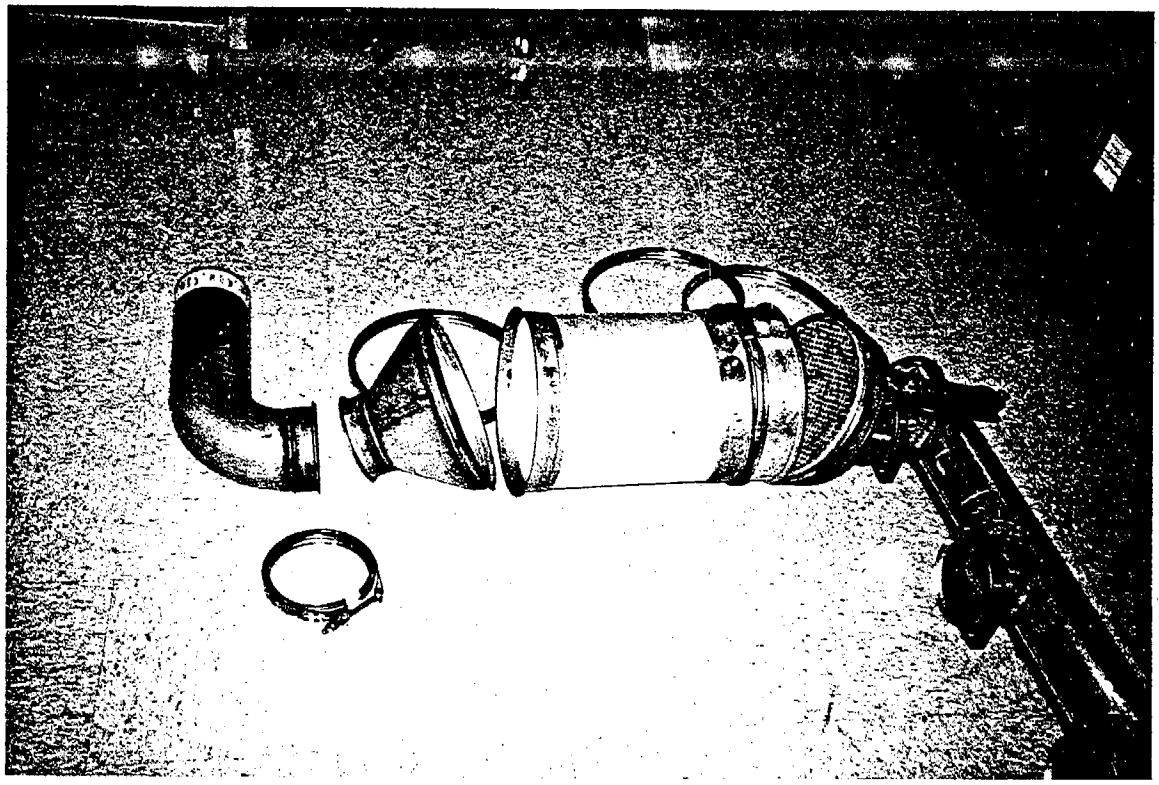
APPENDIX D

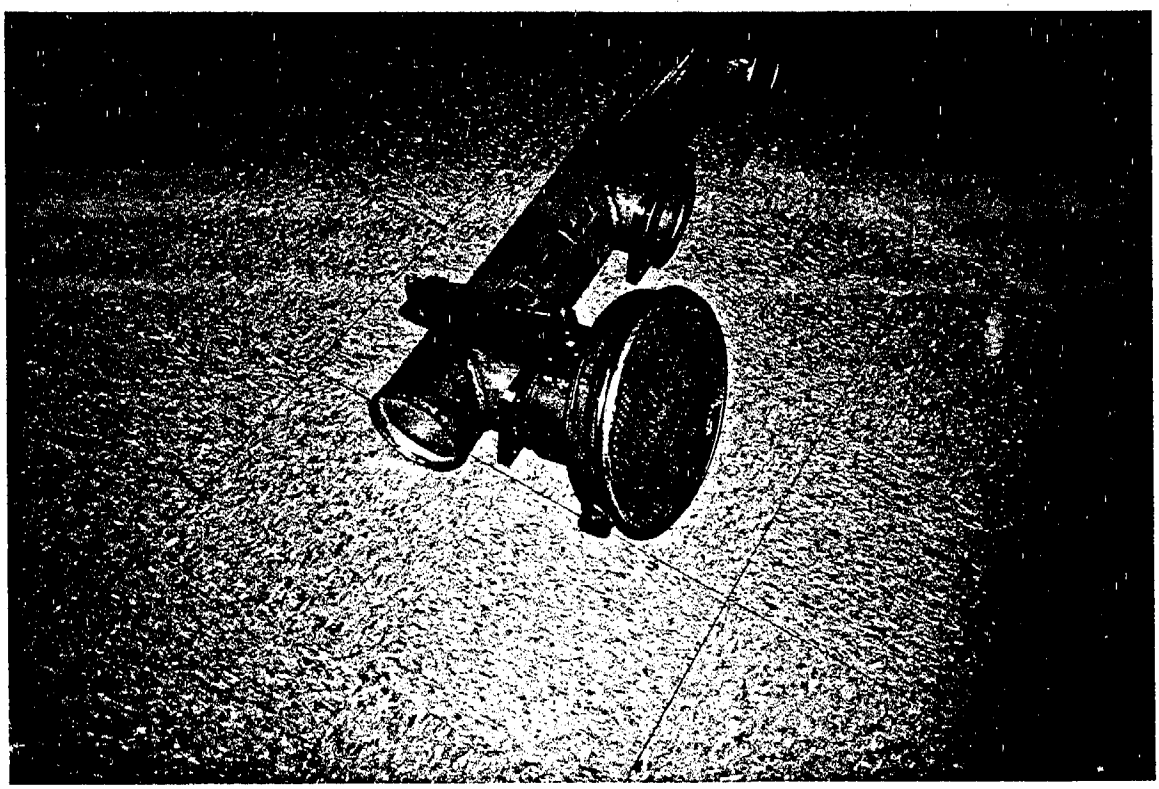
Donaldson Electrical Trap System Components
and Test Cell Set-Up

