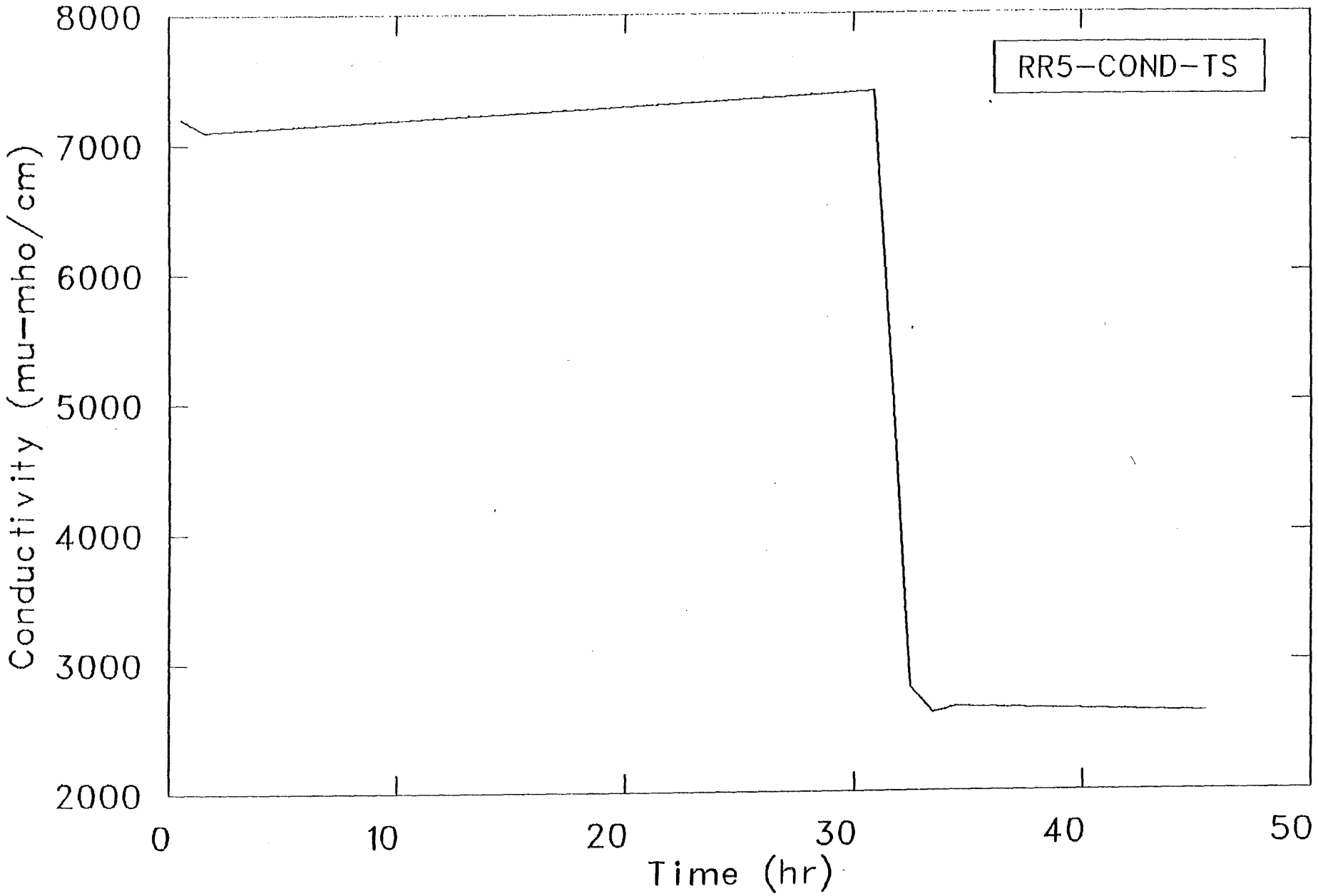

Concentration (ppm)
5
6
7
8
0
10
20
30
40
50
Time (hr)
RR5-F-ICP


RR5-PH-ICP
Concentration (ppm)
7
6.9
6.8
6.7
6.6
0
10
20
30
40
50
Time (hr)

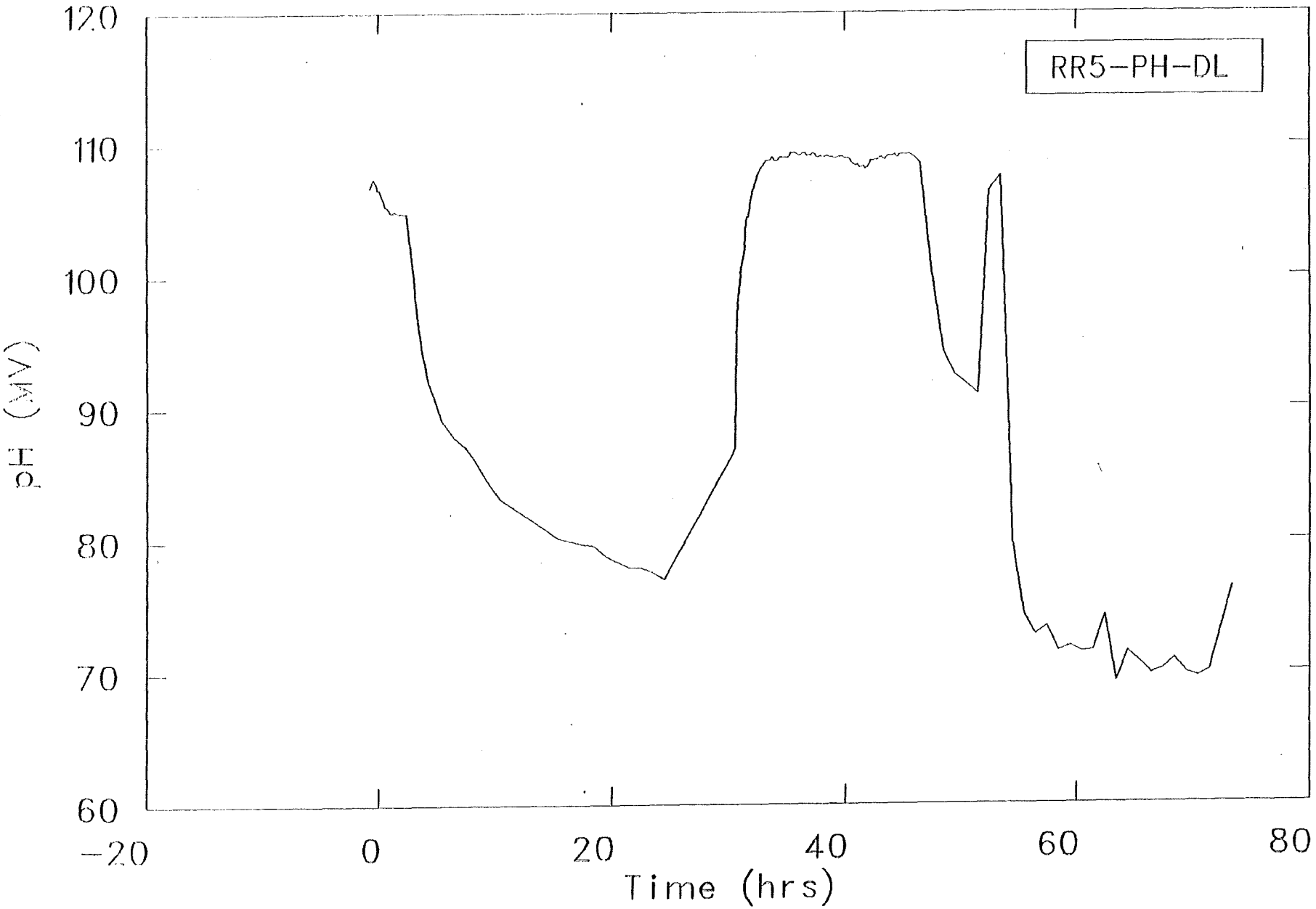

RR5-TEMP-M
260
240
220
200
180
Temperature (°F)
0
10
20
30
40
50
Time (hr)


RR5-WQ-SC
200
100
0
-100
-200
Volumetric flow (gpm)
-100
-50
0
50
100
Time (hr)


RR5-I-TR
Concentration (ppm)
500
400
300
200
100
0
0
10
20
30
40
50
Time (hr)


RR5-COND-TS
Conductivity (mu-mho/cm)
8000
7000
6000
5000
4000
3000
2000
0
10
20
30
40
50
Time (hr)

G-23


RR5-PH-DL
120
110
100
90
80
70
60
pH (MV)
-20
0
20
40
60
80
Time (hrs)

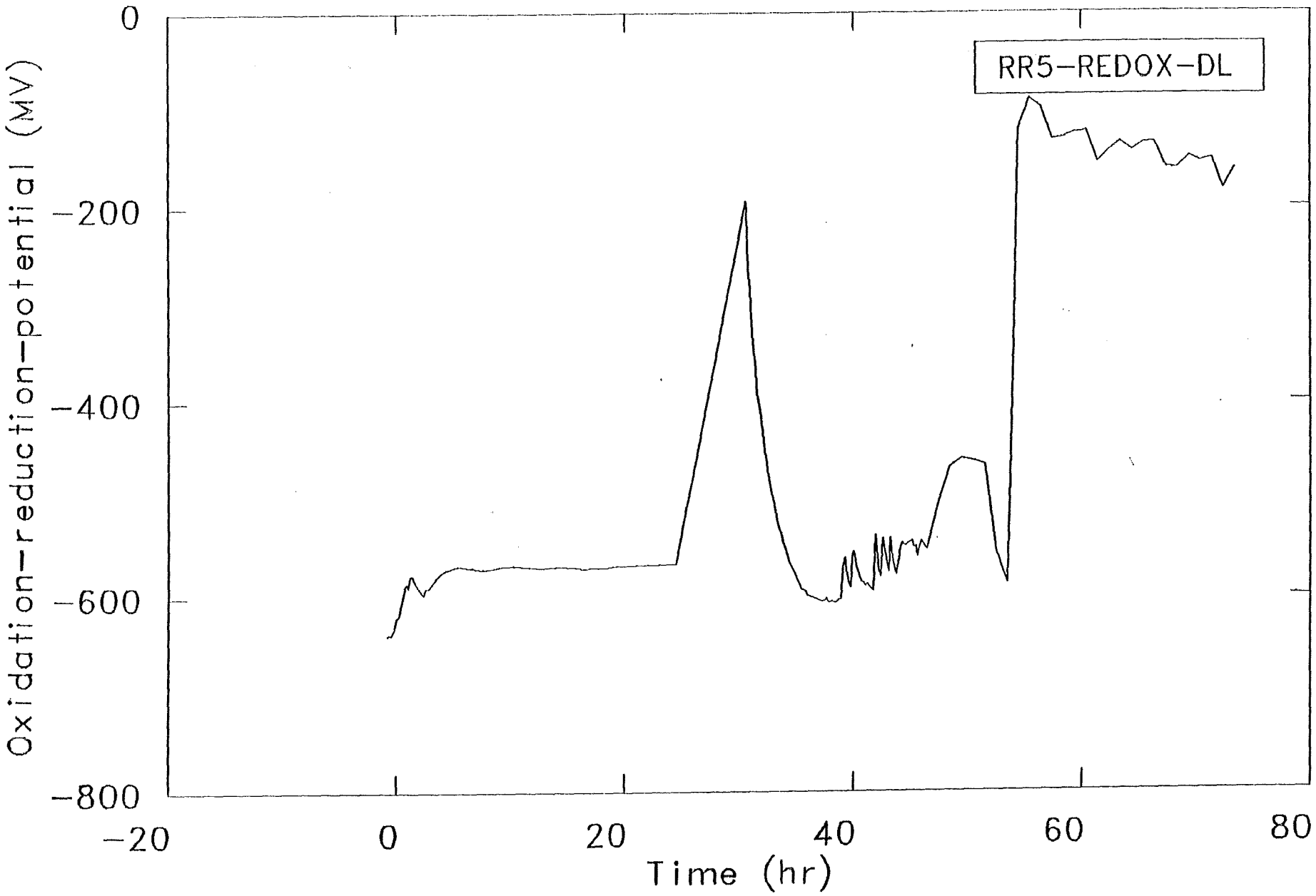
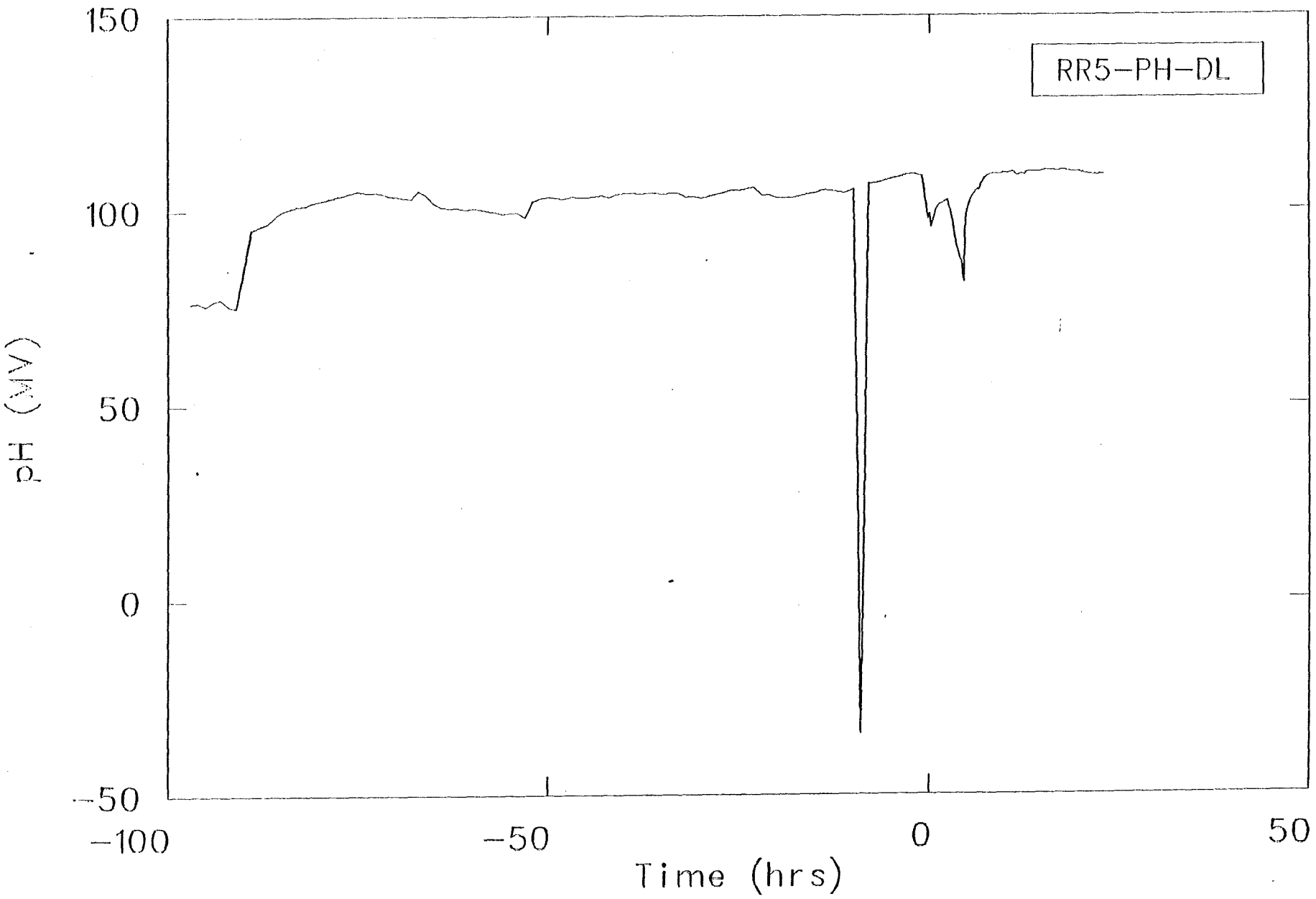

RR5-REDOX-DL
Oxidation-reduction-potential (MV)
0
-200
-400
-600
-800
-20
0
20
40
60
80
Time (hr)

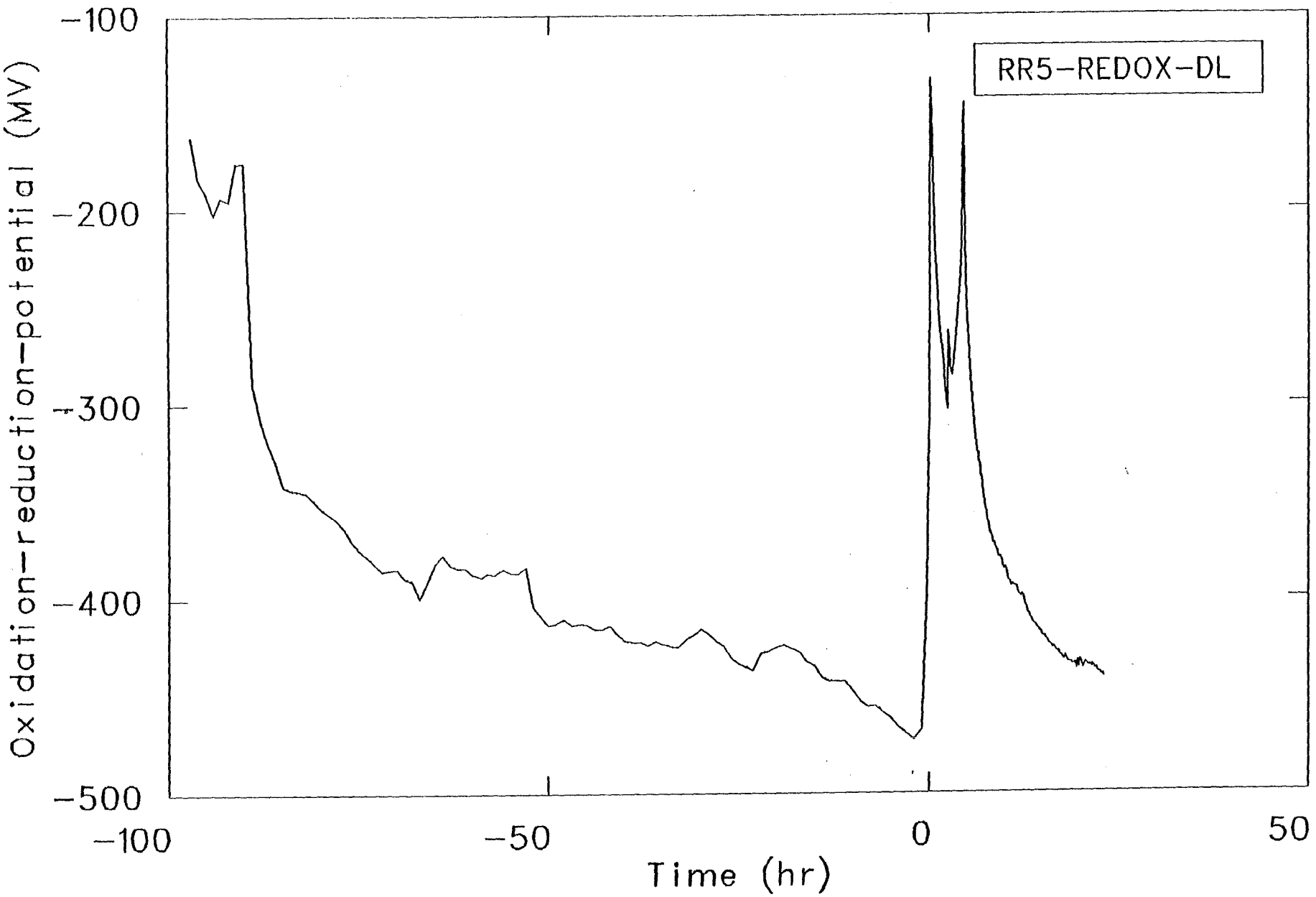
TABLE H. TEST 4B
File Name: RR4B821003 Date: 10-03-82
Start Time: Real--12:00; File Start Time: -97.0

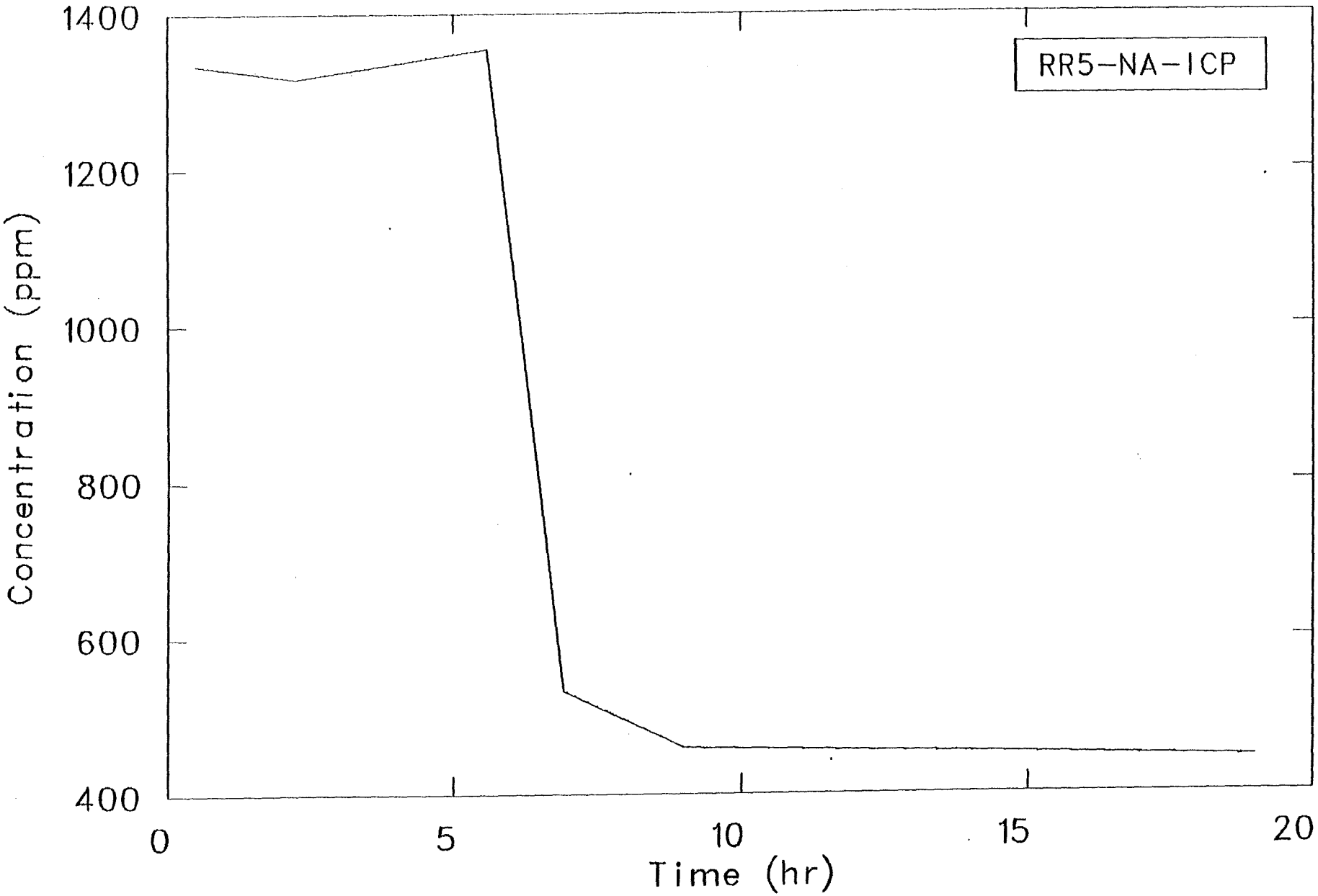
Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	µmho/cm
RR5-REDOX-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	°F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR56-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-HCO3-ICP	14	Bicarbonate	Titration	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	SIE	ppm
RR5-F-ICP	17	Fluoride	Titration	ppm
RR5-TDS-ICP	18	TDS	Evaporation and weighing	ppm
RR5-PH-ICP	19	pH	SIE	standard
RR5-TEMP-M	20	Temperature	Manually recorded	°F
RR5-WP-D	21	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	22	Well flow	Stripchart	±gpm
RR5-TEMP-SC	23	Temperature	Stripchart	°F
RR5-I-TR	24	Iodide	SIE	ppm
RR5-SCN-TR	25	Thiocyanate	SIE	ppm
RR5-FLUOR-TR	26	Fluorocein	Fluorometer	ppm
RR5-PH-TS	27	pH	SIE	standard
RR5-COND-TS	28	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	29	Alkalinity	Titration	ppm

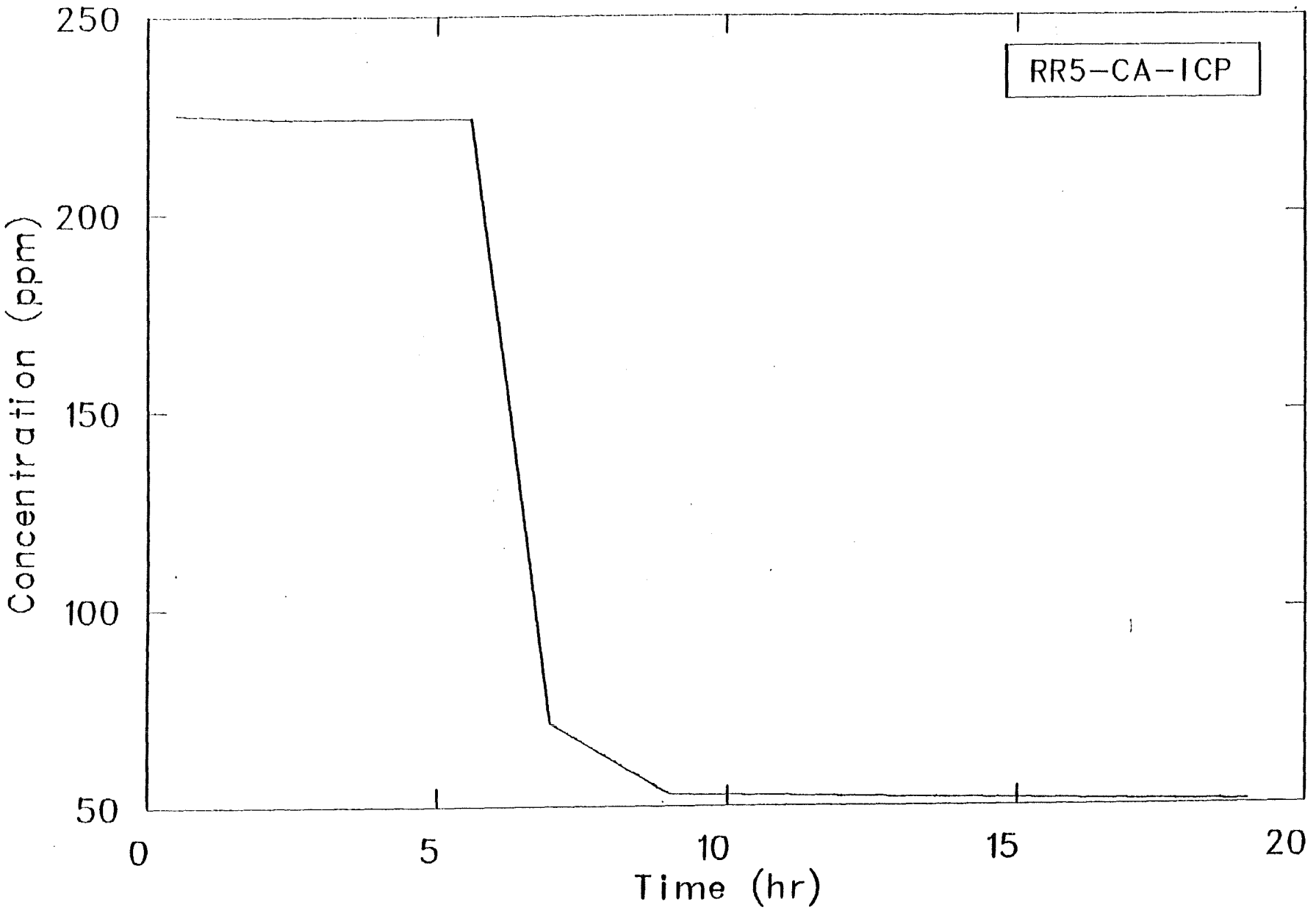
DOWNHOLE LOGS VERSUS DEPTH--TEST 4B

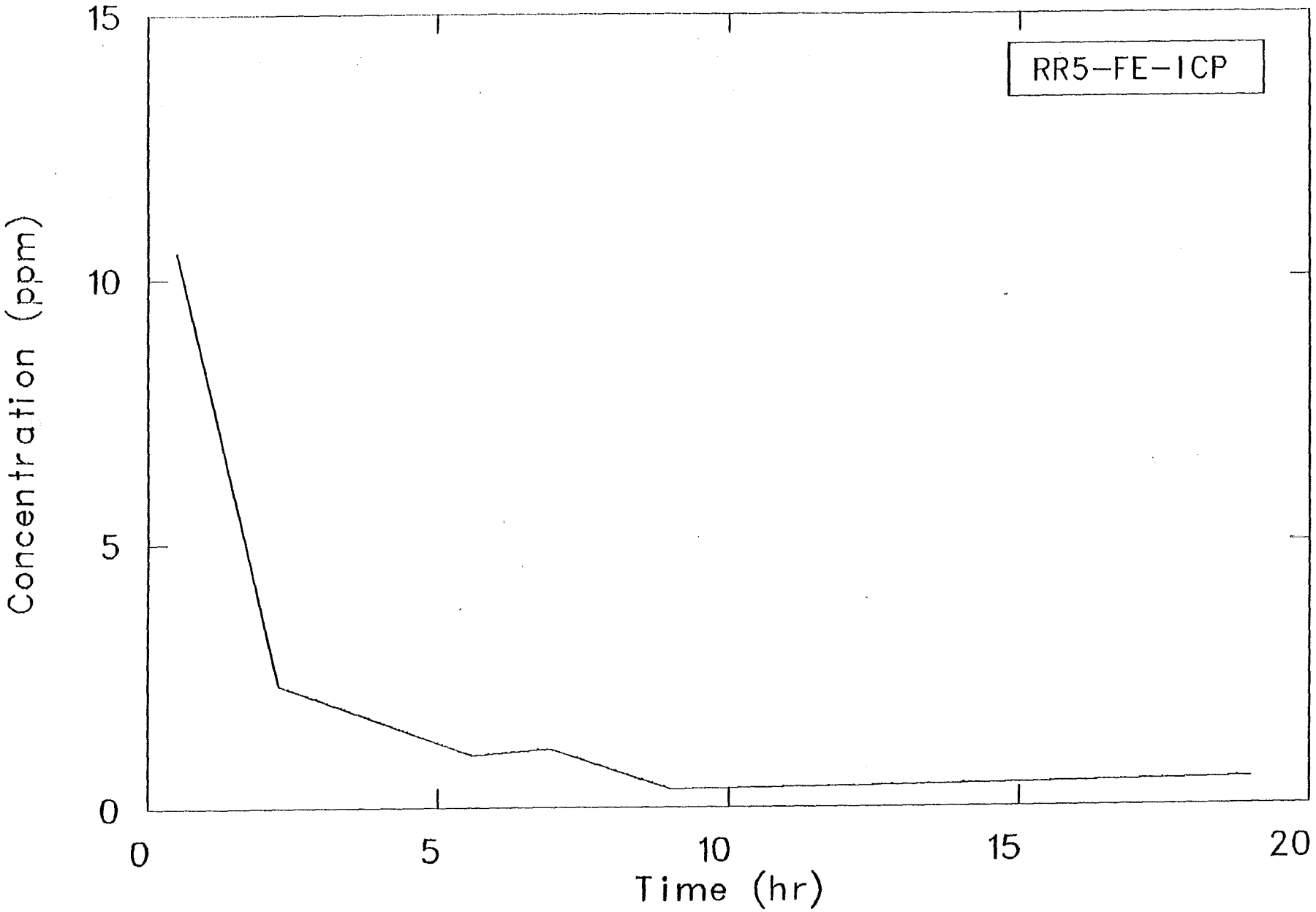
Record Name	#	Time	Data	Depth Logged	Units
1004 TEM DHT-10D	30	15:00	Temperature	3000' to 4300'	°F
1004 TEM DHT-20U	31	17:00	Temperature	4300' to 3000'	°F

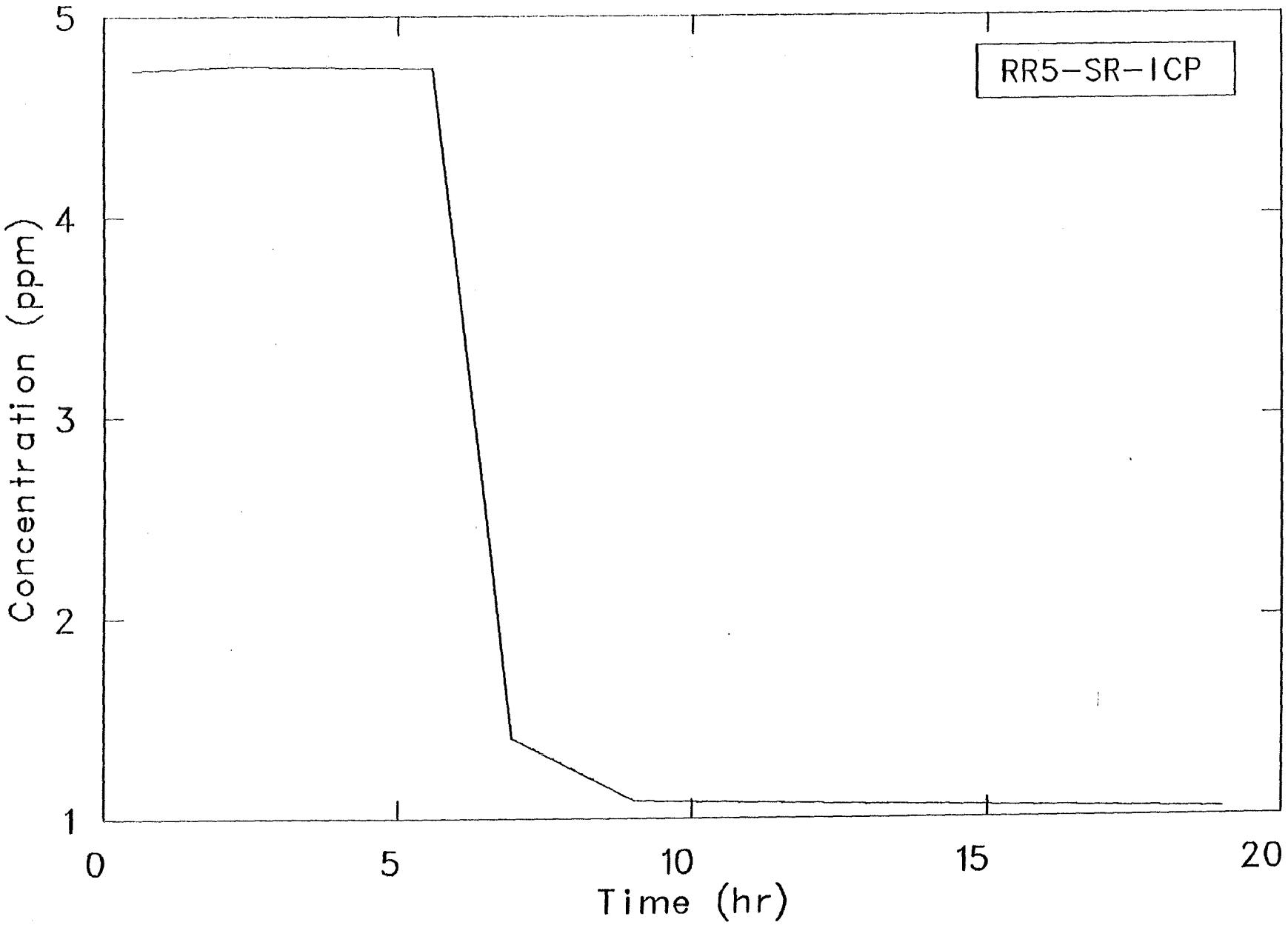

RR5-PH-DL
150
100
50
0
-50
pH (MV)
-100
-50
0
50
Time (hrs)

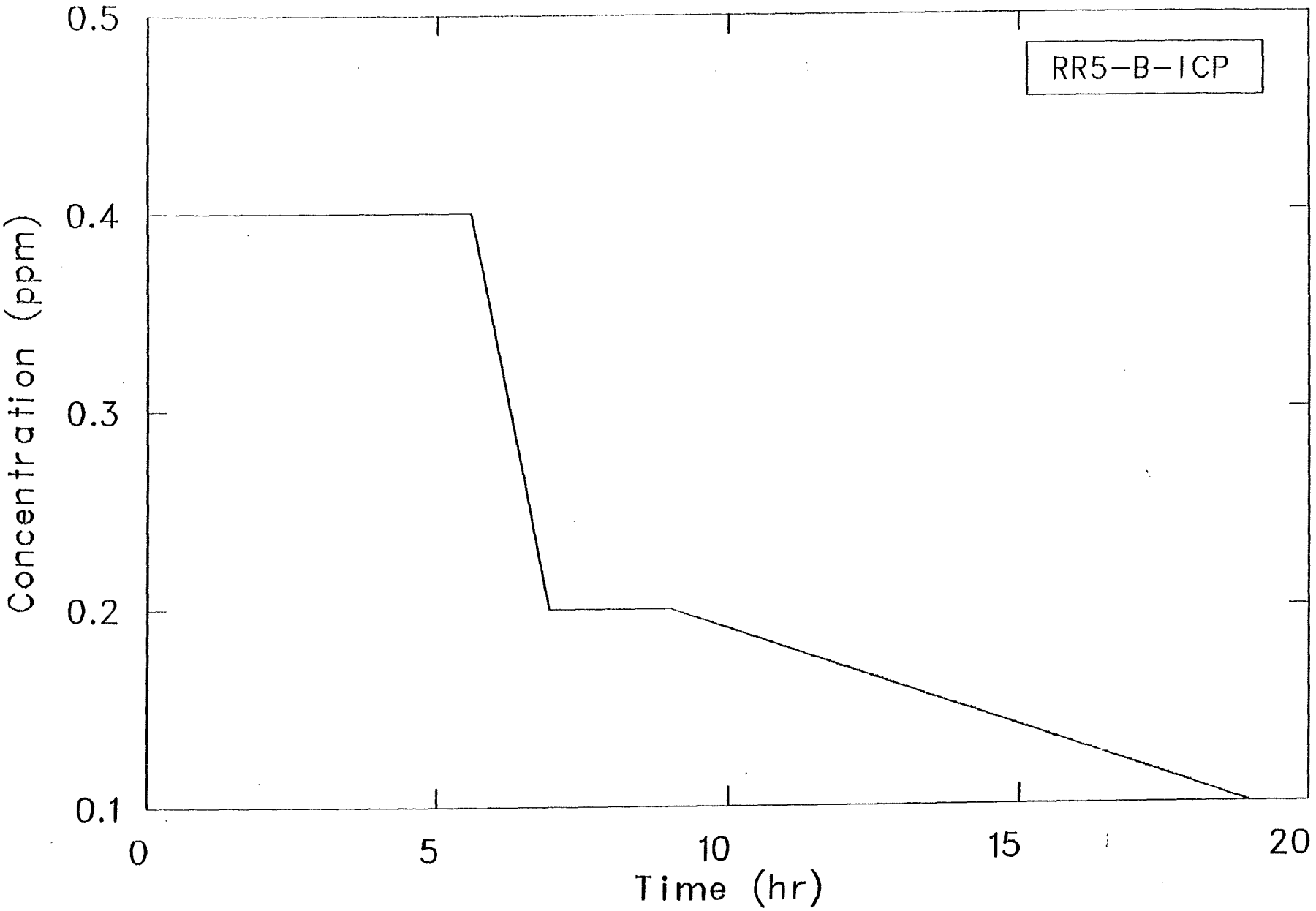

RR5-REDOX-DL
Oxidation-reduction-potential (MV)
-100
-200
-300
-400
-500
-100
-50
0
50
Time (hr)

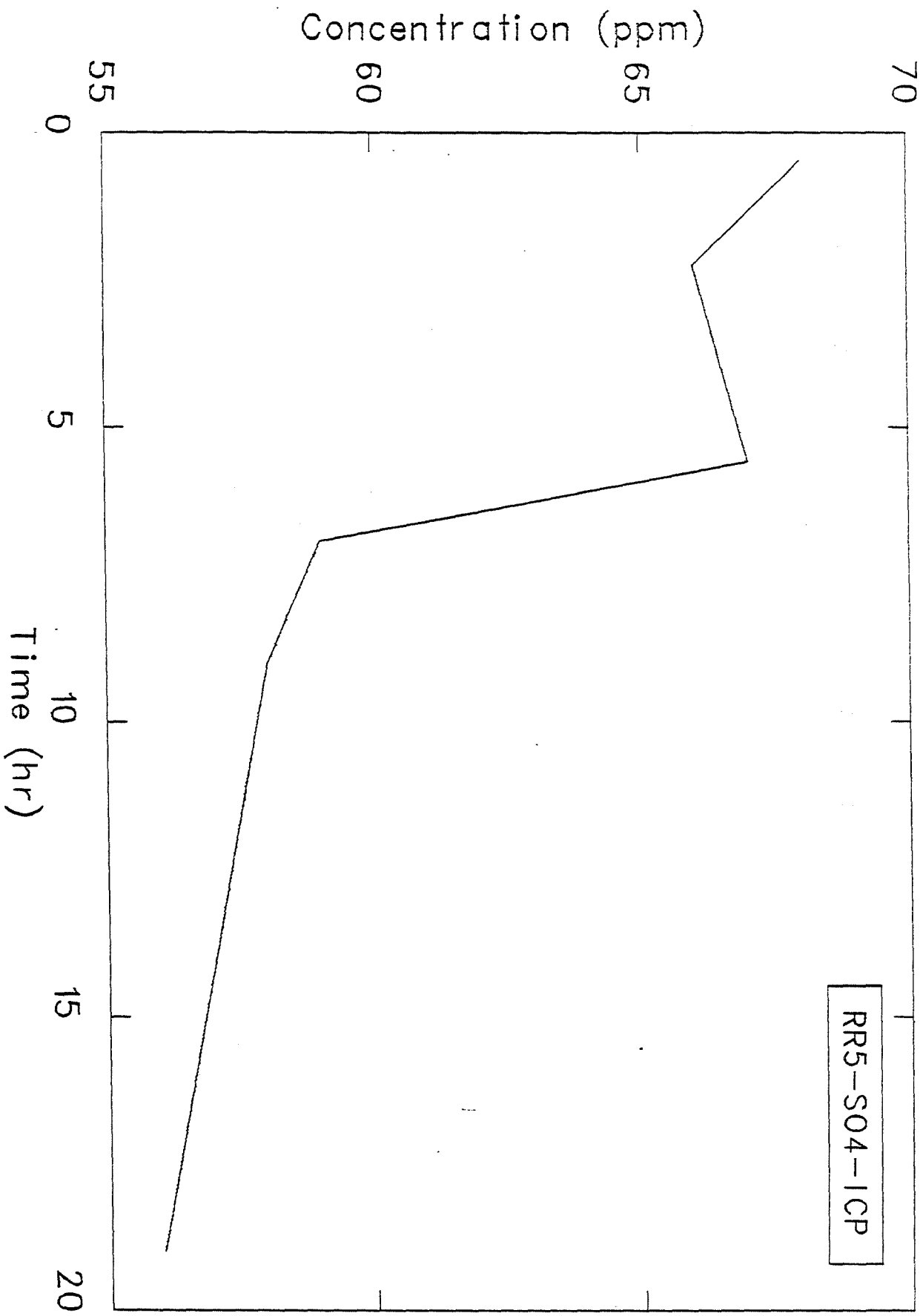

RR5-NA-ICP
1400
1200
1000
800
600
400
Concentration (ppm)
0
5
10
15
20
Time (hr)

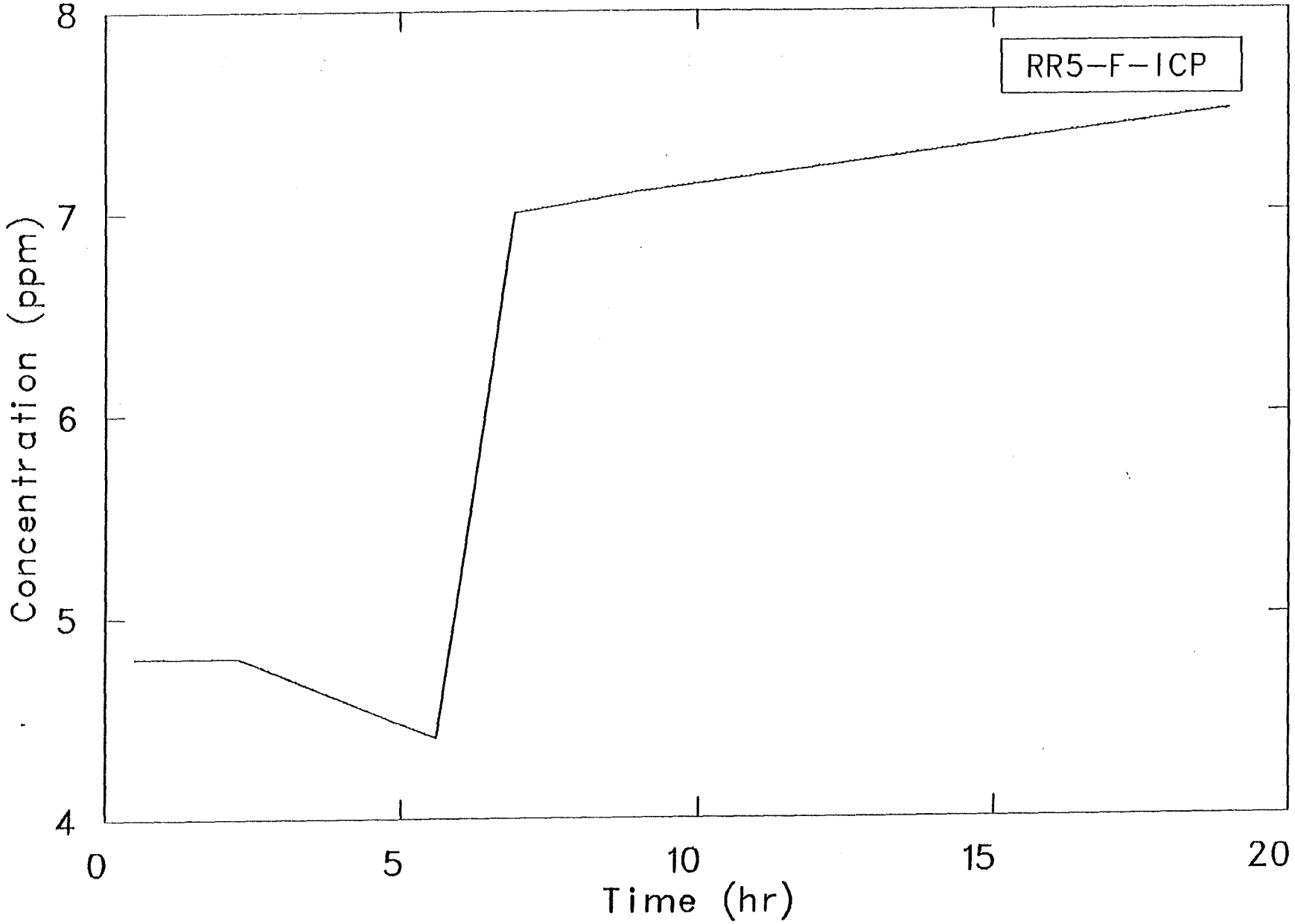

RR5-CA-ICP
250
200
150
100
50
Concentration (ppm)
0
5
10
15
20
Time (hr)