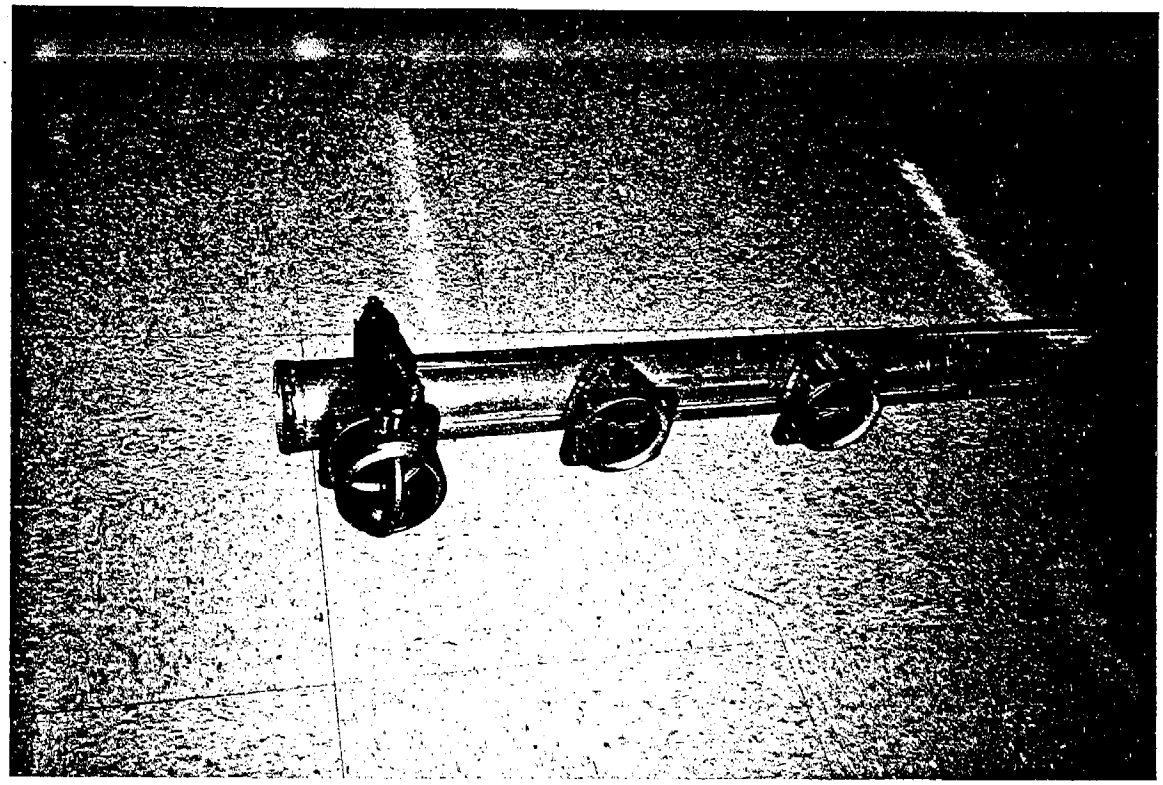


The photographs show the trap system used in the test cell to conduct performance and durability testing.

The photograph above shows the electrical heating element.

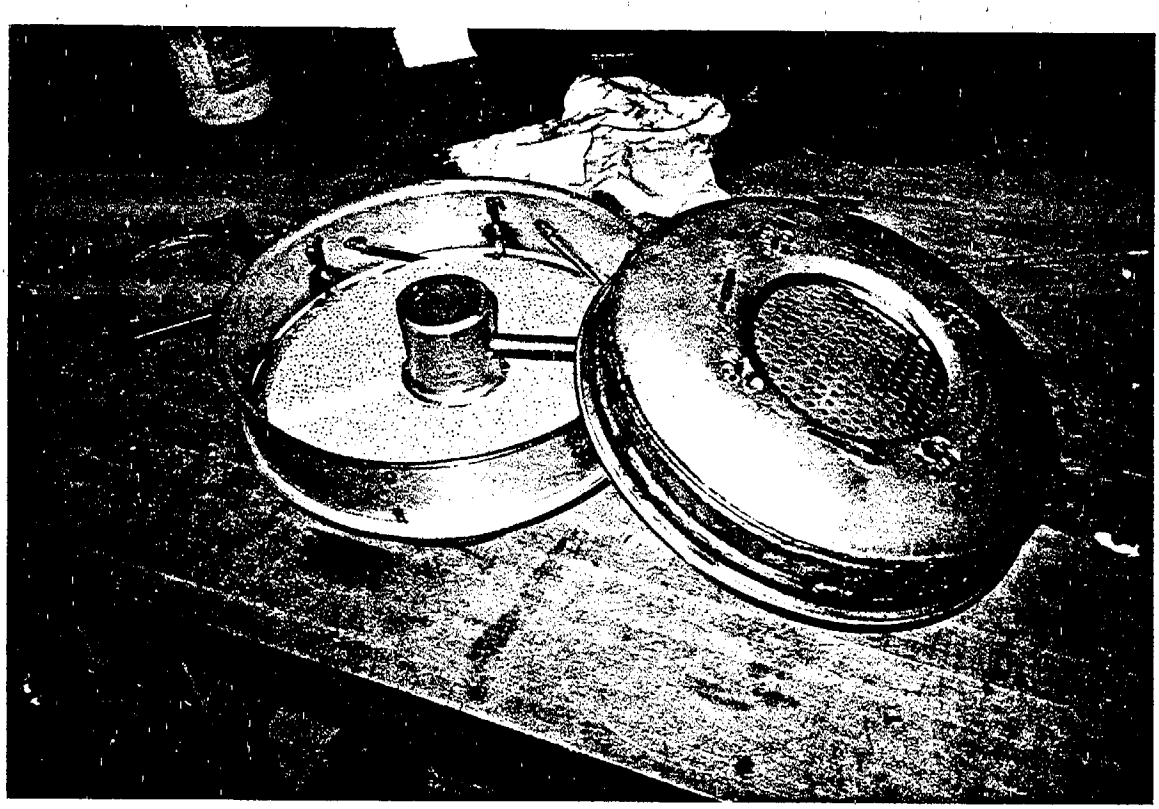
The photograph below shows the diffuser plate.

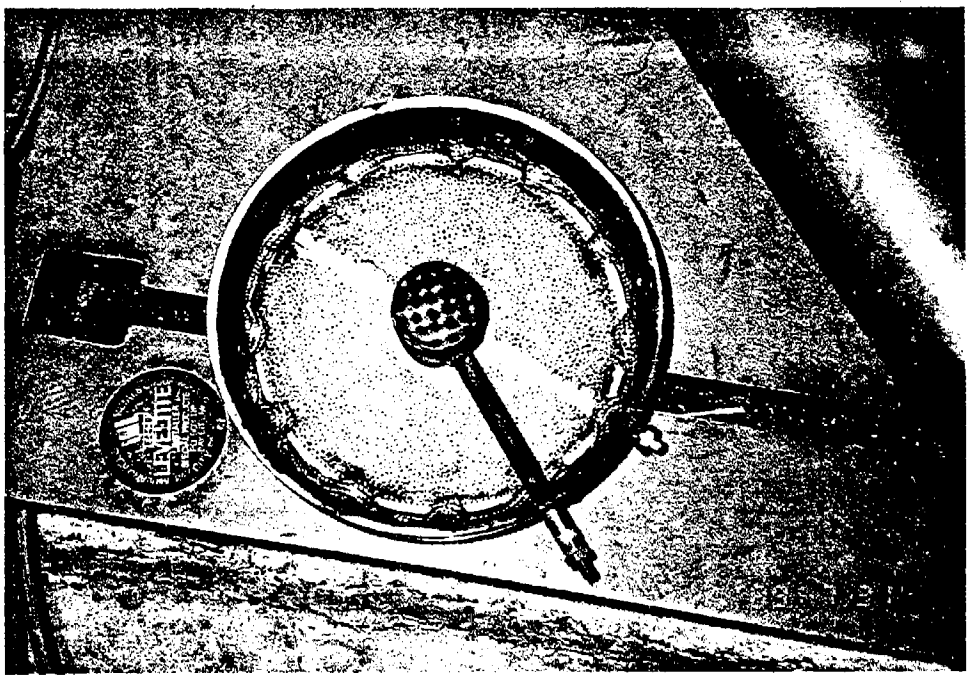




The photograph above shows the divertor valve.

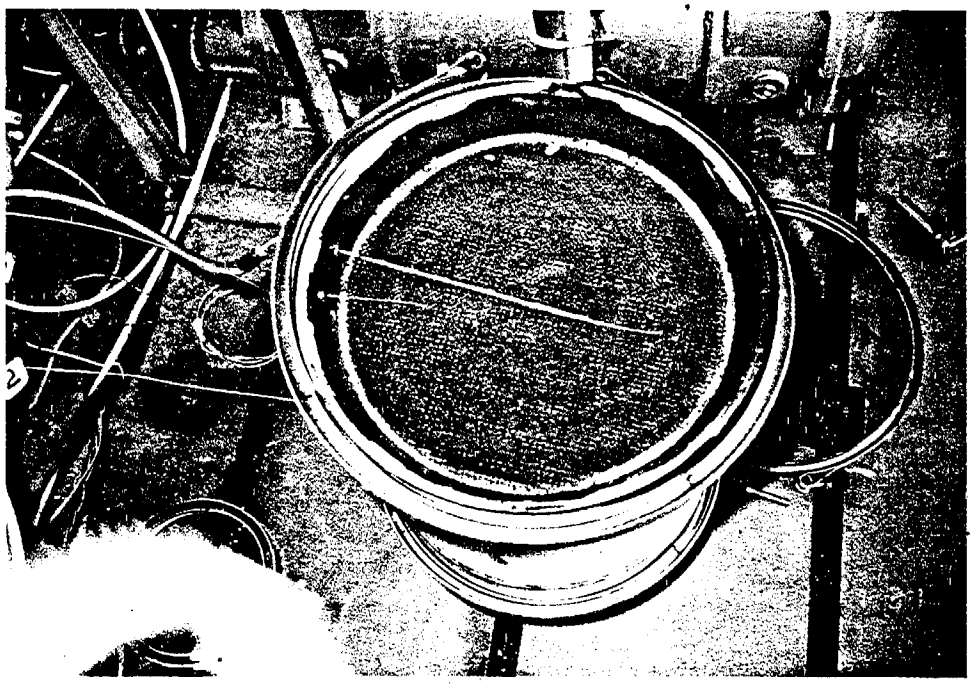
The photograph below shows the ceramic foam to reduce heat loss by radiation.

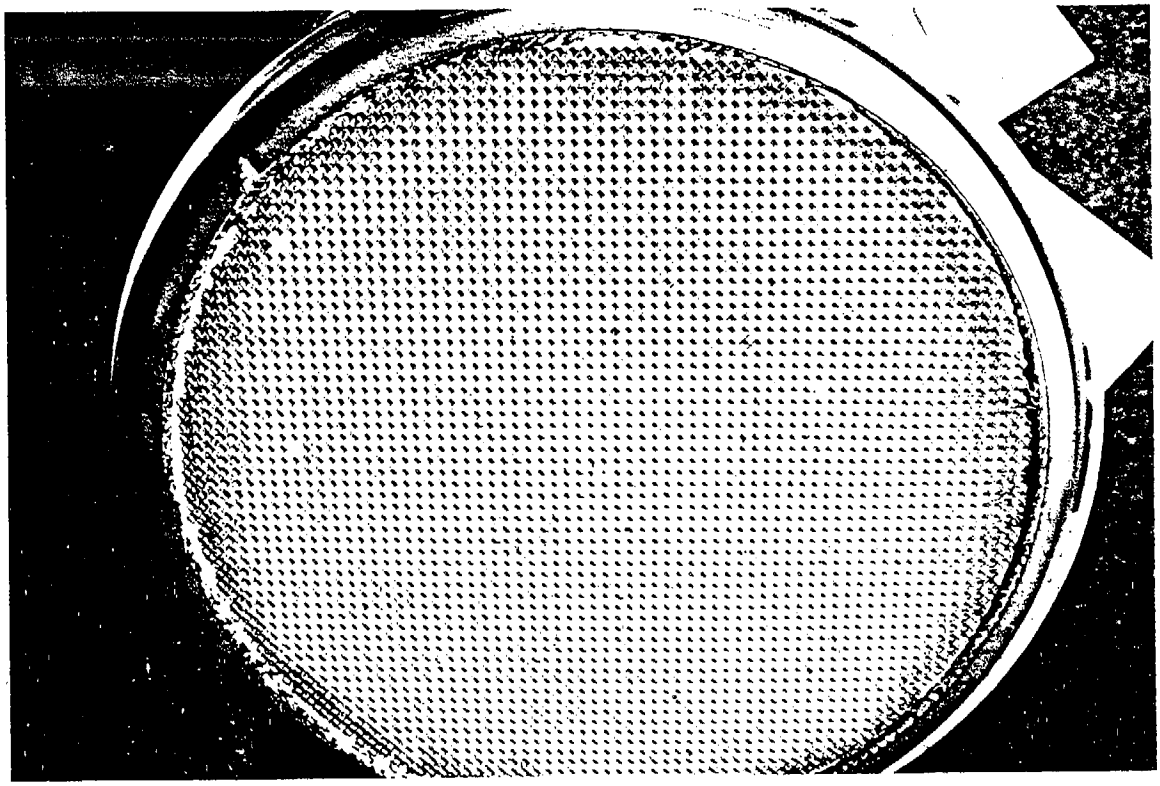




The photograph above shows the upstream side of the ceramic foam used to reduce heat loss by radiation.