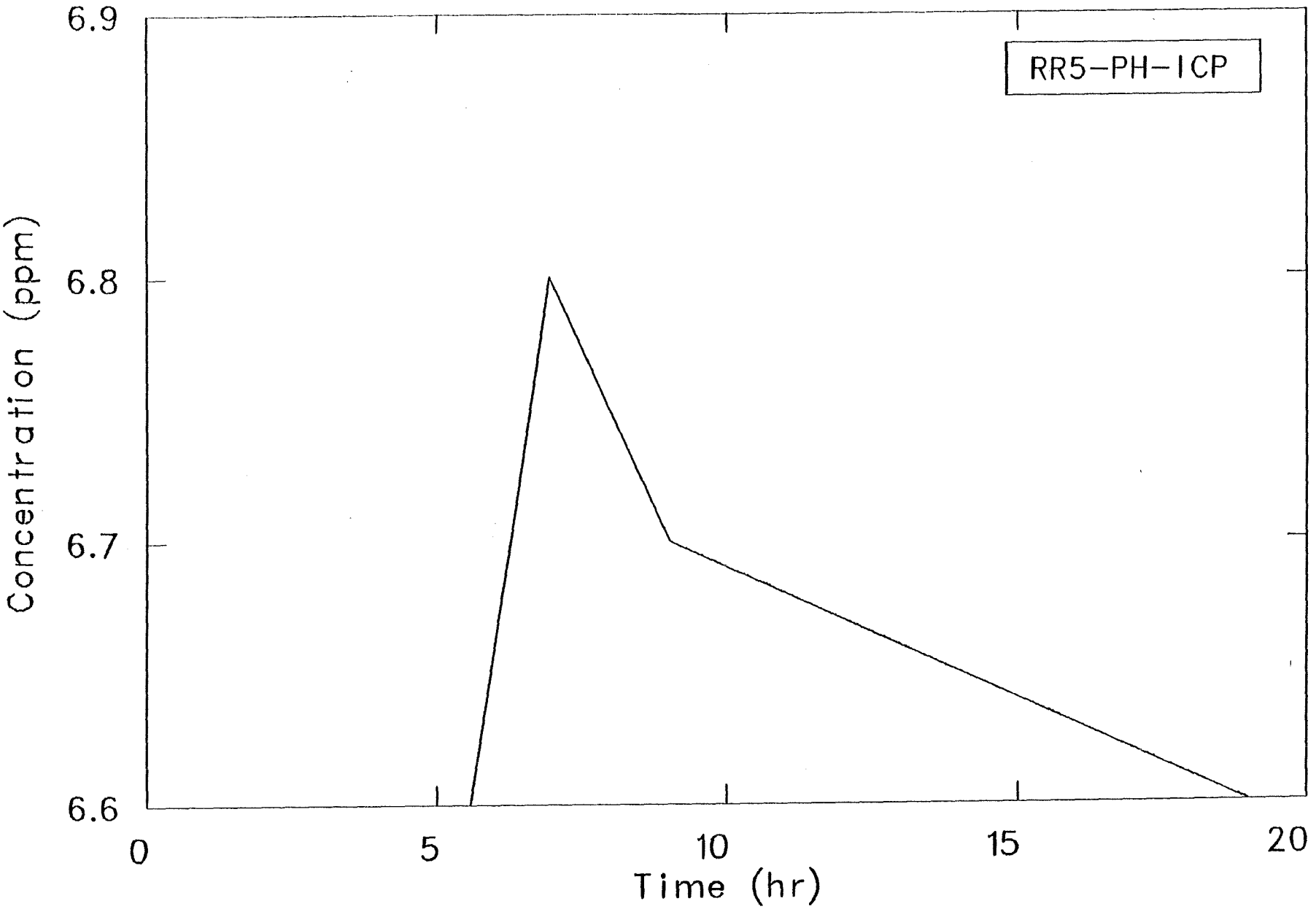

RR5-FE-ICP
Concentration (ppm)
15
10
5
0
0
5
10
15
20
Time (hr)


RR5-SR-ICP
Concentration (ppm)
Time (hr)
5
4
3
2
1
0
5
10
15
20

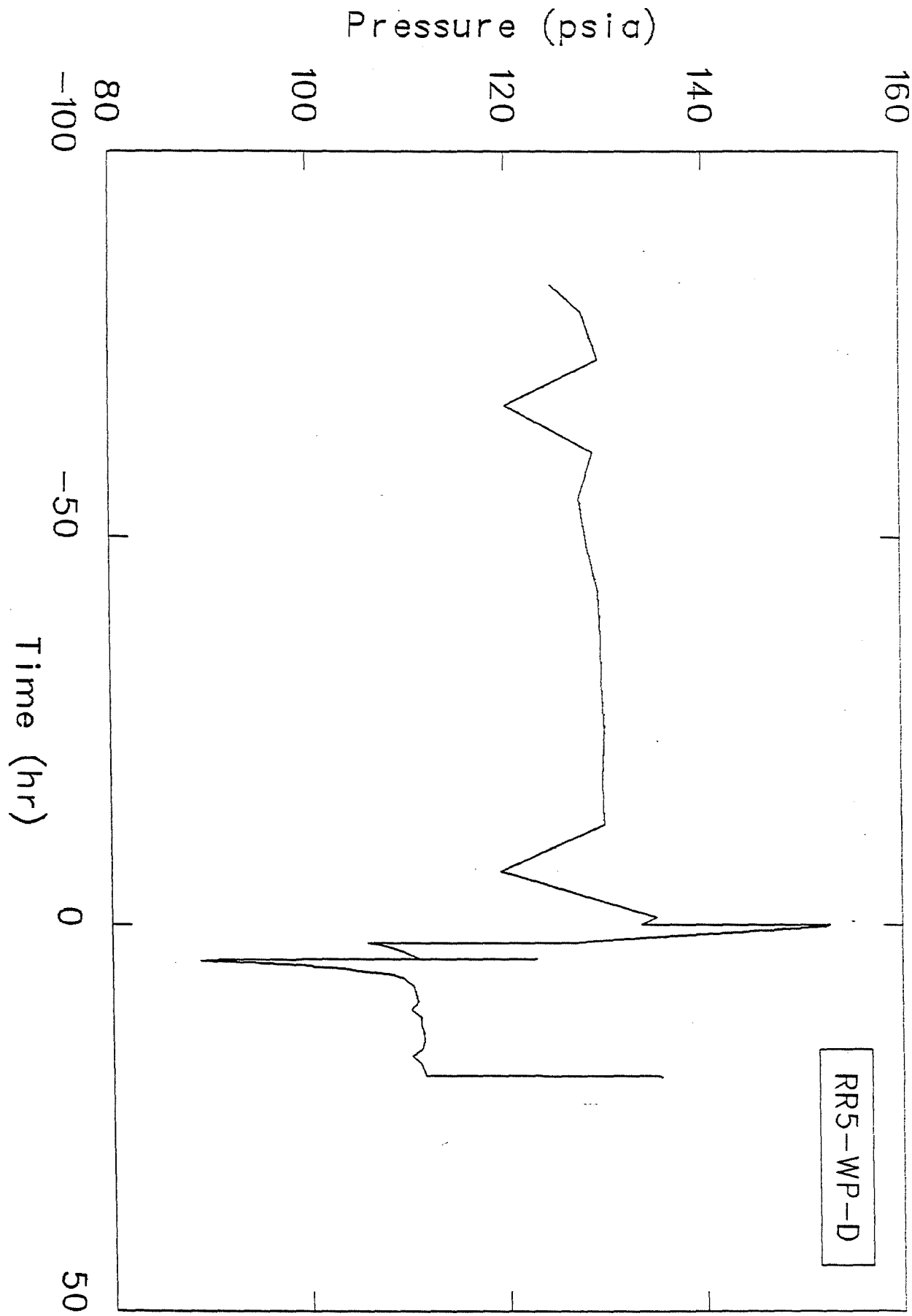

RR5-B-ICP
0.5
0.4
0.3
0.2
0.1
Concentration (ppm)
0
5
10
15
20
Time (hr)

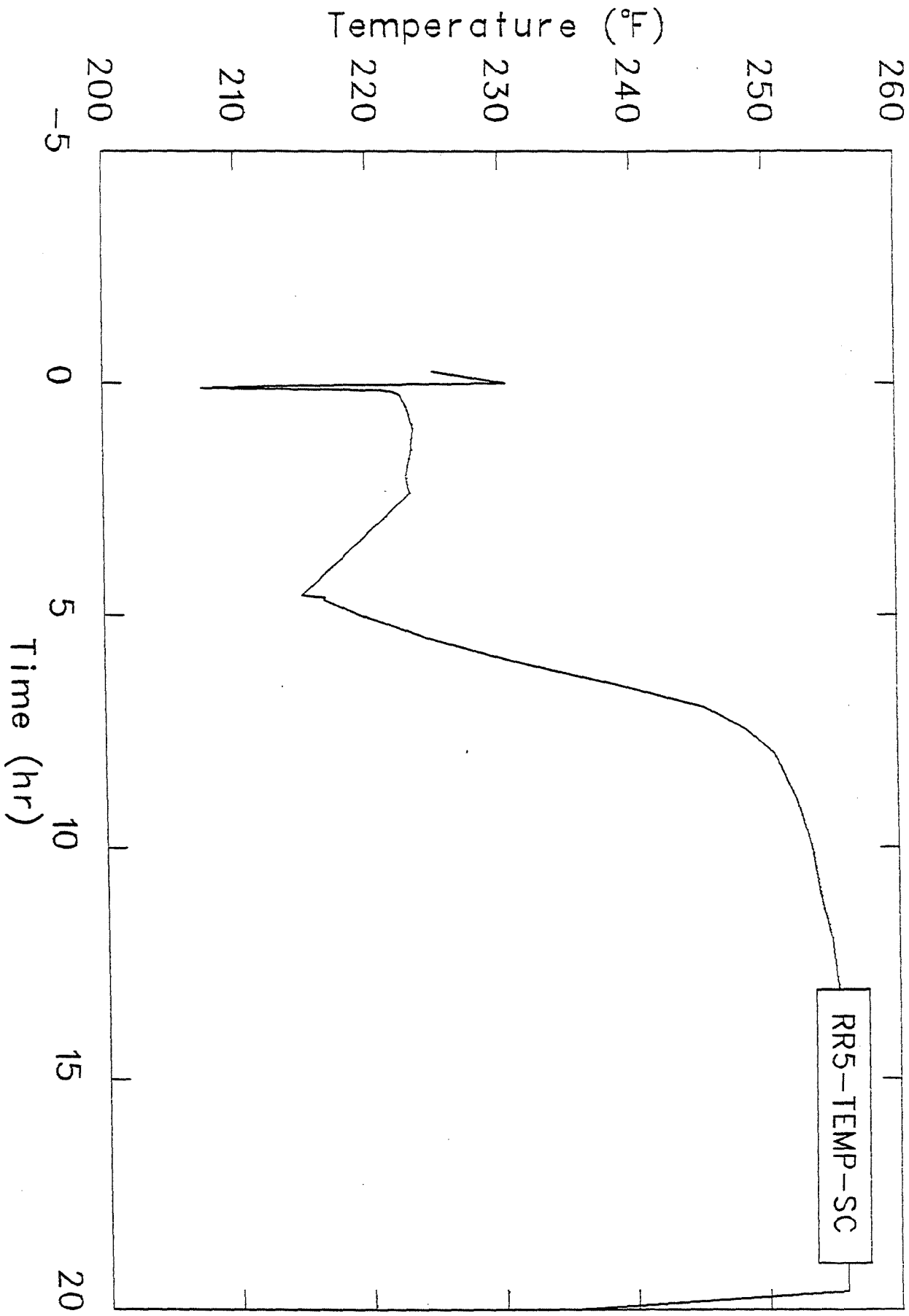

Concentration (ppm)
55
60
65
70
0
5
10
15
20
Time (hr)
RR5-SO4-ICP

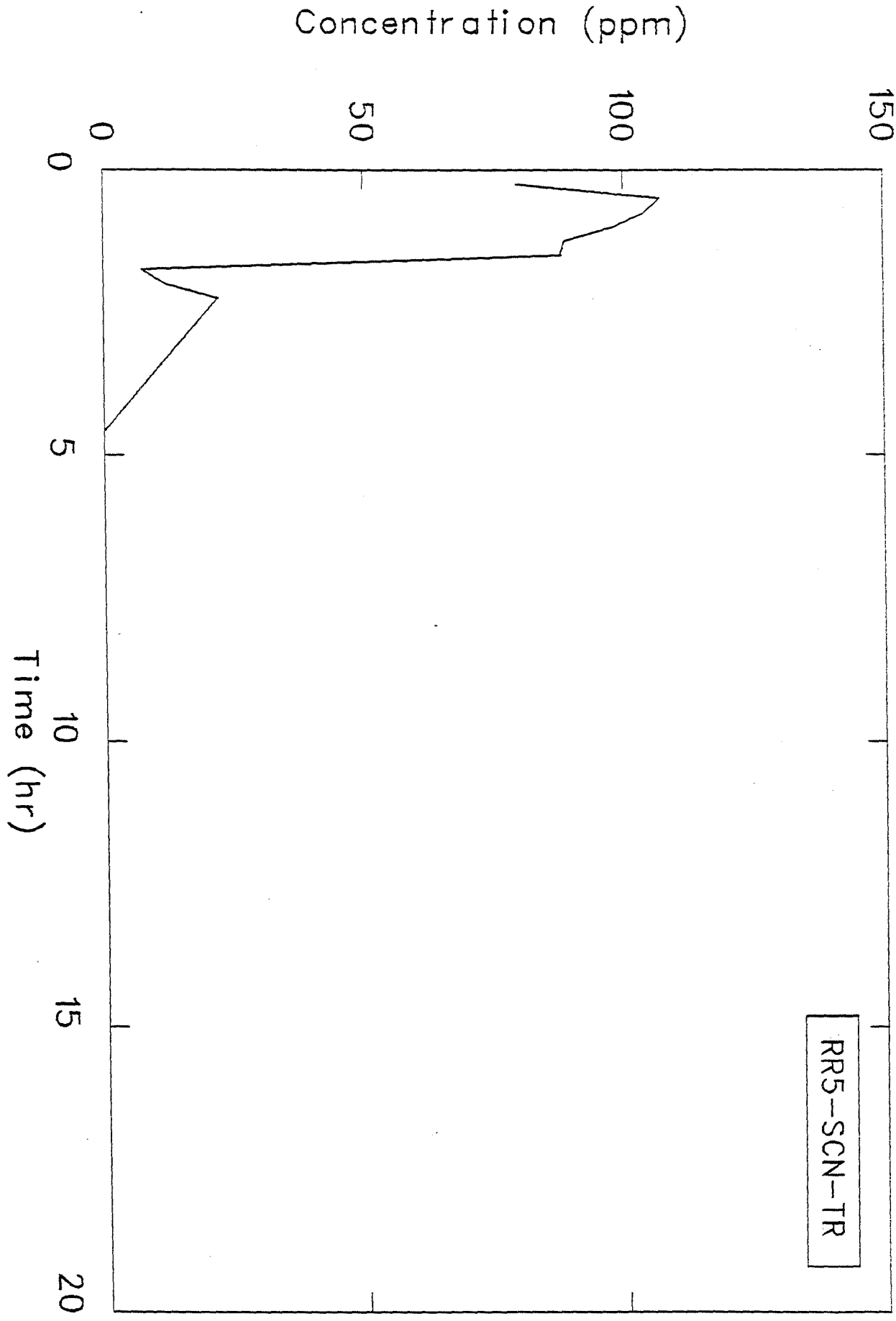

RR5-F-ICP
Concentration (ppm)
8
7
6
5
4
0
5
10
15
20
Time (hr)

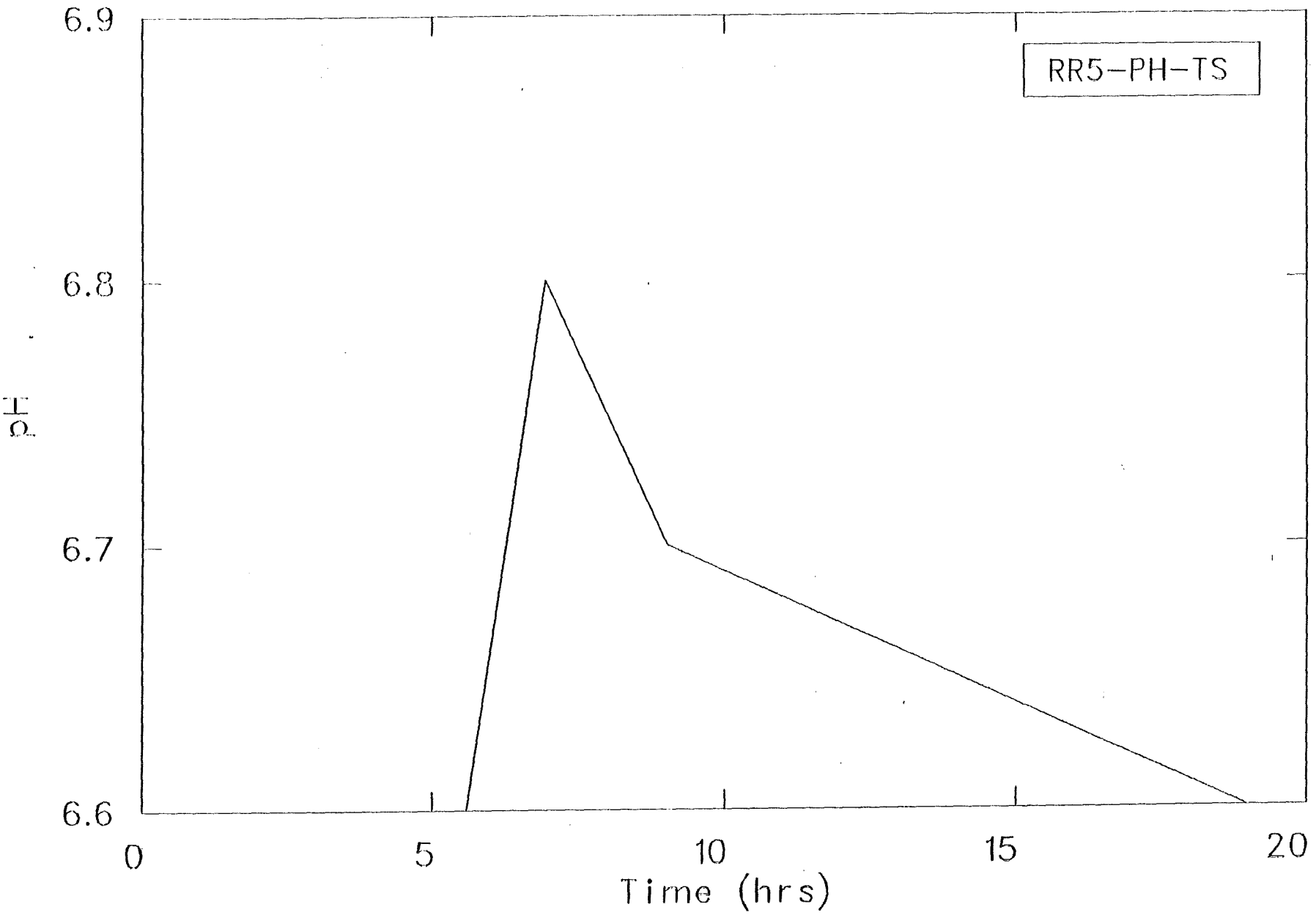


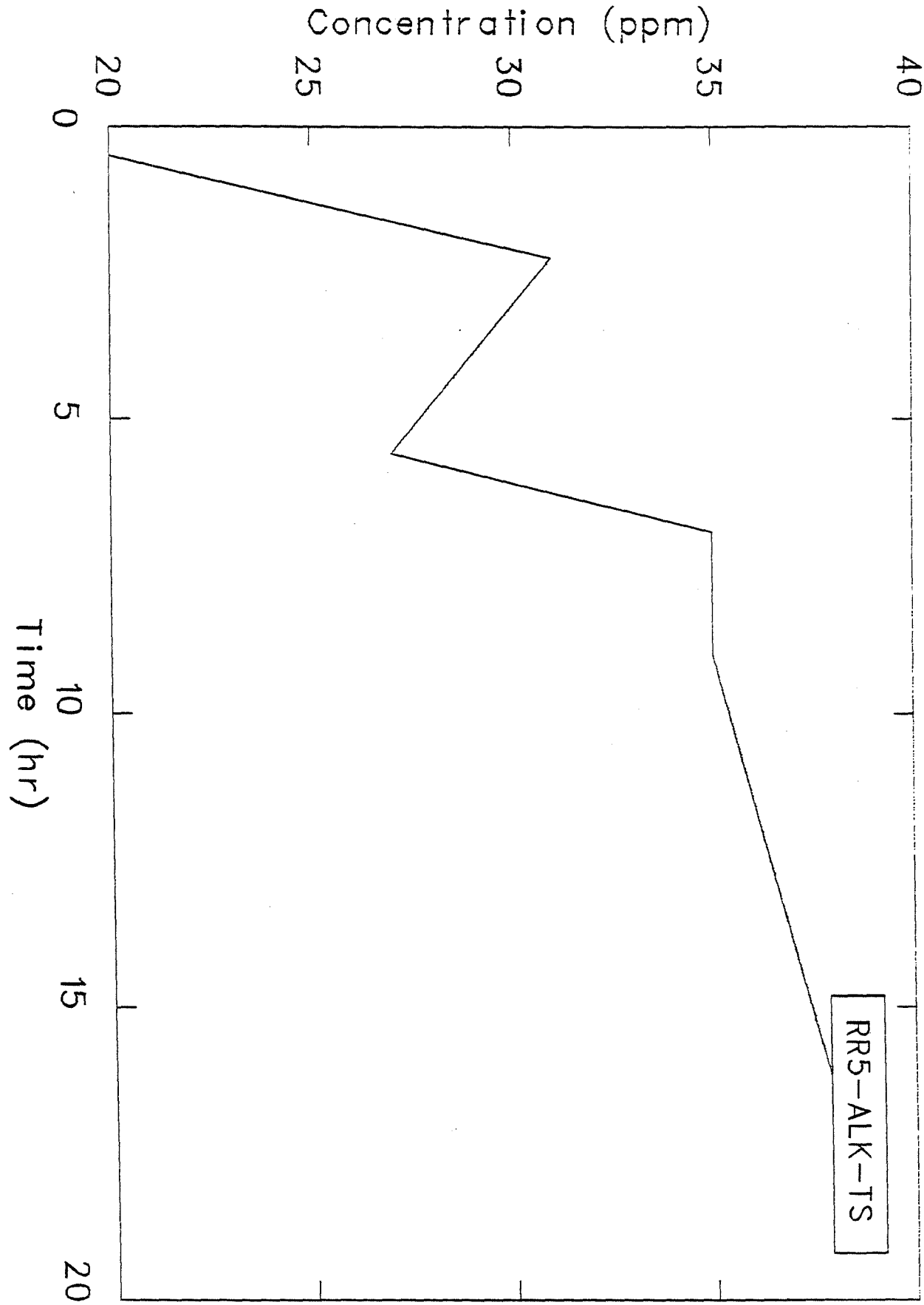
FR-19


Pressure (psia)
80
100
120
140
160
-100
-50
0
50
Time (hr)
RR5-WP-D


Temperature (°F)
200
210
220
230
240
250
260
−5
0
5
10
15
20
Time (hr)
RR5-TEMP-SC


Concentration (ppm)
0
50
100
150
0
5
10
15
20
Time (hr)
RR5-SCN-TR


RR5-PH-TS
6.9
6.8
6.7
6.6
pH
0
5
10
15
20
Time (hrs)


Concentration (ppm)
20
25
30
35
40
0
5
10
15
20
Time (hr)
RR5-ALK-TS

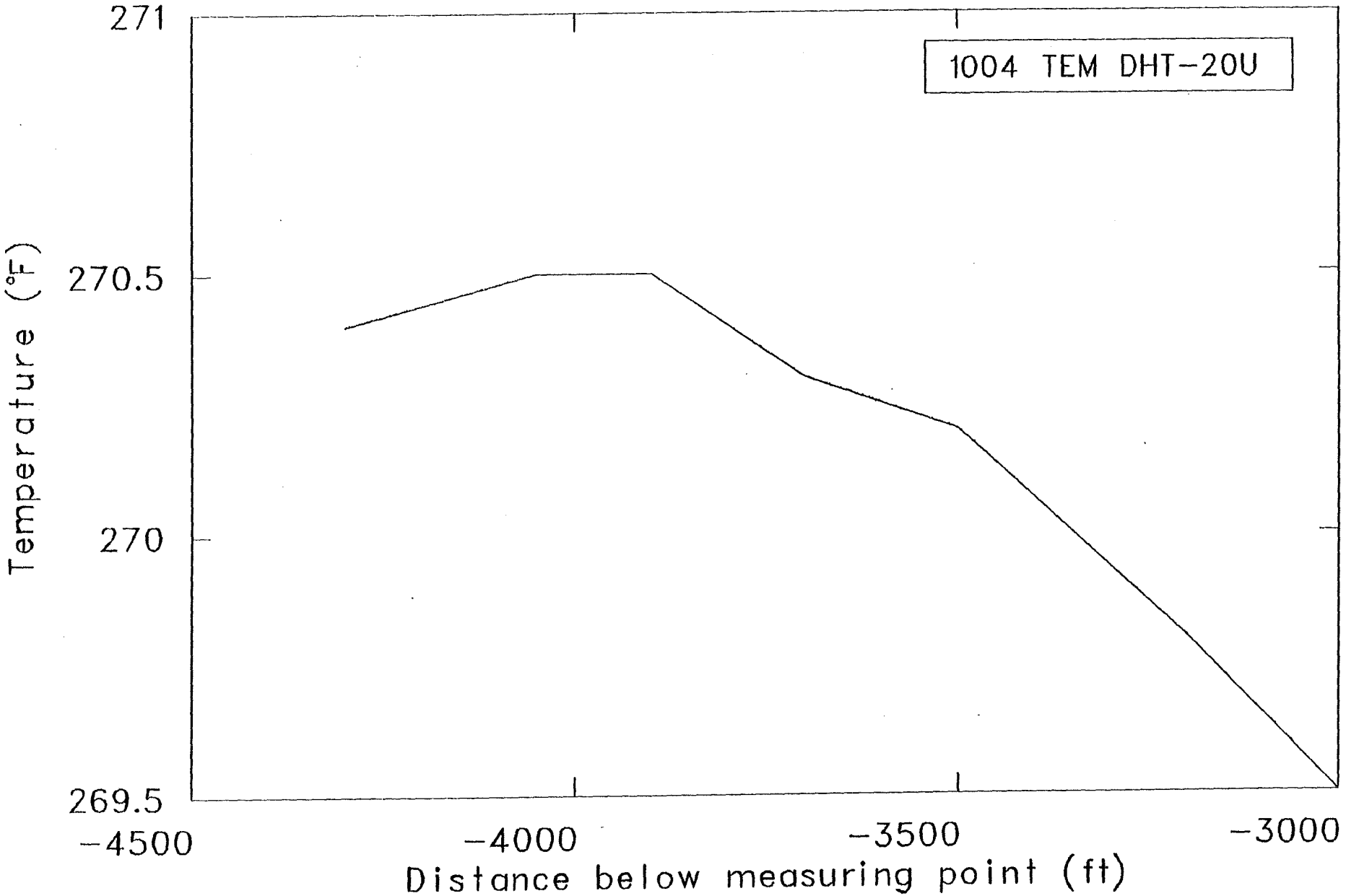
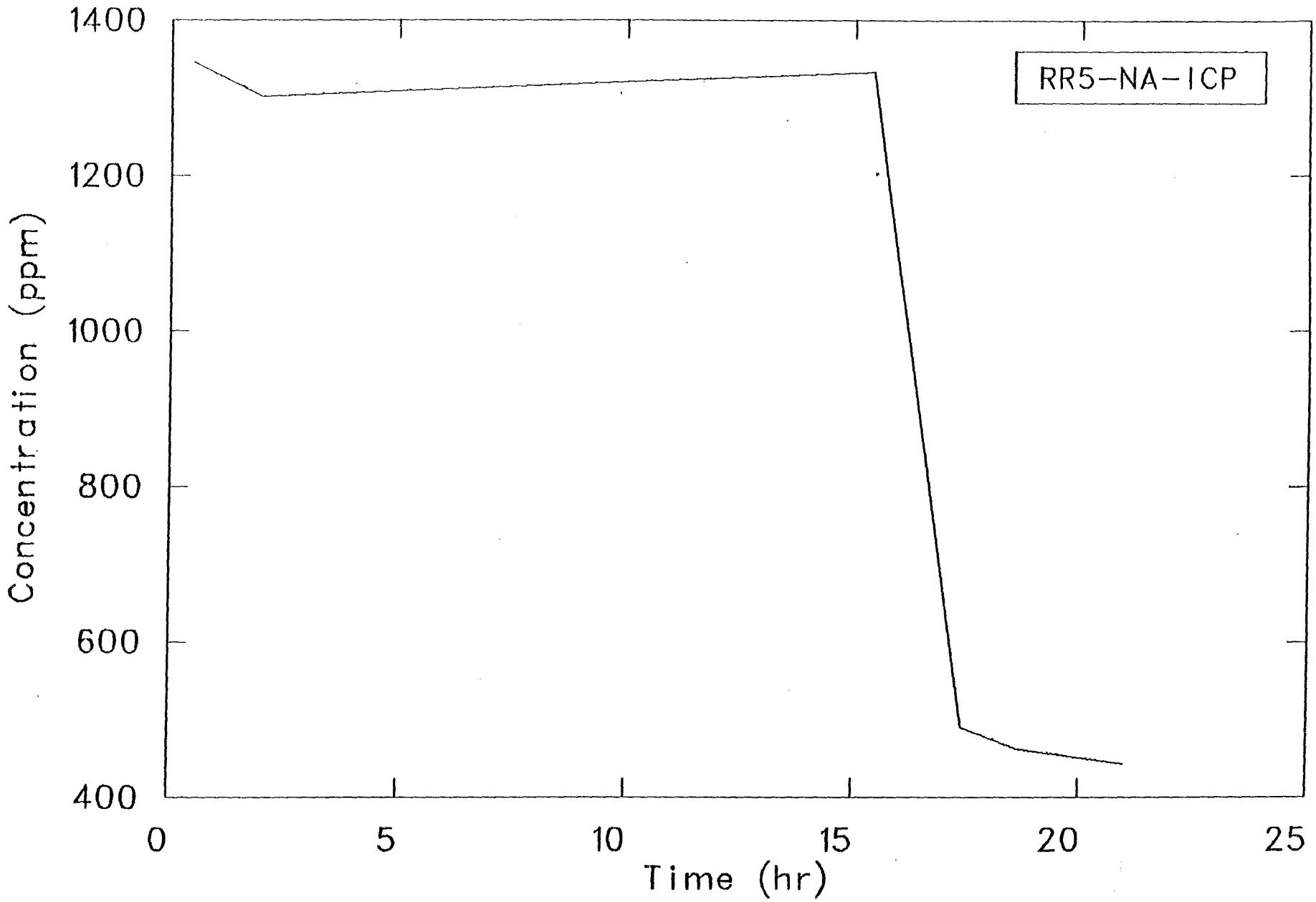
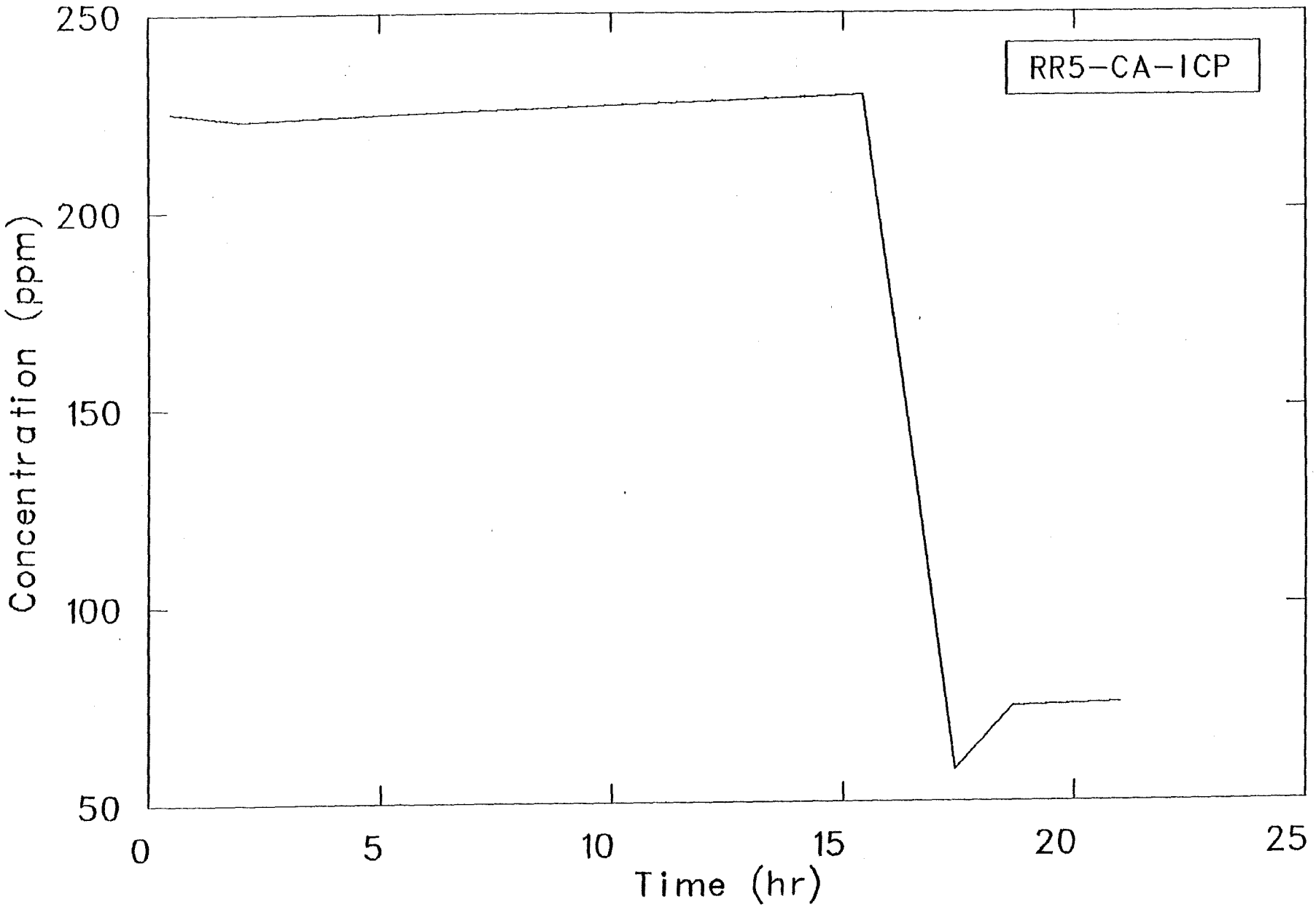
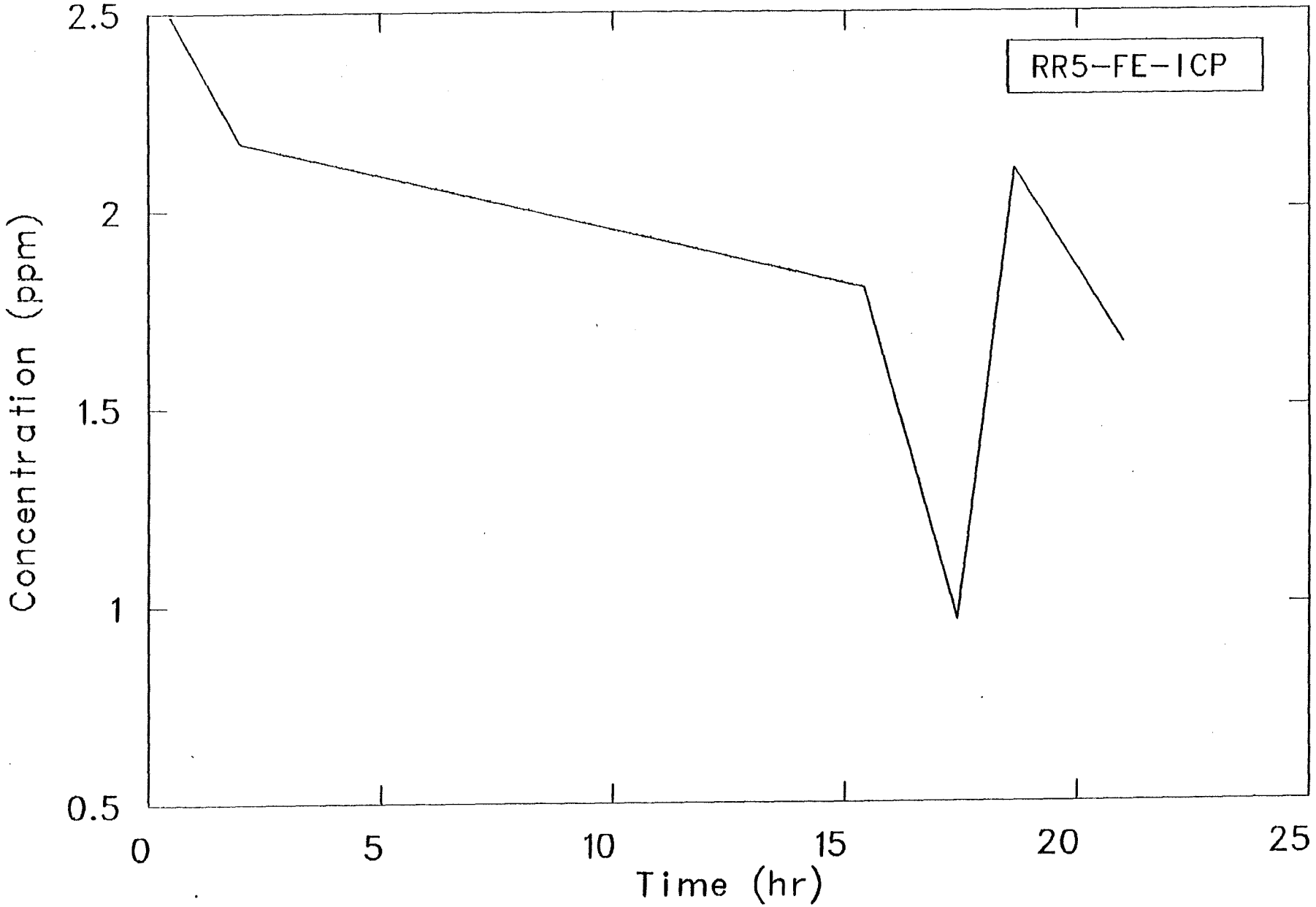

1004 TEM DHT-20U
271
270.5
270
269.5
Temperature (°F)
-4500
-4000
-3500
-3000
Distance below measuring point (ft)

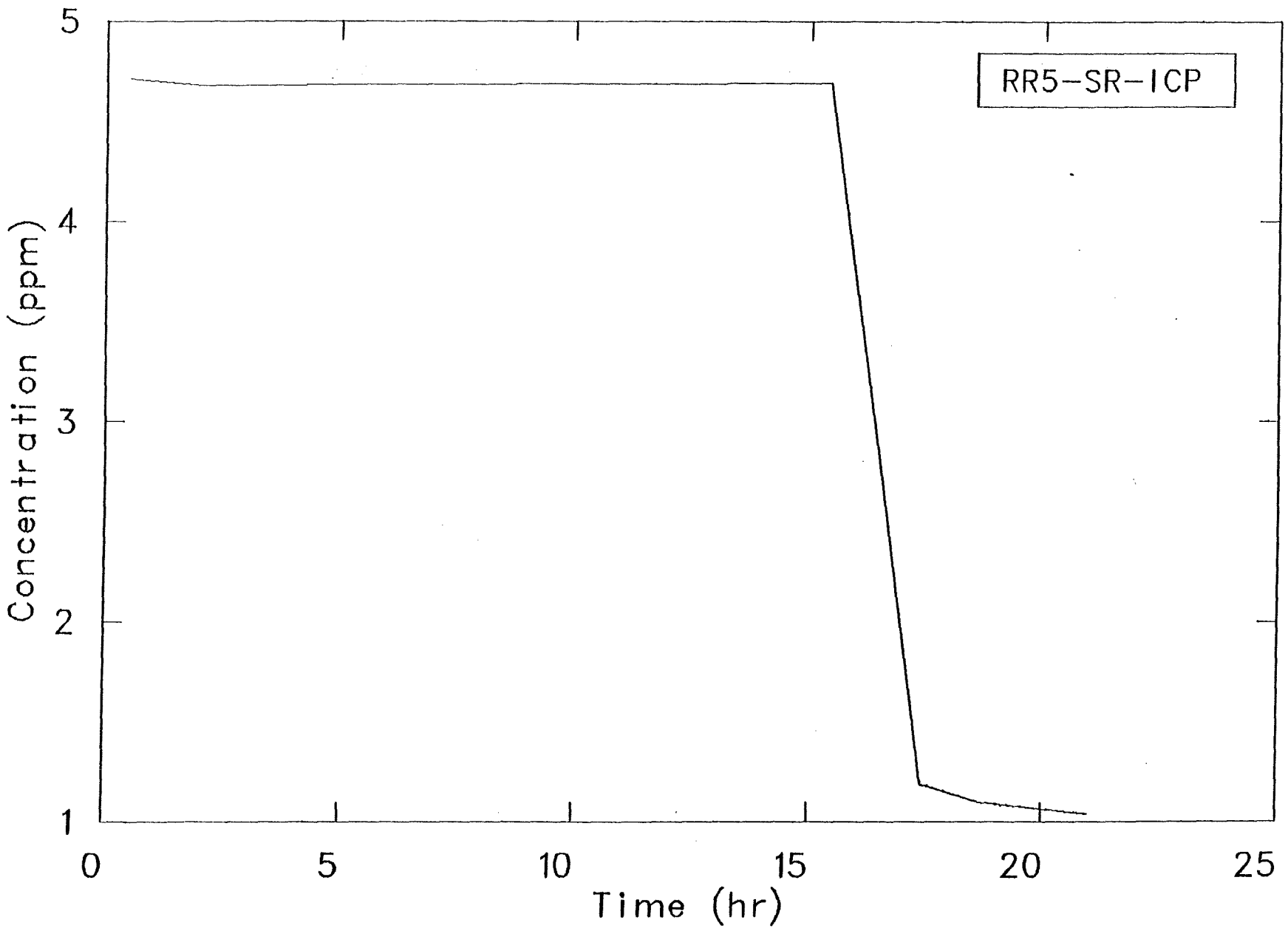
TABLE I. TEST 4C
File Name: RR4C821008 Date: 10-08-82
Start Time: Real--12:00; File Start Time: -6.00

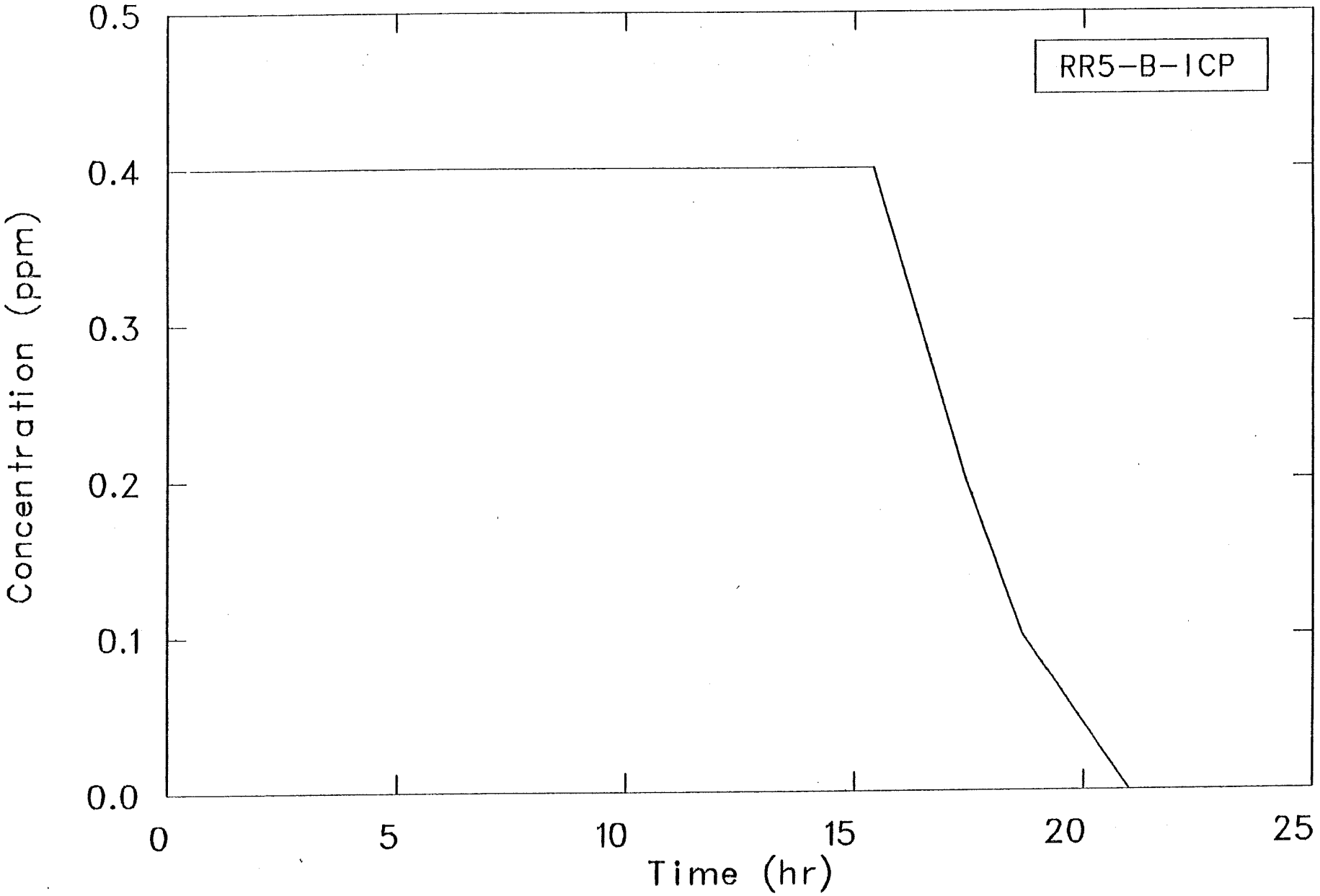
Record Name	#	Data Sampled	Recorder or Method	Units
RR5-NA-ICP	1	Sodium	ICP	ppm
RR5-K-ICP	2	Potassium	ICP	ppm
RR5-CA-ICP	3	Calcium	ICP	ppm
RR5-MG-ICP	4	Magnesium	ICP	ppm
RR5-FE-ICP	5	Iron	ICP	ppm
RR5-SIO2-ICP	6	Silica	ICP	ppm
RR5-SR-ICP	7	Strontium	ICP	ppm
RR5-LI-ICP	8	Lithium	ICP	ppm
RR5-B-ICP	9	Boron	ICP	ppm
RR5-HCO3-ICP	10	Bicarbonate	Titration	ppm
RR5-SO4-ICP	11	Sulfate	Gravimetric	ppm
RR5-CL-ICP	12	Chloride	Titration	ppm
RR5-F-ICP	13	Fluoride	SIE	ppm
RR5-TDS-ICP	14	TDS	Evaporation and weighing	ppm
RR5-PH-ICP	15	pH	SIE	standard
RR5-TEMP-M	16	Temperature	Manually recorded	°F
RR5-WP-D	17	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	18	Well flow	Stripchart	±gpm
RR5-TEMP-SC	19	Temperature	Stripchart	°F
RR5-I-TR	20	Iodide	SIE	ppm
RR5-PH-TS	21	pH	SIE	standard
RR5-COND-TS	22	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	23	Alkalinity	Titration	ppm
RR5-PH-DL	24	pH	Data logger	millivolts
RR5-COND-DL	25	Conductivity	Data logger	µmho/cm
RR5-REDOX-DL	26	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	27	Temperature	Data logger	°F

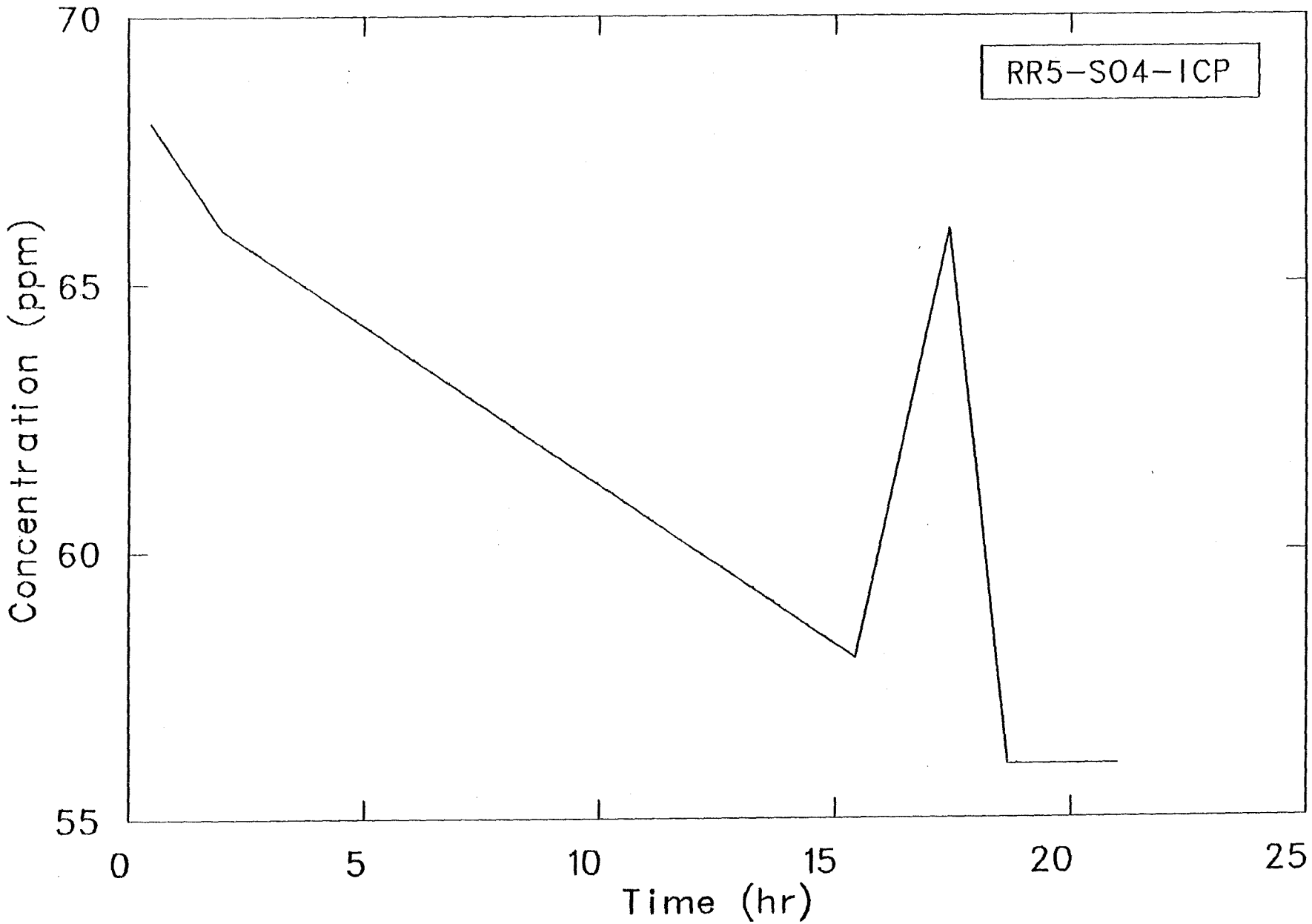

RR5-NA-ICP
Concentration (ppm)
1400
1200
1000
800
600
400
0
5
10
15
20
25
Time (hr)