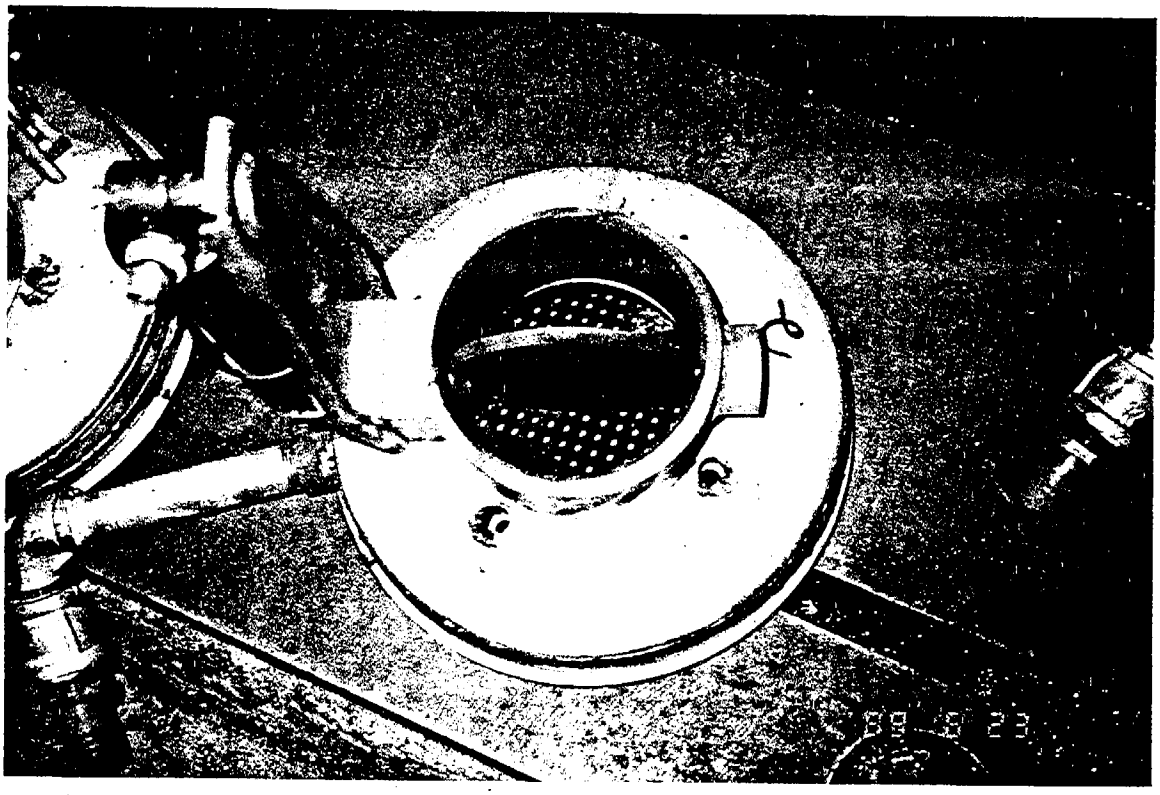
The photograph below shows the upstream side of the filter.

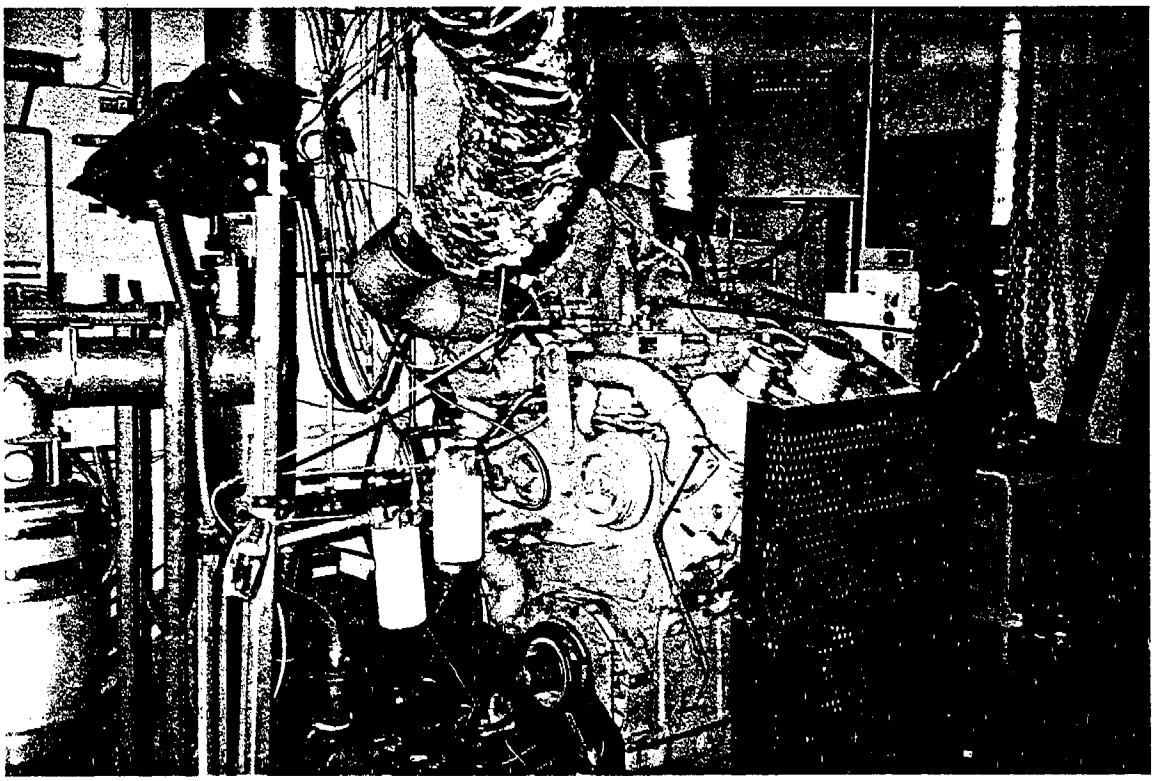




The photograph above shows the ceramic monolith filter
10-1/2" diameter by 12.0" long.

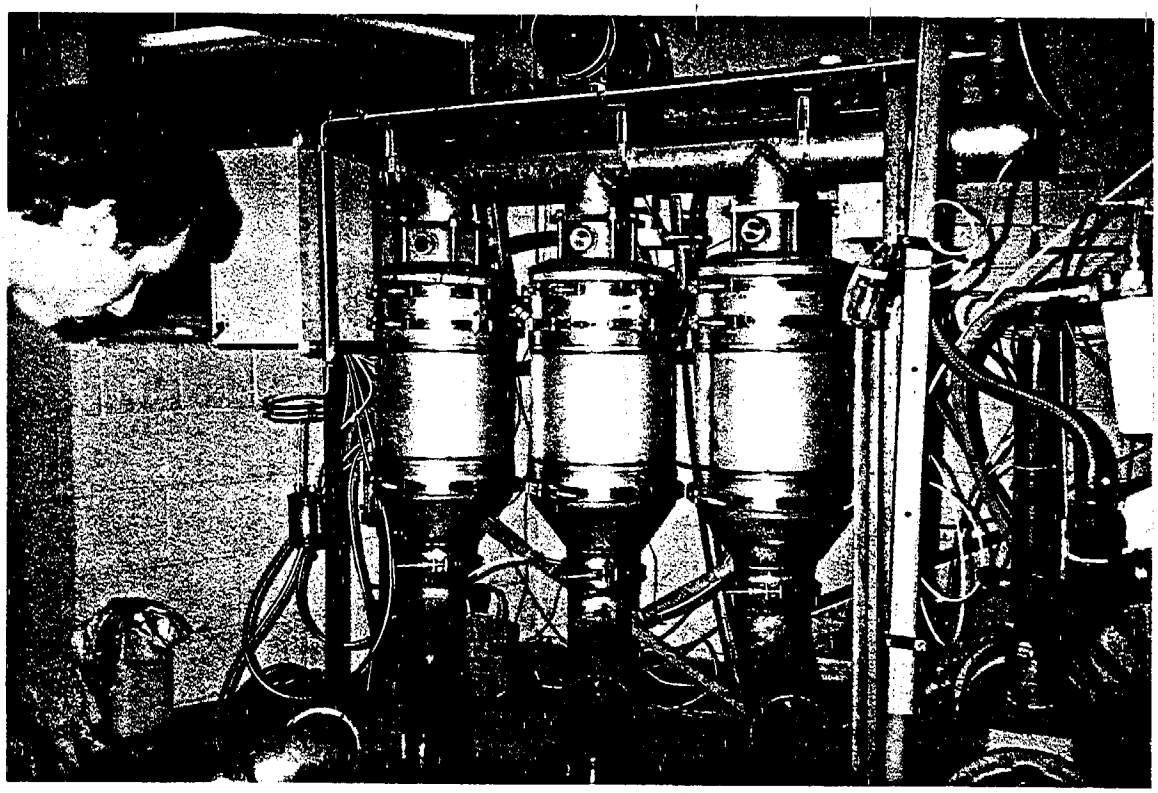
The photograph below shows the actuating mechanism of the diverter valve.