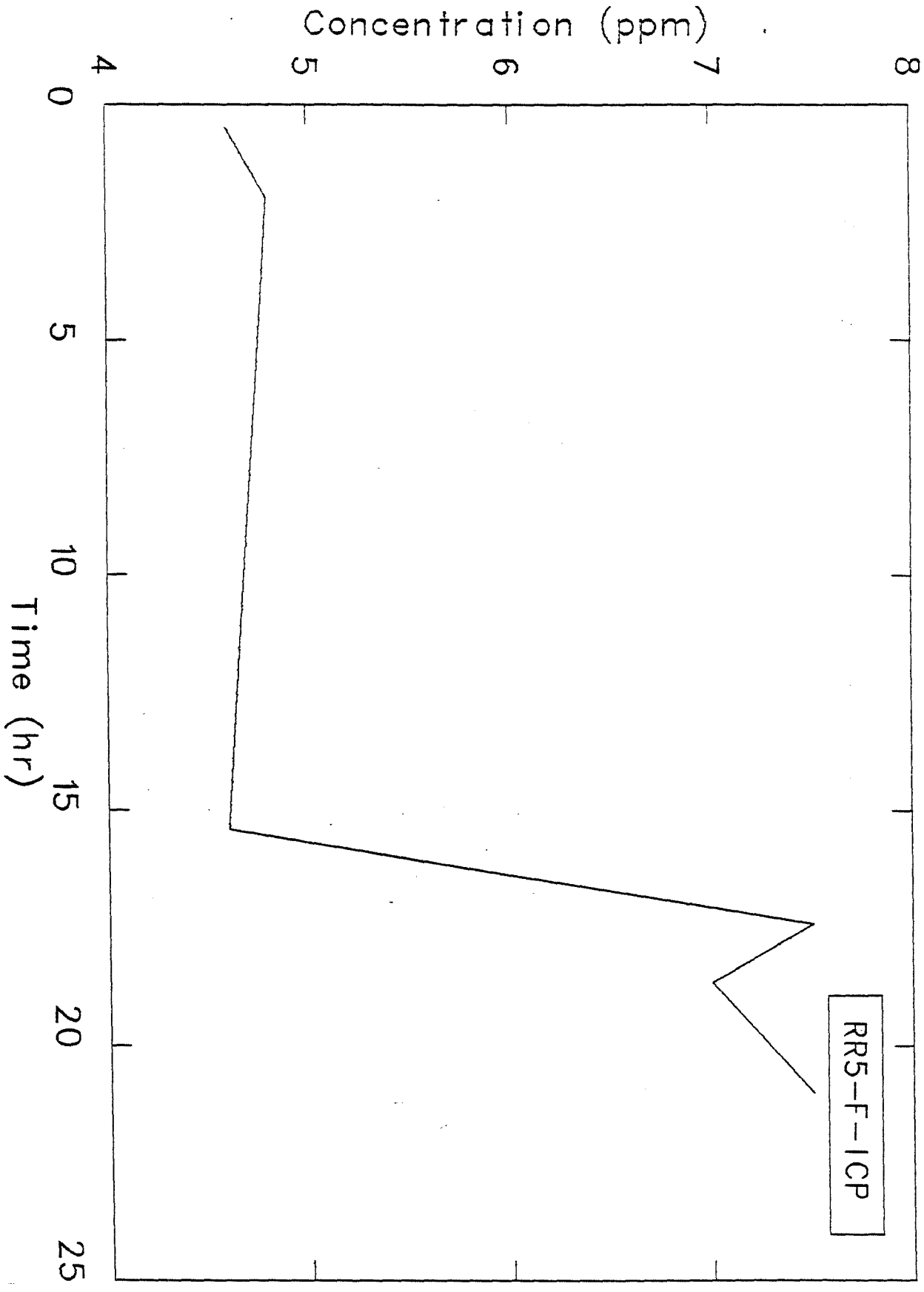

RR5-CA-ICP
Concentration (ppm)
250
200
150
100
50
0
5
10
15
20
25
Time (hr)

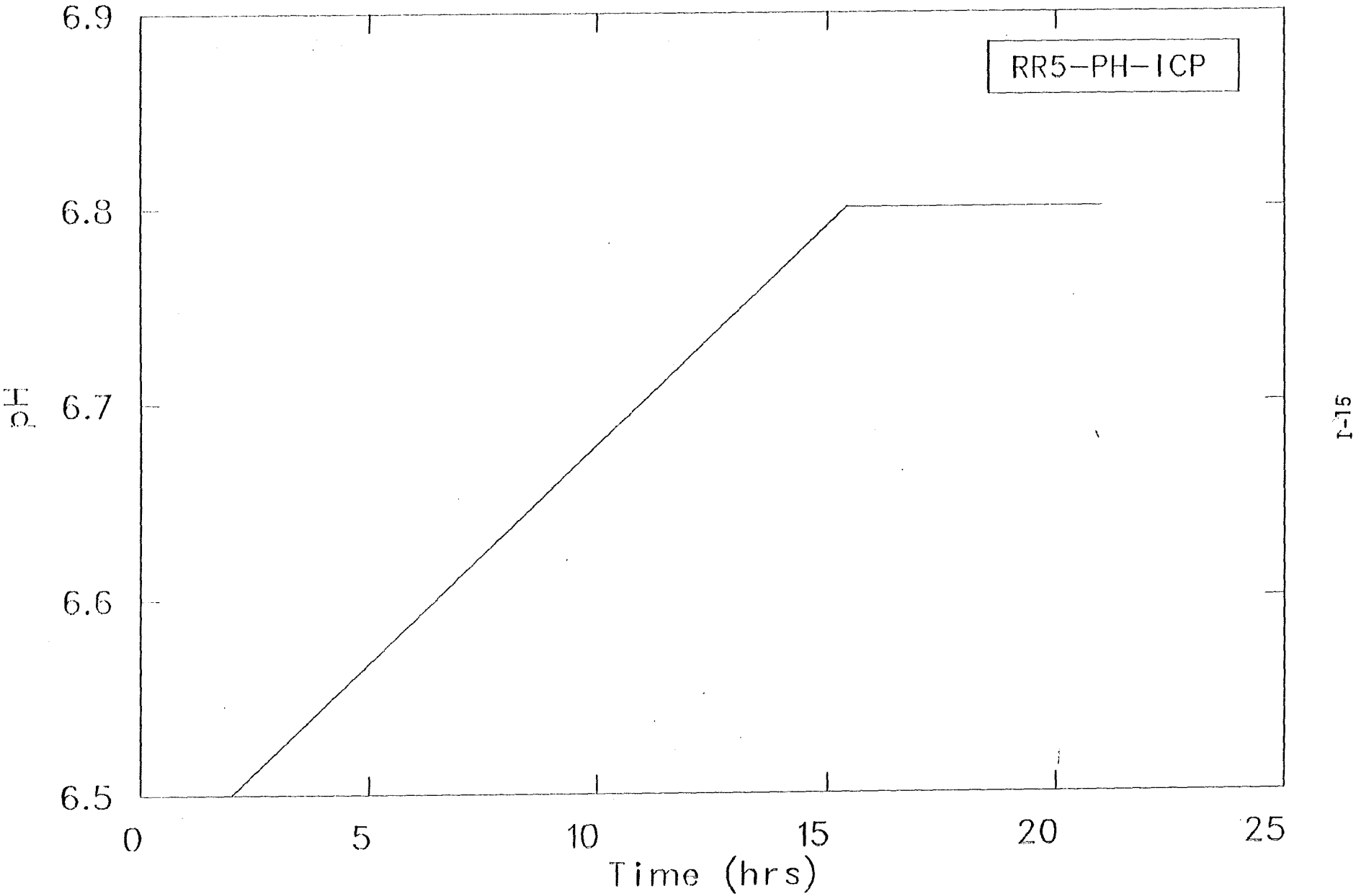

RR5-FE-ICP
Concentration (ppm)
2.5
2
1.5
1
0.5
0
5
10
15
20
25
Time (hr)

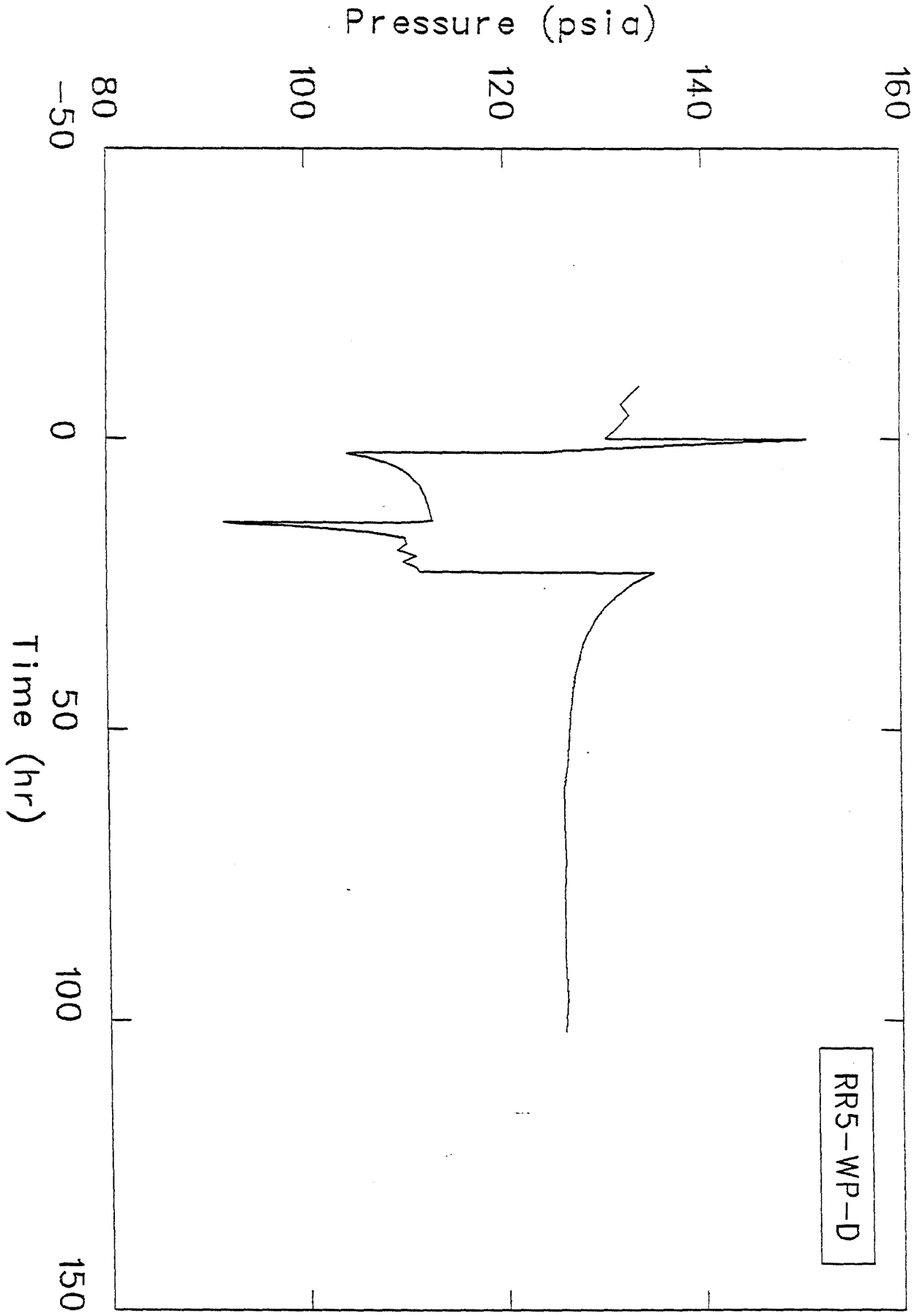

RR5-SR-ICP
Concentration (ppm)
Time (hr)
5
4
3
2
1
0
5
10
15
20
25

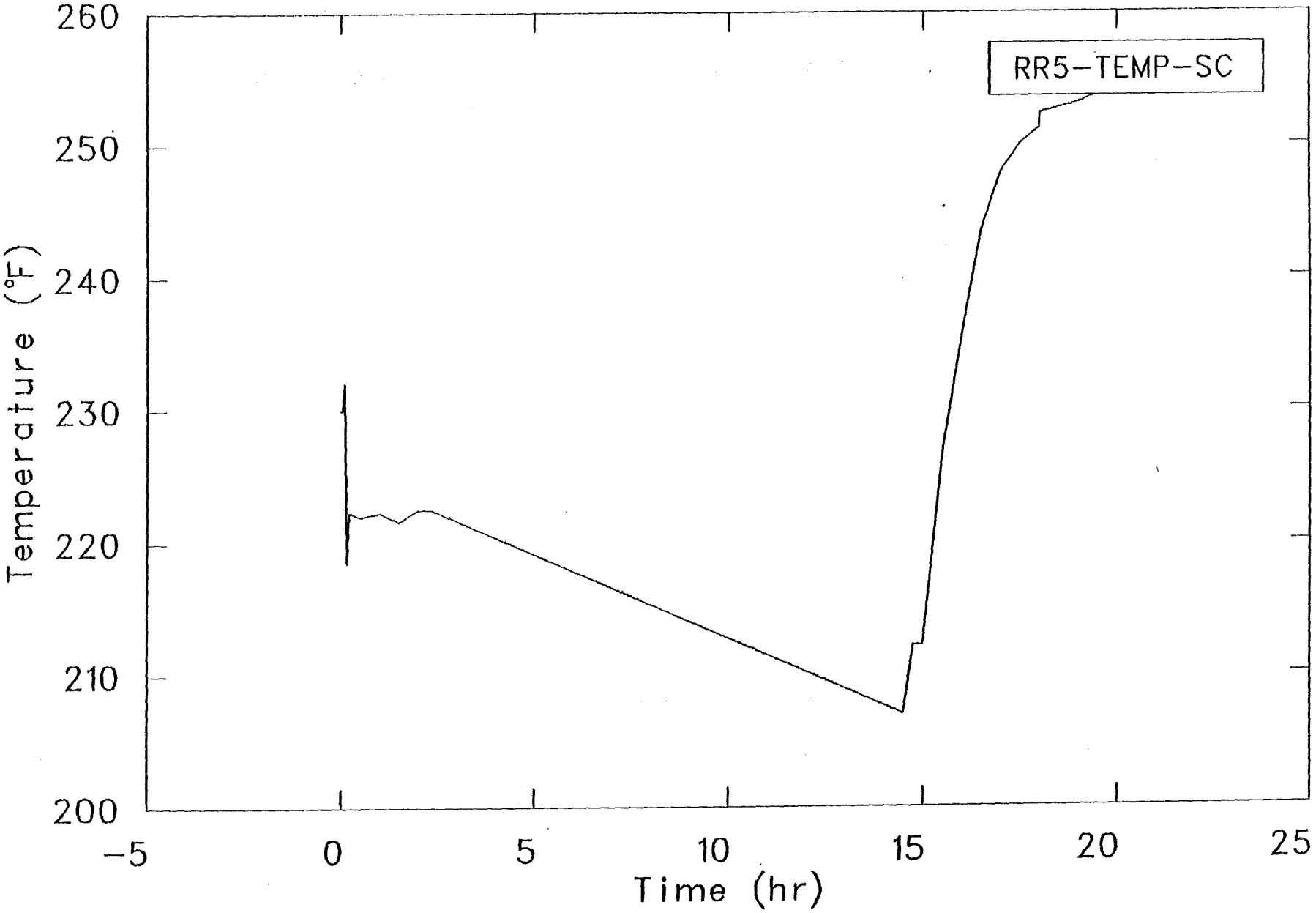

RR5-B-ICP
Concentration (ppm)
0.5
0.4
0.3
0.2
0.1
0.0
0
5
10
15
20
25
Time (hr)


RR5-SO4-ICP
70
65
60
55
Concentration (ppm)
0
5
10
15
20
25
Time (hr)

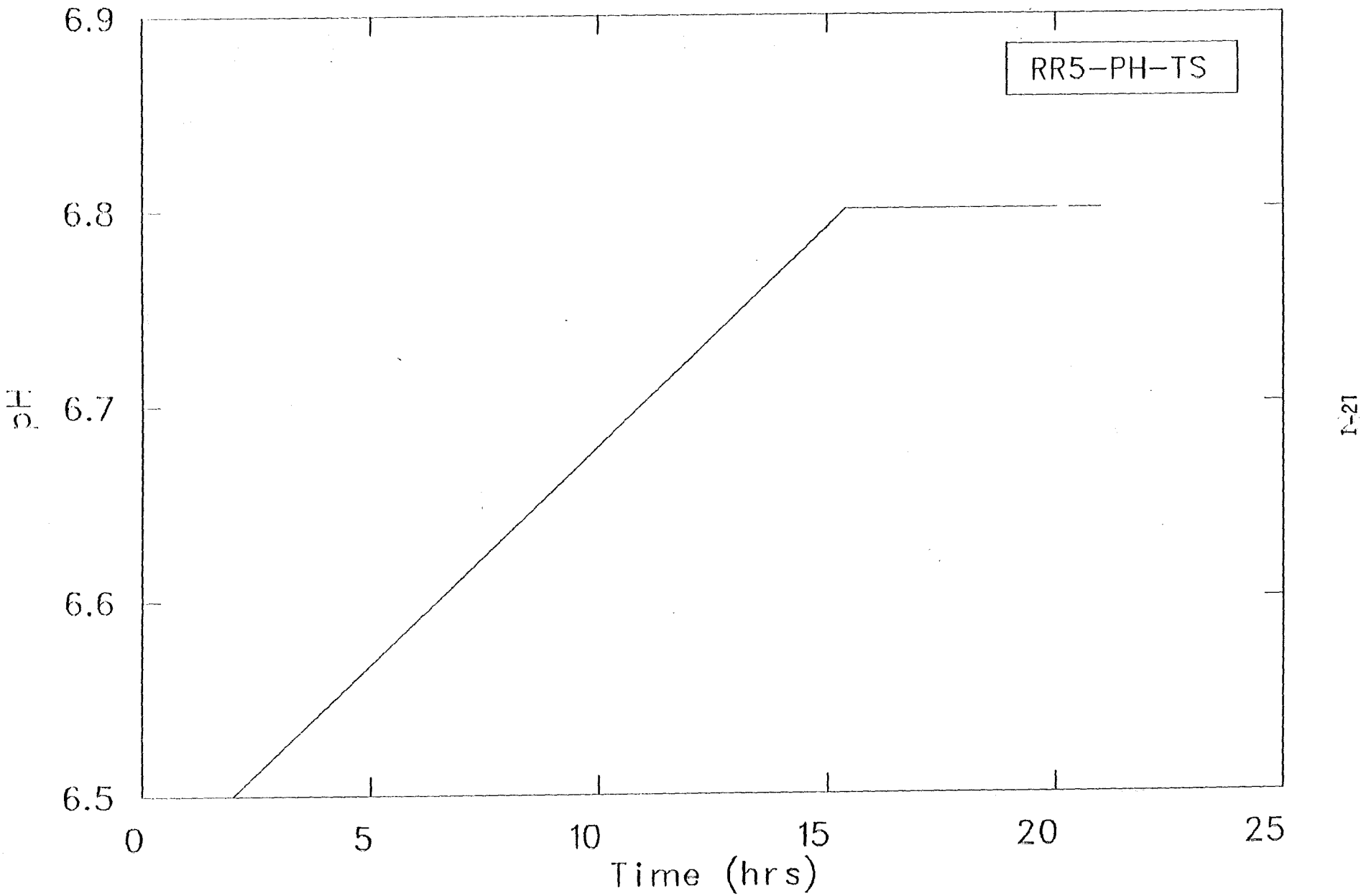

Concentration (ppm)
4
5
6
7
8
0
5
10
15
20
25
Time (hr)
RR5-F-ICP

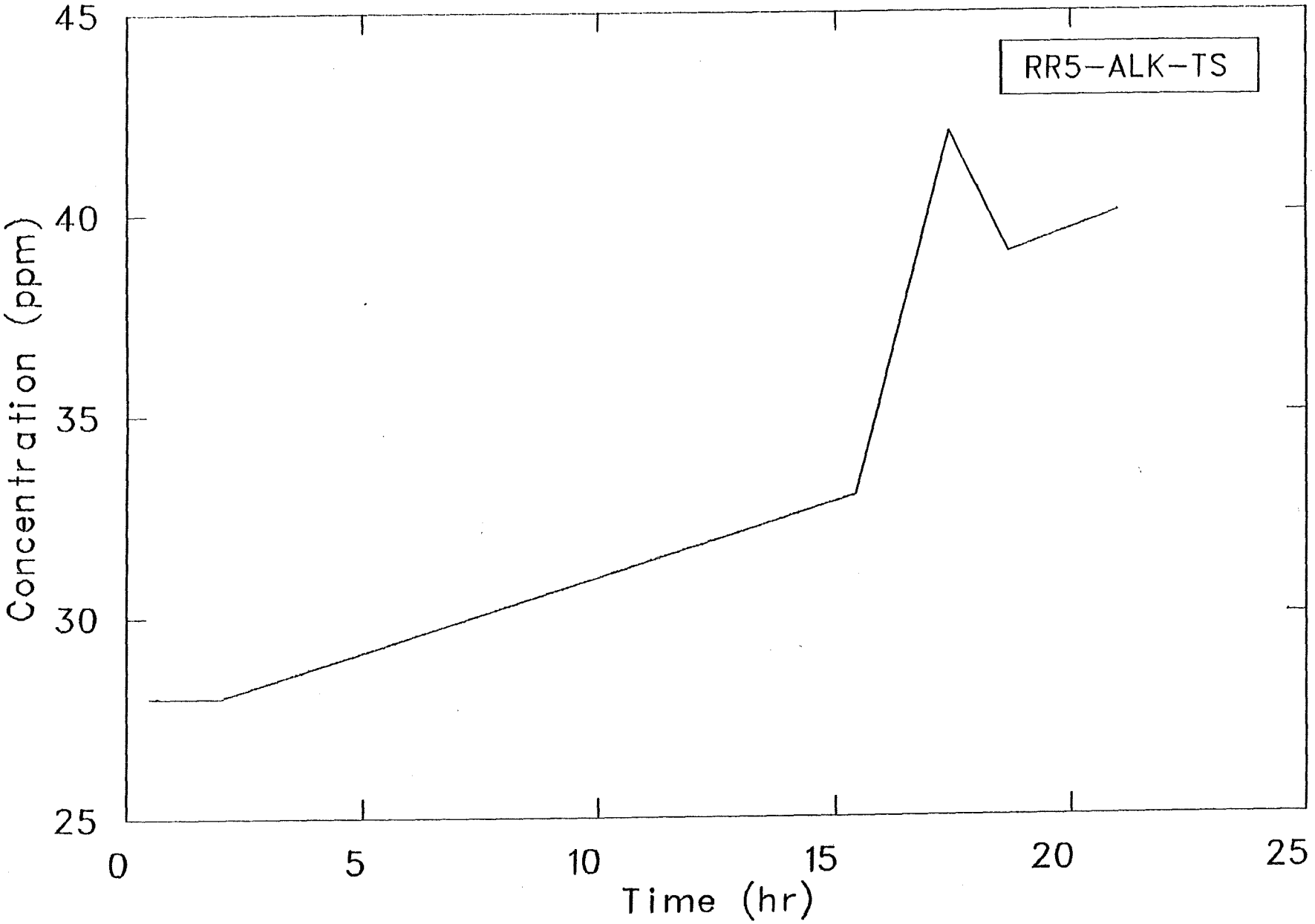

RR5-PH-ICP
6.9
6.8
6.7
6.6
6.5
pH
0
5
10
15
20
25
Time (hrs)

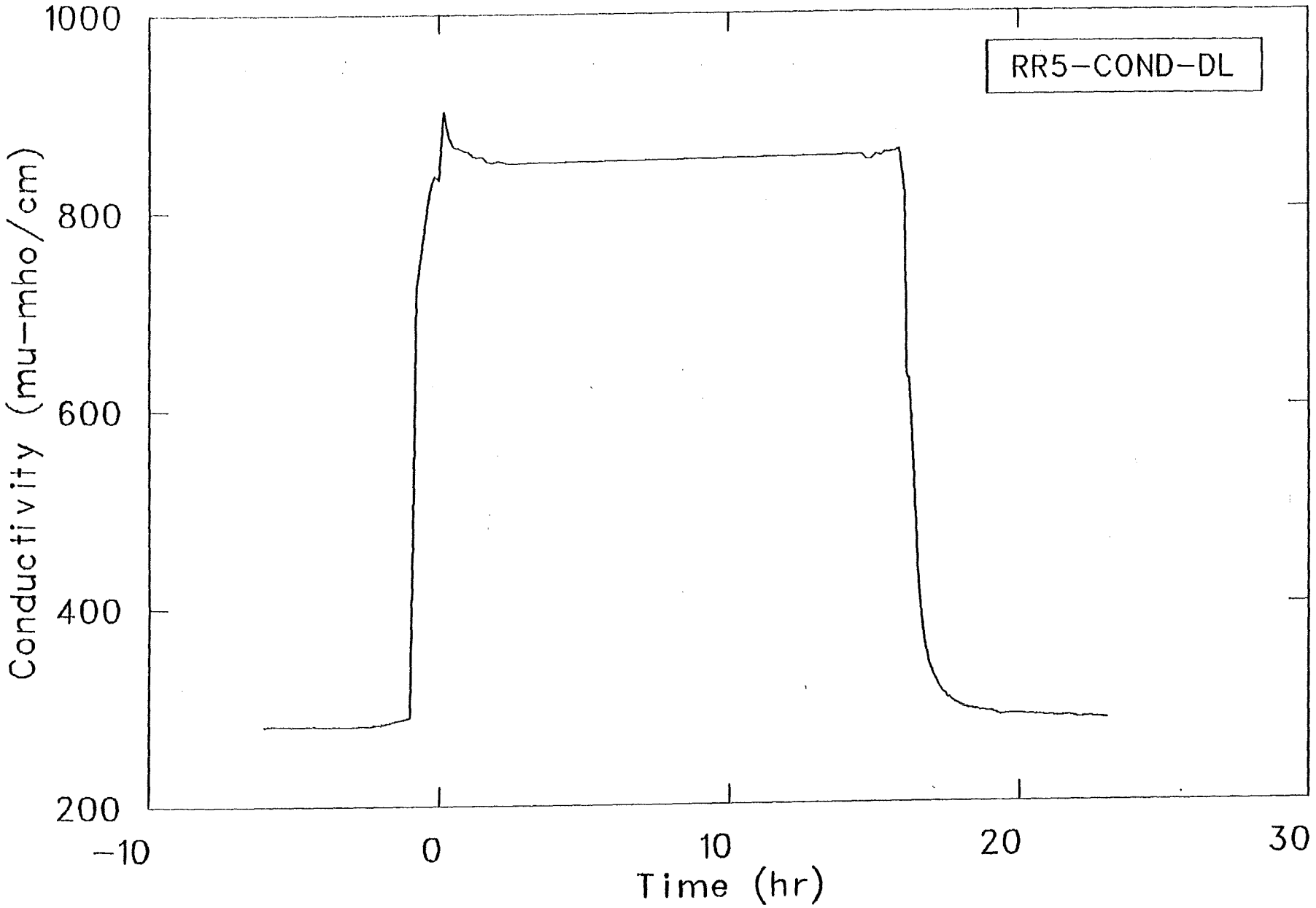

Pressure (psia)
80
100
120
140
160
−50
0
50
100
150
Time (hr)
RR5−WP−D


RR5-TEMP-SC
Temperature (°F)
260
250
240
230
220
210
200
-5
0
5
10
15
20
25
Time (hr)

Fig


RR5-PH-TS
6.9
6.8
6.7
6.6
6.5
pH
0
5
10
15
20
25
Time (hrs)


RR5-ALK-TS
Concentration (ppm)
45
40
35
30
25
0
5
10
15
20
25
Time (hr)


RR5-COND-DL
1000
800
600
400
200
Conductivity (mu-mho/cm)
-10
0
10
20
30
Time (hr)

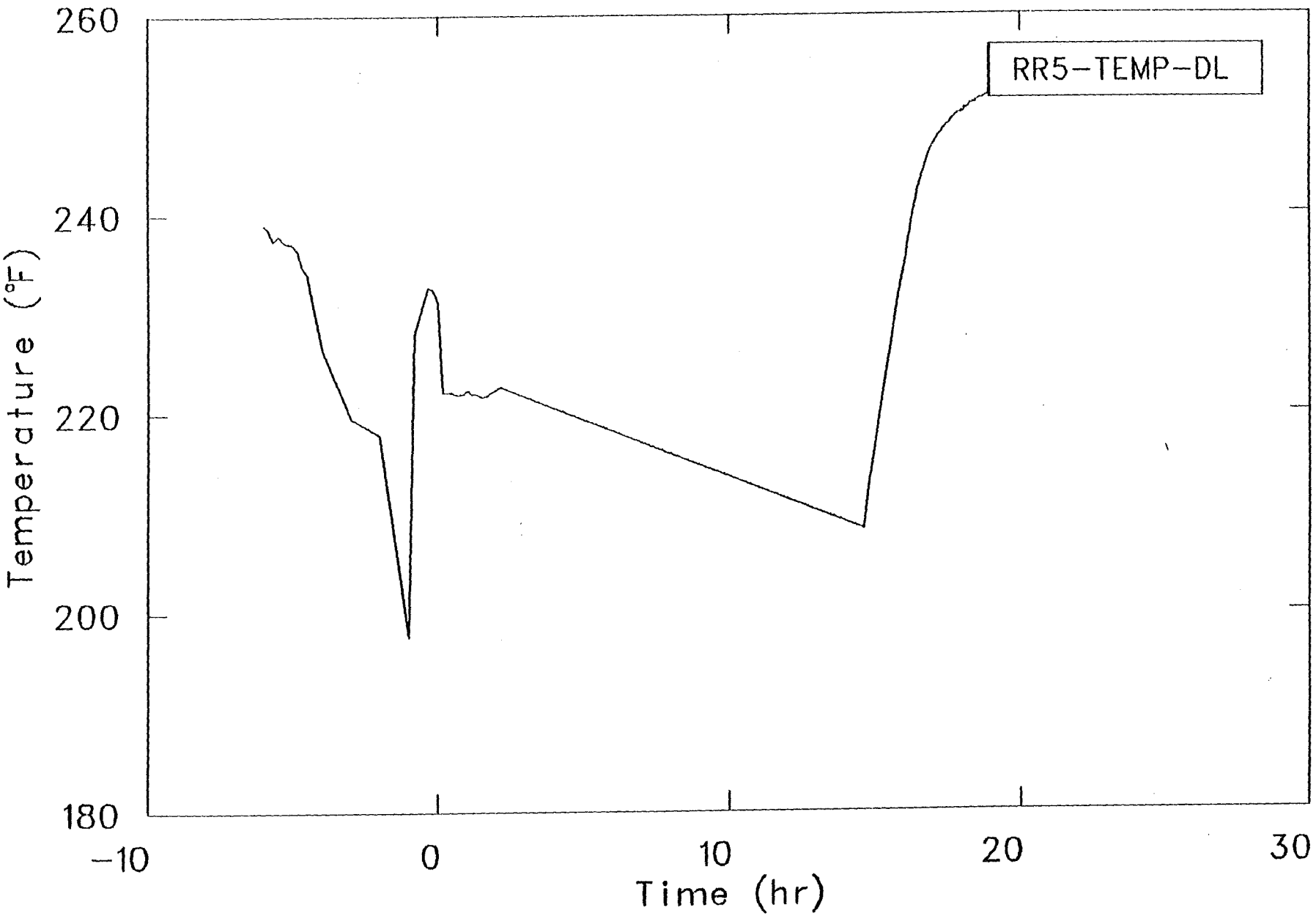
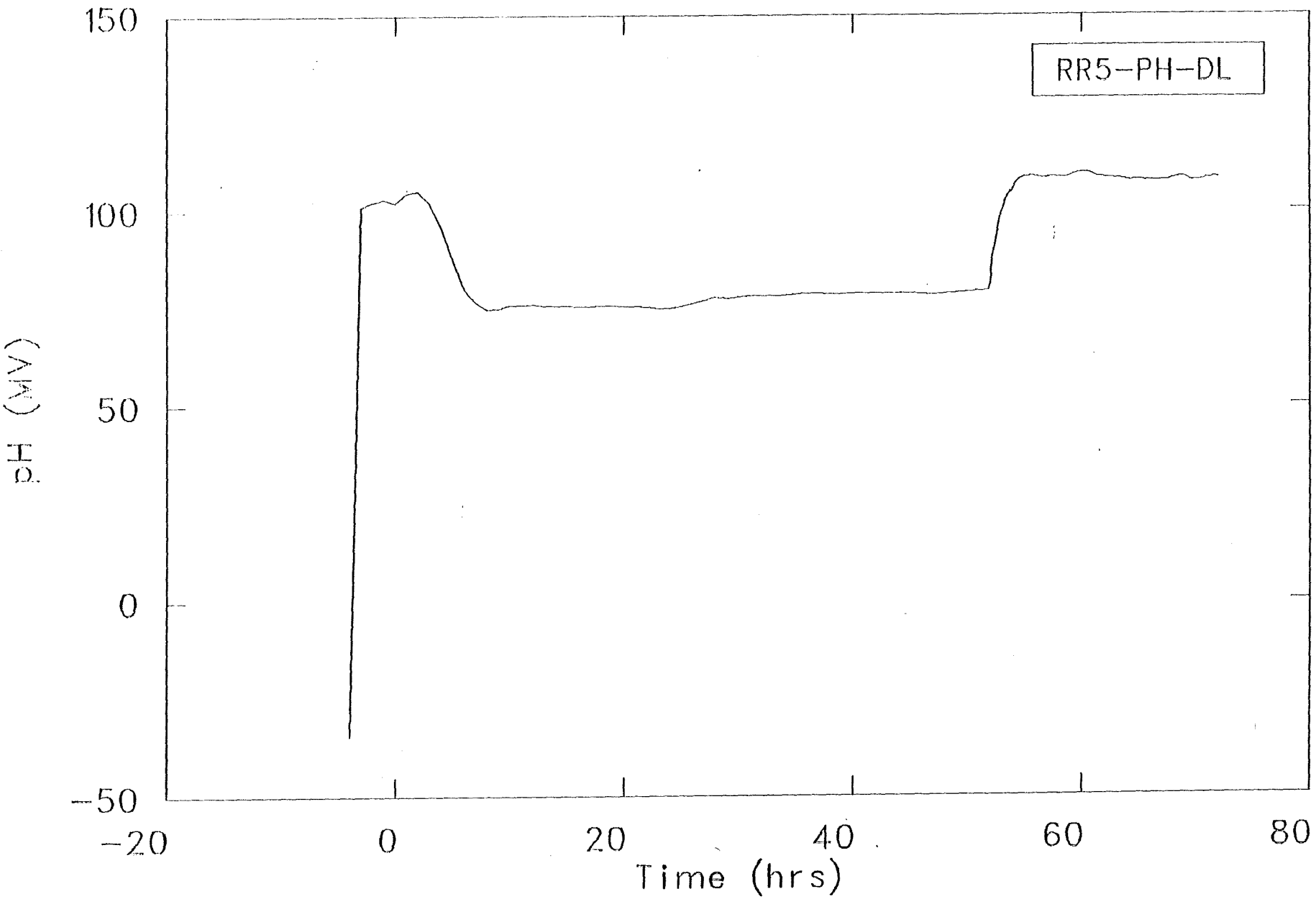

RR5-TEMP-DL
260
240
220
200
180
Temperature (°F)
-10
0
10
20
30
Time (hr)

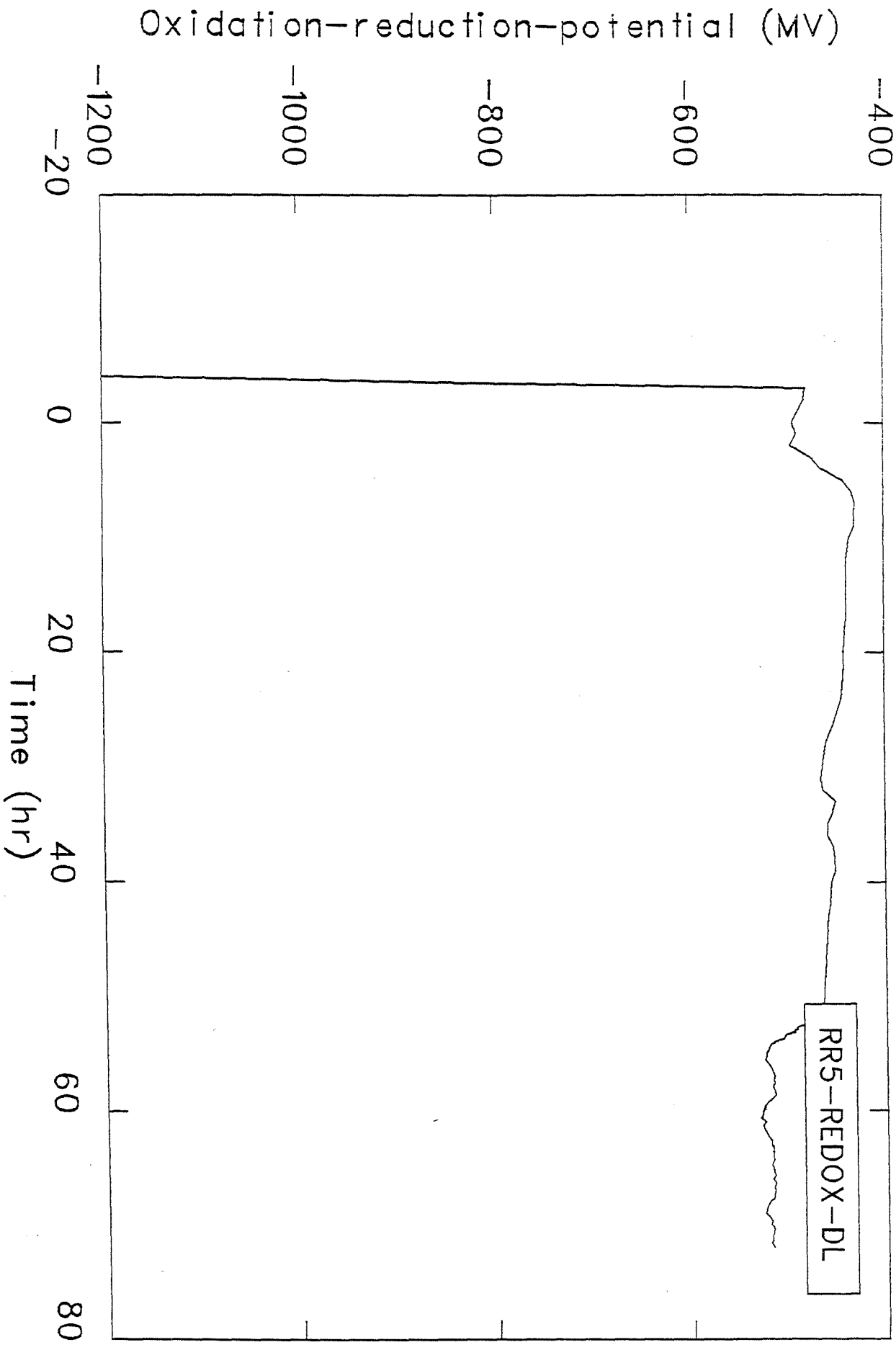
TABLE J. TEST 4D
File Name: RR4D821013 Date: 10-13-82
Start Time: Real--00:00; File Start Time: -9.05

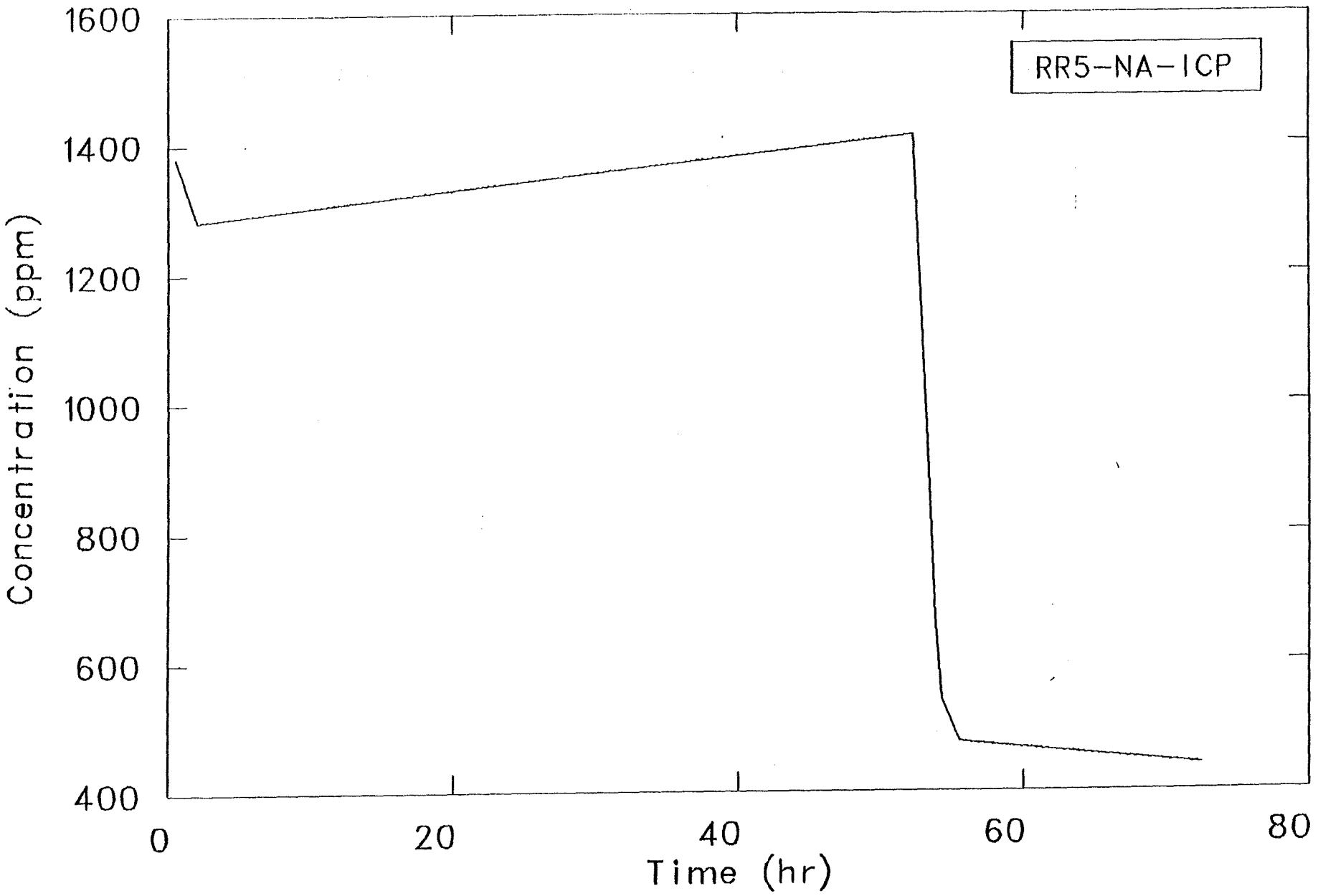
Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	µmho/cm
RR5-REDOX-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	°F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR5-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-HCO3-ICP	14	Bicarbonate	Titration	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	Titration	ppm
RR5-F-ICP	17	Fluoride	SIE	ppm
RR5-TDS-ICP	18	TDS	Evaporation and weighing	ppm
RR5-PH-ICP	19	pH	SIE	standard
RR5-TEMP-M	20	Temperature	Manually recorded	°F
RR5-TEMP-SC	21	Temperature	Stripchart	°F
RR5-BR-TR	22	Bromide	SIE	ppm
RR5-FLUOR-TR	23	Fluorescein	Fluorometer	ppm
RR5-PH-TS	24	pH	SIE	standard
RR5-COND-TS	25	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	26	Alkalinity	Titration	ppm
RR5-WP-D	27	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	28	Well flow	Stripcharts	±gpm

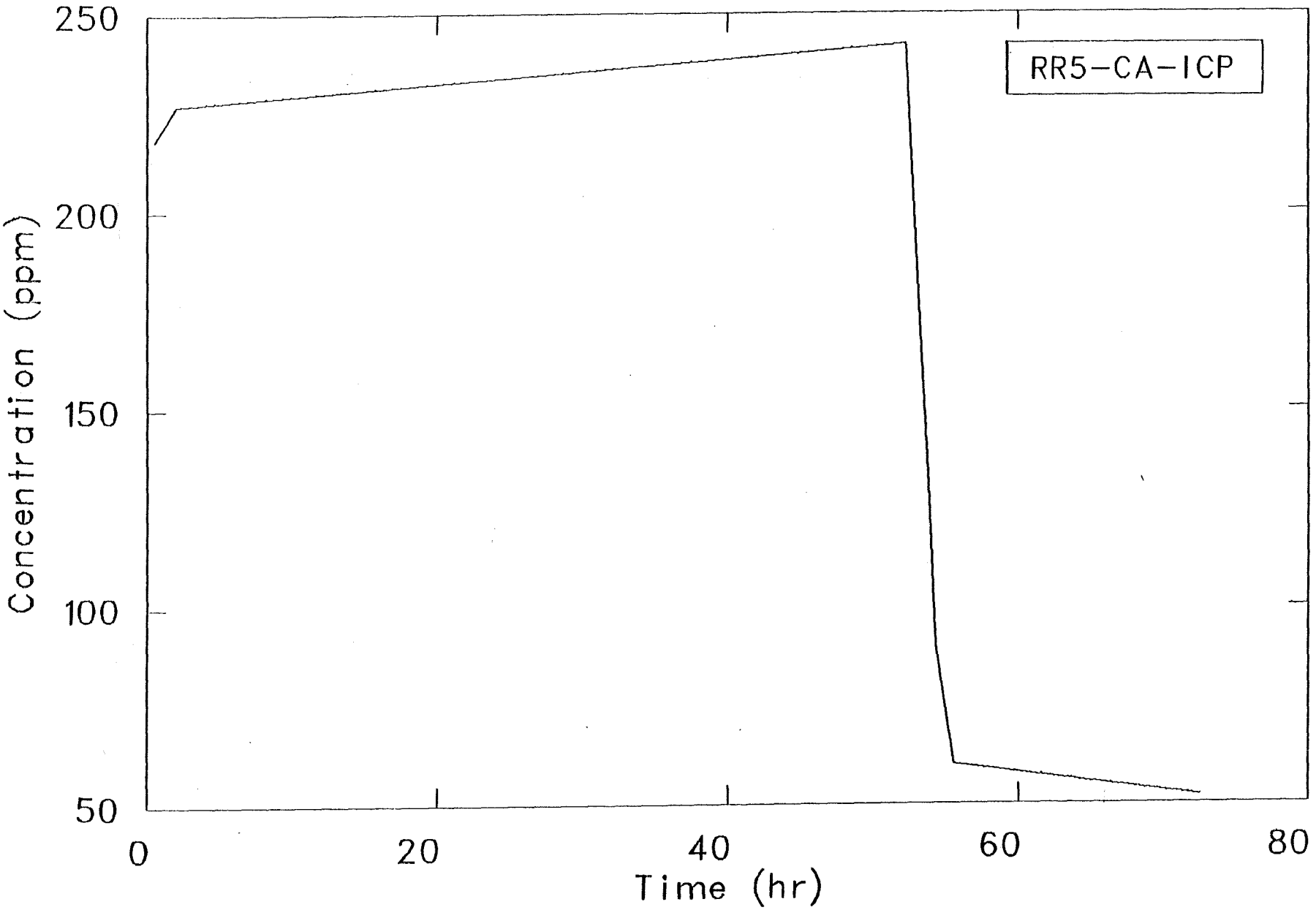
DOWNHOLE LOGS VERSUS DEPTH

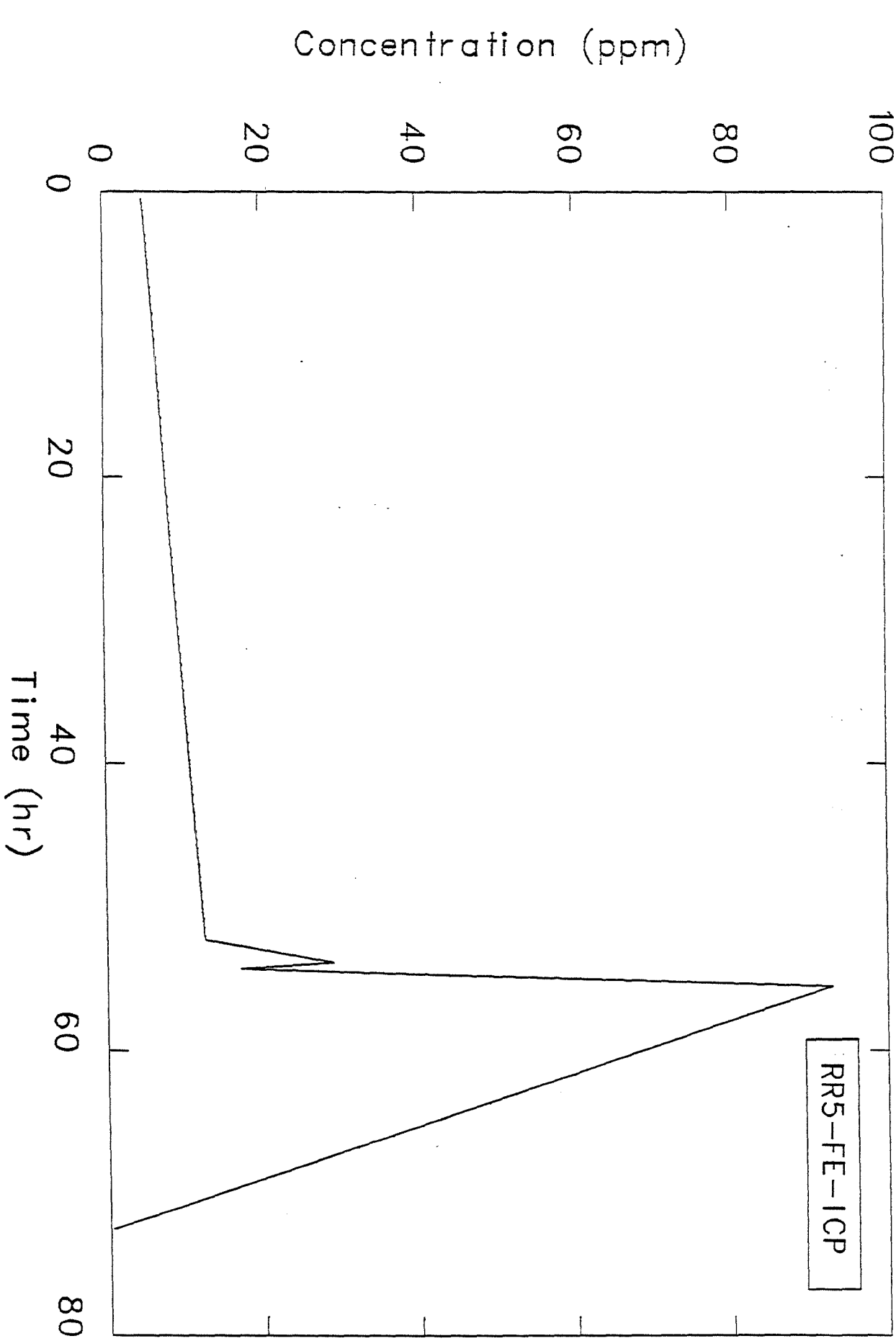
Record Name	#	Time	Data	Depth Logged	Units
1013 CON DHT-10D	29	17:31	Conductivity	4600' to 4840'	µmho/cm
1013 TEM DHT-10D	30	17:31	Temperature	4600' to 4840'	°F
1014 CON DHT-15D	31	00:30	Conductivity	4600' to 4842'	µmho/cm
1014 TEM DHT-15D	32	00:30	Temperature	4600' to 4842'	°F
1014 CON DHT-15D	33	06:52	Conductivity	4600' to 4842'	µmho/cm
1014 TEM DHT-15D	34	06:52	Temperature	4600' to 4842'	°F
1015 CON DHT-15D	35	00:15	Conductivity	4600' to 4842'	µmho/cm
1015 TEM DHT-15D	36	00:15	Temperature	4600' to 4842'	°F
1015 CON DHT-15D	37	10:46	Conductivity	4600' to 4840'	µmho/cm
1015 TEM DHT-15D	38	10:46	Temperature	4600' to 4840'	°F

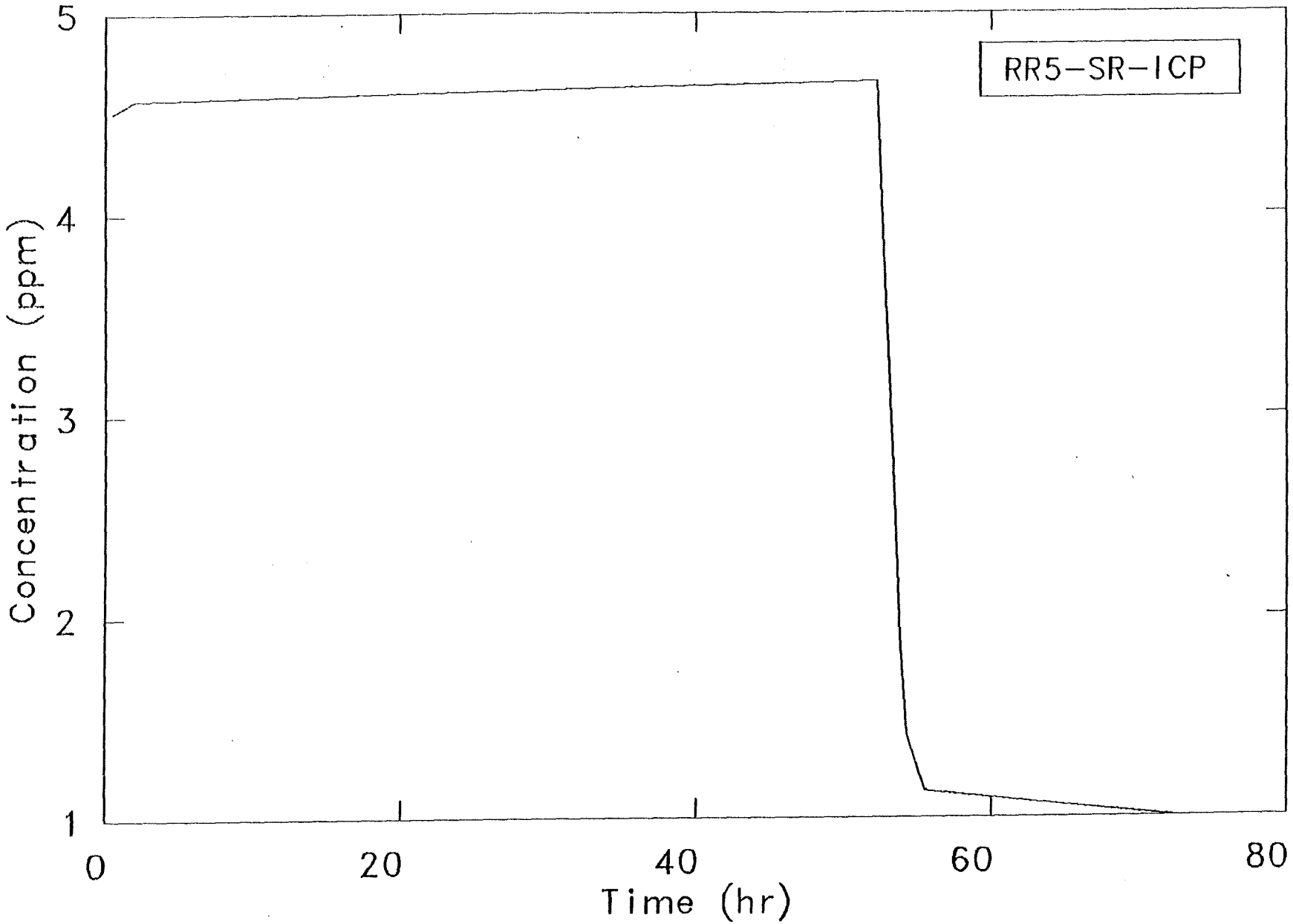

RR5-PH-DL
150
100
50
0
-50
pH (MV)
-20
0
20
40
60
80
Time (hrs)

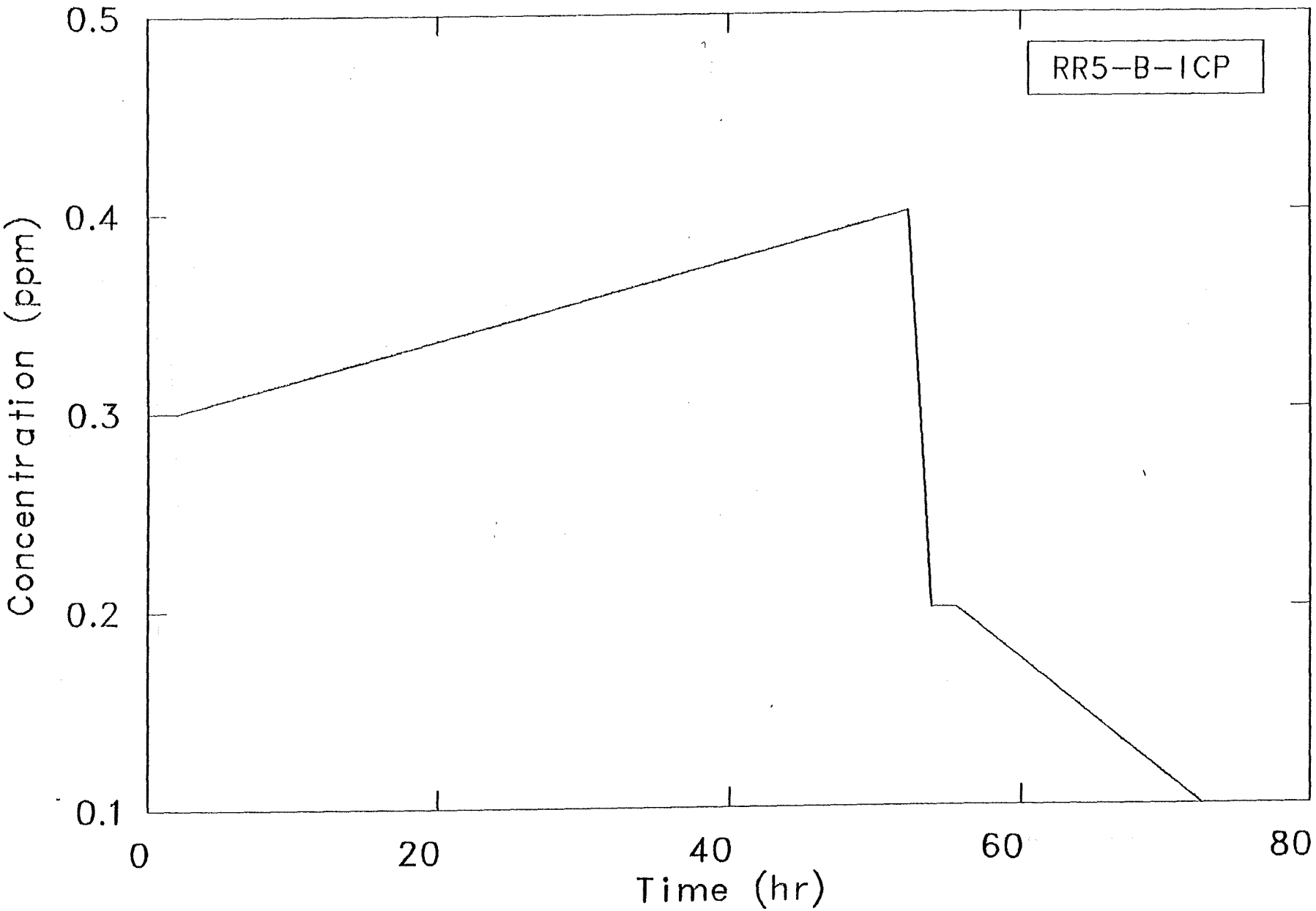

Oxidation-reduction-potential (MV)
-1200
-1000
-800
-600
-400
-20
0
20
40
60
80
Time (hr)
RR5-REDOX-DL


RR5-NA-ICP
Concentration (ppm)
1600
1400
1200
1000
800
600
400
0
20
40
60
80
Time (hr)


RR5-CA-ICP
250
200
150
100
50
Concentration (ppm)
0
20
40
60
80
Time (hr)


Concentration (ppm)
0
20
40
60
80
100
Time (hr)
0
20
40
60
80
RR5-FE-ICP


RR5-SR-ICP
Concentration (ppm)
5
4
3
2
1
0
20
40
60
80
Time (hr)



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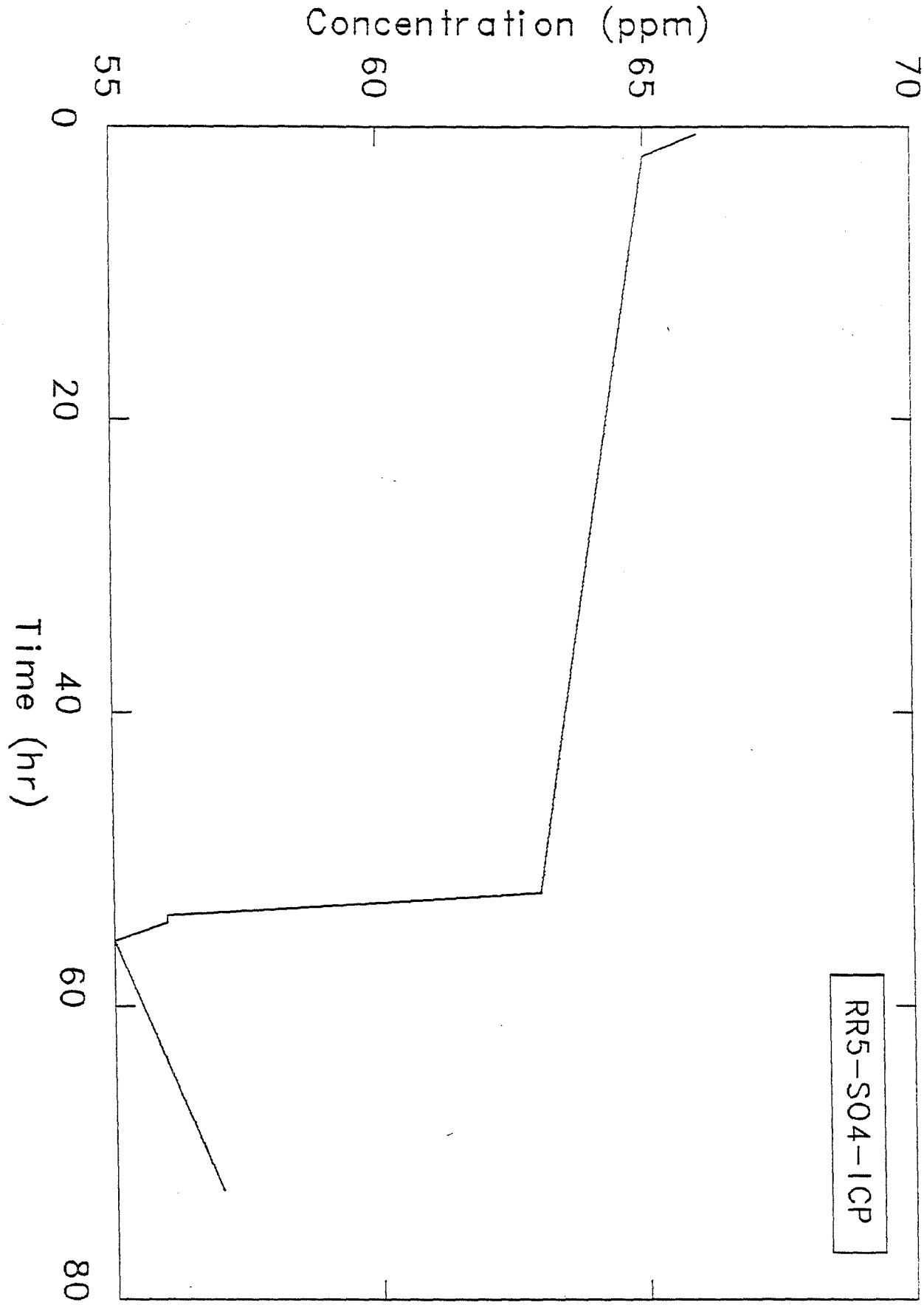
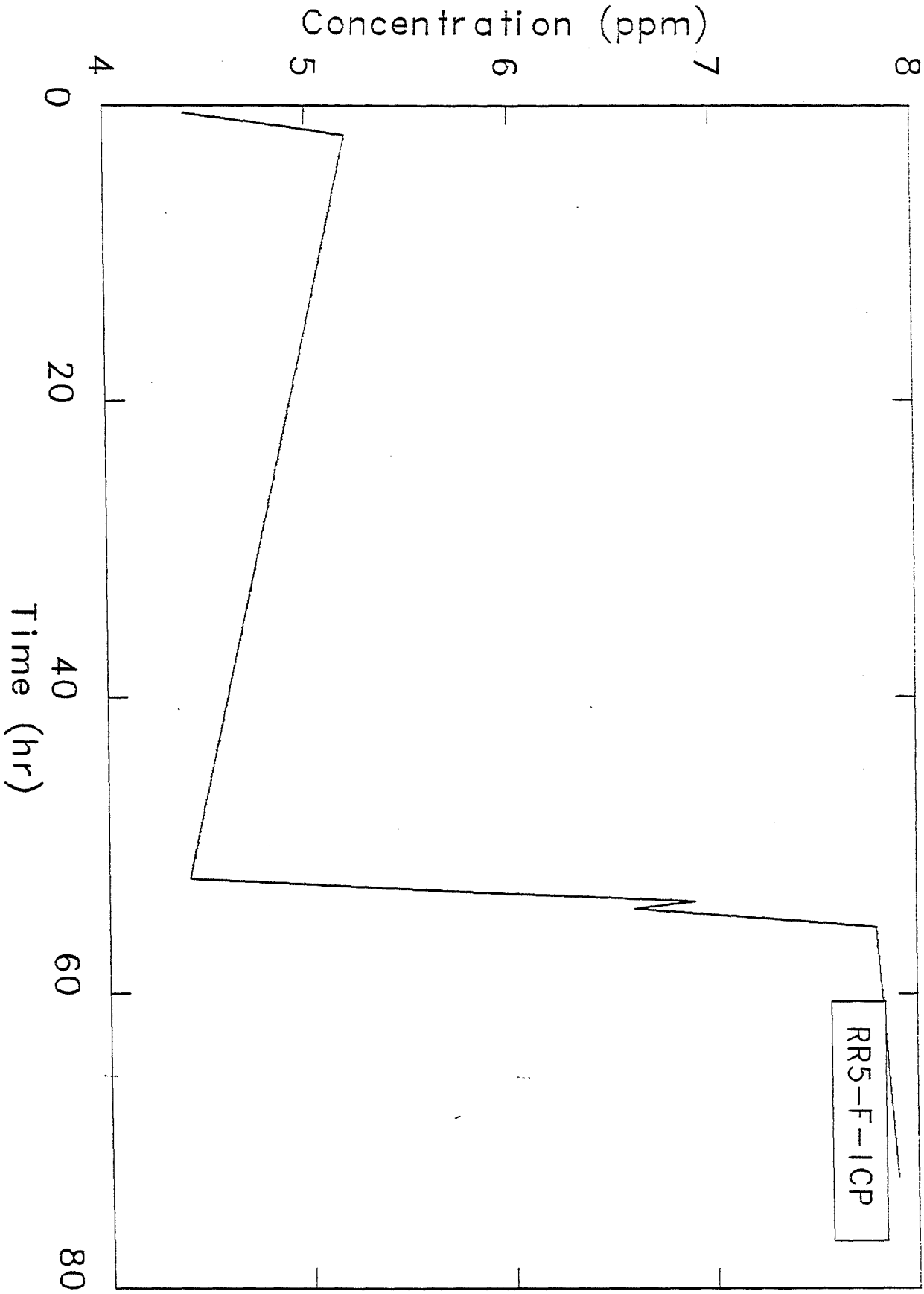
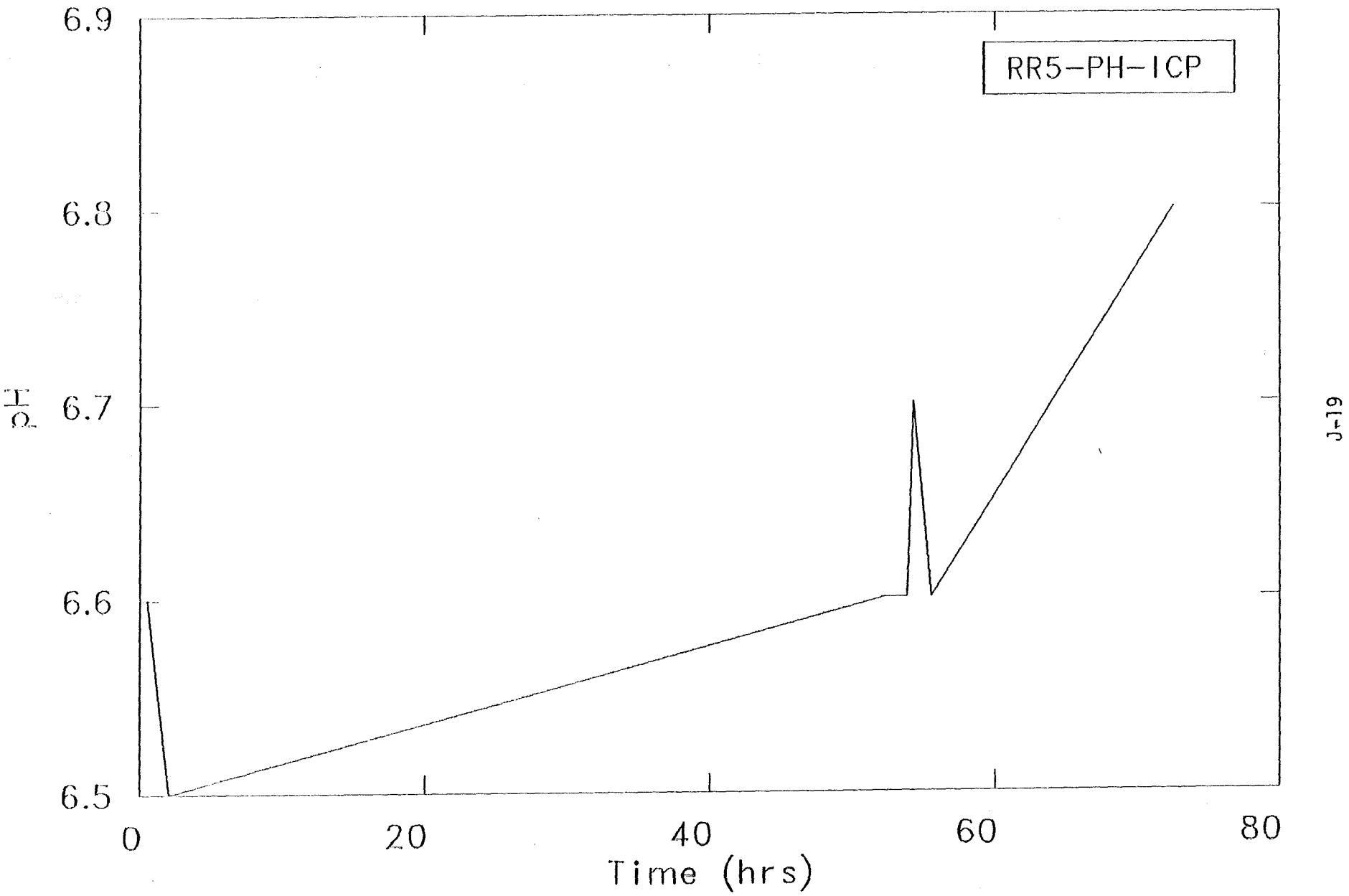
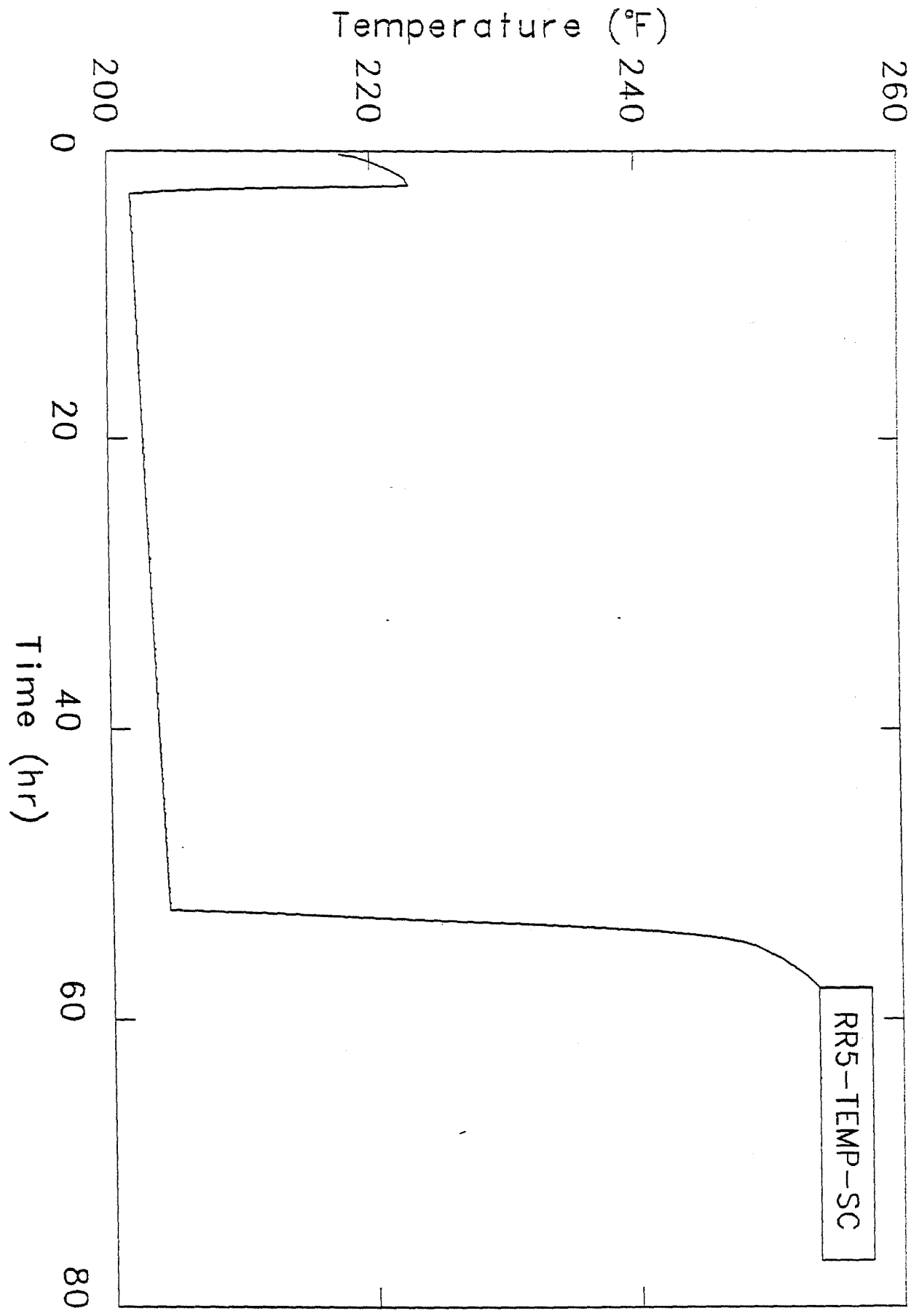
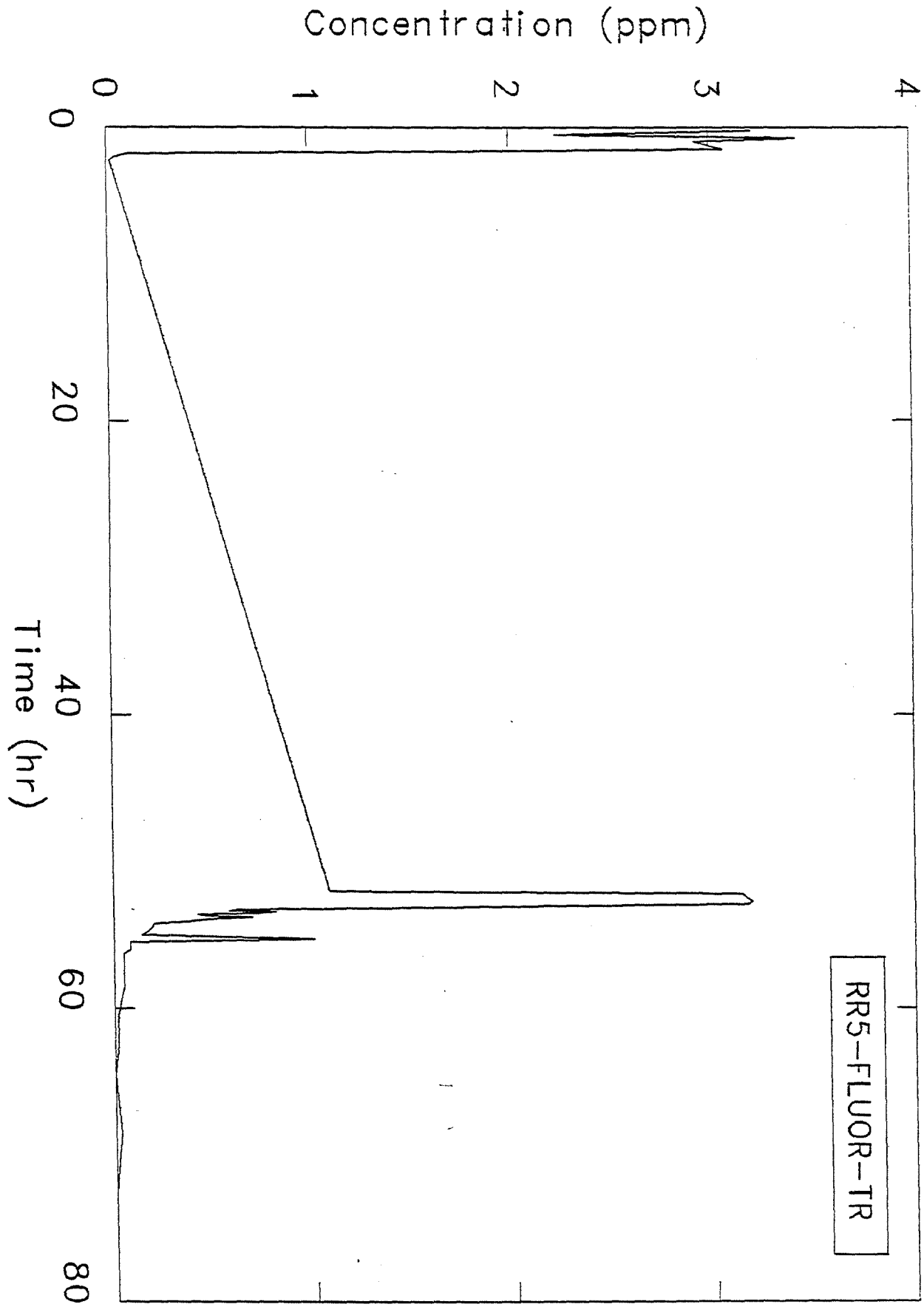
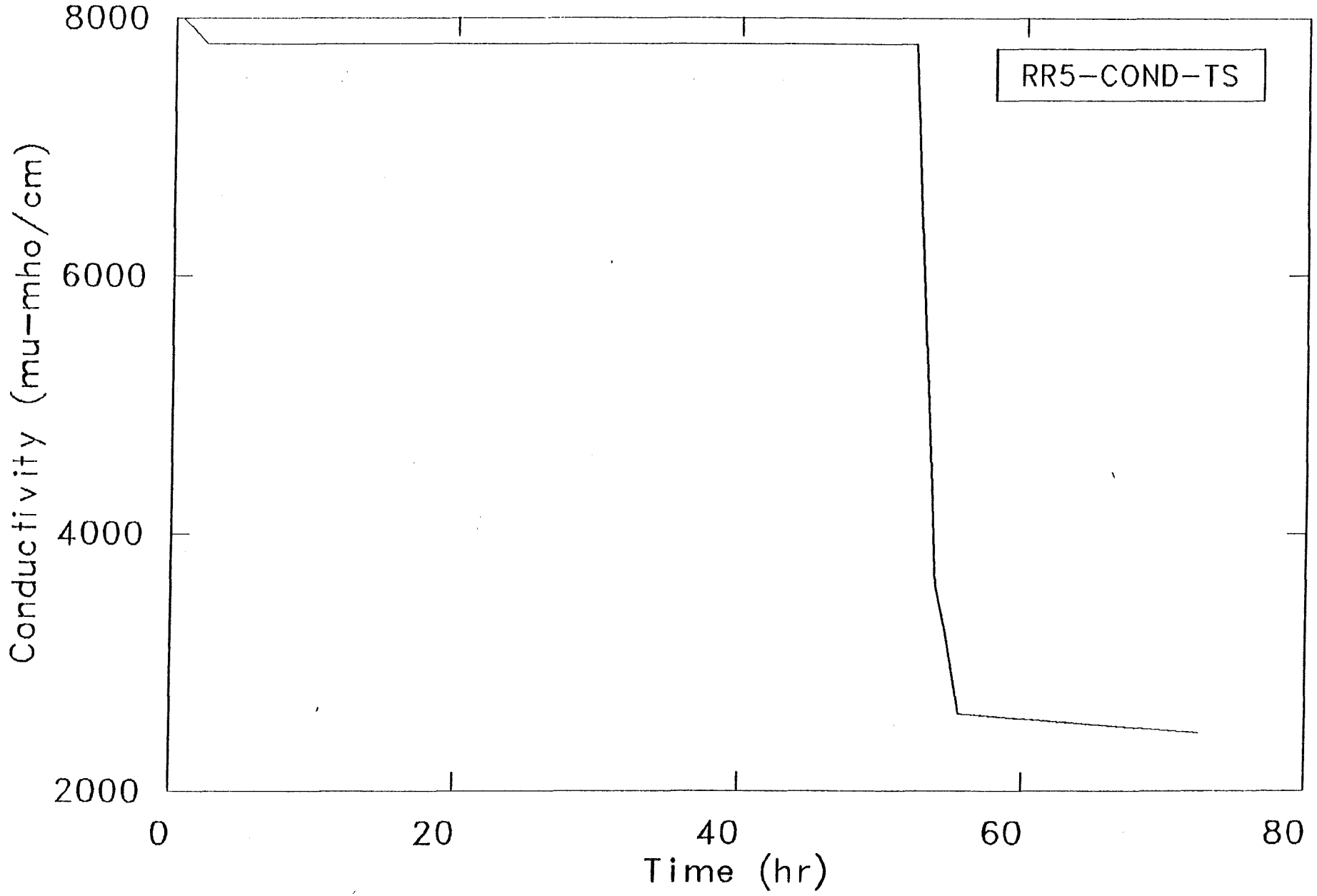

Concentration (ppm)
55
60
65
70
0
20
40
60
80
Time (hr)
RR5-SO4-ICP

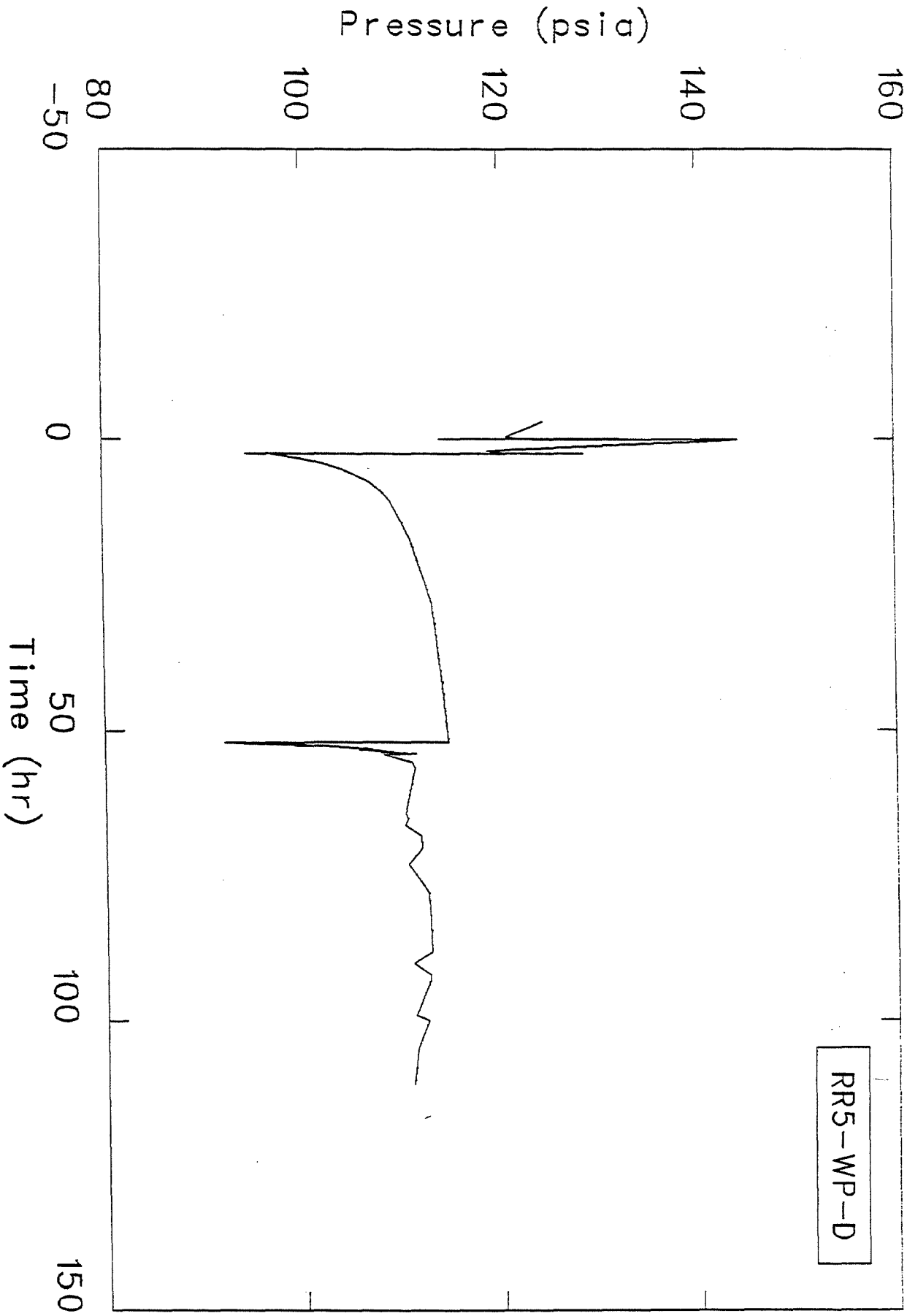

Concentration (ppm)
4
5
6
7
8
0
20
40
60
80
Time (hr)
RR5-F-ICP

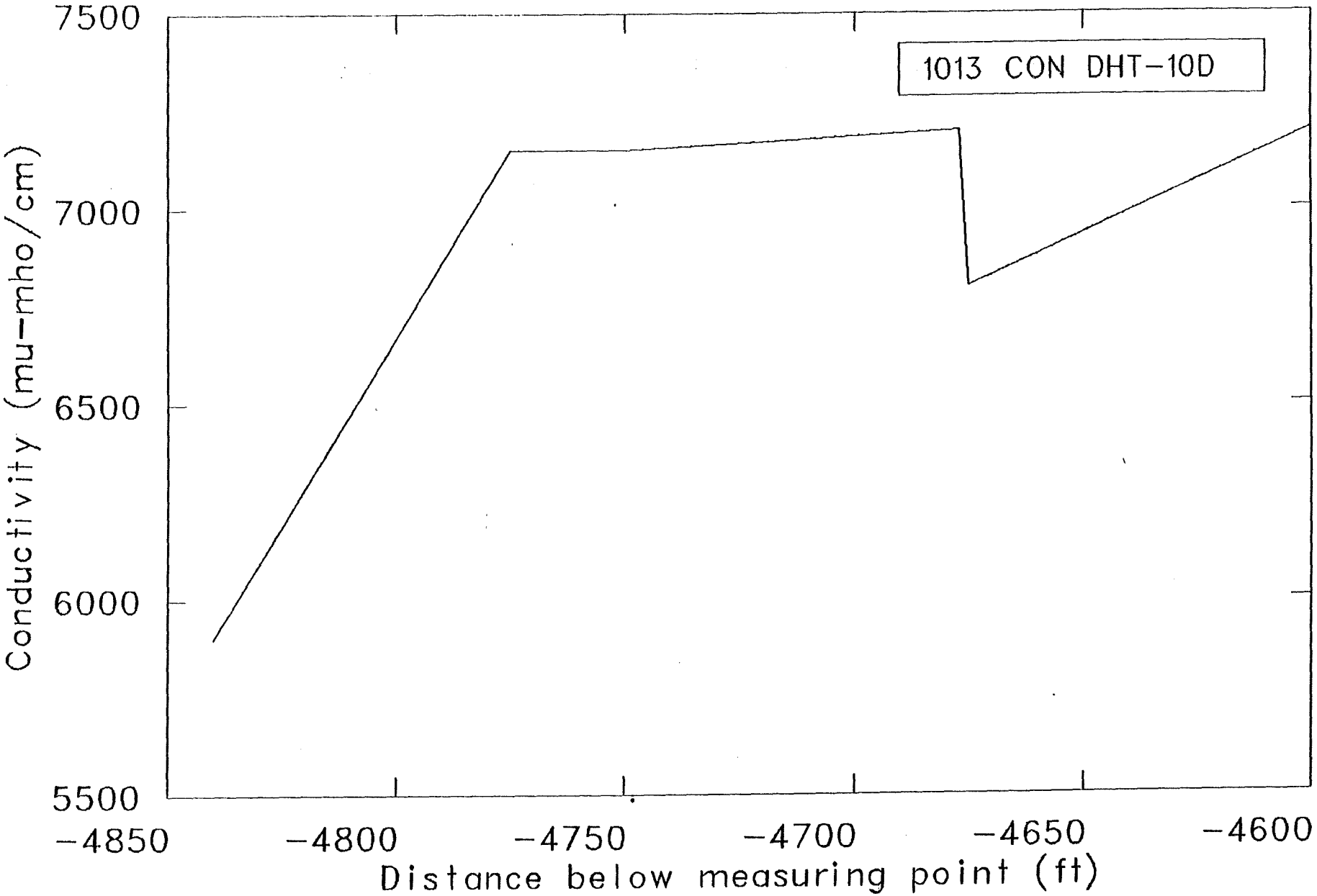

RR5-PH-ICP
6.9
6.8
6.7
6.6
6.5
pH
0
20
40
60
80
Time (hrs)

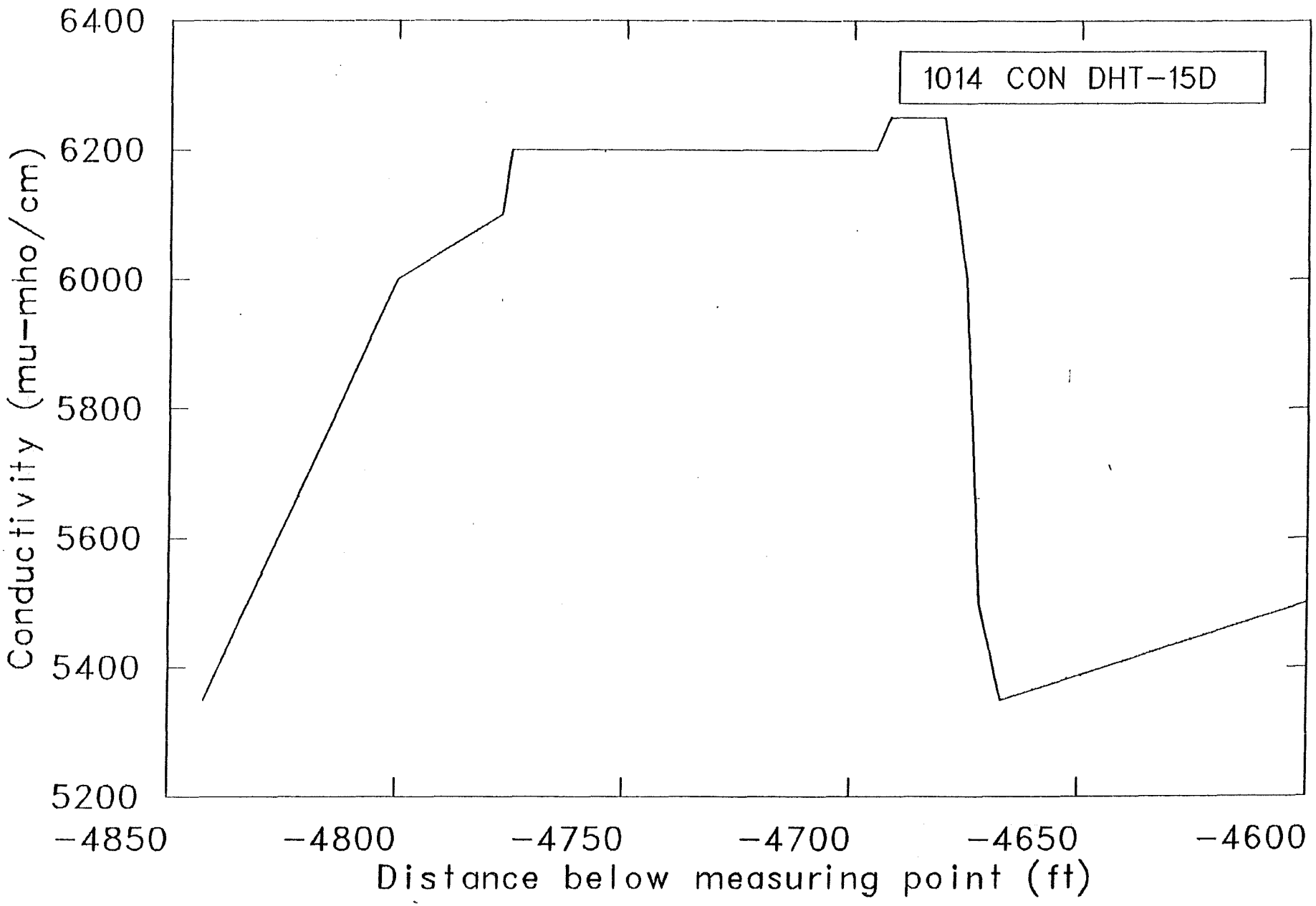

Temperature (°F)
200
220
240
260
0
20
40
60
80
Time (hr)
RR5-TEMP-SC

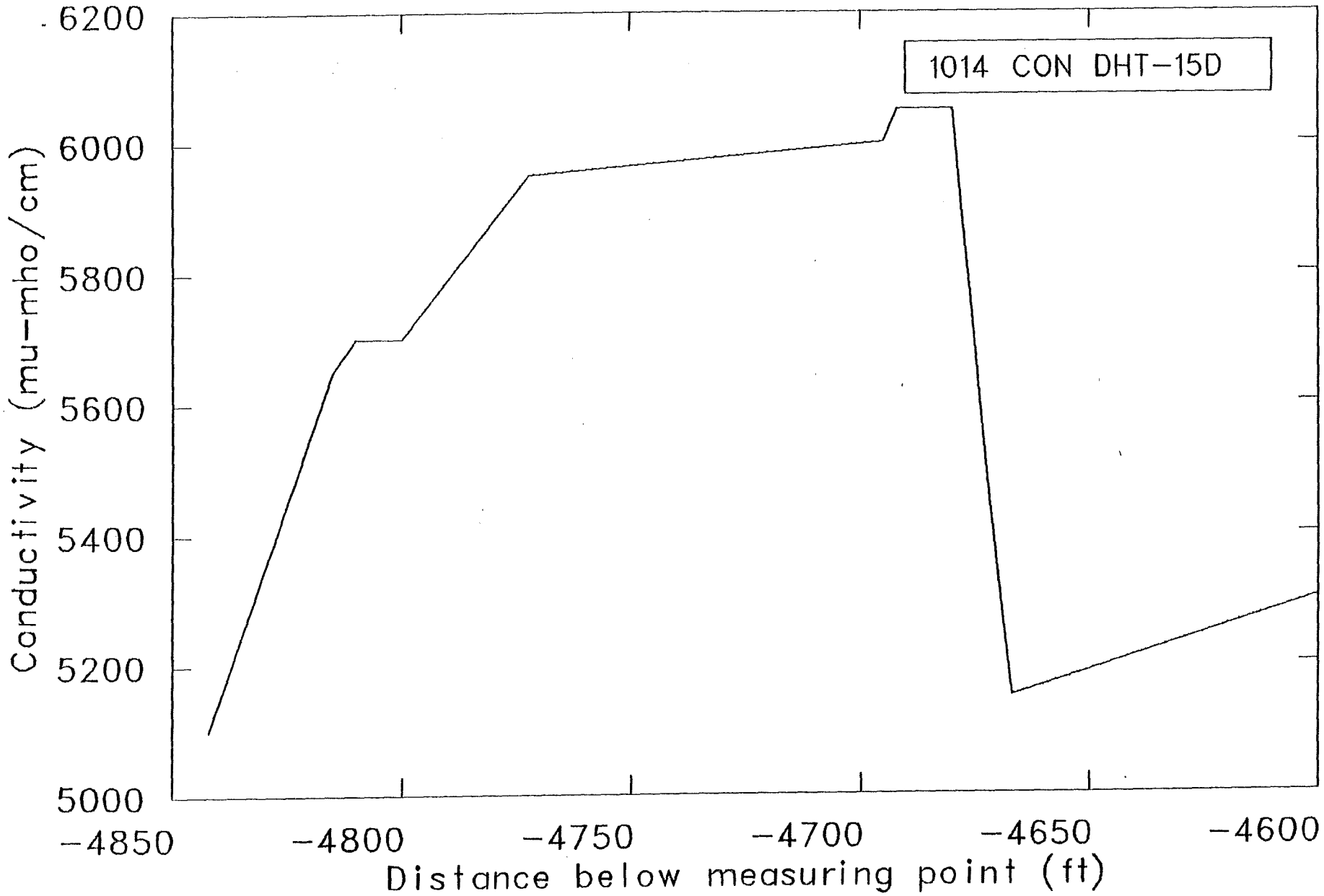

Concentration (ppm)
0
1
2
3
4
0
20
40
60
80
Time (hr)
RR5-FLUOR-TR

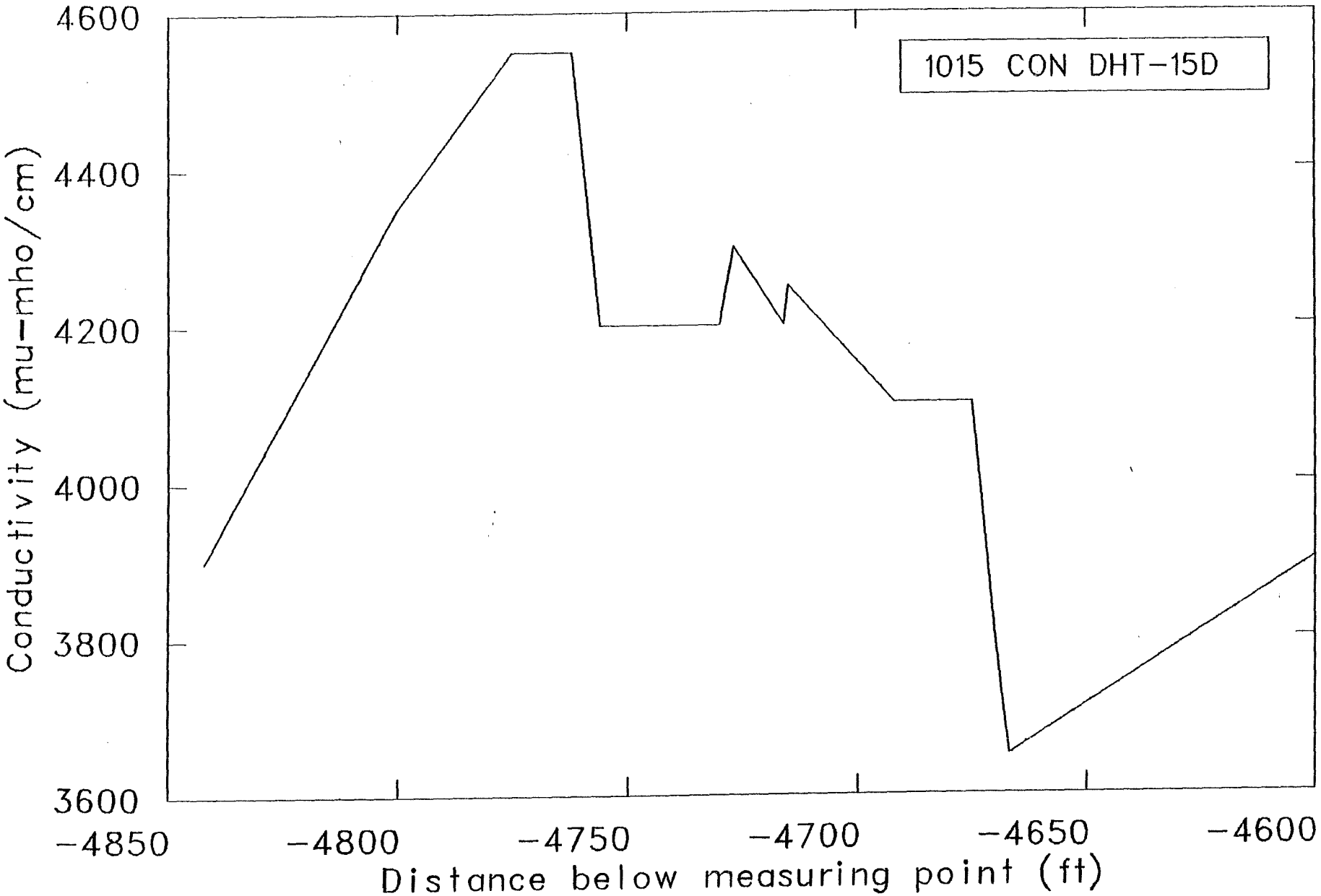

RR5-COND-TS
Conductivity (mu-mho/cm)
8000
6000
4000
2000
0
20
40
60
80
Time (hr)