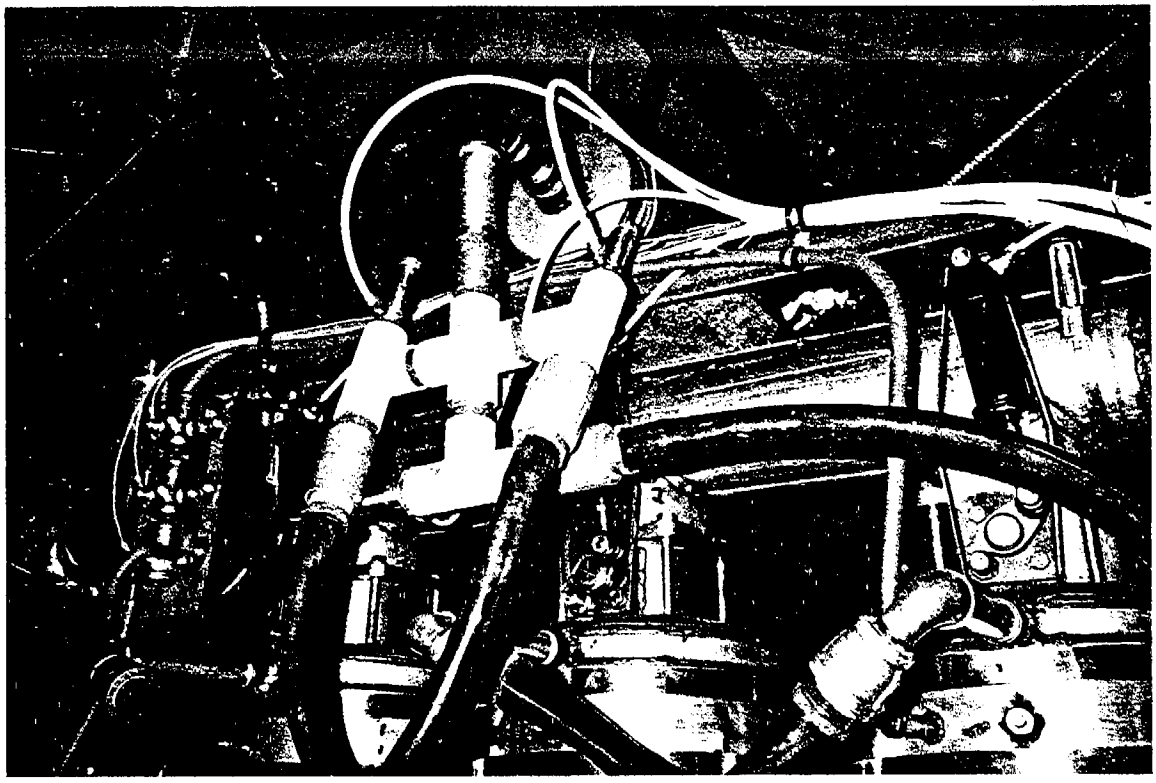




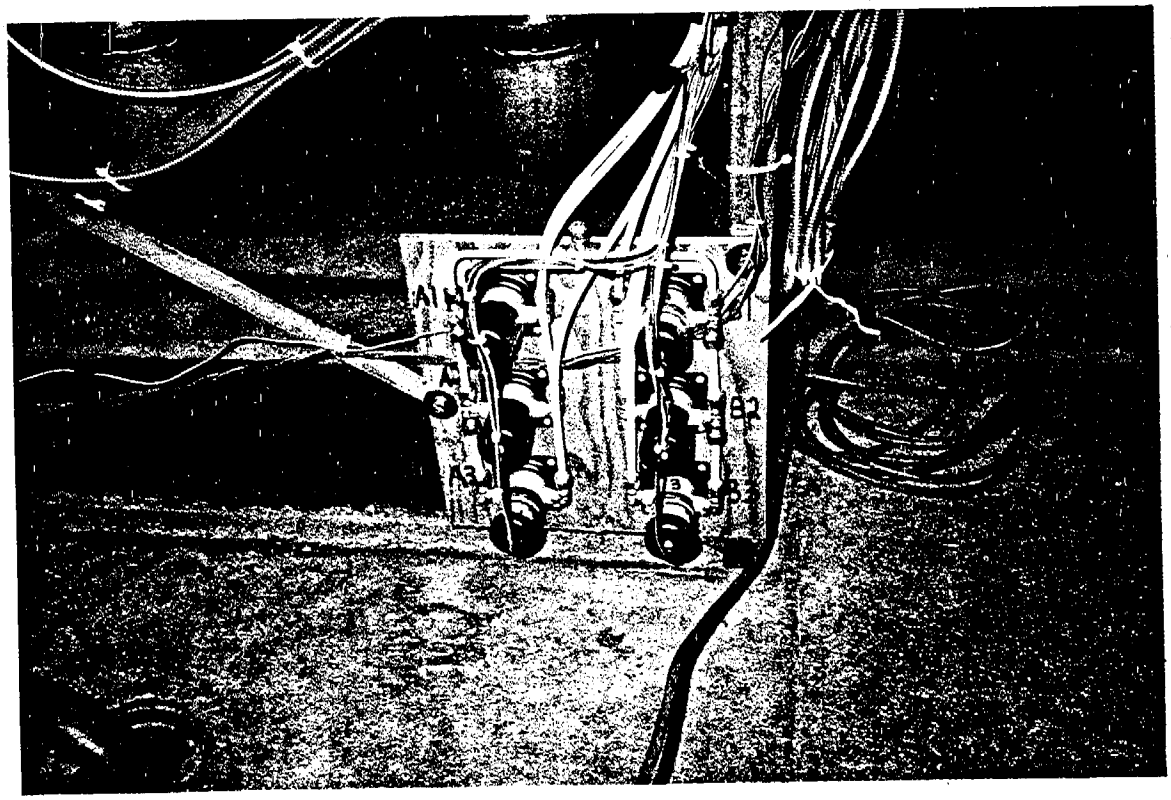
The photograph above shows the Detroit Diesel Engine in the test cell.

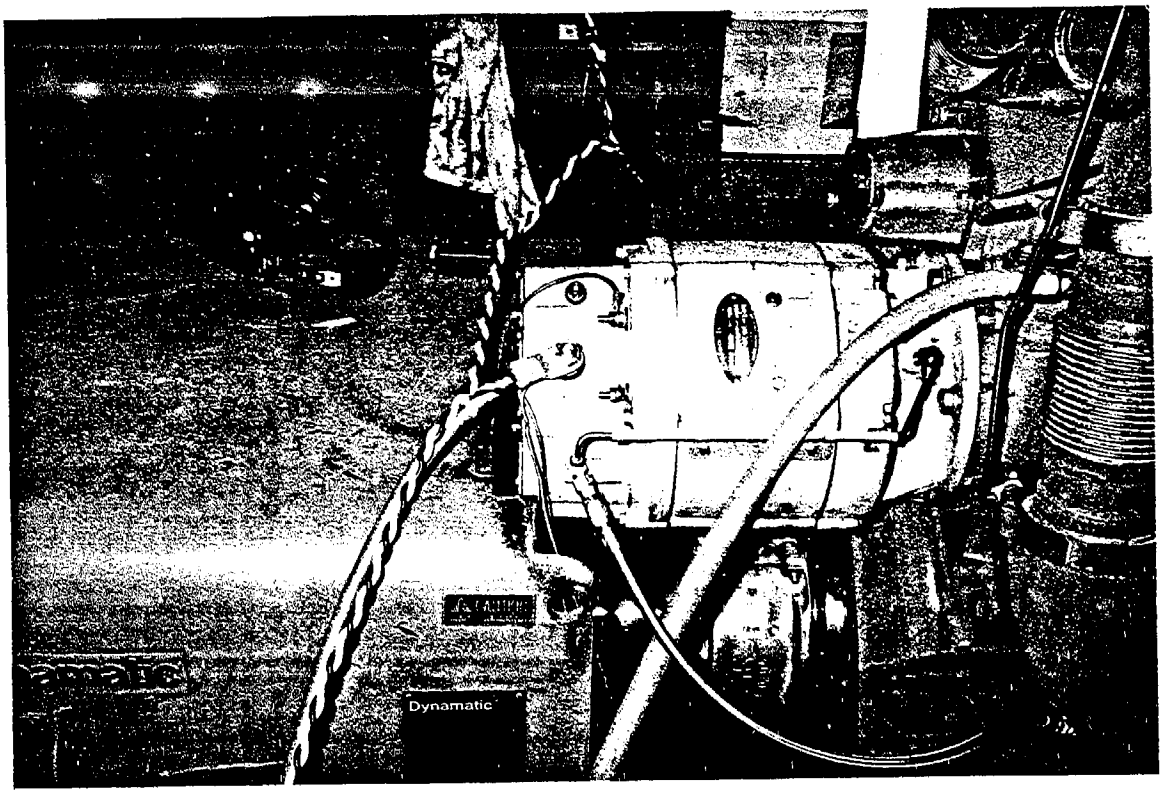
The photograph below shows the three particulate traps used initially to assess performance and durability.





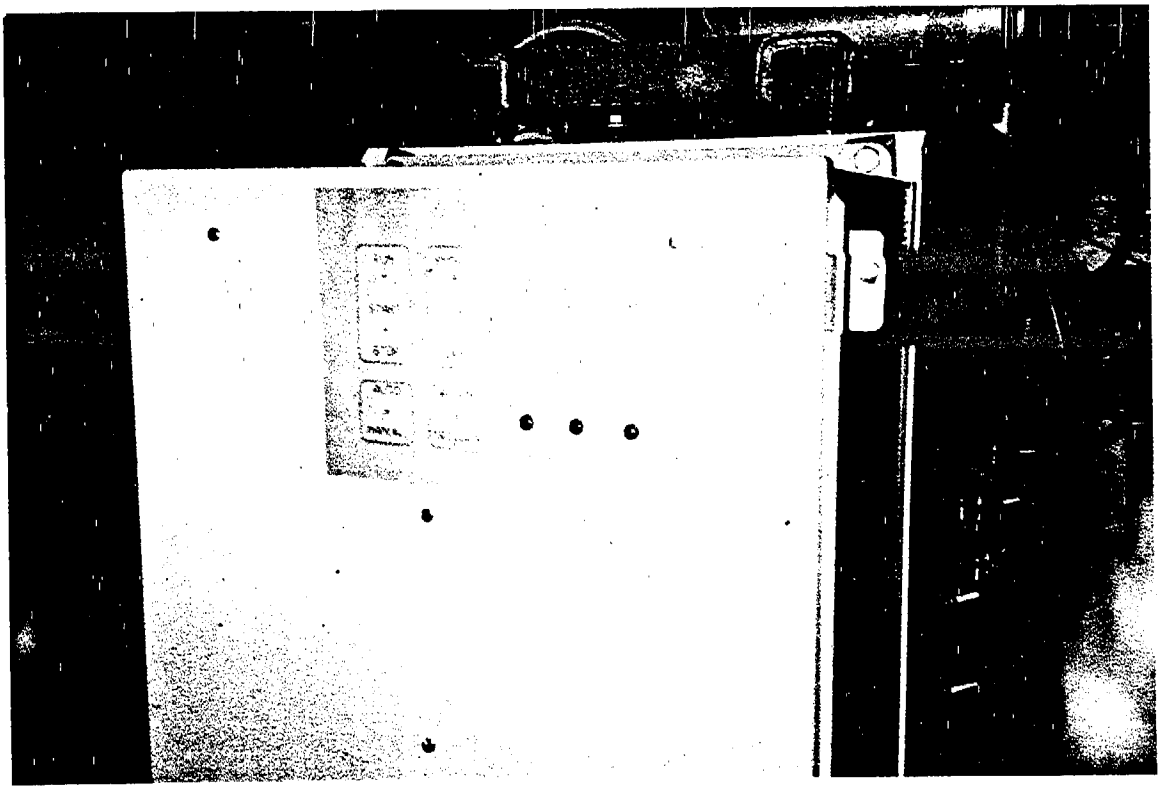
The photographs above and below show the pneumatic solenoids and the pipework used

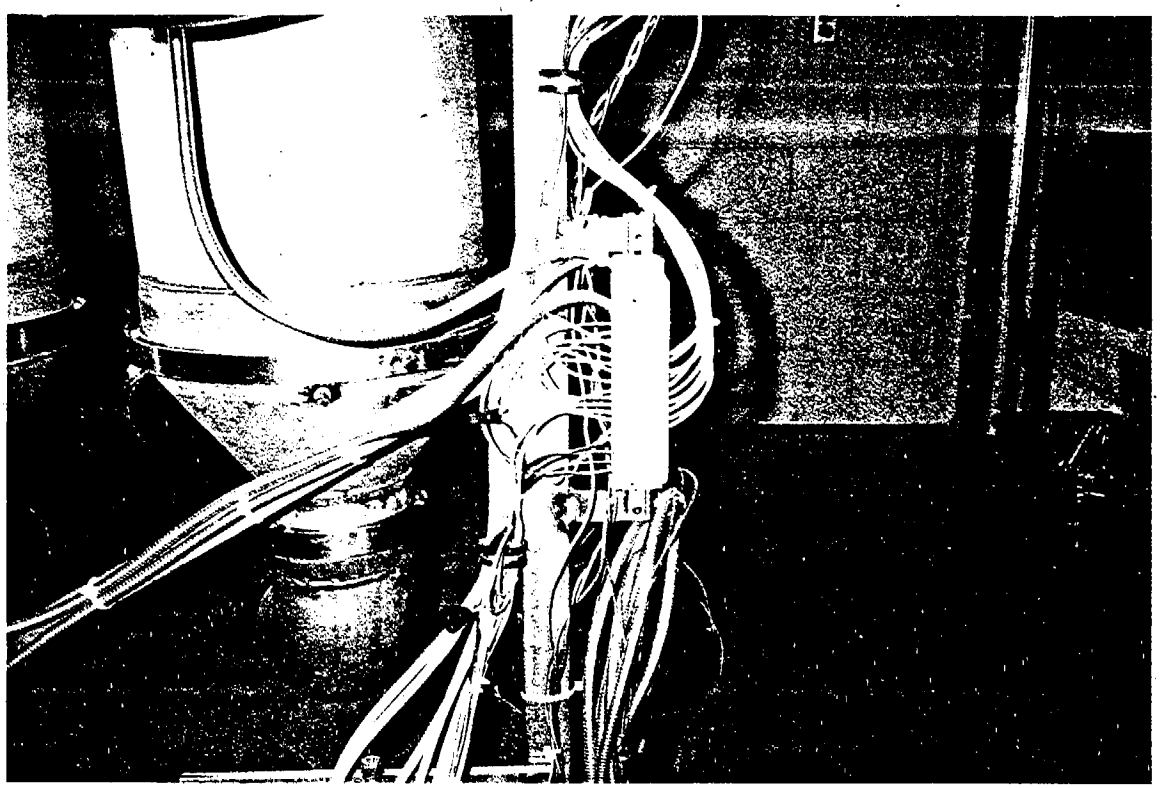




The photograph above shows the alternator mounted on an engine in a test cell.

The photograph below shows the control unit.