Pressure (psia)
80
100
120
140
160
−50
0
50
100
150
Time (hr)
RR5-WP-D


1013 CON DHT-10D
7500
7000
6500
6000
5500
Conductivity (mu-mho/cm)
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)


1014 CON DHT-15D
Conductivity (mu-mho/cm)
6400
6200
6000
5800
5600
5400
5200
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)


1014 CON DHT-15D
6200
6000
5800
5600
5400
5200
5000
Conductivity (mu-mho/cm)
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)


1015 CON DHT-15D
Conductivity (mu-mho/cm)
4600
4400
4200
4000
3800
3600
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)

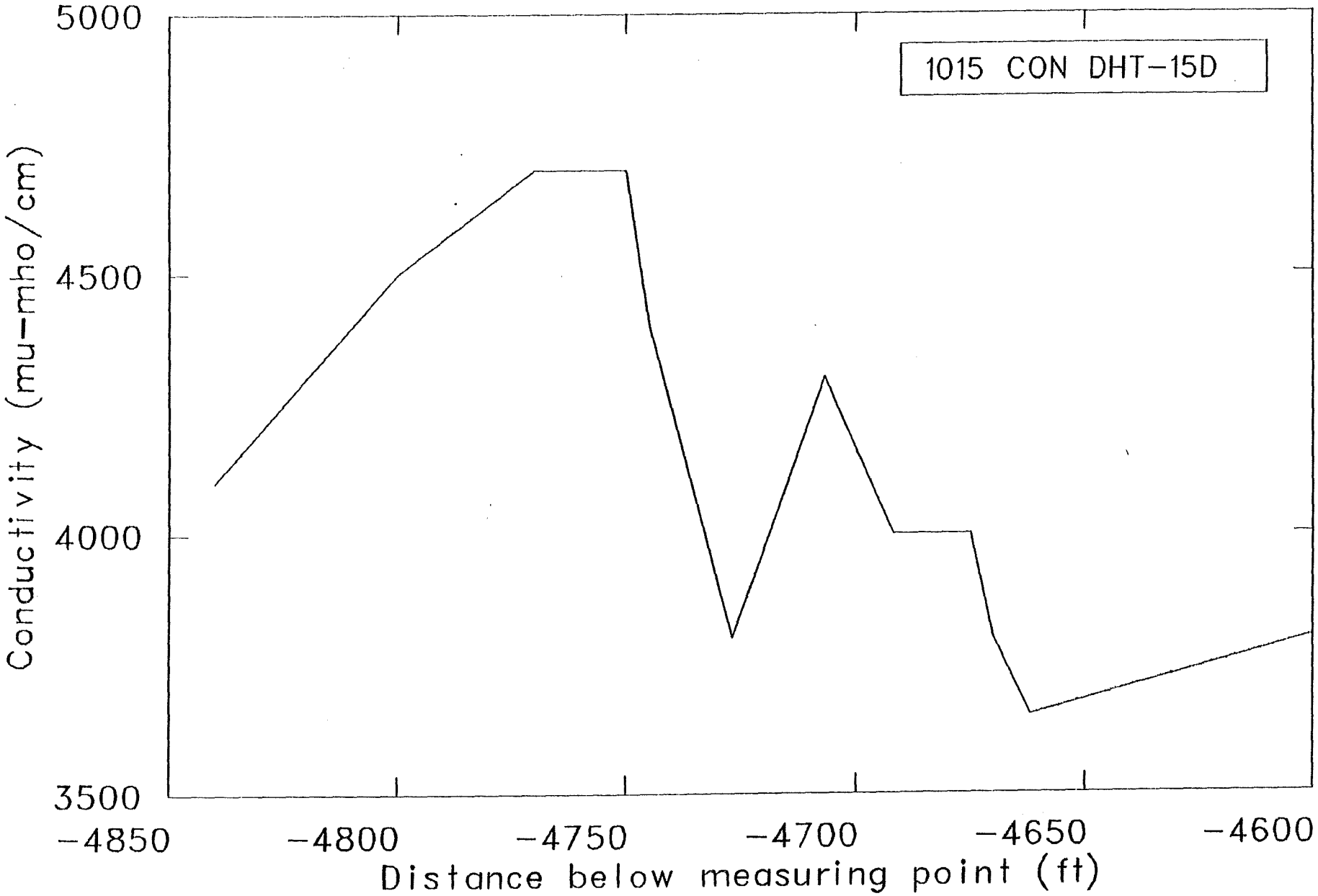
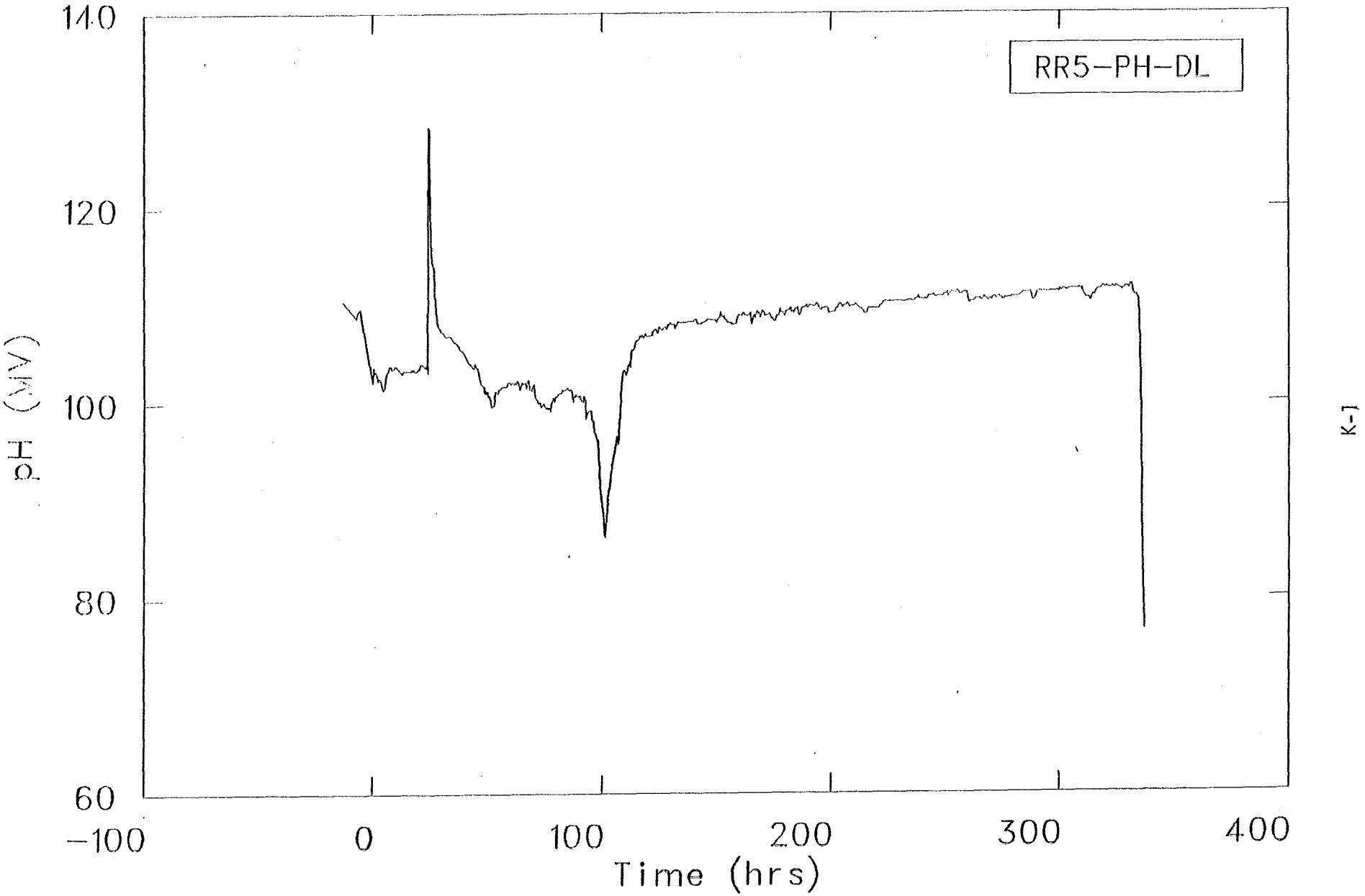

1015 CON DHT-15D
5000
4500
4000
3500
Conductivity (mu-mho/cm)
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)

TABLE K. TEST 2D
File Name: RR2D821018 Date: 10-18-82
Start Time: Real--00:00; File Start Time: -13.5

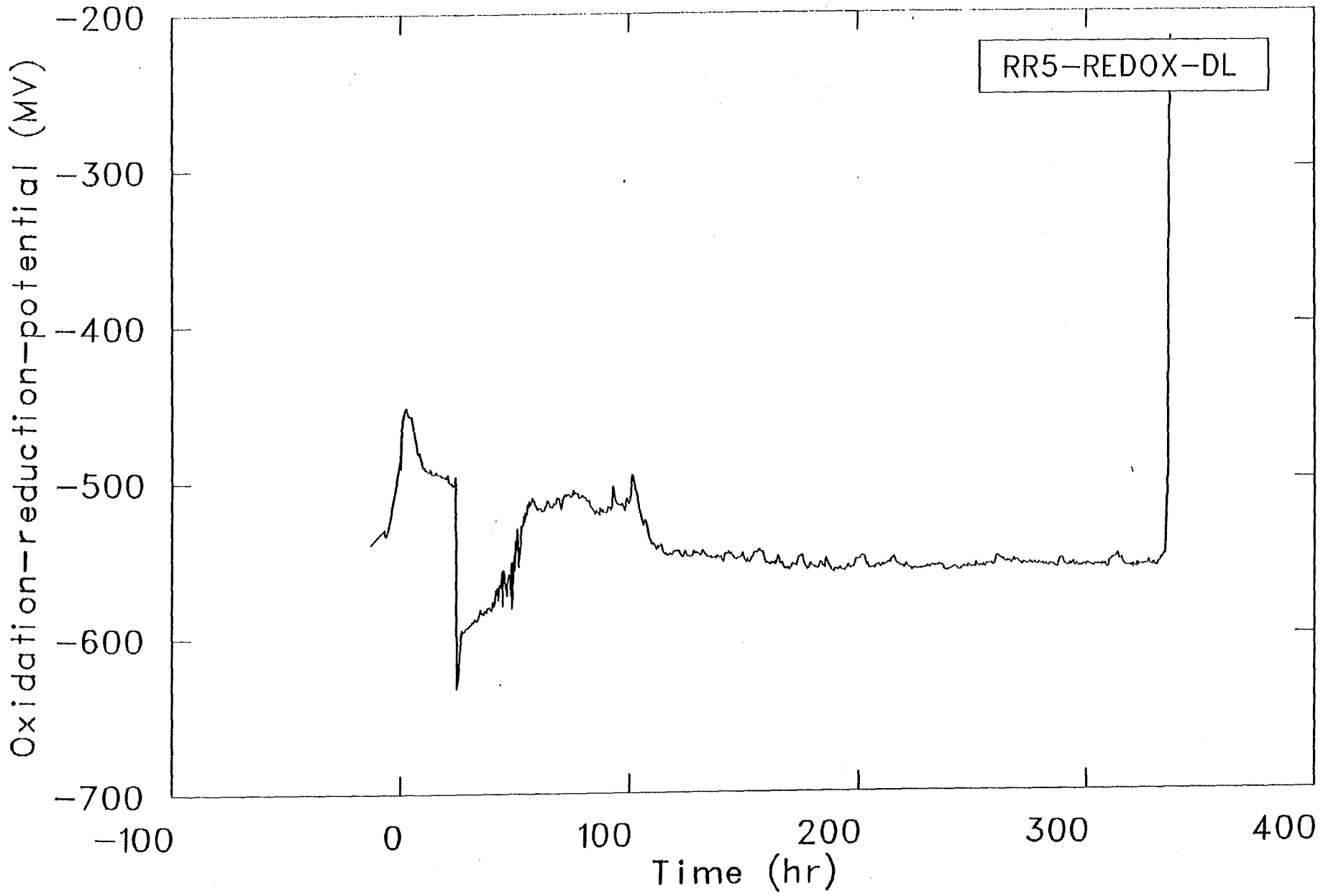
Record Name	#	Data Sampled	Recorder or Method	Units
RR5-PH-DL	1	pH	Data logger	millivolts
RR5-COND-DL	2	Conductivity	Data logger	µmho/cm
RR5-REDOX-DL	3	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	4	Temperature	Data logger	°F
RR5-NA-ICP	5	Sodium	ICP	ppm
RR5-K-ICP	6	Potassium	ICP	ppm
RR5-CA-ICP	7	Calcium	ICP	ppm
RR5-MG-ICP	8	Magnesium	ICP	ppm
RR5-FE-ICP	9	Iron	ICP	ppm
RR5-SIO2-ICP	10	Silica	ICP	ppm
RR5-SR-ICP	11	Strontium	ICP	ppm
RR5-LI-ICP	12	Lithium	ICP	ppm
RR5-B-ICP	13	Boron	ICP	ppm
RR5-TDS-ICP	14	TDS	Evaporation and weighing	ppm
RR5-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR5-CL-ICP	16	Chloride	Titration	ppm
RR5-F-ICP	17	Fluoride	SIE	ppm
RR5-TEMP-M	18	Temperature	Manually recorded	°F
RR5-I-TR	19	Iodide	SIE	ppm
RR5-FLUOR-TR	20	Fluorescein	Fluorometer	ppm
RR5-B-TR	21	Boron	Colorimetrically	ppm
RR5-MG-TR	22	Magnesium	AA	ppm
RR5-CA-TS	23	Calcium	AA	ppm
RR5-CL-TS	24	Chloride	SIE	ppm
RR5-WP-D	25	Wellhead pressure	Digiquartz	psia
RR5-WQ-SC	26	Well flow	Stripcharts	±gpm
RR5-TEMP-SC	27	Temperature	Stripcharts	°F
RR5-PH-TS	28	pH	SIE	standard
RR5-COND-TS	29	Conductivity	Conductance cell	µmho/cm
RR5-ALK-TS	30	Alkalinity	Titration	ppm
RR5-TEMP-DH4600'	39	Temperature	Stripchart	°F

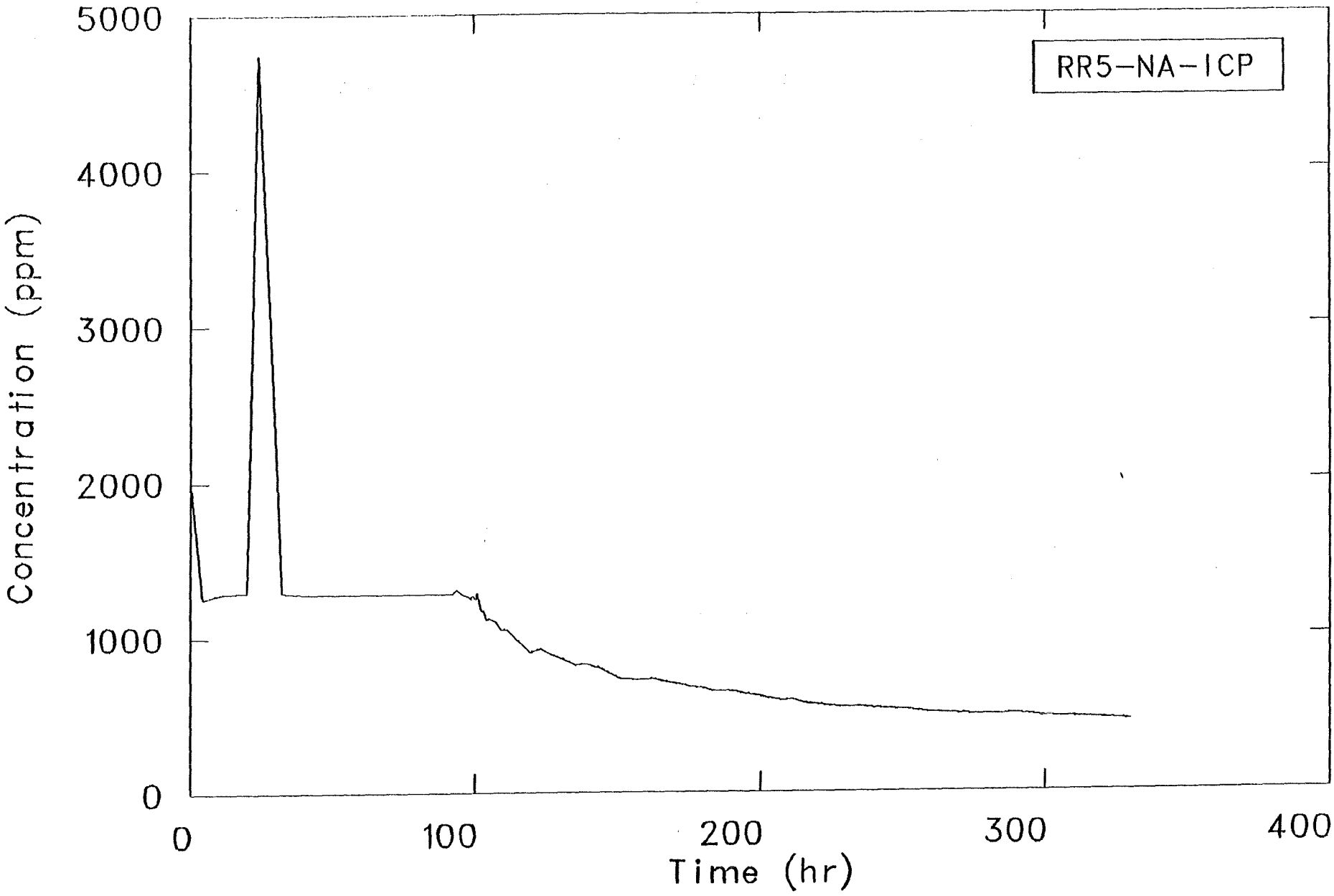
DOWNHOLE LOGS VERSUS DEPTH--TEST 2D

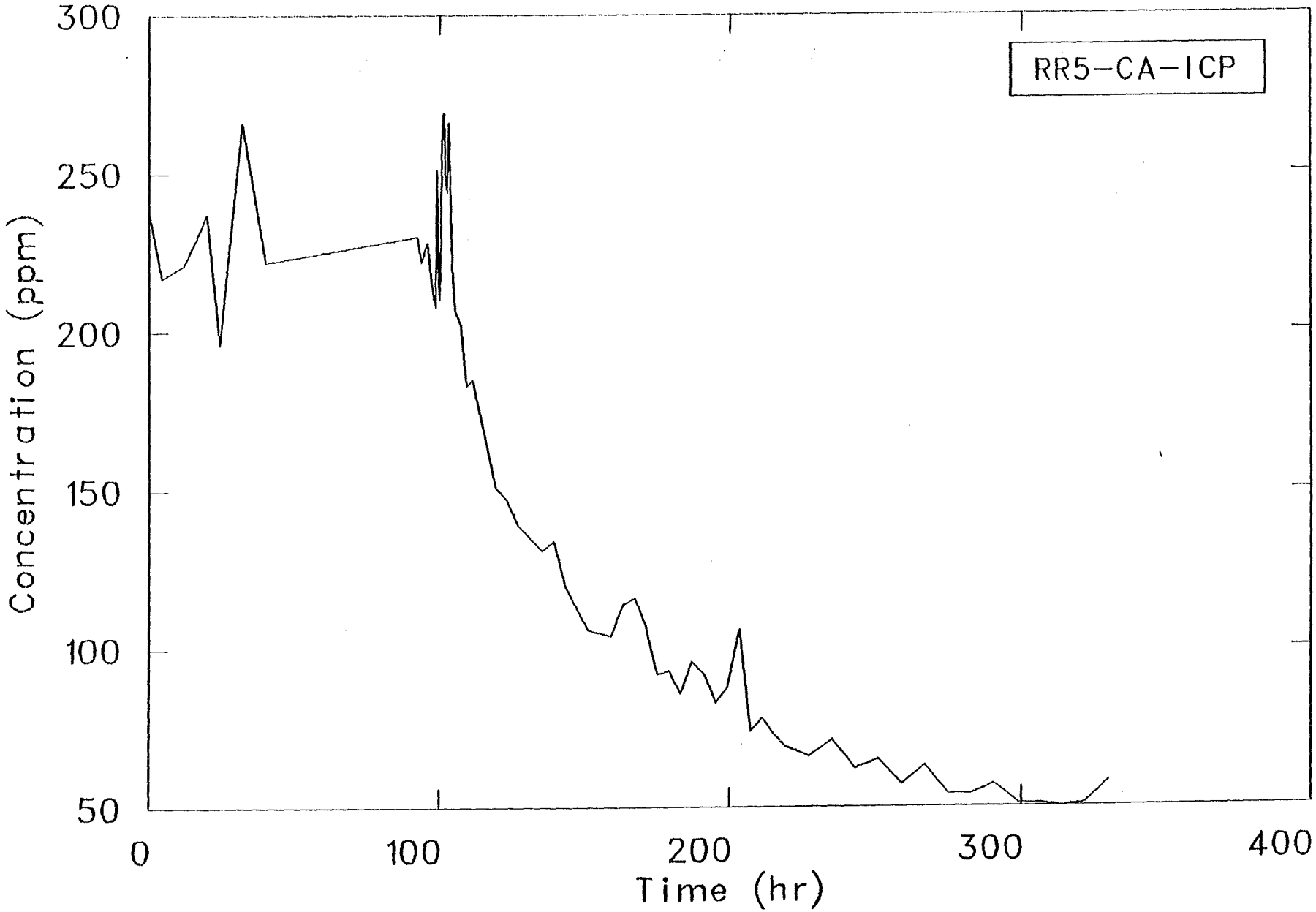
Record Name	#	Time	Data	Depth Logged	Units
1020 SPF DHT-20D	31	18:30	Spinner	4600' to 4820'	%
1020 SPF DHT-20U	32	18:41	Spinner	4820' to 4600'	%
1029 SPF DHT-20D	33	10:30	Spinner	4600' to 4820'	%
1029 SPF DHT-10U	34	10:41	Spinner	4820' to 4600'	%
1025 TEM DHT-15D	35	17:30	Temperature	4600' to 4840'	°F
1025 TEM DHT-15U	36	17:46	Temperature	4840' to 4600'	°F
1029 XCAL DHT-U	37	16:00	Caliper	4700' to 0'	inches-diameter
1029 YCAL DHT-U	38	16:00	Caliper	4700' to 0'	inches-diameter



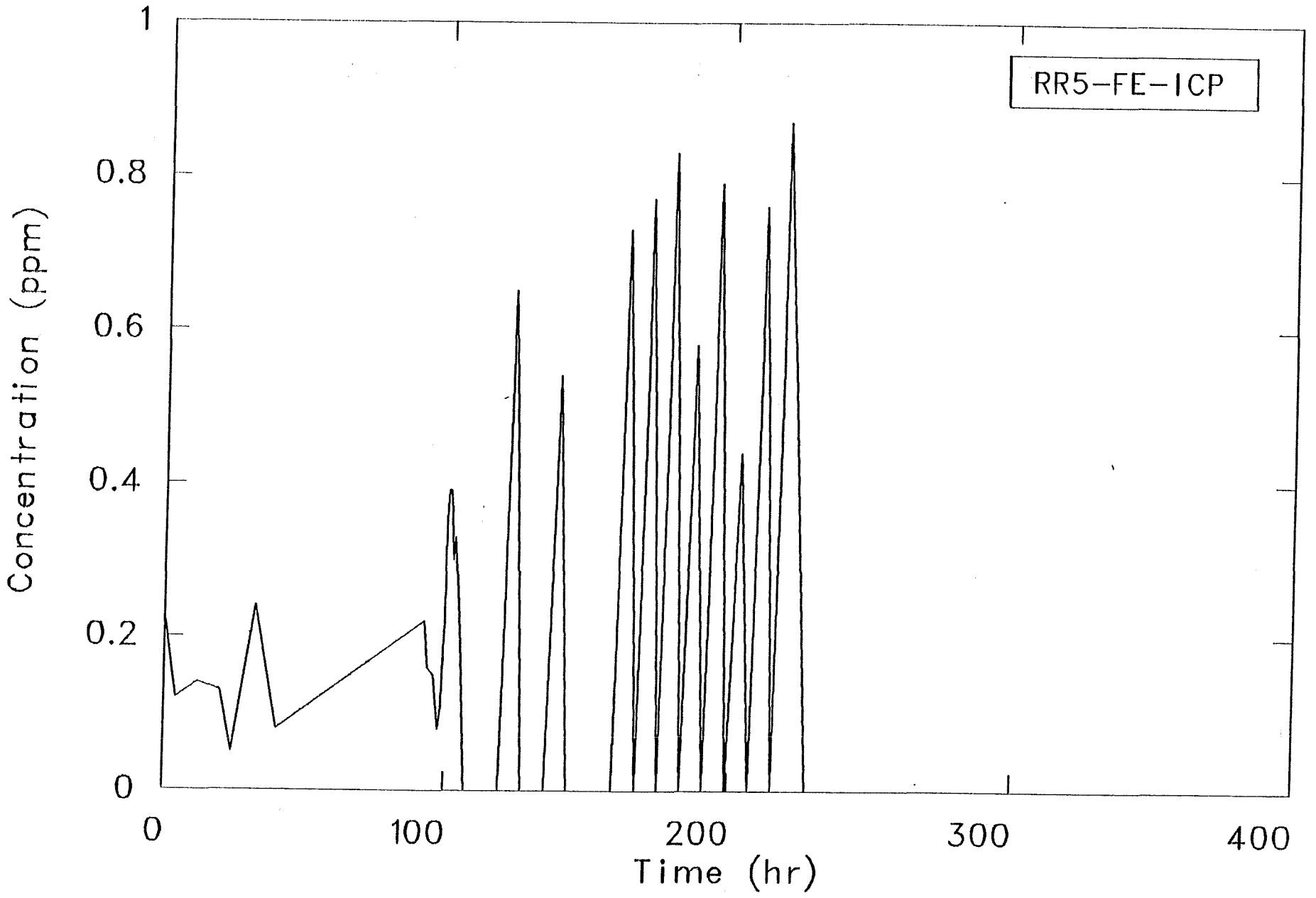
K-1

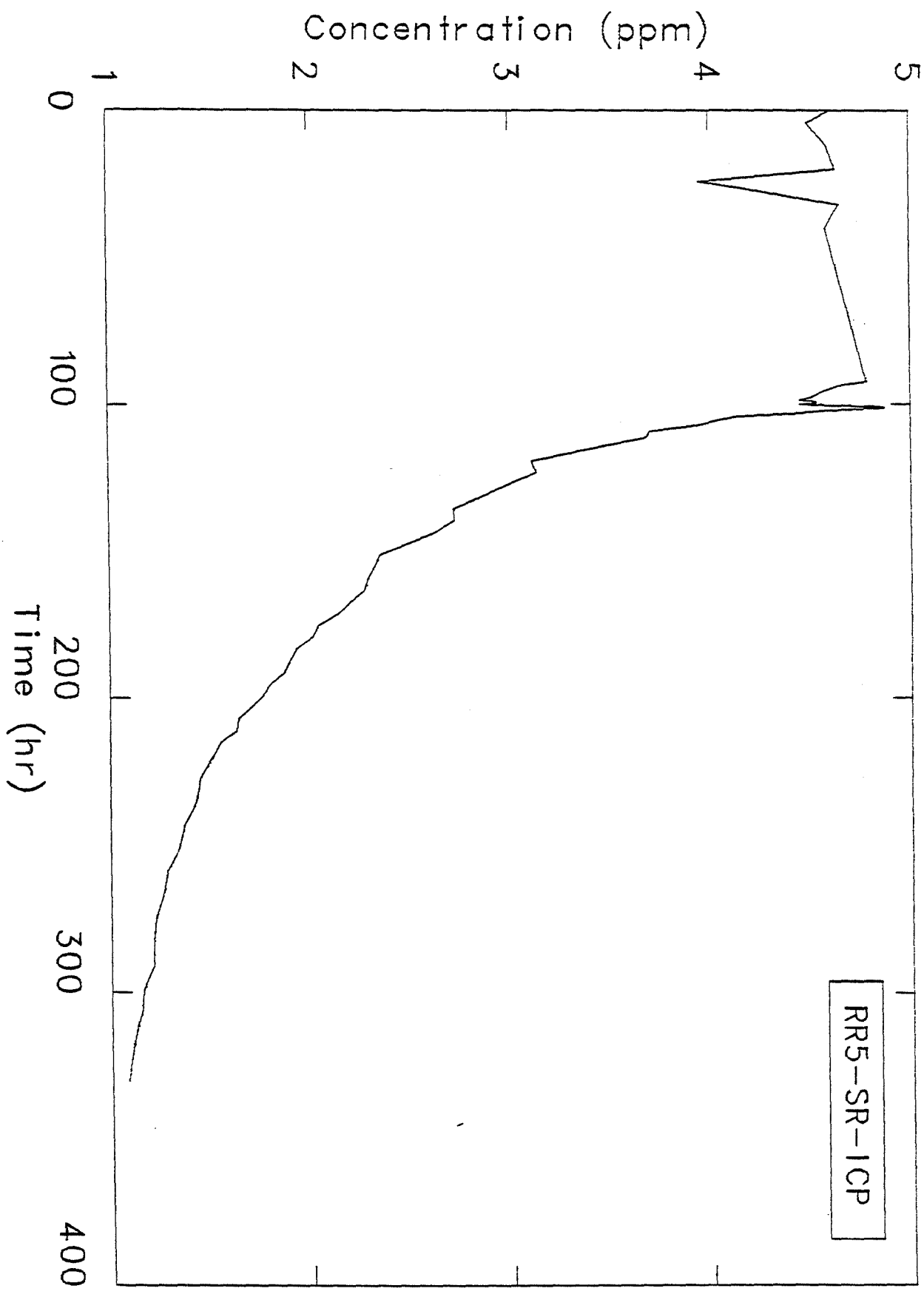

RR5-REDOX-DL
Oxidation-reduction-potential (MV)
-200
-300
-400
-500
-600
-700
-100
0
100
200
300
400
Time (hr)

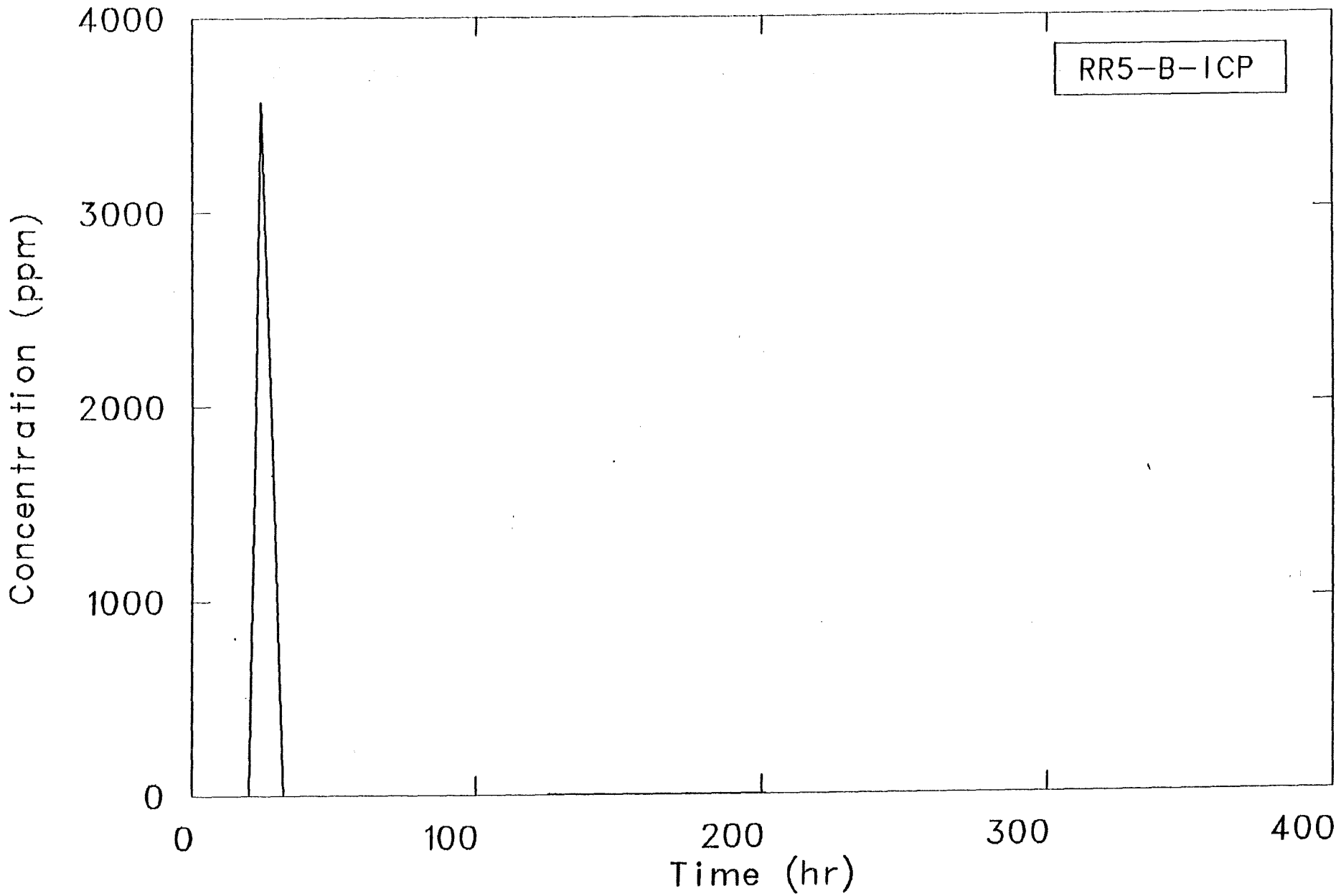

RR5-NA-ICP
Concentration (ppm)
5000
4000
3000
2000
1000
0
0
100
200
300
400
Time (hr)

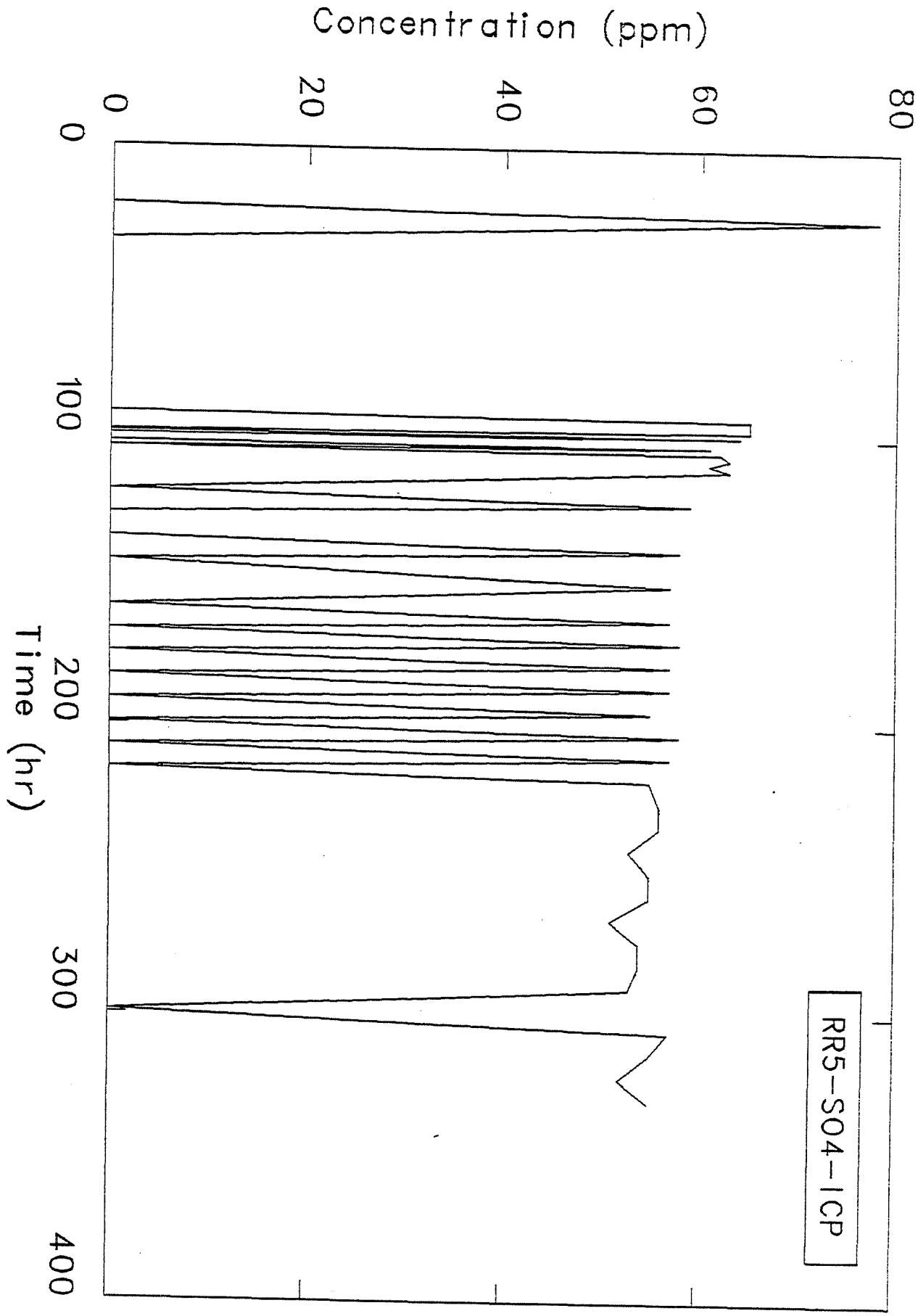

RR5-CA-ICP
Concentration (ppm)
300
250
200
150
100
50
0
100
200
300
400
Time (hr)

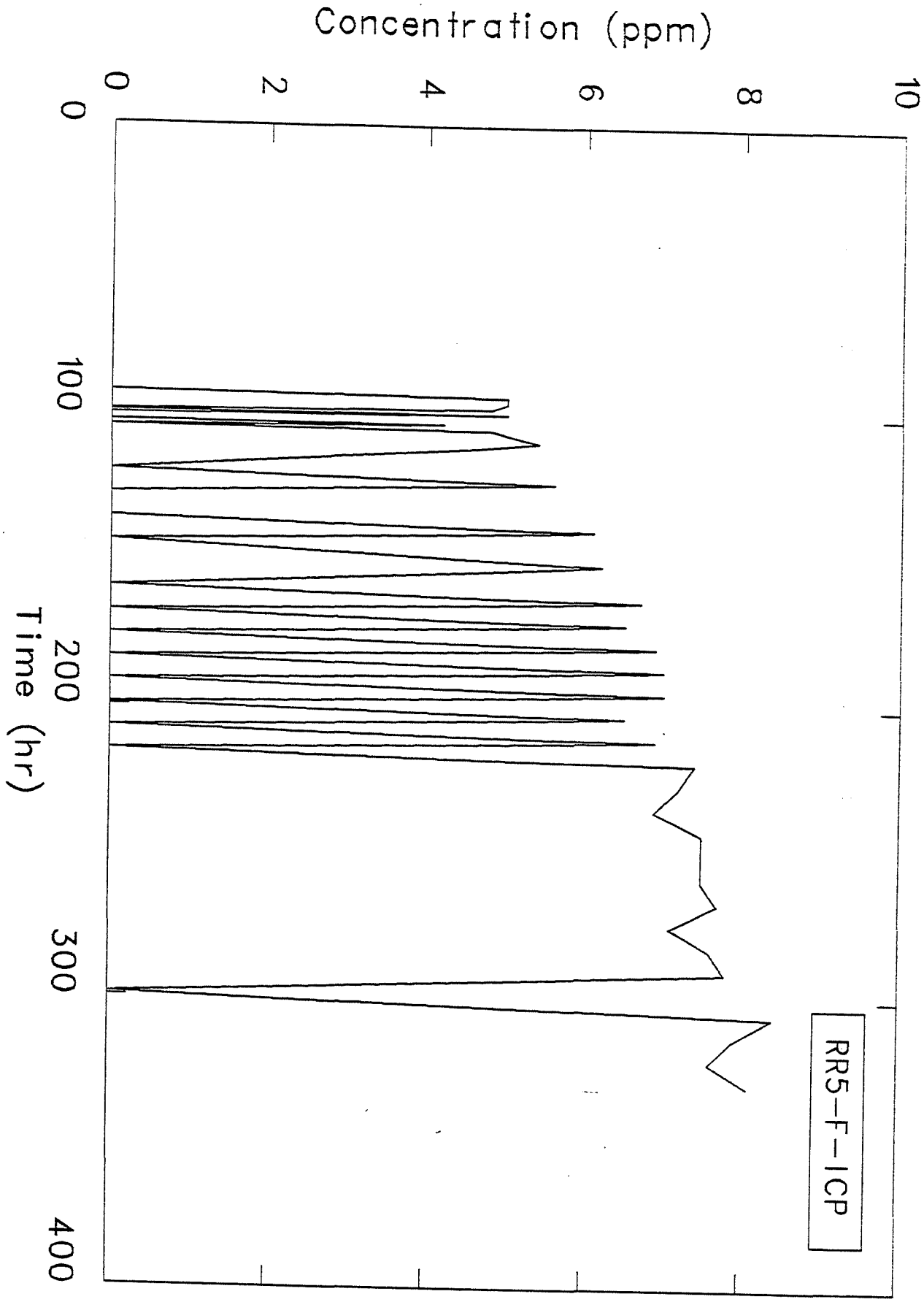
K-7

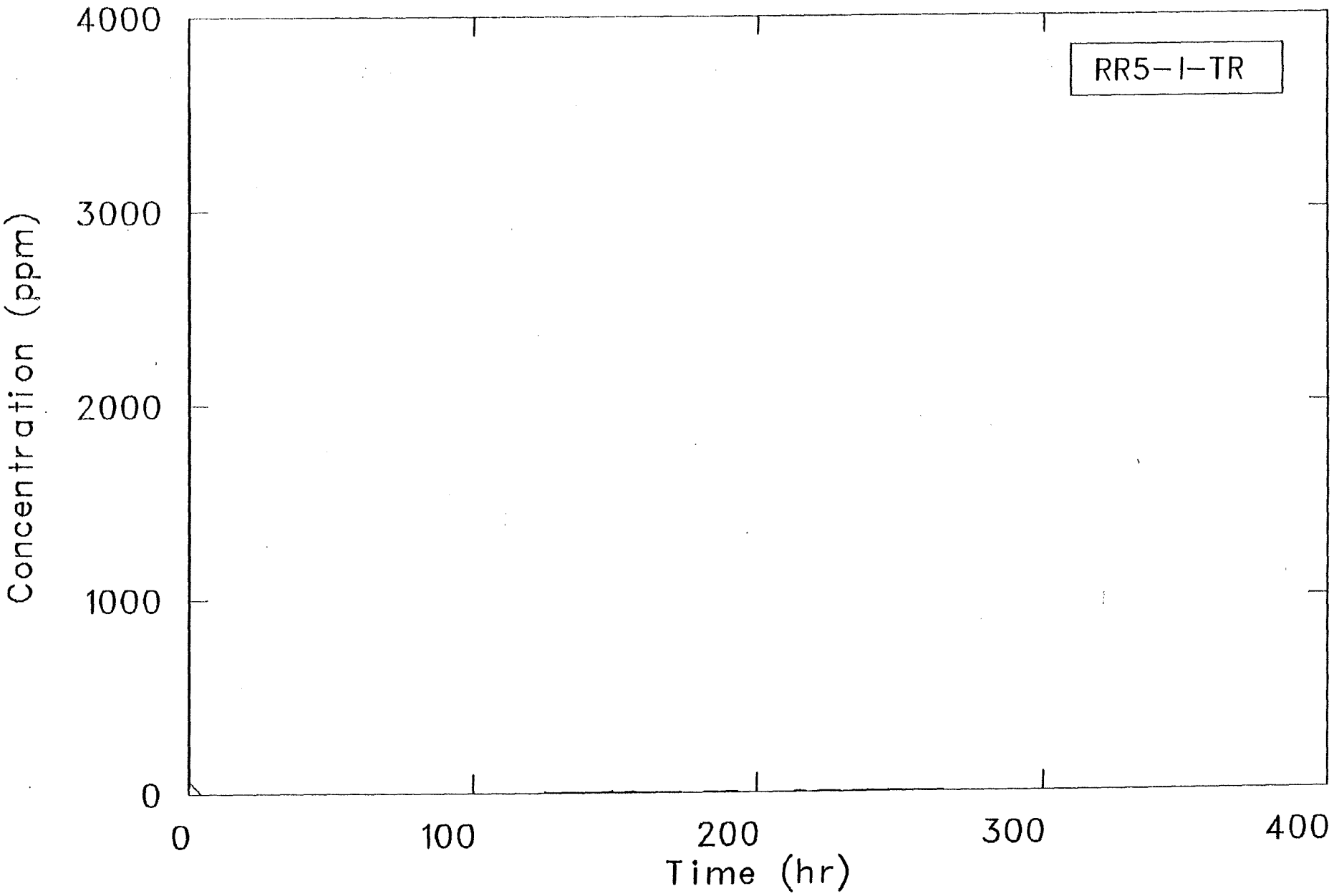

RR5-FE-ICP
Concentration (ppm)
1
0.8
0.6
0.4
0.2
0
0
100
200
300
400
Time (hr)

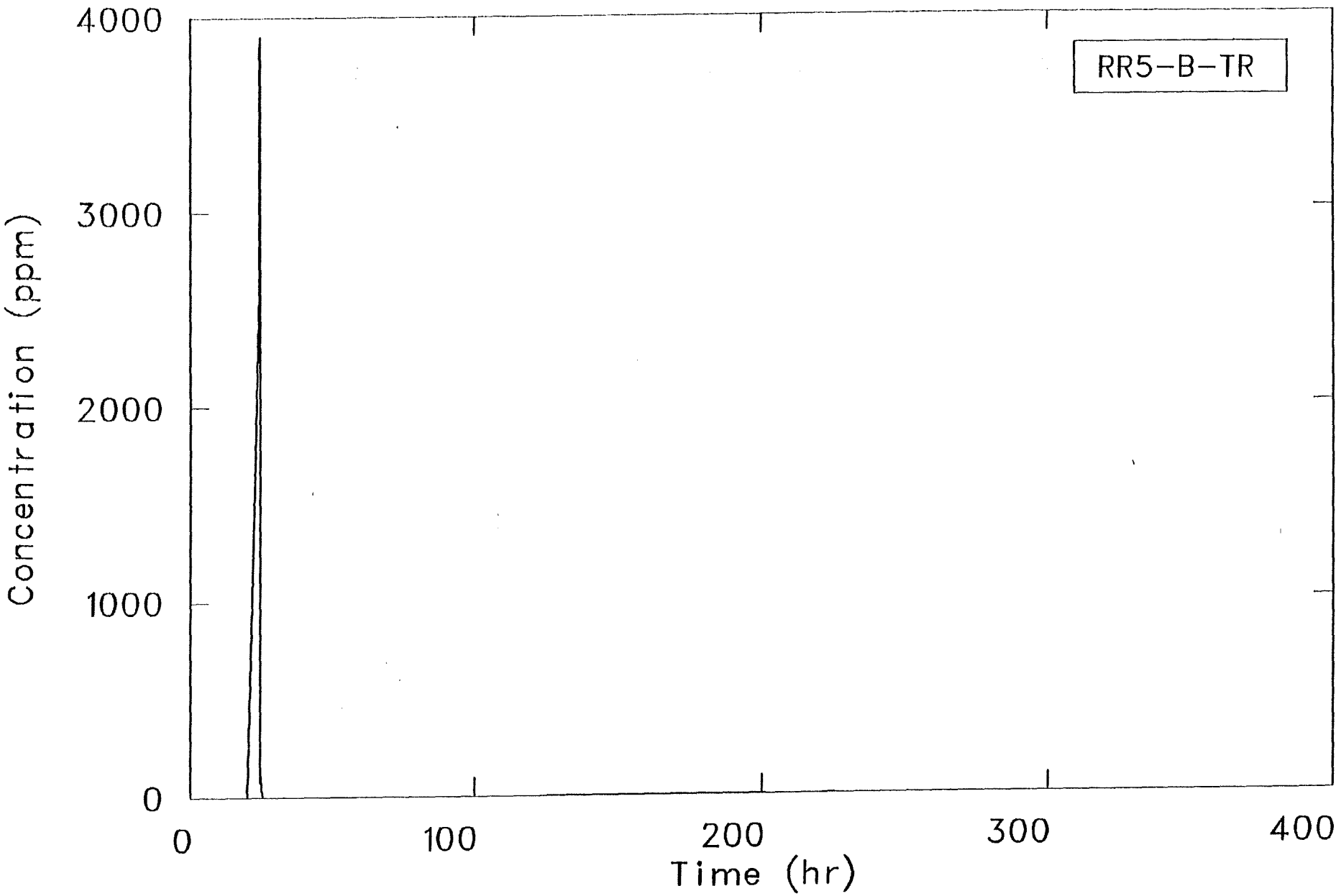

Concentration (ppm)
1
2
3
4
5
0
100
200
300
400
Time (hr)
RR5-SR-1CP

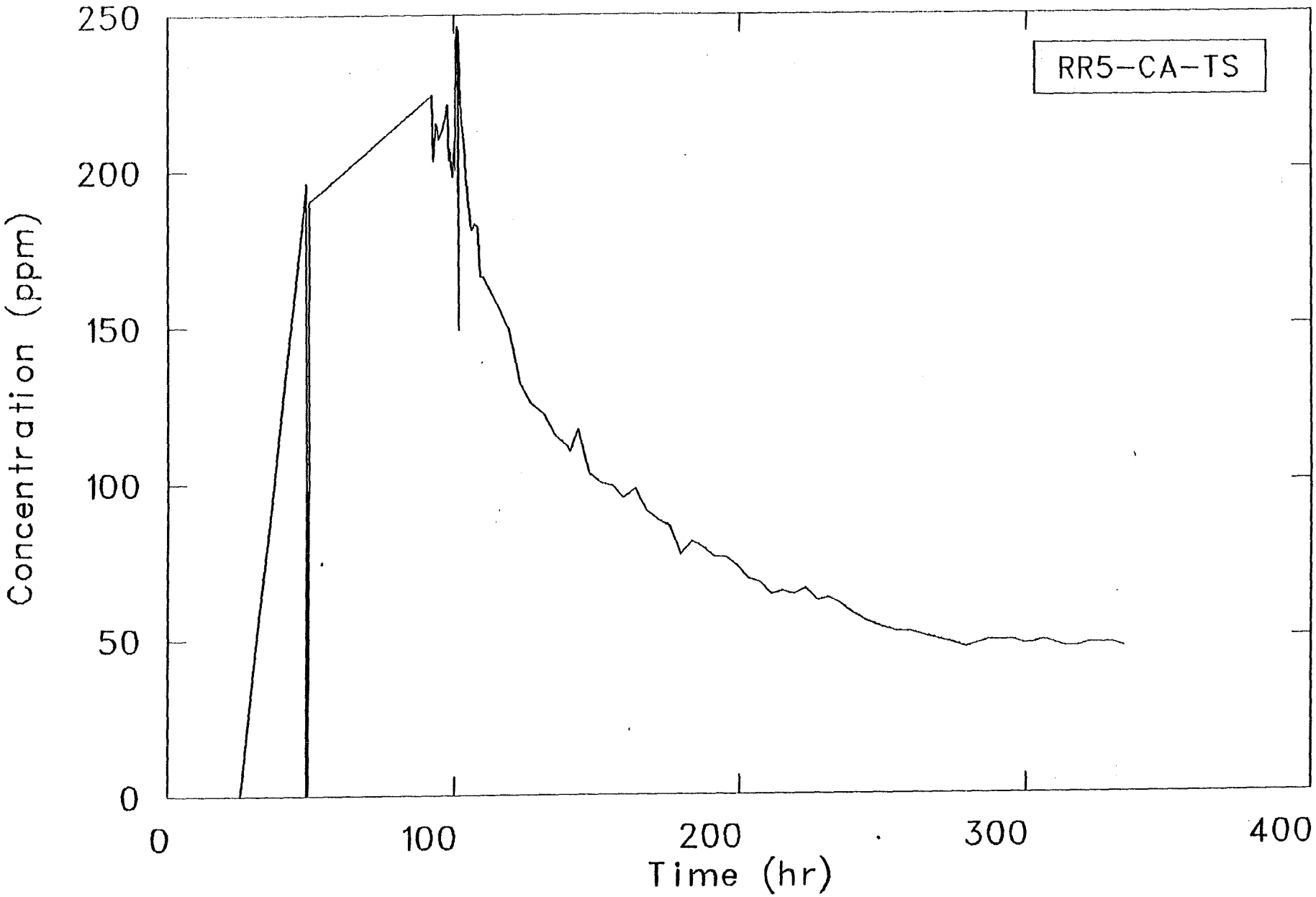

RR5-B-ICP
Concentration (ppm)
4000
3000
2000
1000
0
0
100
200
300
400
Time (hr)

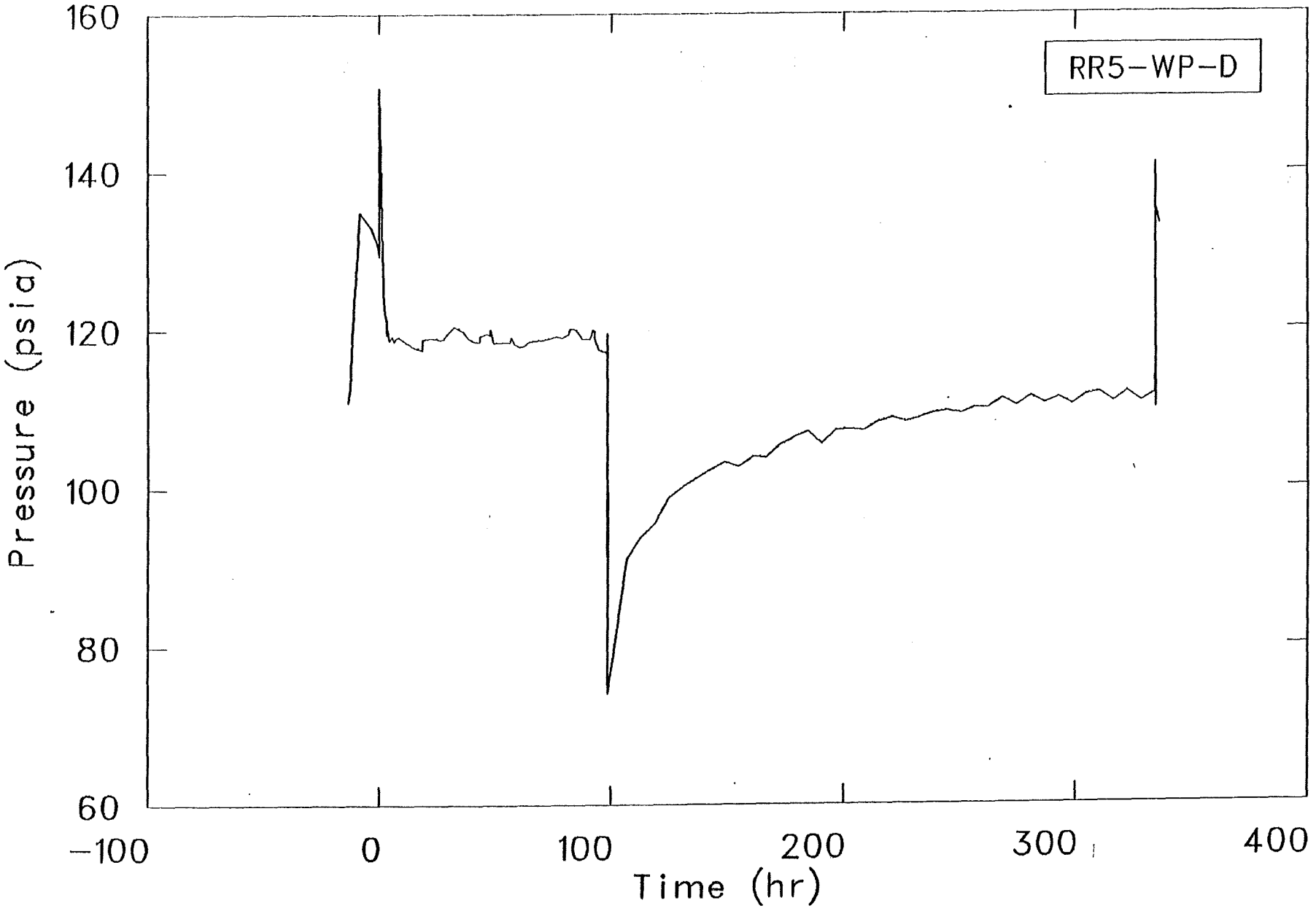

Concentration (ppm)
0
20
40
60
80
0
100
200
300
400
Time (hr)
RR5-SO4-ICP

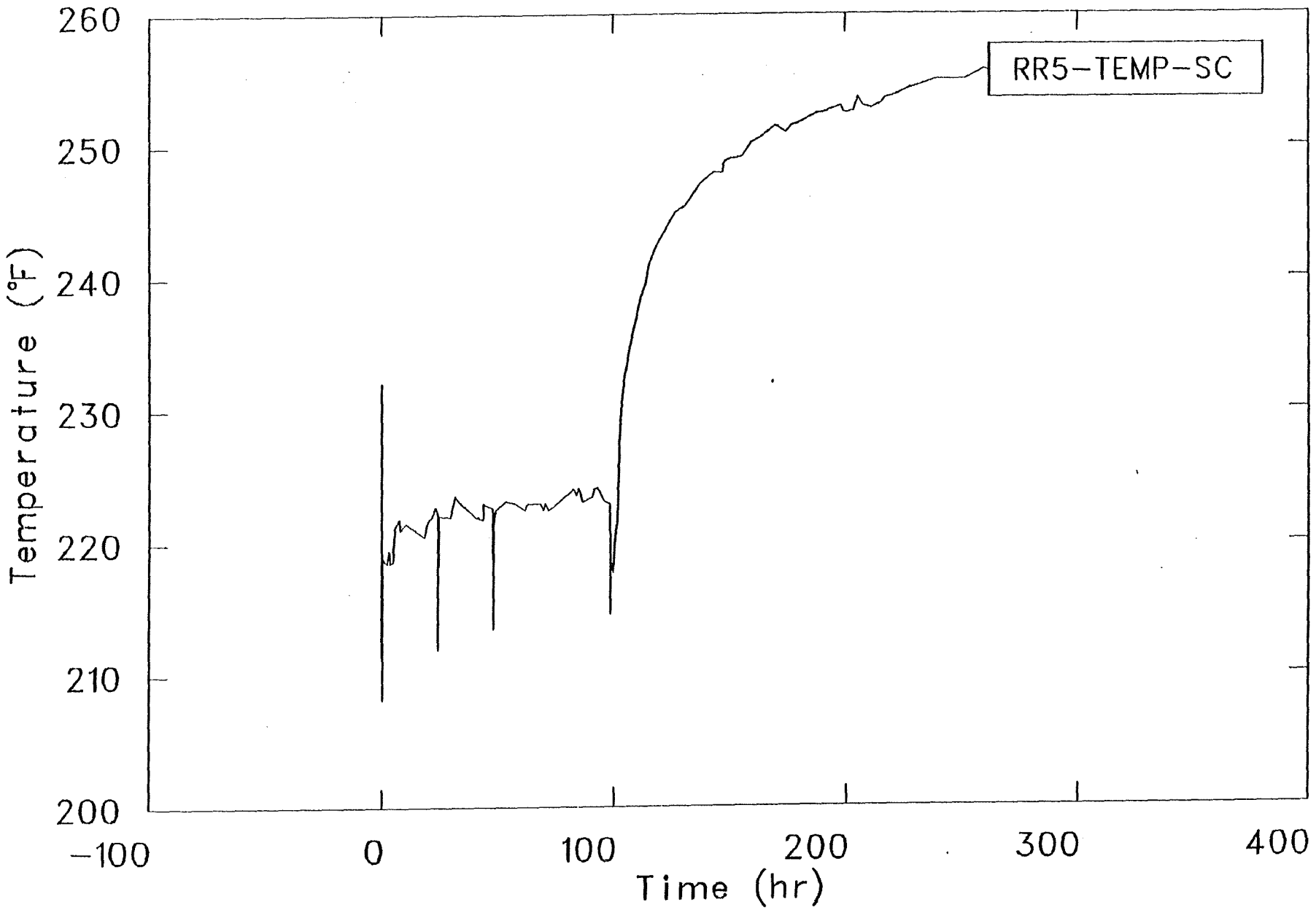

Concentration (ppm)
0
2
4
6
8
10
0
100
200
300
400
Time (hr)
RR5-F-ICP

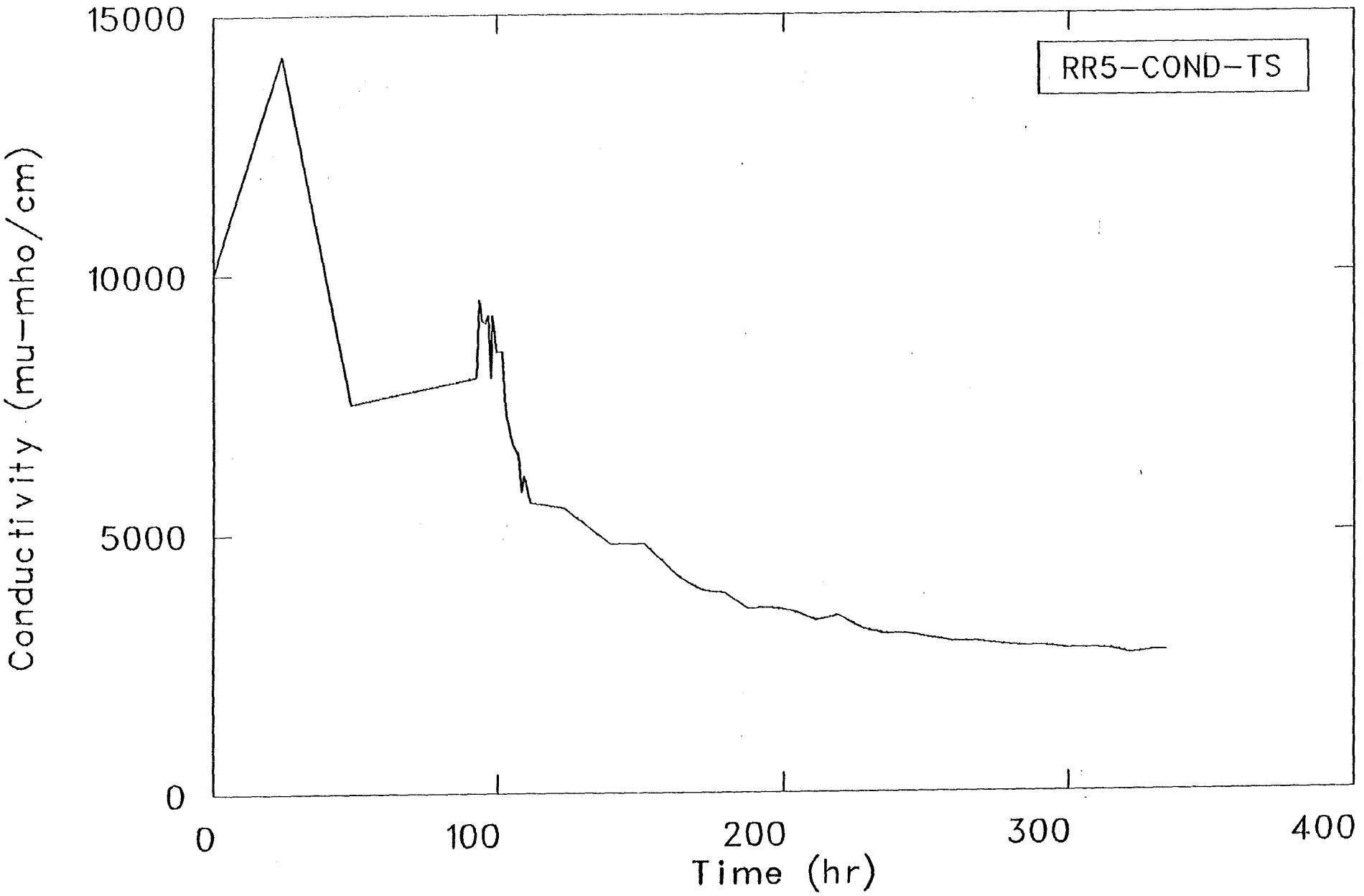

RR5-I-TR
Concentration (ppm)
4000
3000
2000
1000
0
0
100
200
300
400
Time (hr)

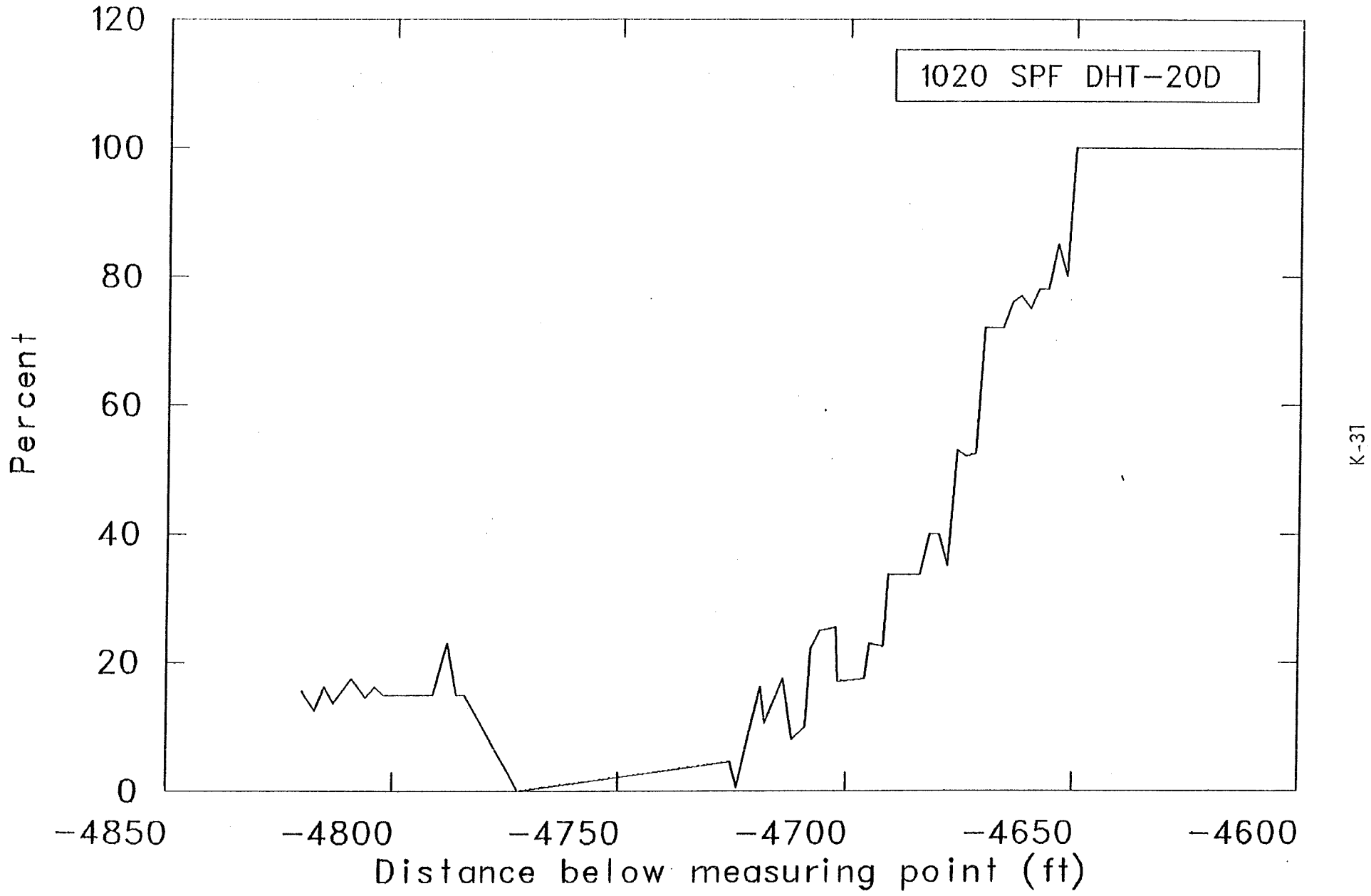

RR5-B-TR
Concentration (ppm)
4000
3000
2000
1000
0
0
100
200
300
400
Time (hr)

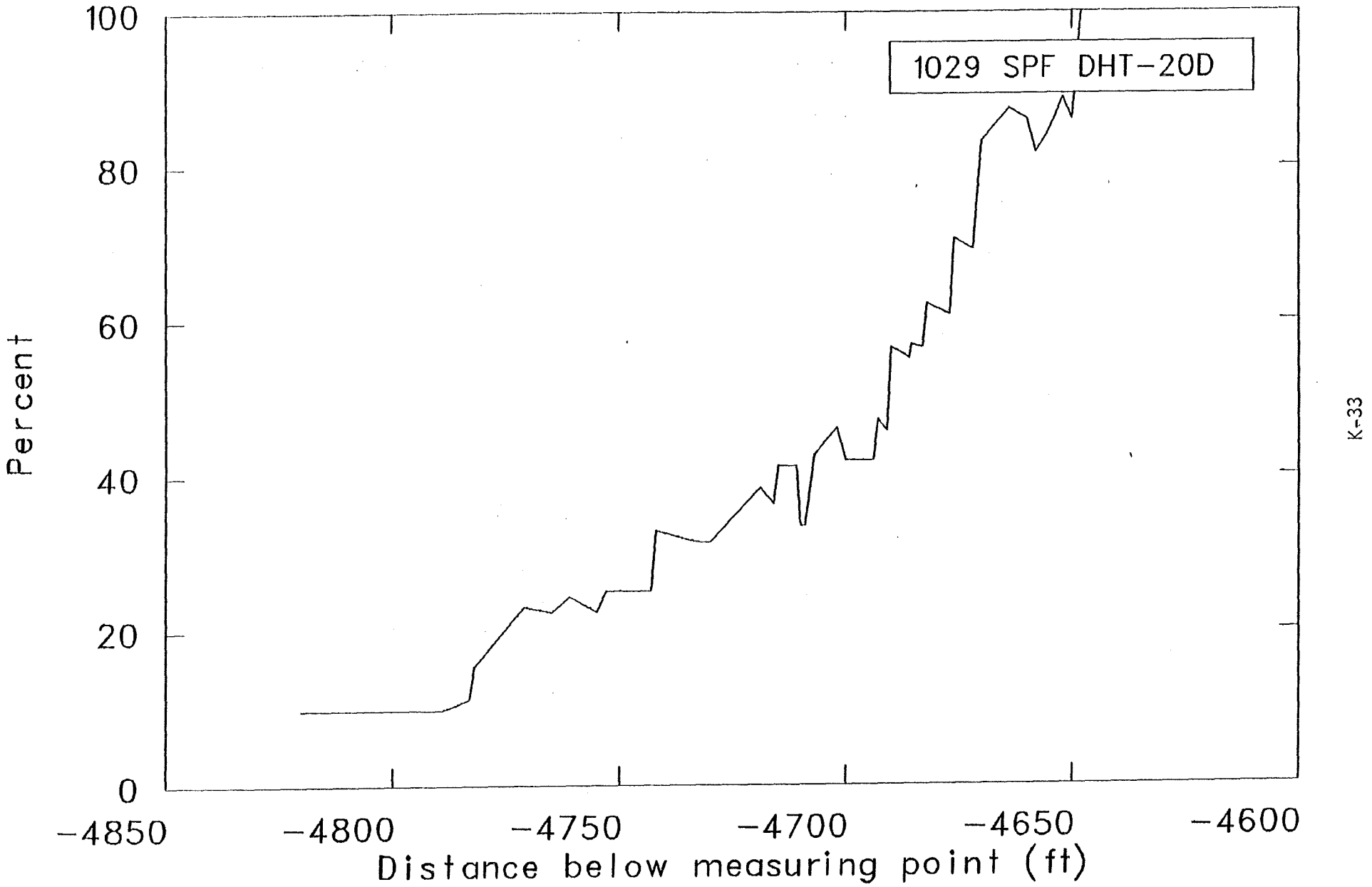

RR5-CA-TS
Concentration (ppm)
250
200
150
100
50
0
0
100
200
300
400
Time (hr)

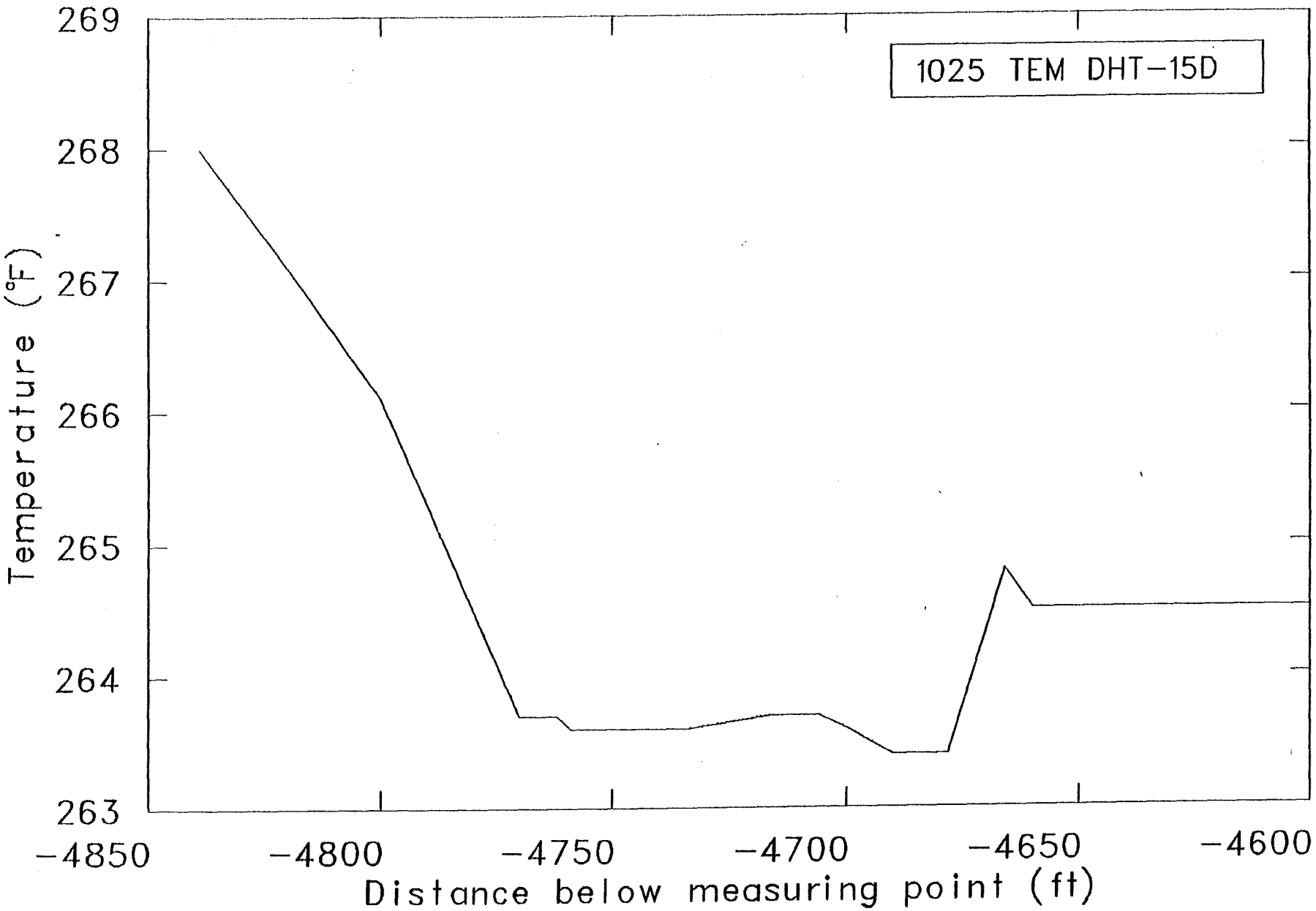

RR5-WP-D
Pressure (psia)
160
140
120
100
80
60
-100
0
100
200
300
400
Time (hr)


RR5-TEMP-SC
260
250
240
230
220
210
200
Temperature (°F)
-100
0
100
200
300
400
Time (hr)


RR5-COND-TS
15000
10000
5000
0
Conductivity (mu-mho/cm)
0
100
200
300
400
Time (hr)


1020 SPF DHT-20D
120
100
80
60
40
20
0
Percent
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)


1029 SPF DHT-20D
100
80
60
40
20
0
Percent
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)


1025 TEM DHT-15D
269
268
267
266
265
264
263
Temperature (°F)
-4850
-4800
-4750
-4700
-4650
-4600
Distance below measuring point (ft)

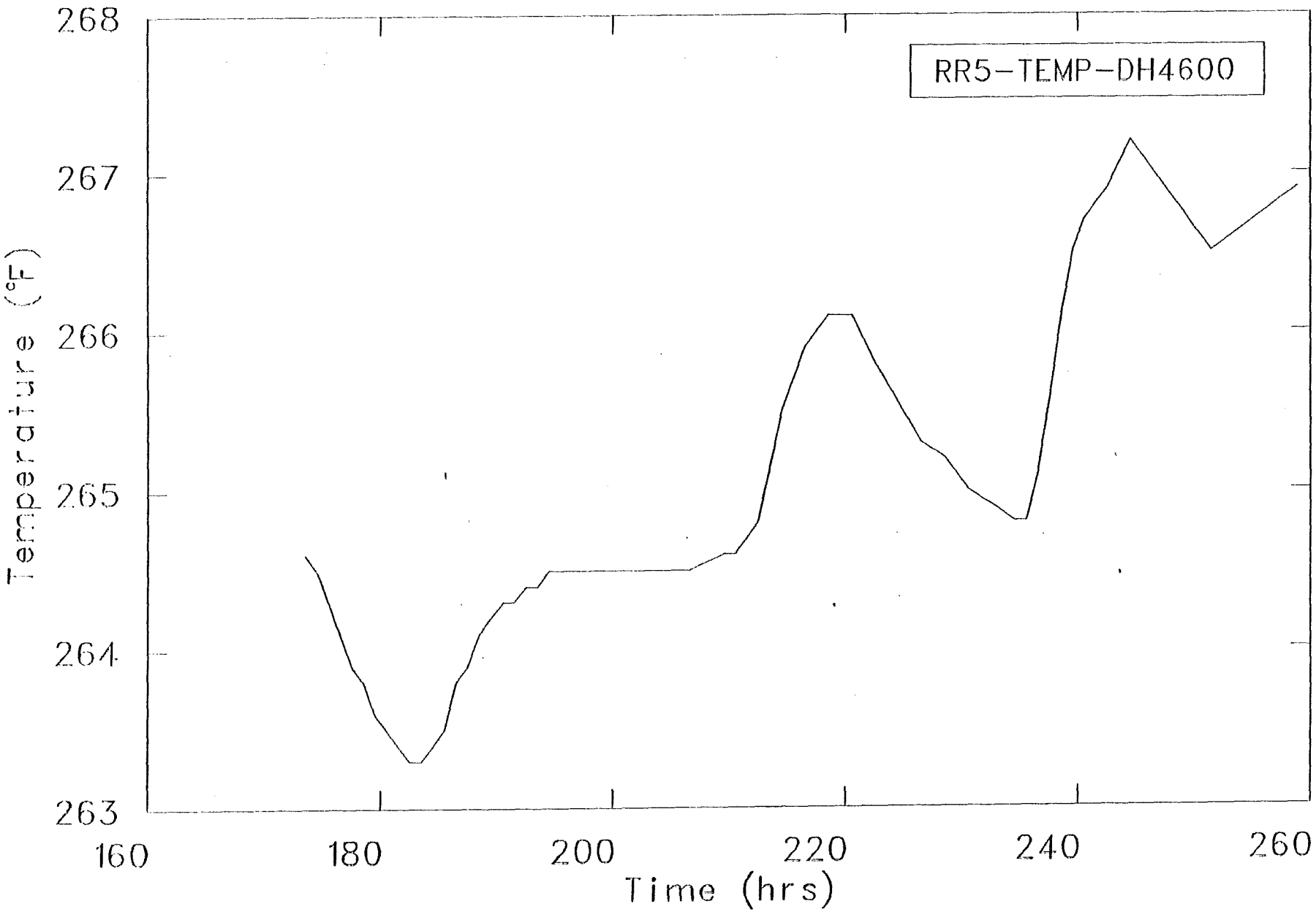
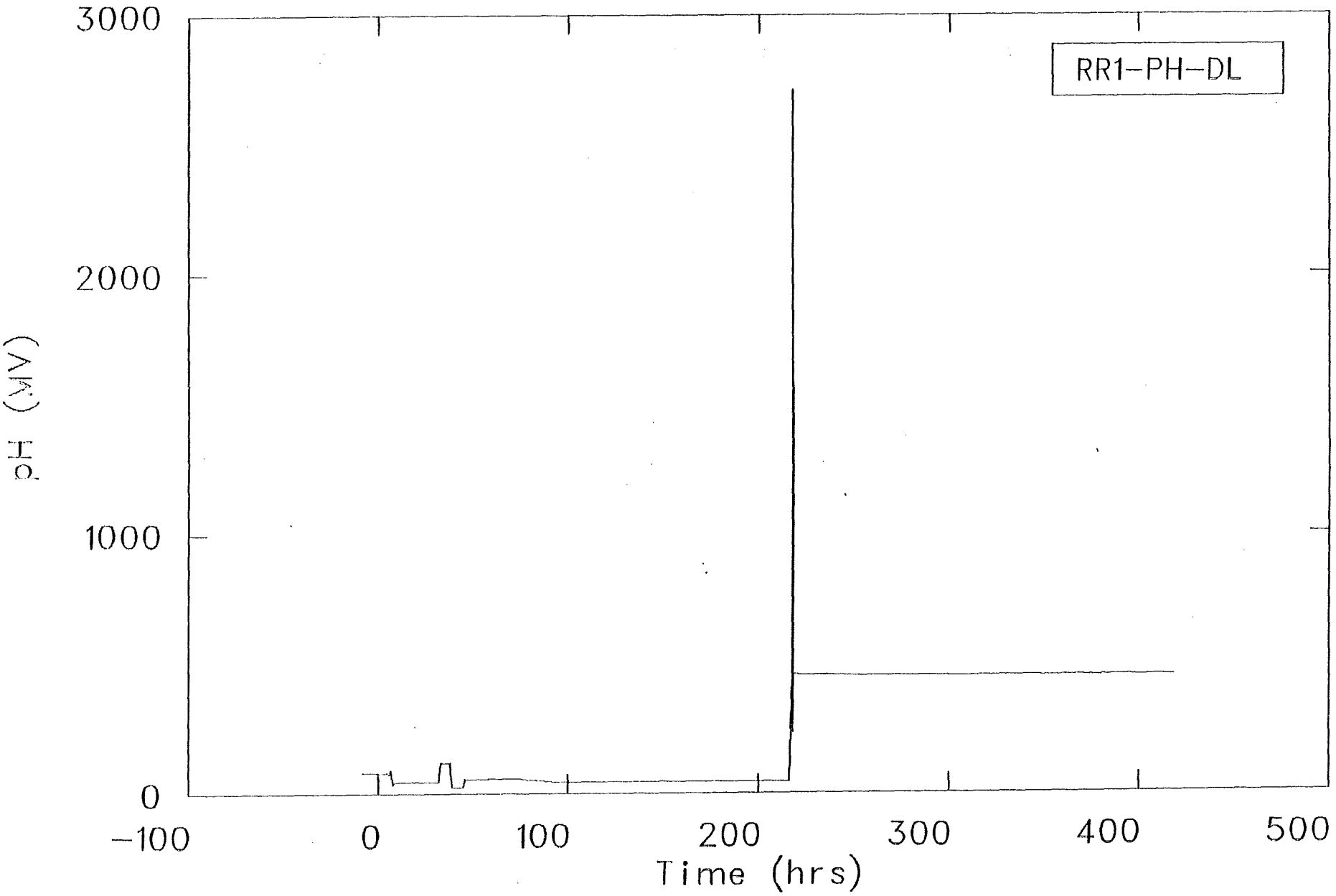
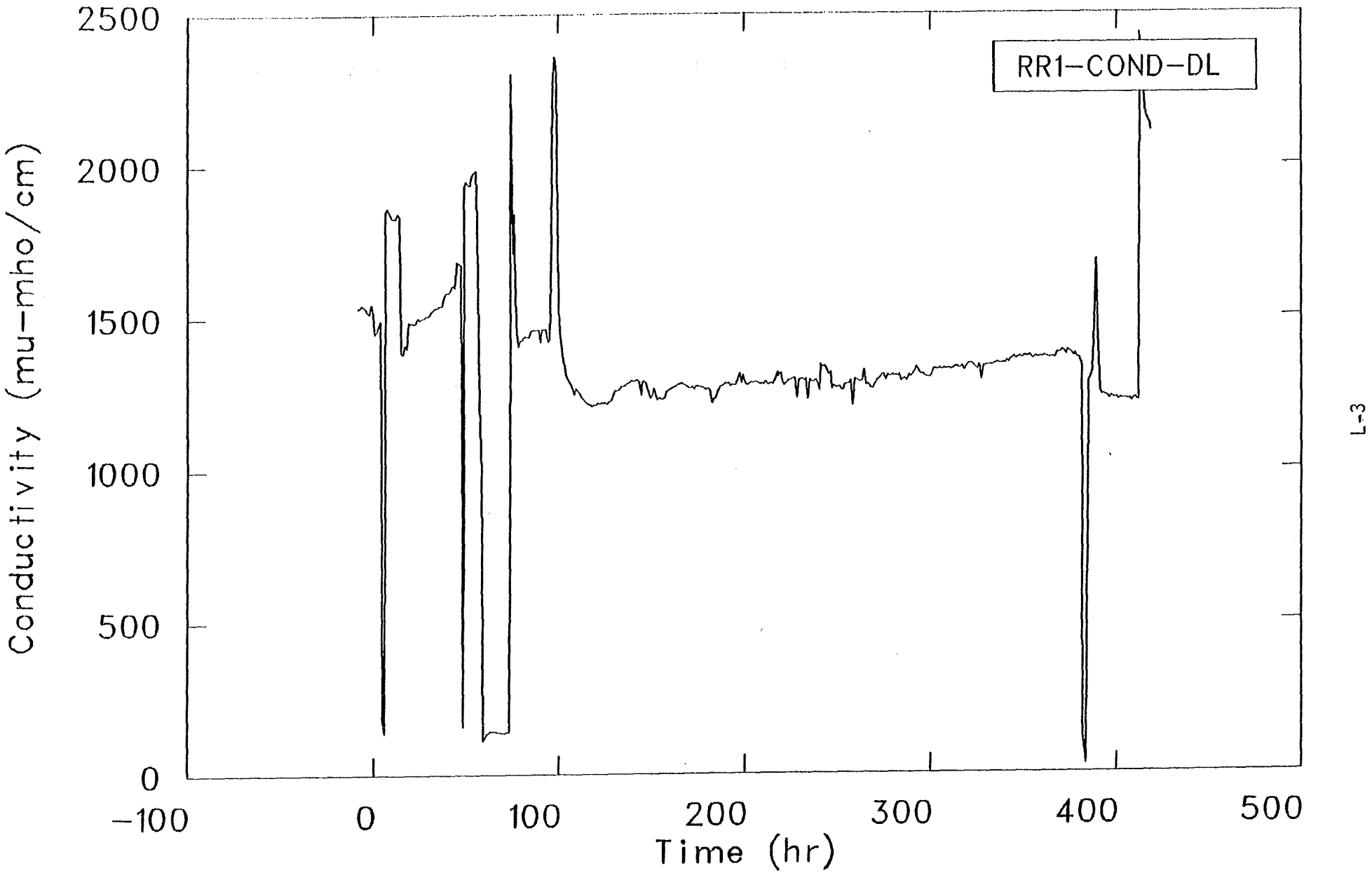

RR5-TEMP-DH4600
268
267
266
265
264
263
Temperature (°F)
160
180
200
220
240
260
Time (hrs)

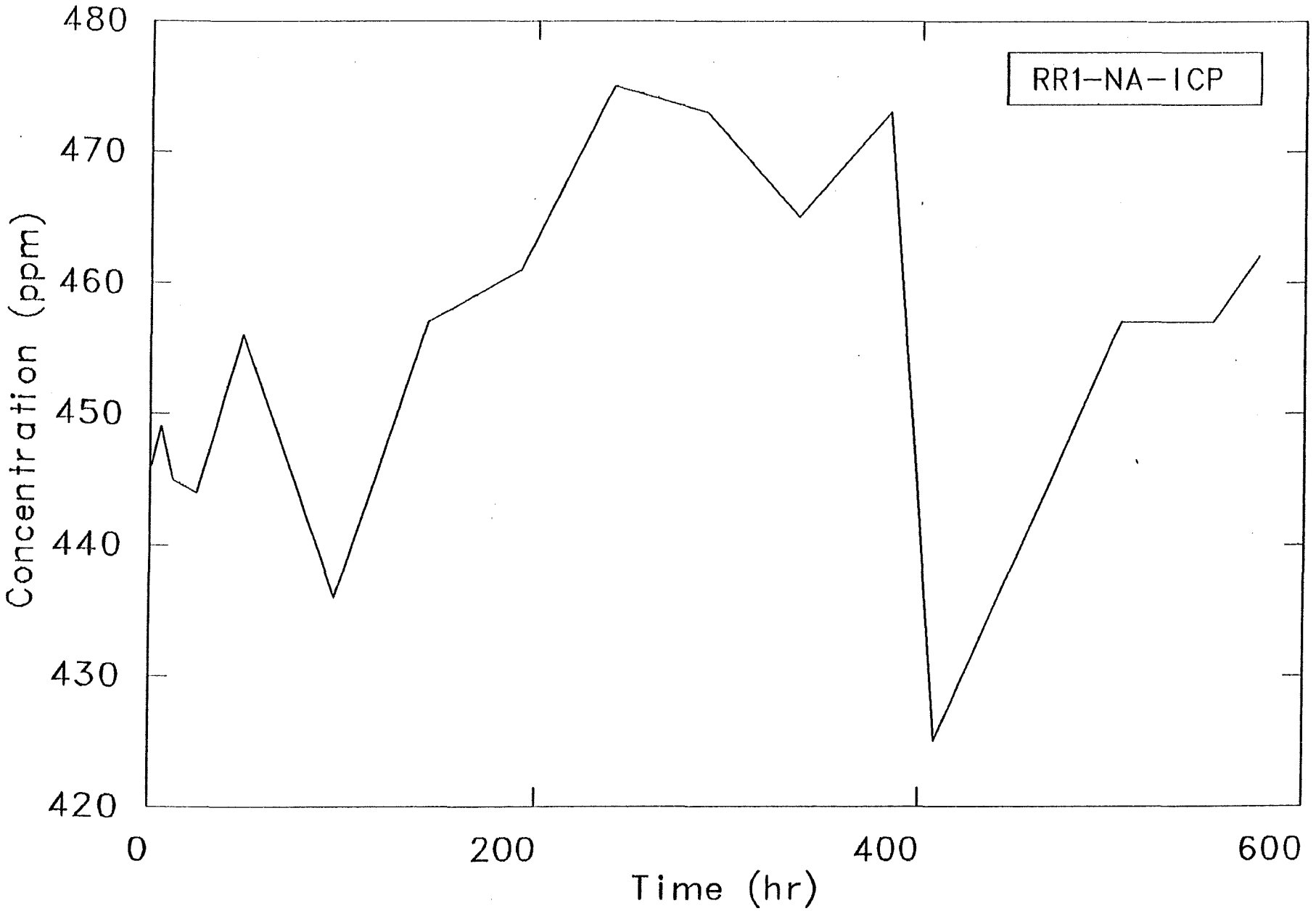
TABLE L. TEST 5
File Name: RR5821106 Date: 11-06-82
Start Time: Real--00:00; File Start Time: -10.08

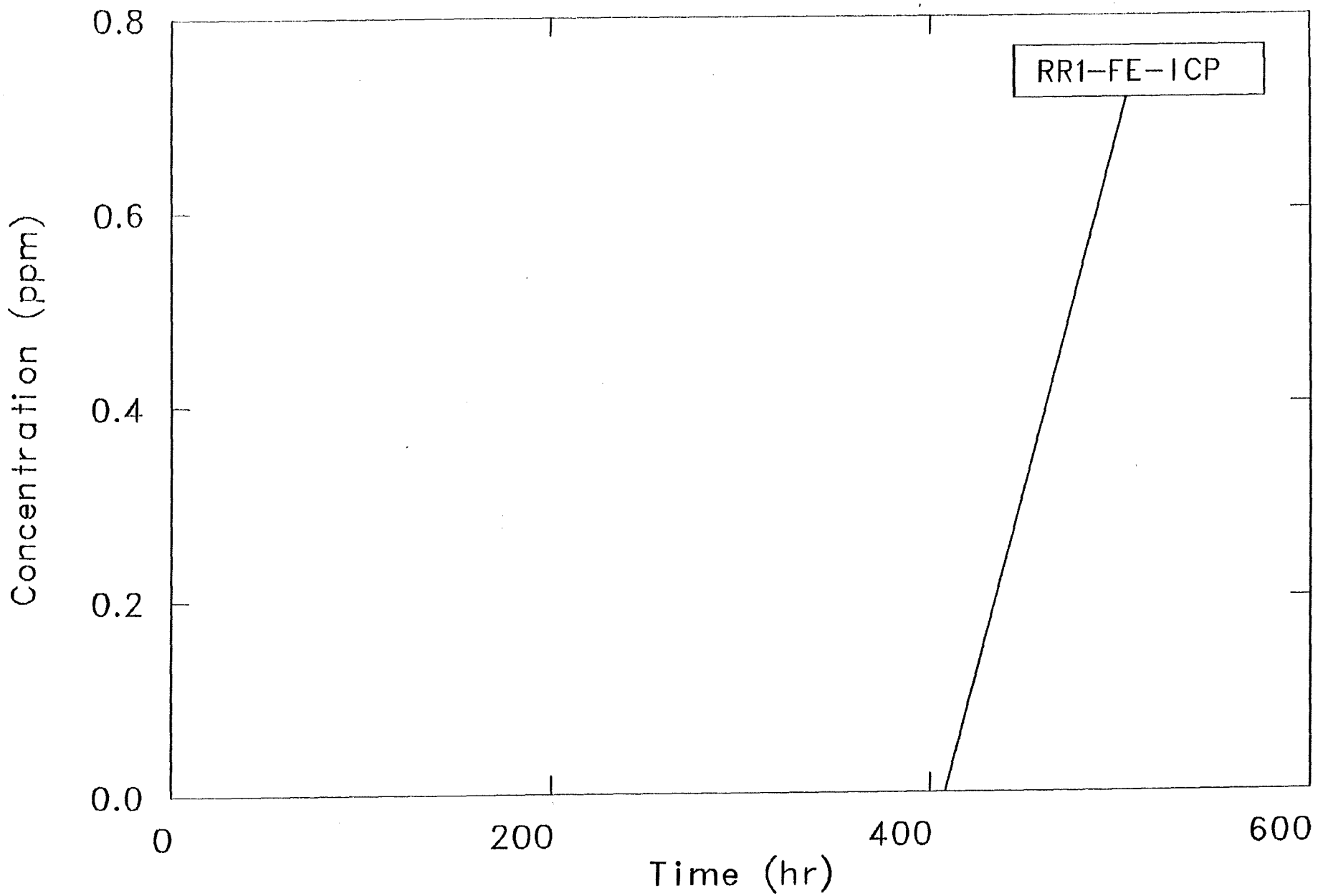
Record Name	#	Data Sampled	Recorder or Method	Units
RR1-PH-DL	1	pH	Data logger	millivolts
RR1-REDOX-DL	2	Oxidation-reduction	Data logger	millivolts
RR1-COND-DL	3	Conductivity	Data logger	µmho/cm
RR1-TEMP-DL	4	Temperature	Data logger	°F
RR1-NA-ICP	5	Sodium	ICP	ppm
RR1-K-ICP	6	Potassium	ICP	ppm
RR1-CA-ICP	7	Calcium	ICP	ppm
RR1-MG-ICP	8	Magnesium	ICP	ppm
RR1-FE-ICP	9	Iron	ICP	ppm
RR1-SIO2-ICP	10	Silica	ICP	ppm
RR1-SR-ICP	11	Strontium	ICP	ppm
RR1-LI-ICP	12	Lithium	ICP	ppm
RR1-B-ICP	13	Boron	ICP	ppm
RR1-HCO3-ICP	14	Bicarbonate	Titration	ppm
RR1-SO4-ICP	15	Sulfate	Gravimetric	ppm
RR1-CL-ICP	16	Chloride	Titration	ppm
RR1-F-ICP	17	Fluoride	SIE	ppm
RR1-TDS-ICP	18	TDS	Evaporation and weighing	ppm
RR1-PH-ICP	19	pH	SIE	standard
RR1-TEMP-M	20	Temperature	Manually recorded	°F
RR1-I-TR	21	Iodide	SIE	ppm
RR1-MG-TS	22	Magnesium	AA	ppm
RR1-CA-TS	23	Calcium	AA	ppm
RR1-PH-TS	24	pH	SIE	standard
RR1-COND-TS	25	Conductivity	Conductance cell	µmho/cm
RR1-ALK-TS	26	Alkalinity	Titration	ppm
RR5-PH-DL	27	pH	Data logger	millivolts
RR5-COND-DL	28	Conductivity	Data logger	µmho/cm
RR5-REDOX-DL	29	Oxidation-reduction	Data logger	millivolts
RR5-TEMP-DL	30	Temperature	Data logger	°F
RR5-NA-ICP	31	Sodium	ICP	ppm
RR5-K-ICP	32	Potassium	ICP	ppm
RR5-CA-ICP	33	Calcium	ICP	ppm
RR5-MG-ICP	34	Magnesium	ICP	ppm
RR5-FE-ICP	35	Iron	ICP	ppm
RR5-SIO2-ICP	36	Silica	ICP	ppm
RR5-SR-ICP	37	Strontium	ICP	ppm
RR5-LI-ICP	38	Lithium	ICP	ppm
RR5-B-ICP	39	Boron	ICP	ppm
RR5-HCO3-ICP	40	Bicarbonate	Titration	ppm

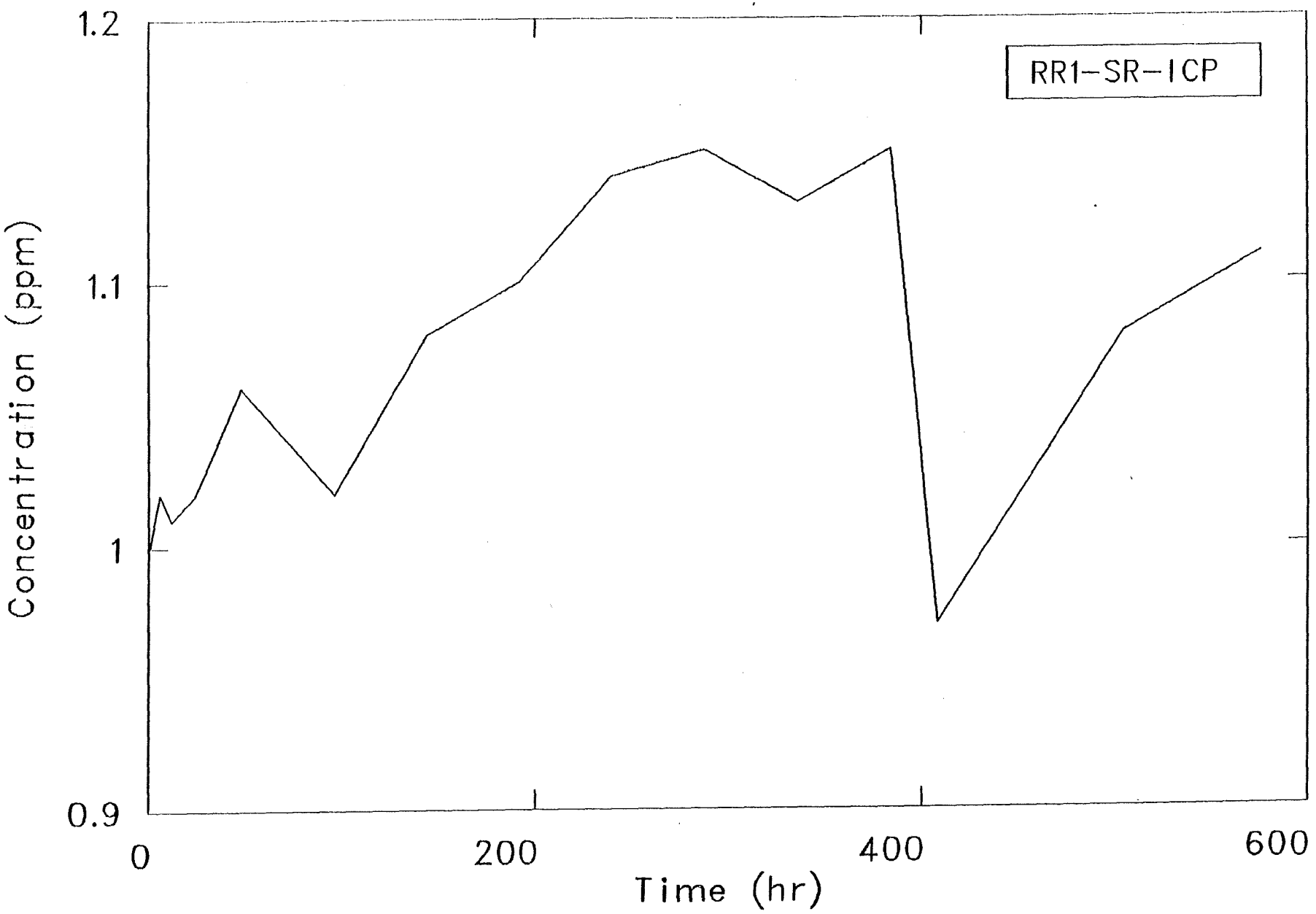

RR1-PH-DL
3000
2000
1000
0
pH (MV)
-100
0
100
200
300
400
500
Time (hrs)

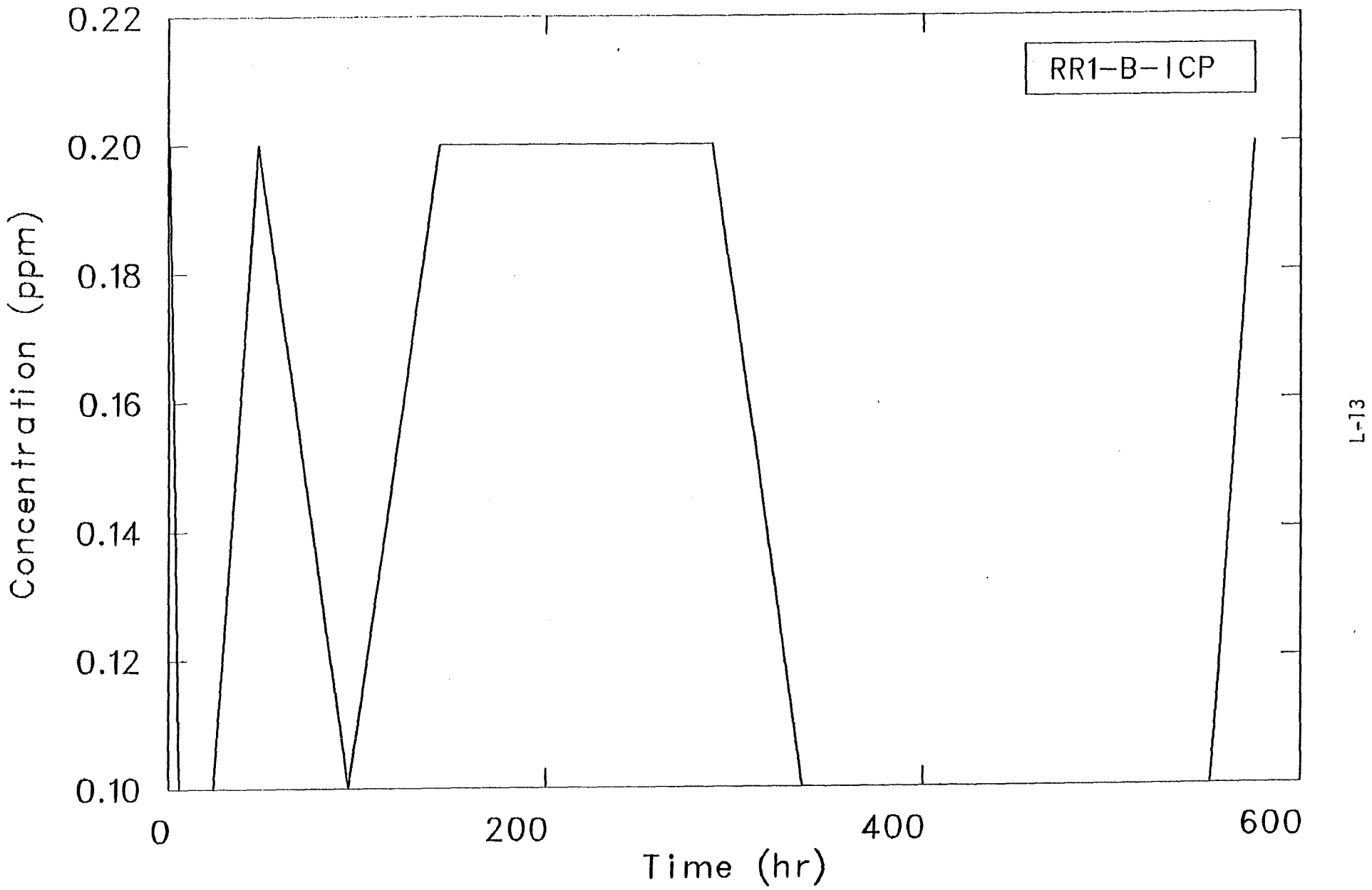

RR1-COND-DL
Conductivity (mu-mho/cm)
2500
2000
1500
1000
500
0
-100
0
100
200
300
400
500
Time (hr)

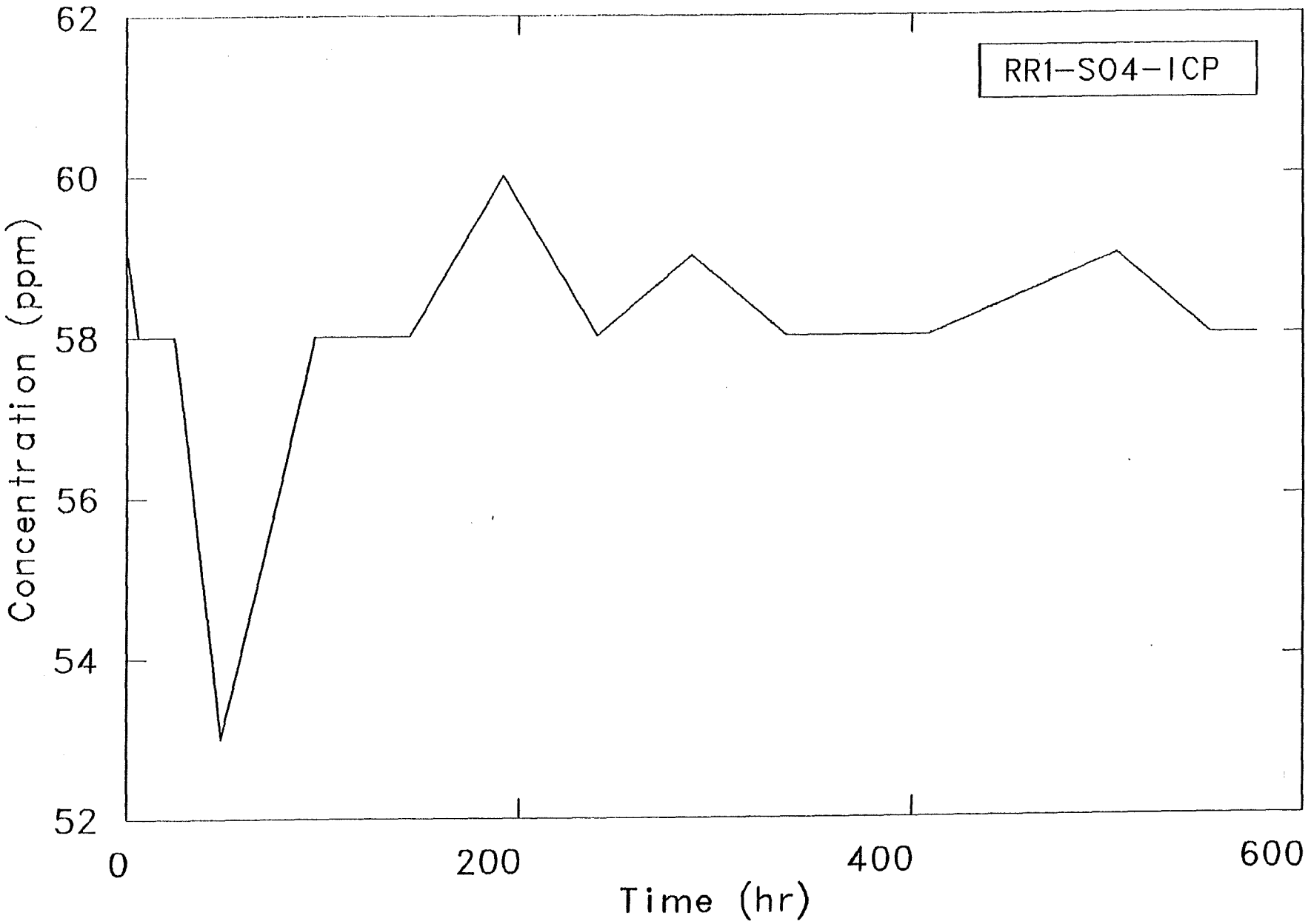
L-3

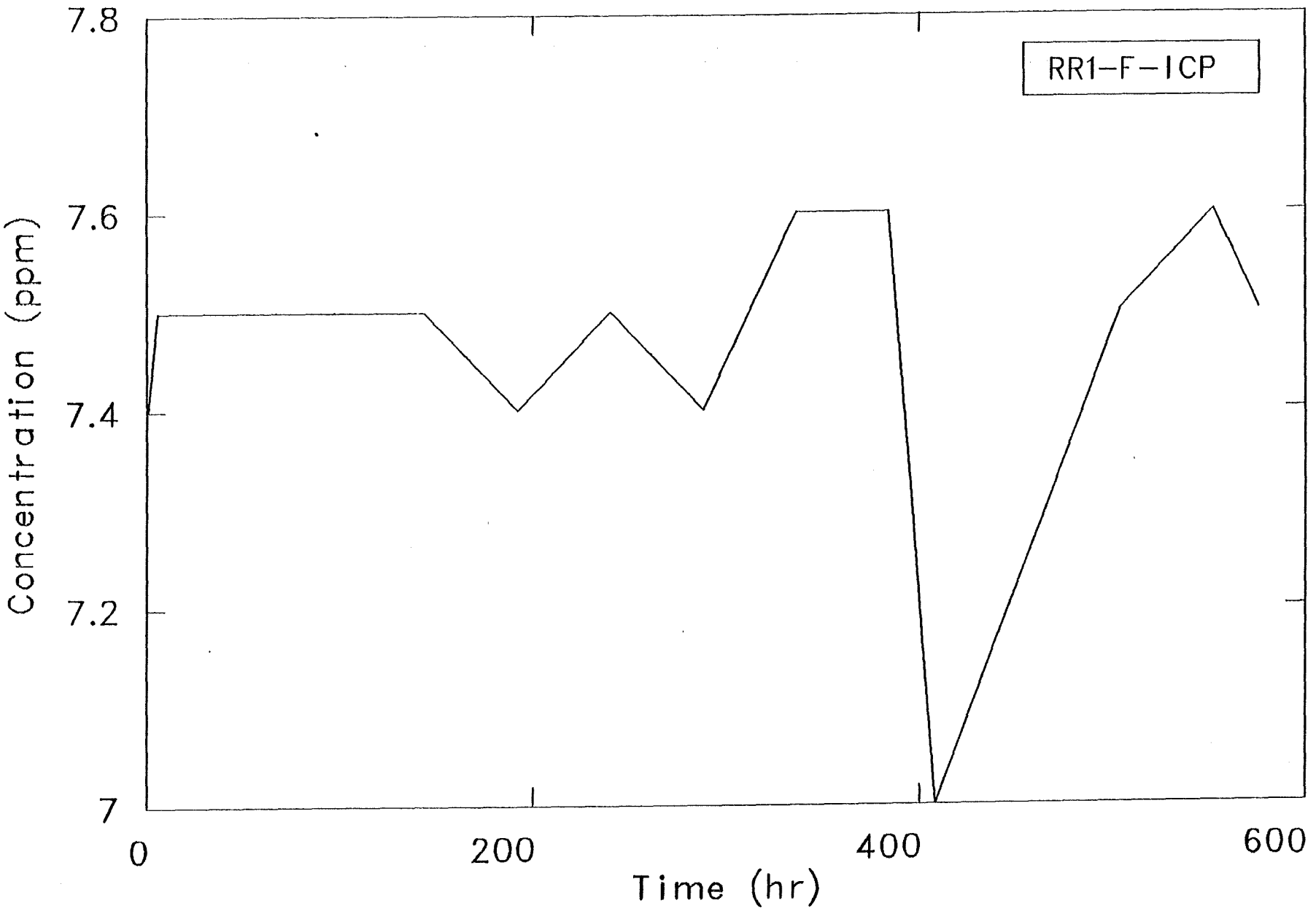

RR1-NA-ICP
480
470
460
450
440
430
420
Concentration (ppm)
0
200
400
600
Time (hr)

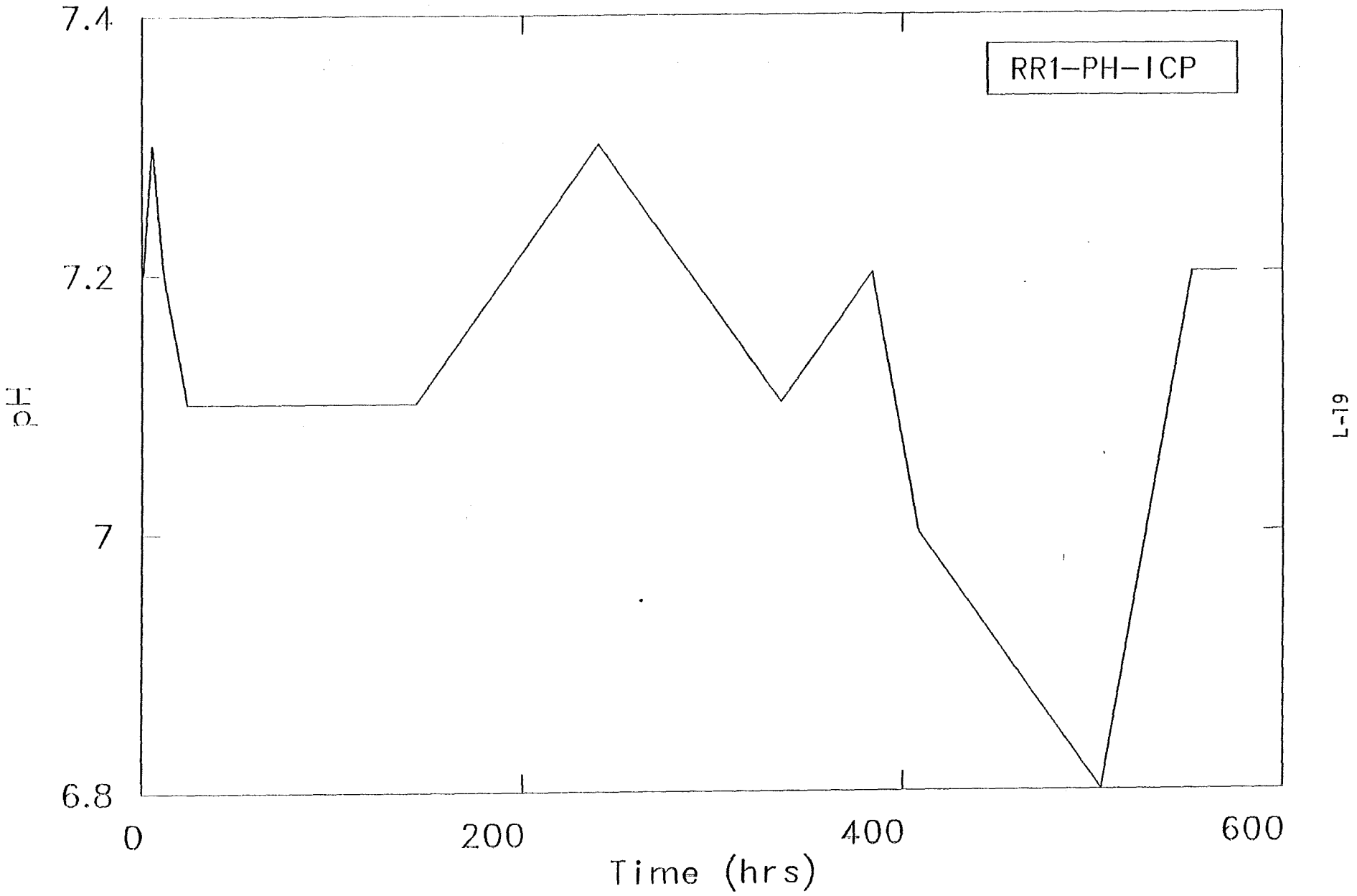

RR1-FE-ICP
0.8
0.6
0.4
0.2
0.0
Concentration (ppm)
0
200
400
600
Time (hr)

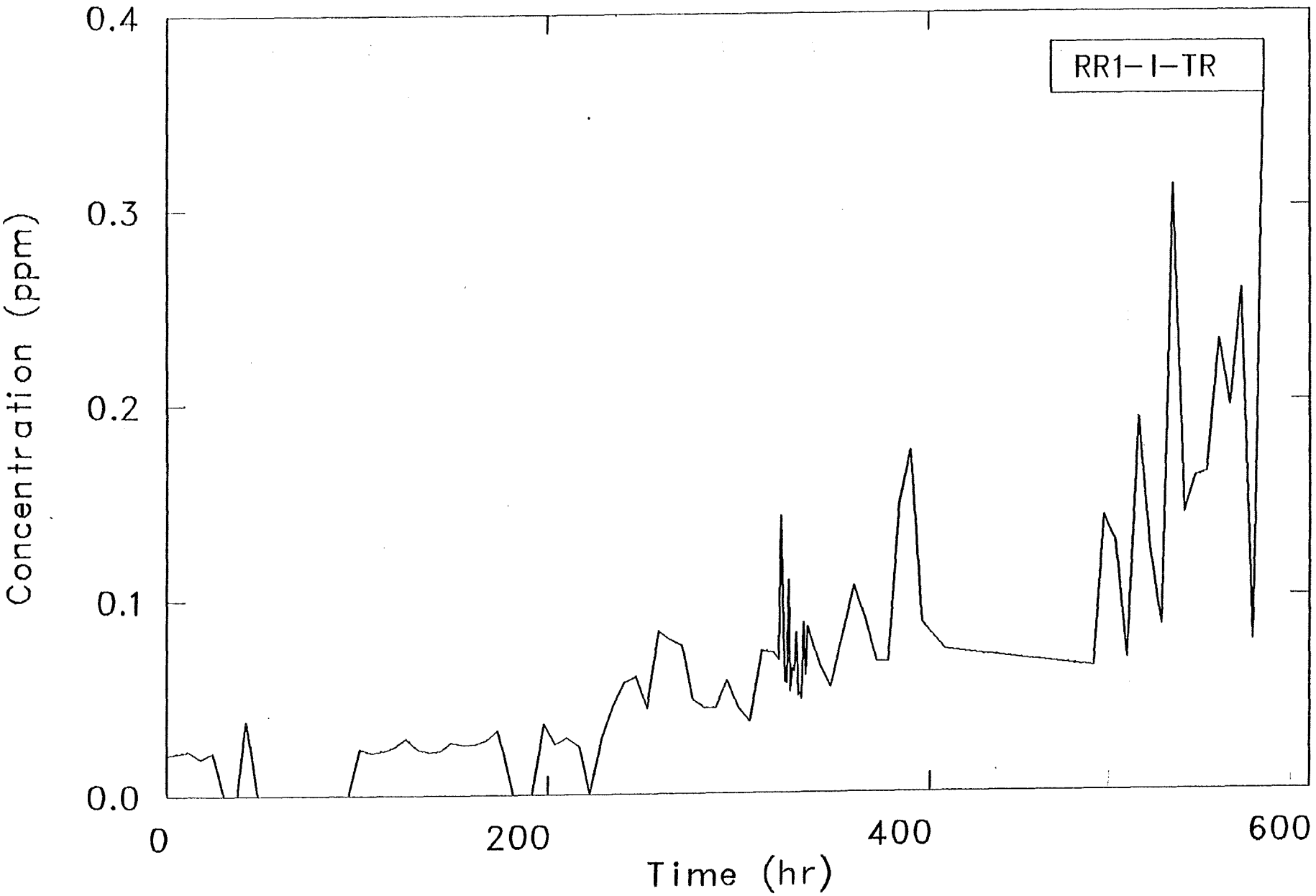

RR1-SR-ICP
Concentration (ppm)
1.2
1.1
1
0.9
0
200
400
600
Time (hr)

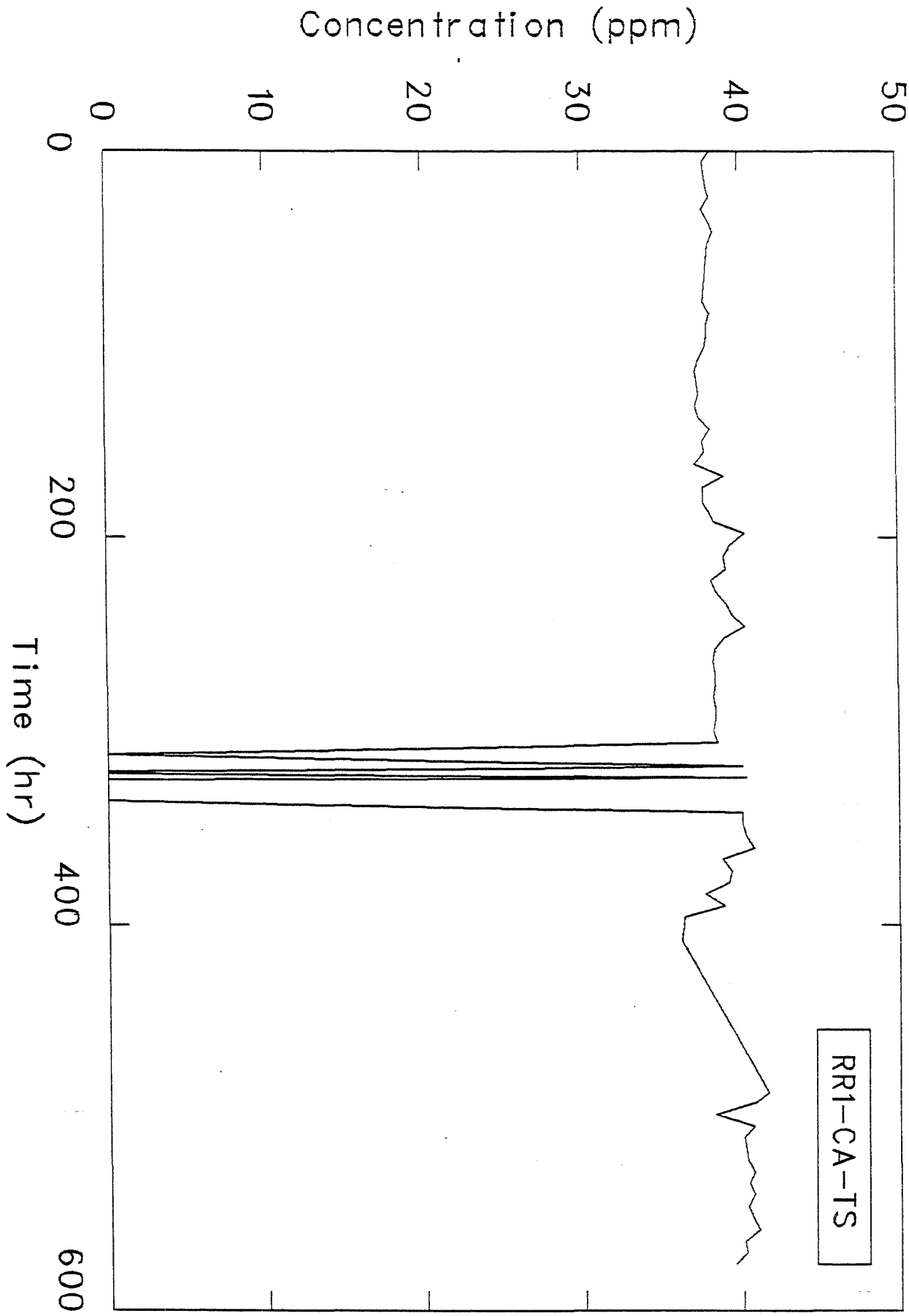

RR1-B-ICP
0.22
0.20
0.18
0.16
0.14
0.12
0.10
Concentration (ppm)
0
200
400
600
Time (hr)

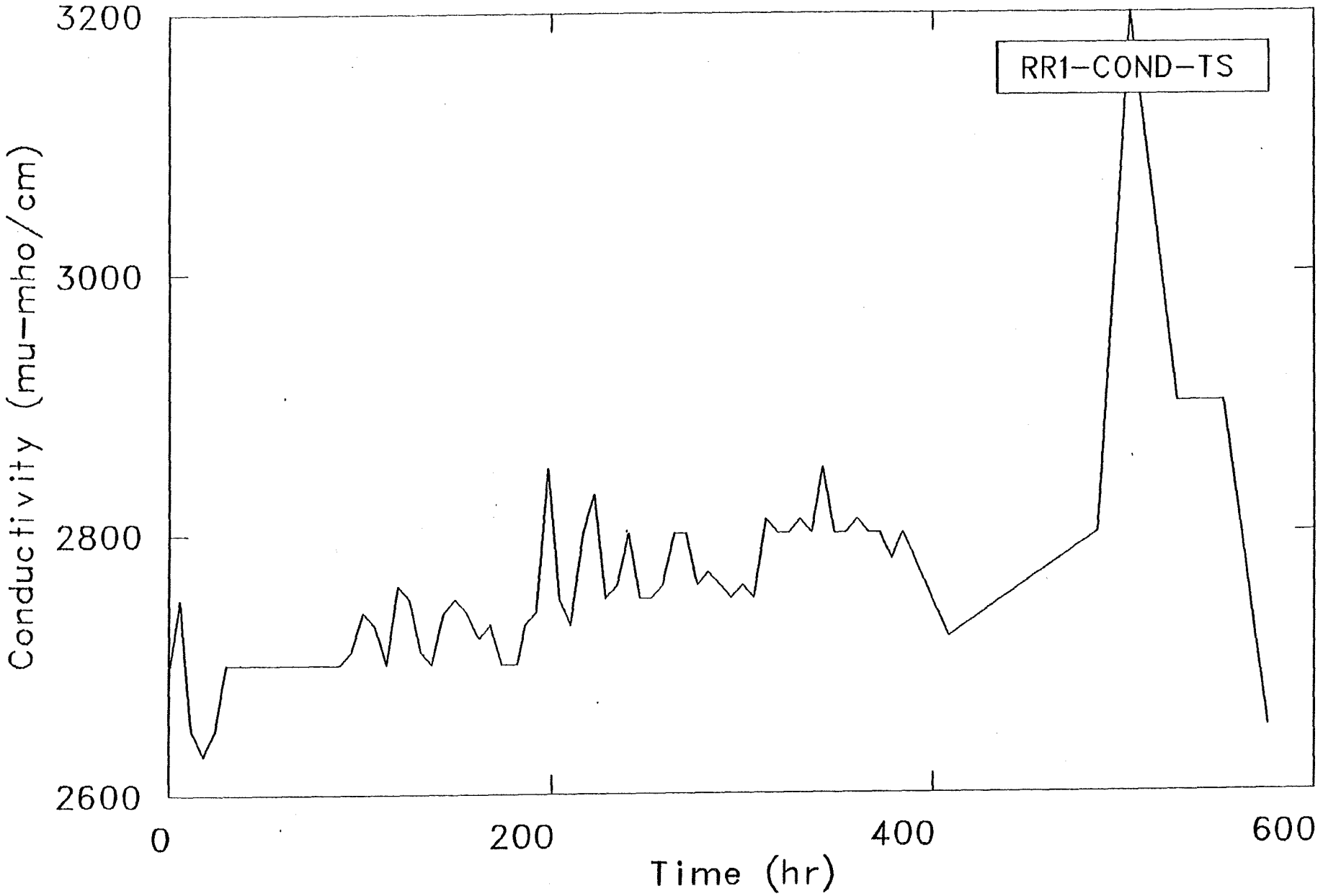

RR1-SO4-ICP
62
60
58
56
54
52
Concentration (ppm)
0
200
400
600
Time (hr)

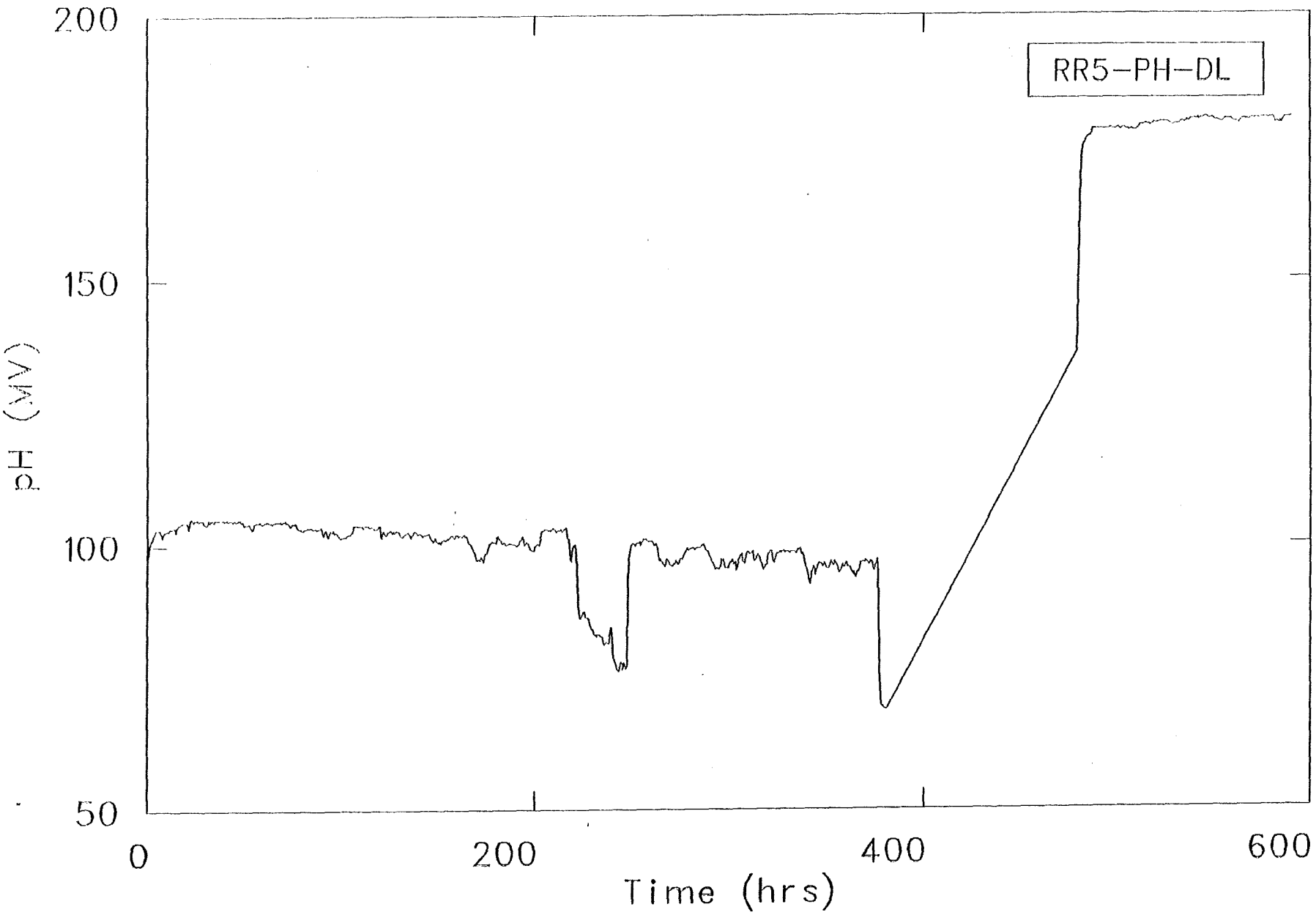

RR1-F-ICP
7.8
7.6
7.4
7.2
7
Concentration (ppm)
0
200
400
600
Time (hr)

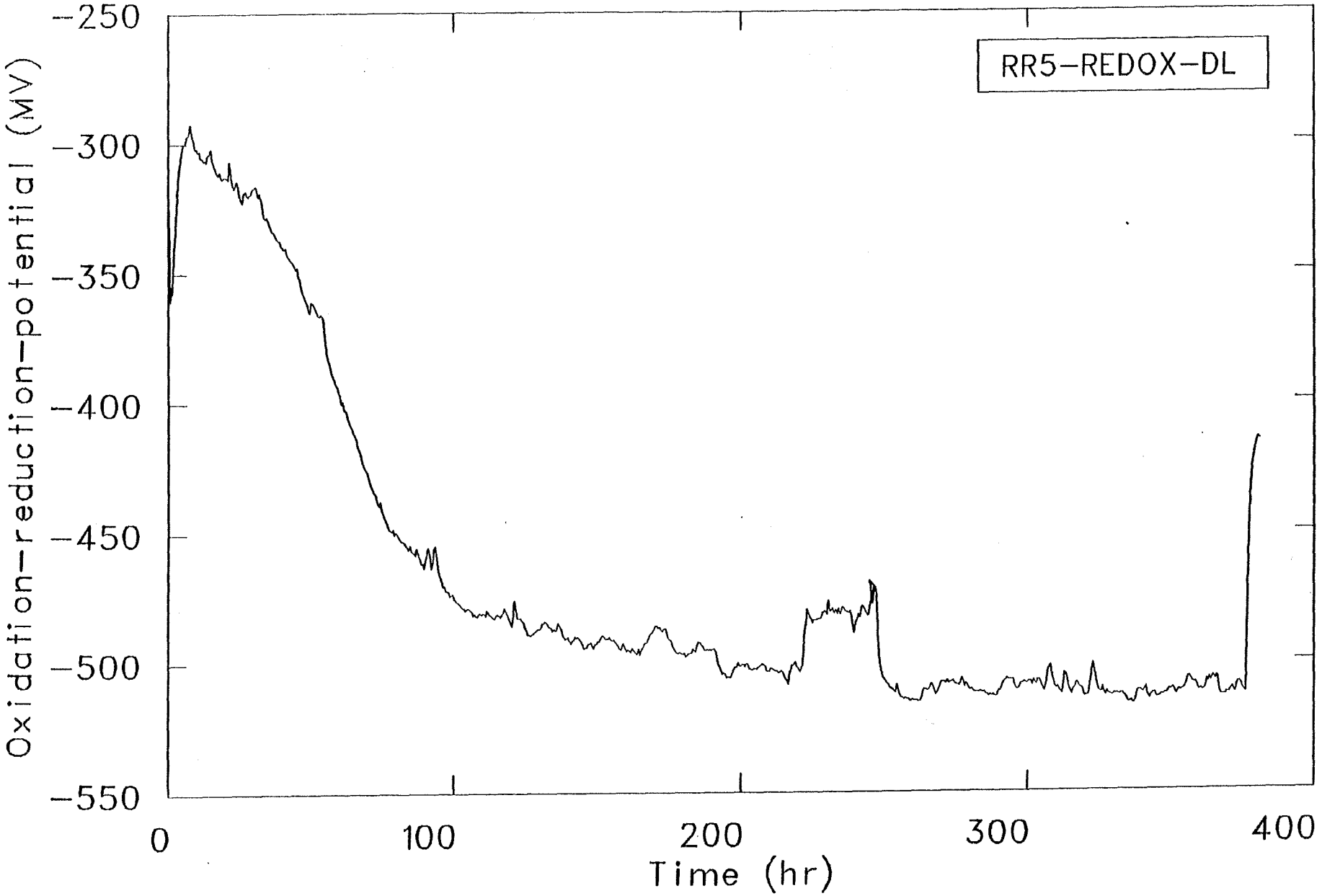

RR1-PH-ICP
7.4
7.2
7
6.8
pH
0
200
400
600
Time (hrs)

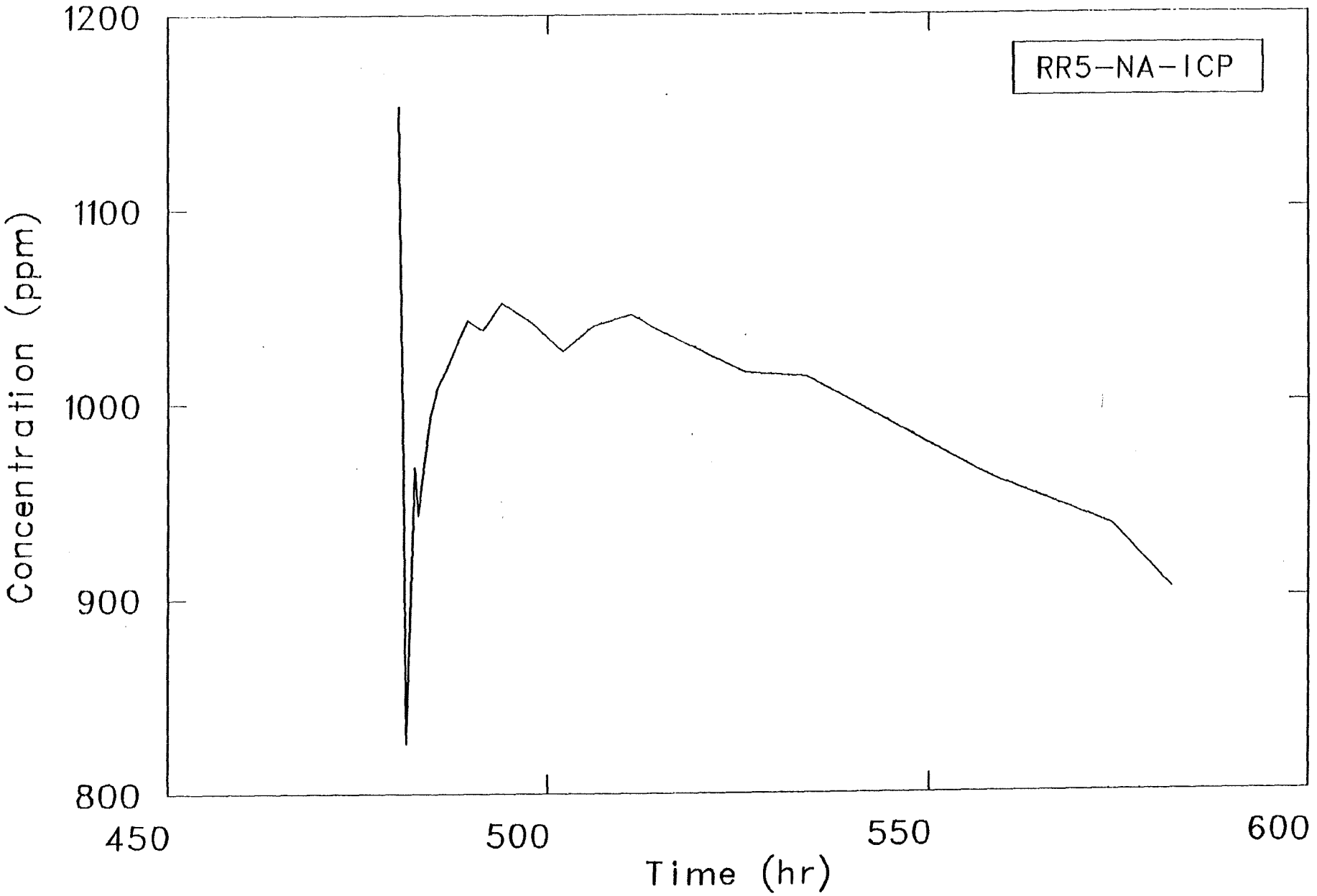

RR1-I-TR
0.4
0.3
0.2
0.1
0.0
Concentration (ppm)
0
200
400
600
Time (hr)

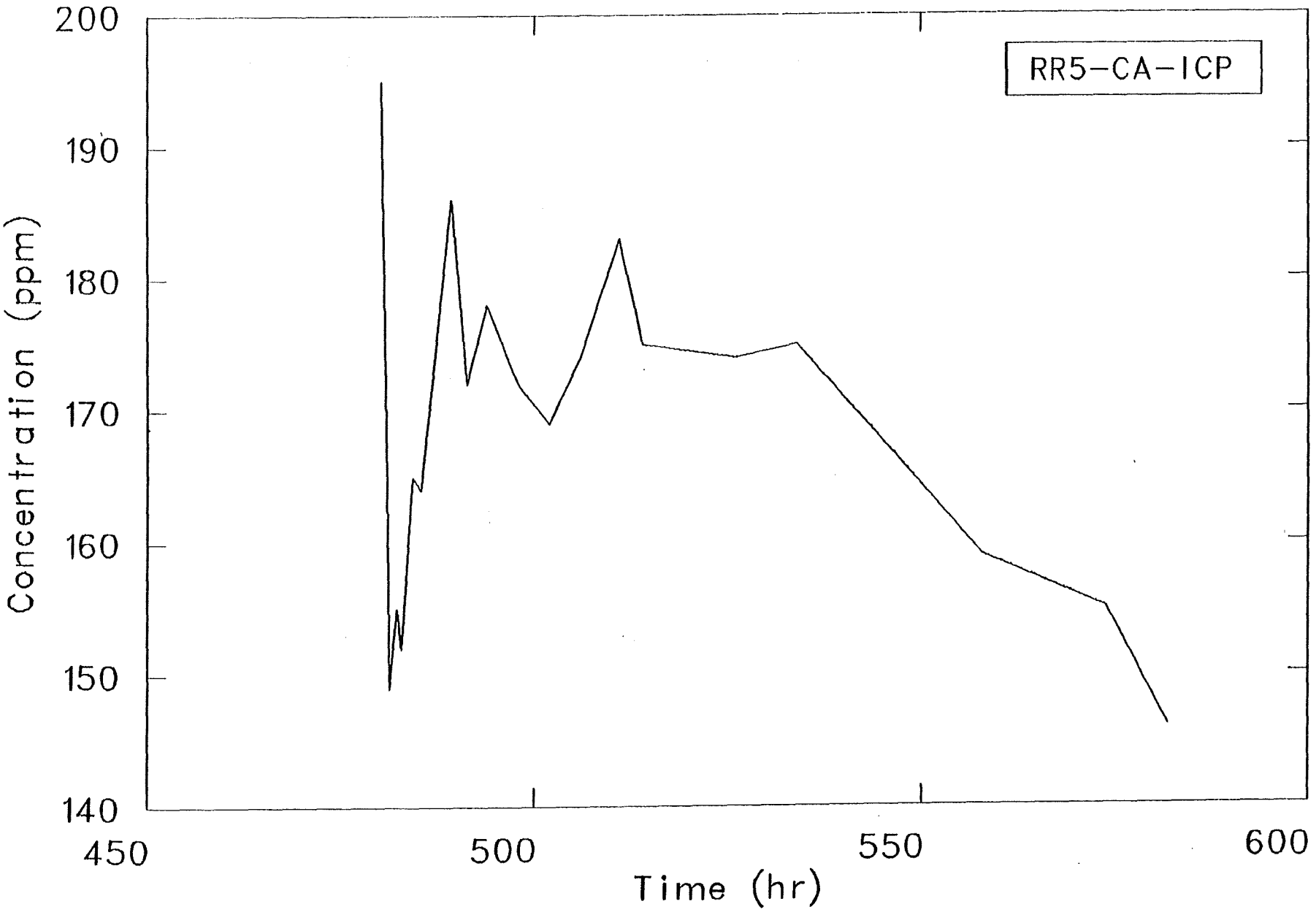

Concentration (ppm)
0
10
20
30
40
50
0
200
400
600
Time (hr)
RR1-CA-TS

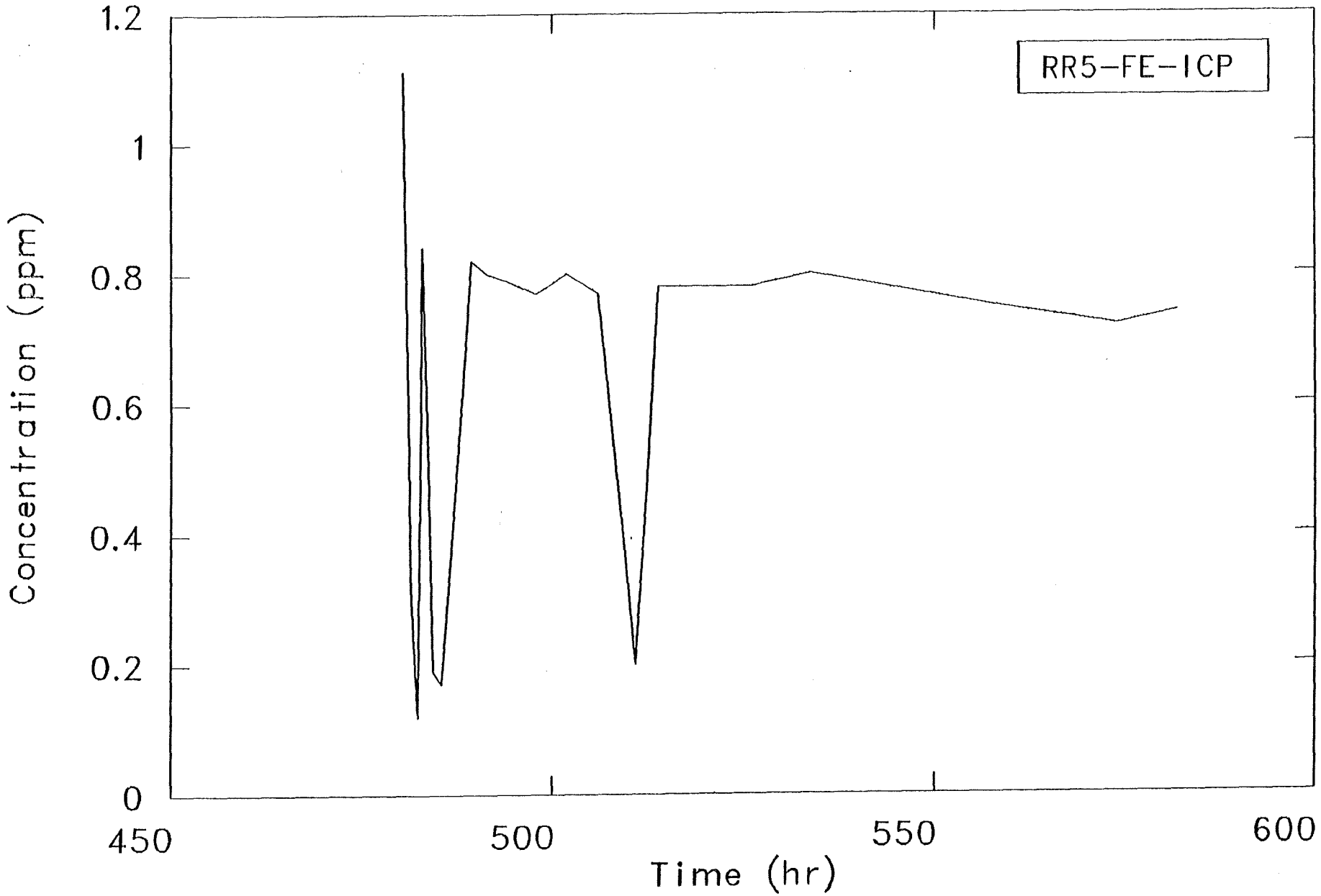

RR1-COND-TS
3200
3000
2800
2600
0
200
400
600
Conductivity (mu-mho/cm)
Time (hr)

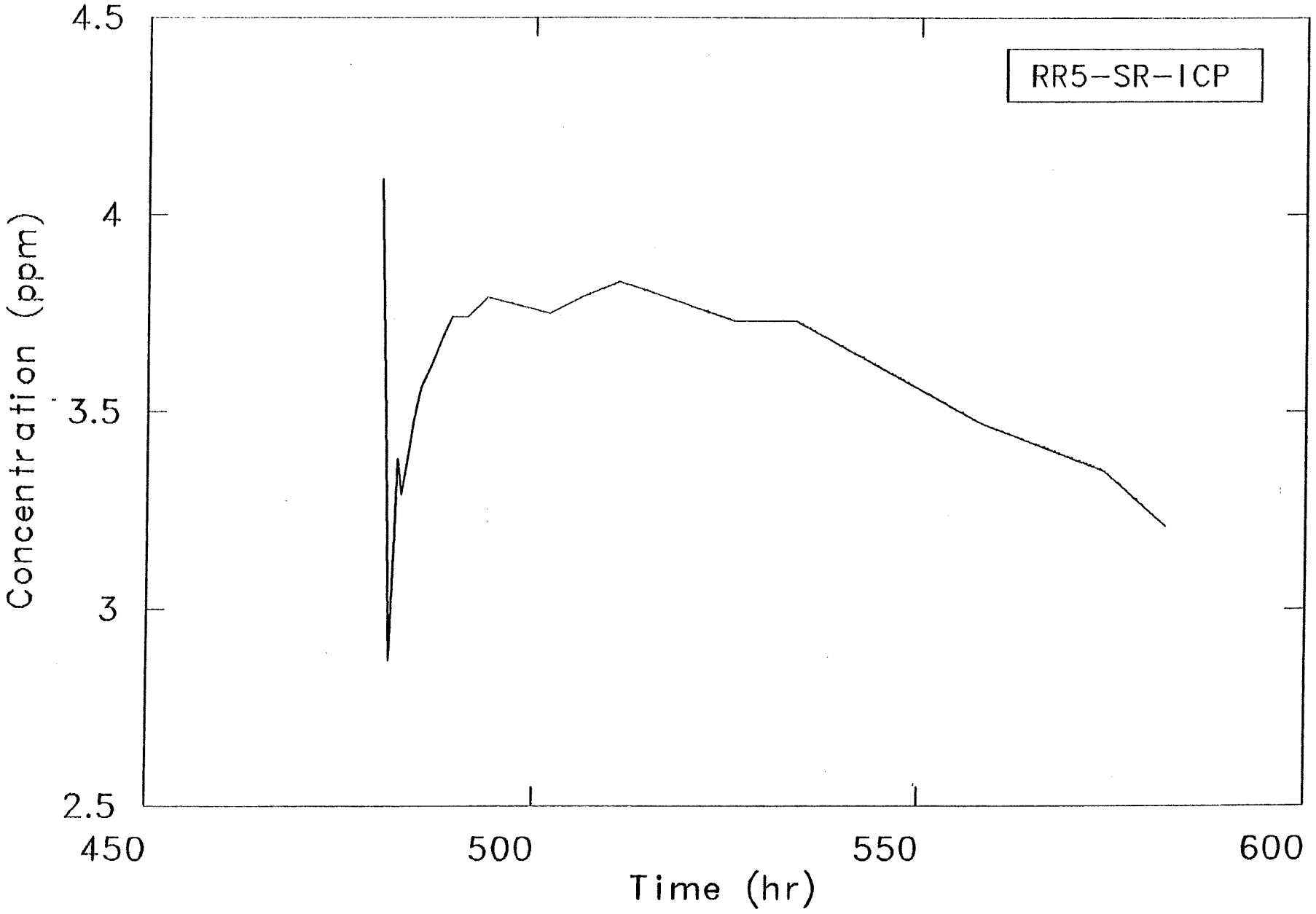

RR5-PH-DL
200
150
100
50
pH (MV)
0
200
400
600
Time (hrs)

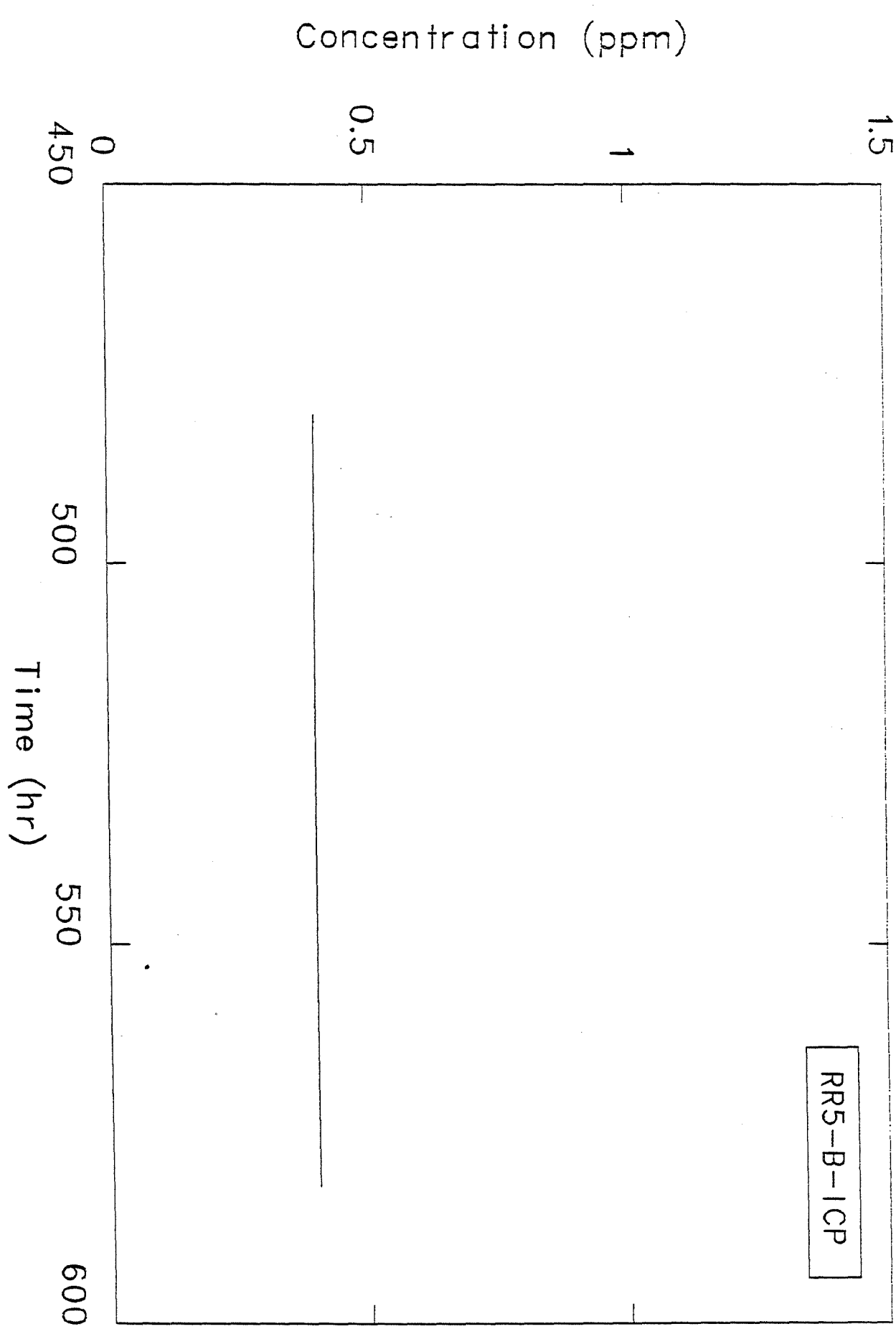

RR5-REDOX-DL
Oxidation-reduction-potential (MV)
-250
-300
-350
-400
-450
-500
-550
0
100
200
300
400
Time (hr)

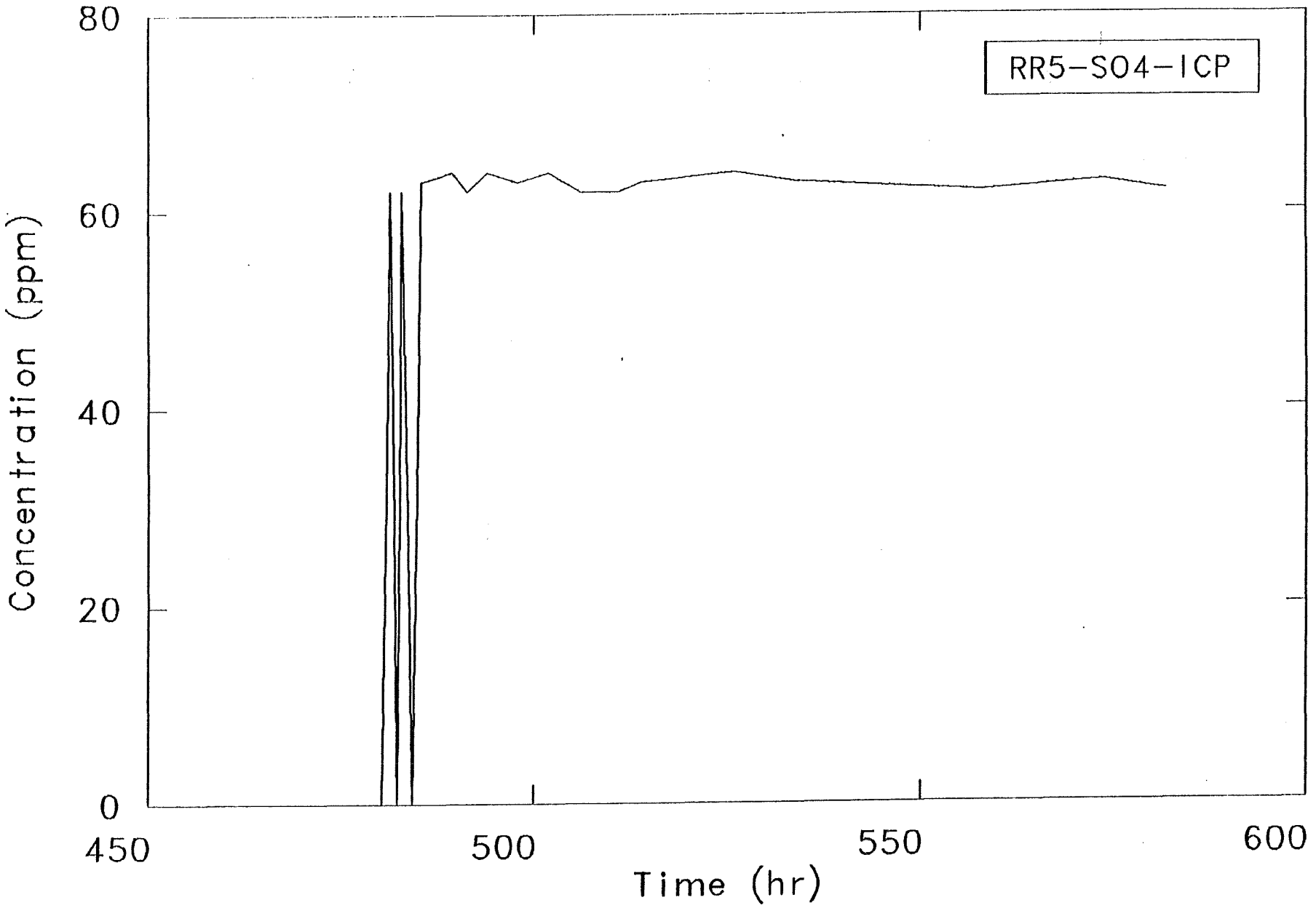

RR5-NA-ICP
1200
1100
1000
900
800
Concentration (ppm)
450
500
550
600
Time (hr)

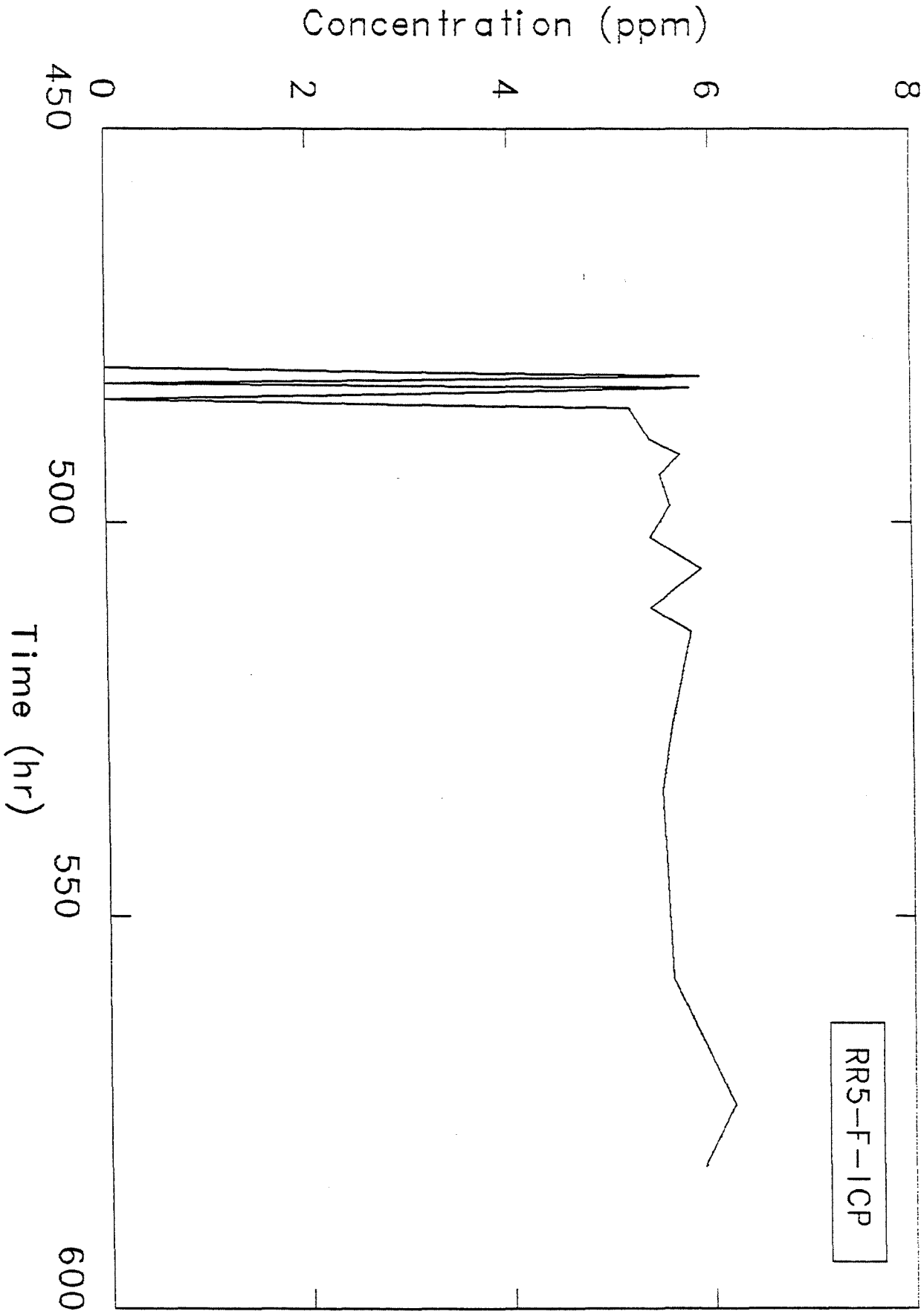

RR5-CA-ICP
200
190
180
170
160
150
140
Concentration (ppm)
450
500
550
600
Time (hr)

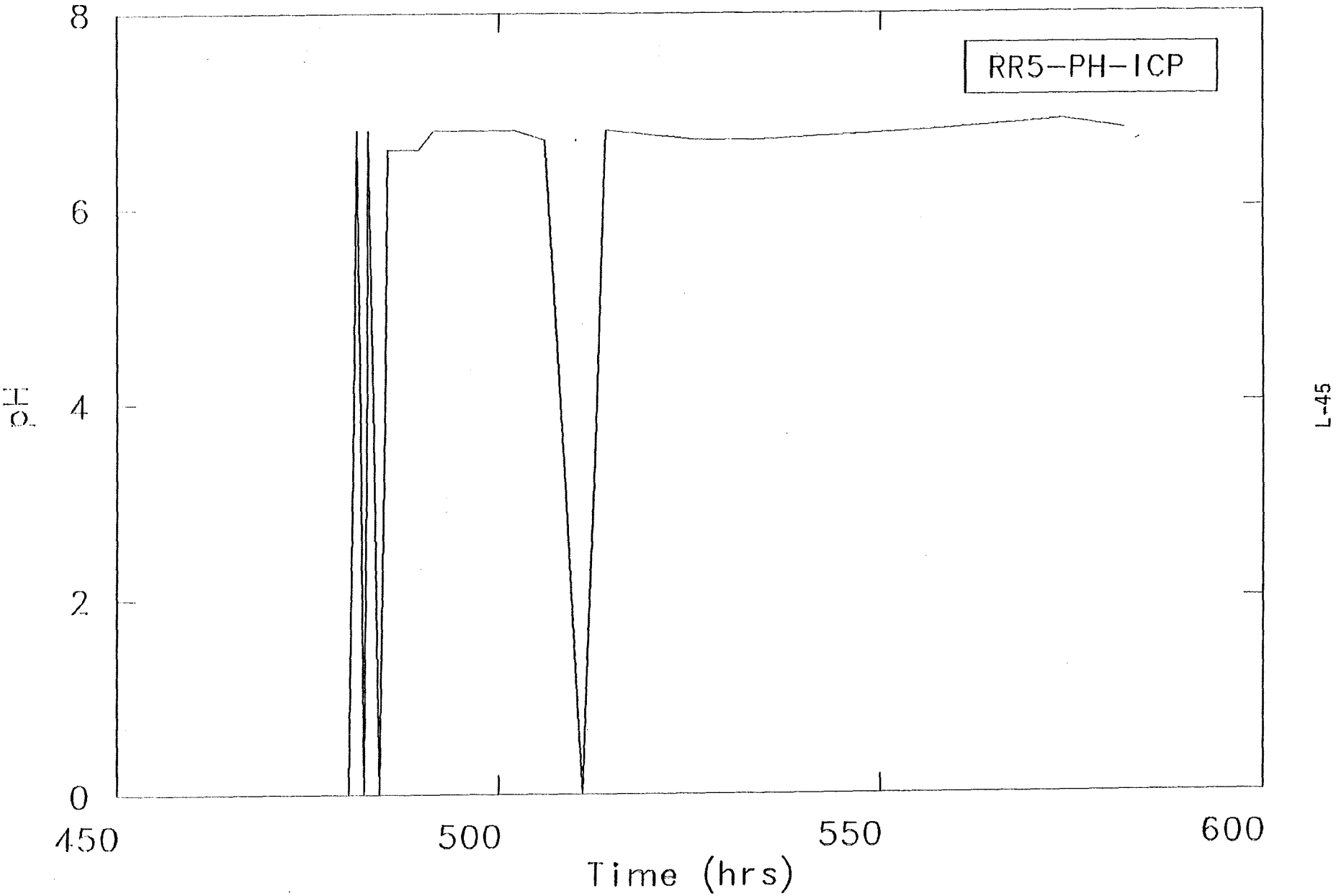

RR5-FE-ICP
1.2
1
0.8
0.6
0.4
0.2
0
Concentration (ppm)
450
500
550
600
Time (hr)

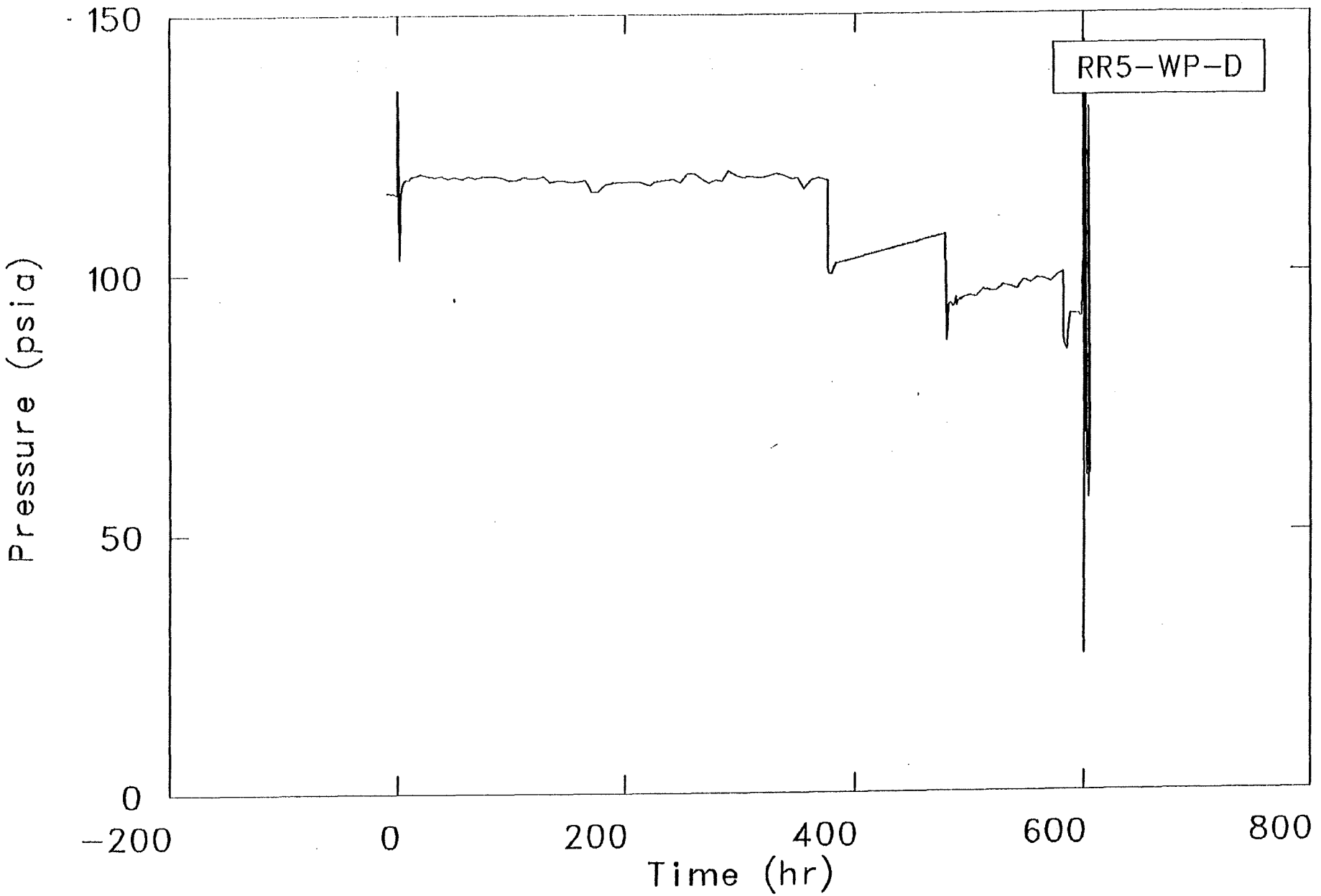

RR5-SR-ICP
Concentration (ppm)
4.5
4
3.5
3
2.5
450
500
550
600
Time (hr)

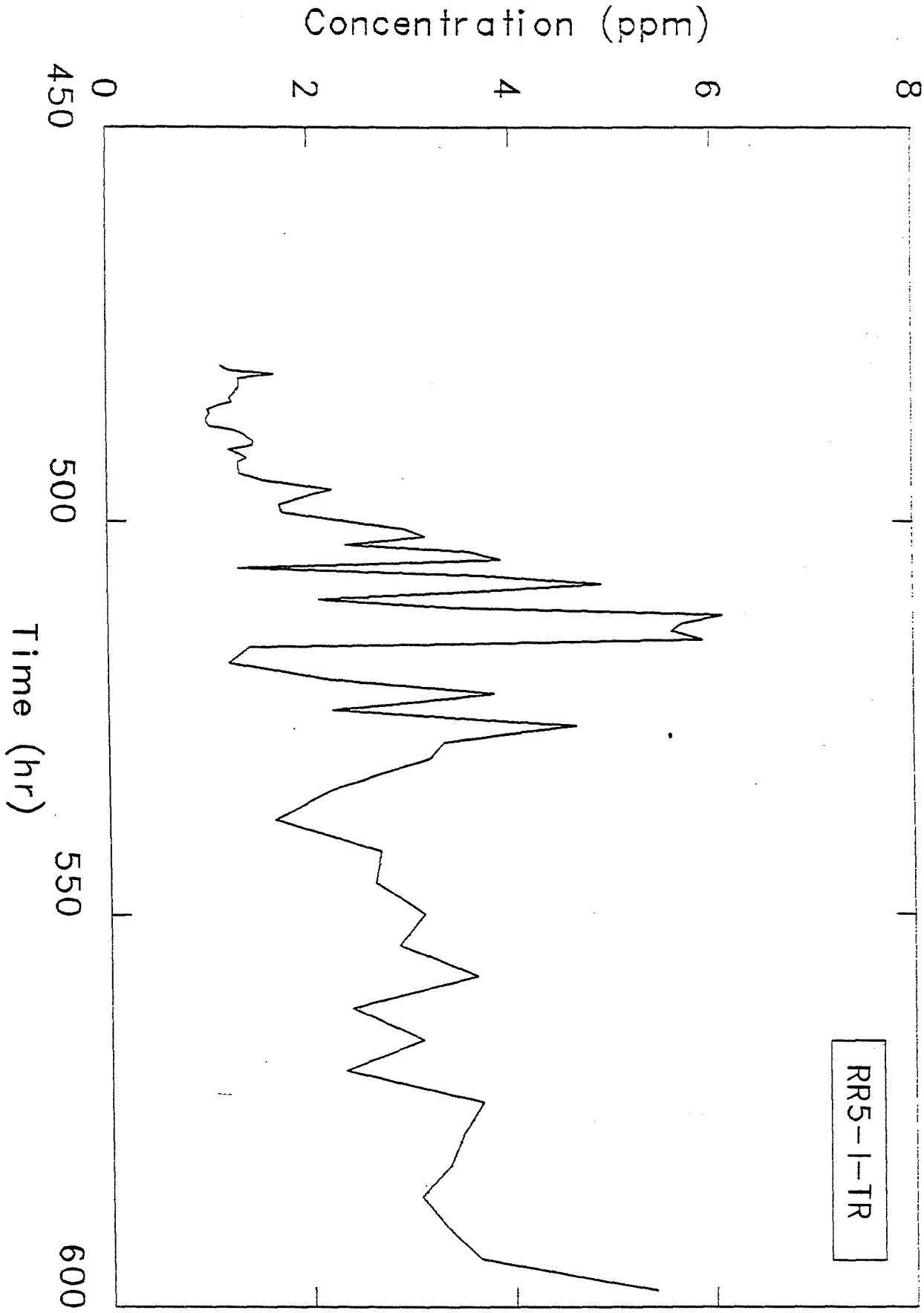

Concentration (ppm)
0
0.5
1
1.5
450
500
550
600
Time (hr)
RR5-B-ICP

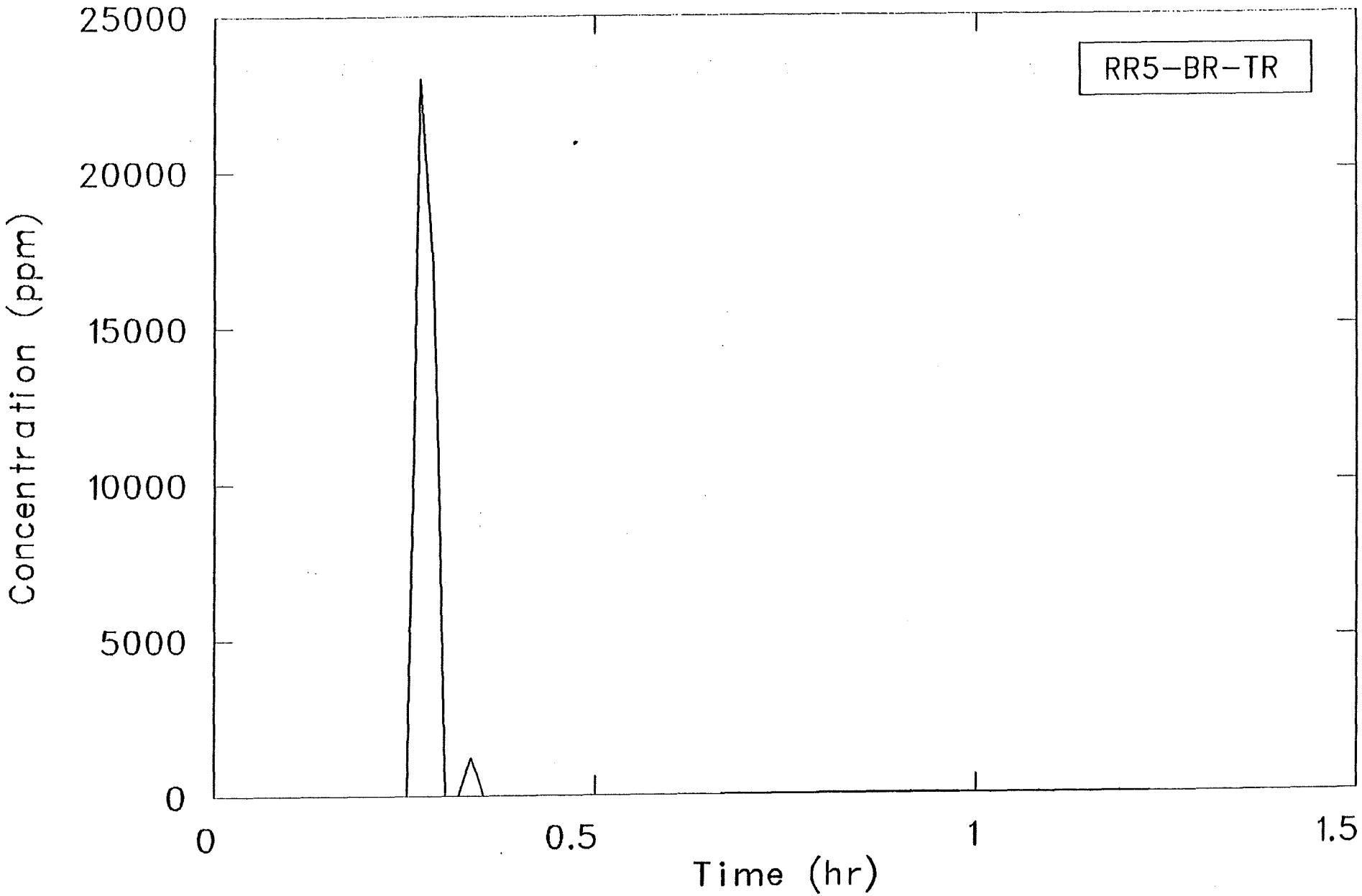

RR5-SO4-ICP
80
60
40
20
0
Concentration (ppm)
450
500
550
600
Time (hr)

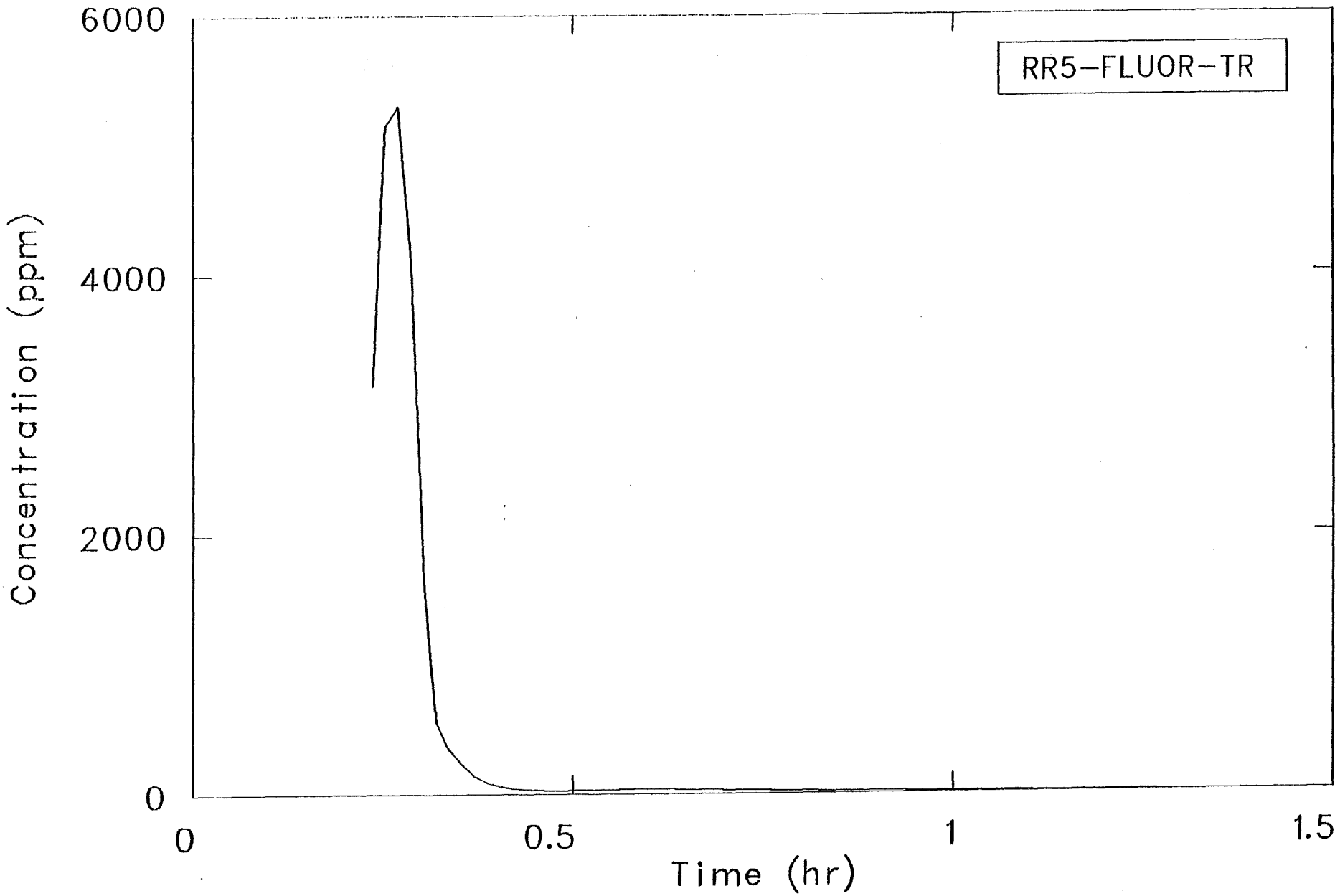

Concentration (ppm)
0
2
4
6
8
450
500
550
600
Time (hr)
RR5-F-ICP

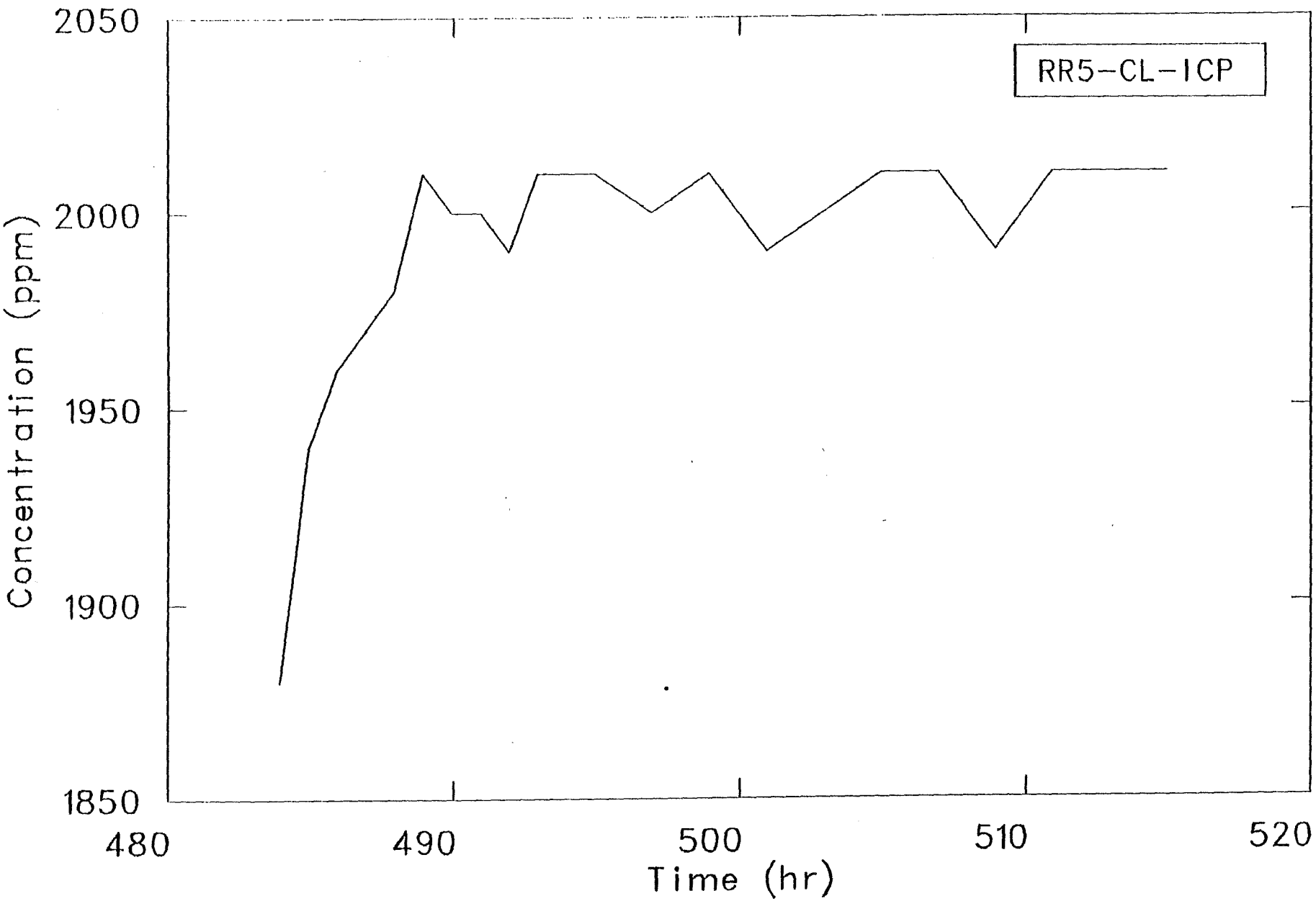

RR5-PH-ICP
8
6
4
2
0
pH
450
500
550
600
Time (hrs)

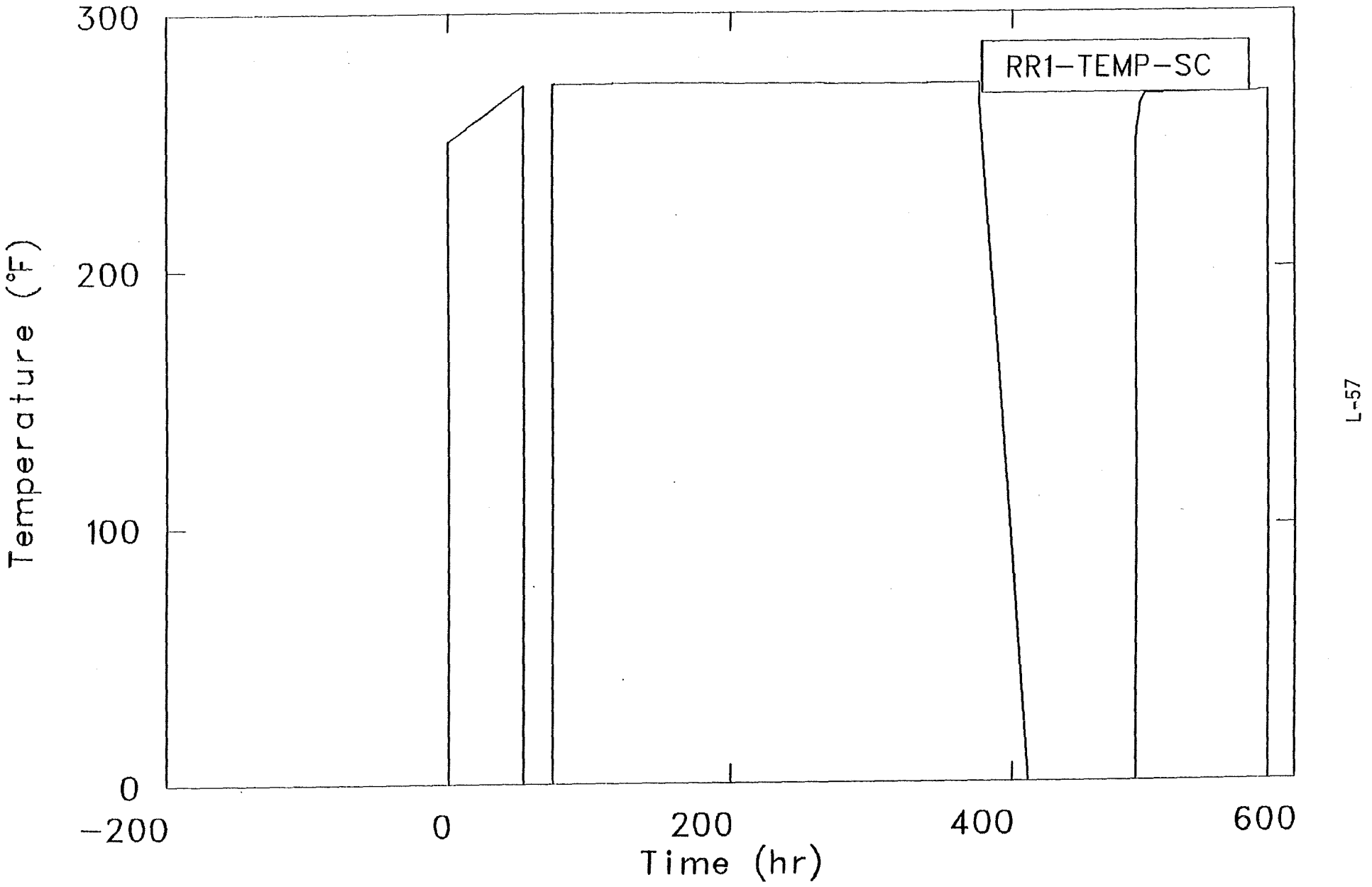

RR5-WP-D
150
100
50
0
Pressure (psia)
-200
0
200
400
600
800
Time (hr)


Concentration (ppm)
0
2
4
6
8
450
500
550
600
Time (hr)
RR5-I-TR


RR5-BR-TR
Concentration (ppm)
25000
20000
15000
10000
5000
0
0
0.5
1
1.5
Time (hr)


RR5-FLUOR-TR
6000
4000
2000
0
Concentration (ppm)
0
0.5
1
1.5
Time (hr)


RR5-CL-ICP
2050
2000
1950
1900
1850
Concentration (ppm)
480
490
500
510
520
Time (hr)


RR1-TEMP-SC
300
200
100
0
-200
0
200
400
600
Temperature (°F)
Time (hr)