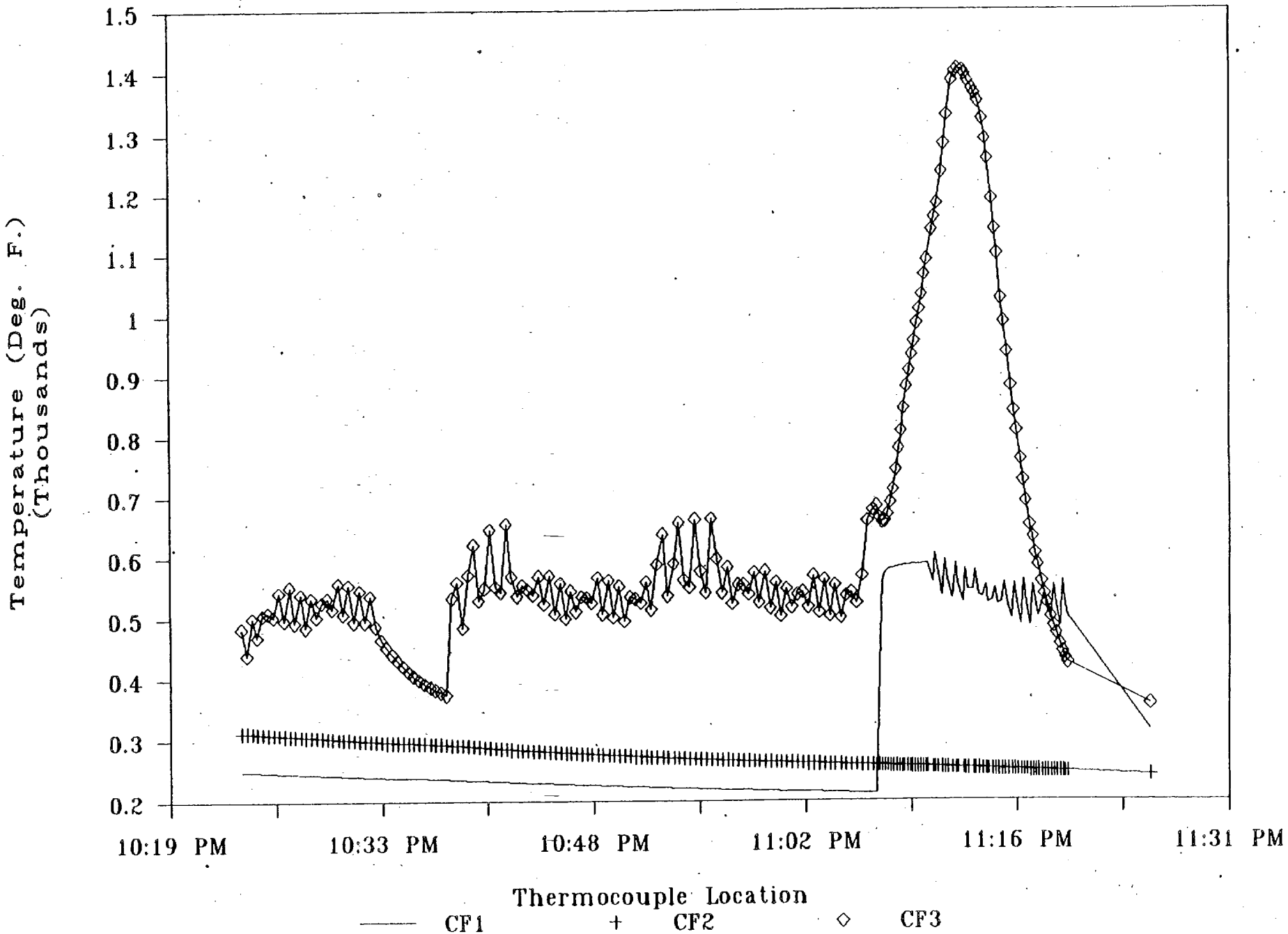
The photographs above and below show the trap system and the exhaust ducting used.

APPENDIX E

Graphs of the 2 Trap BTS Regeneration Parameters

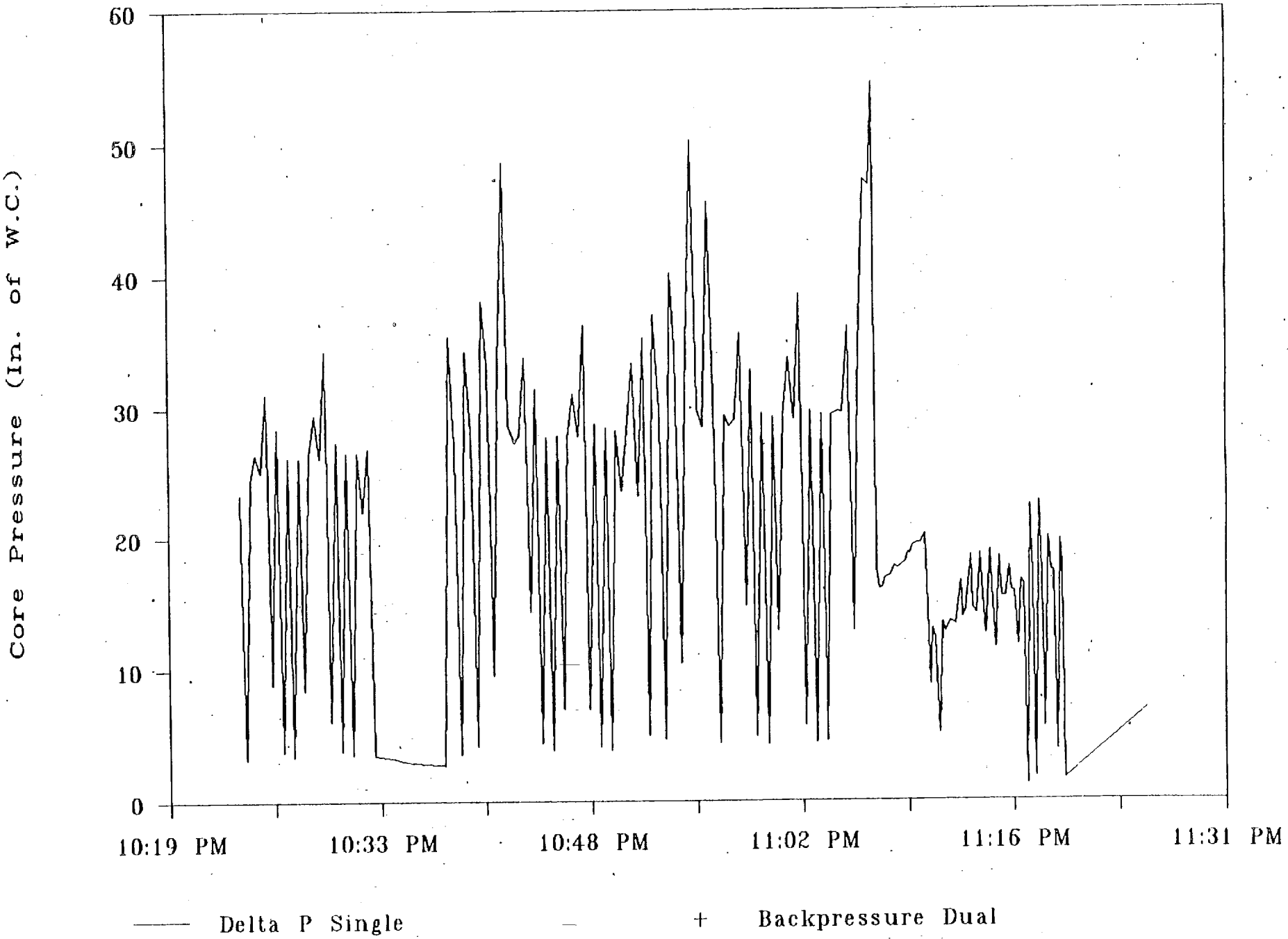
ADATEK LOGGING

26-Jul-89



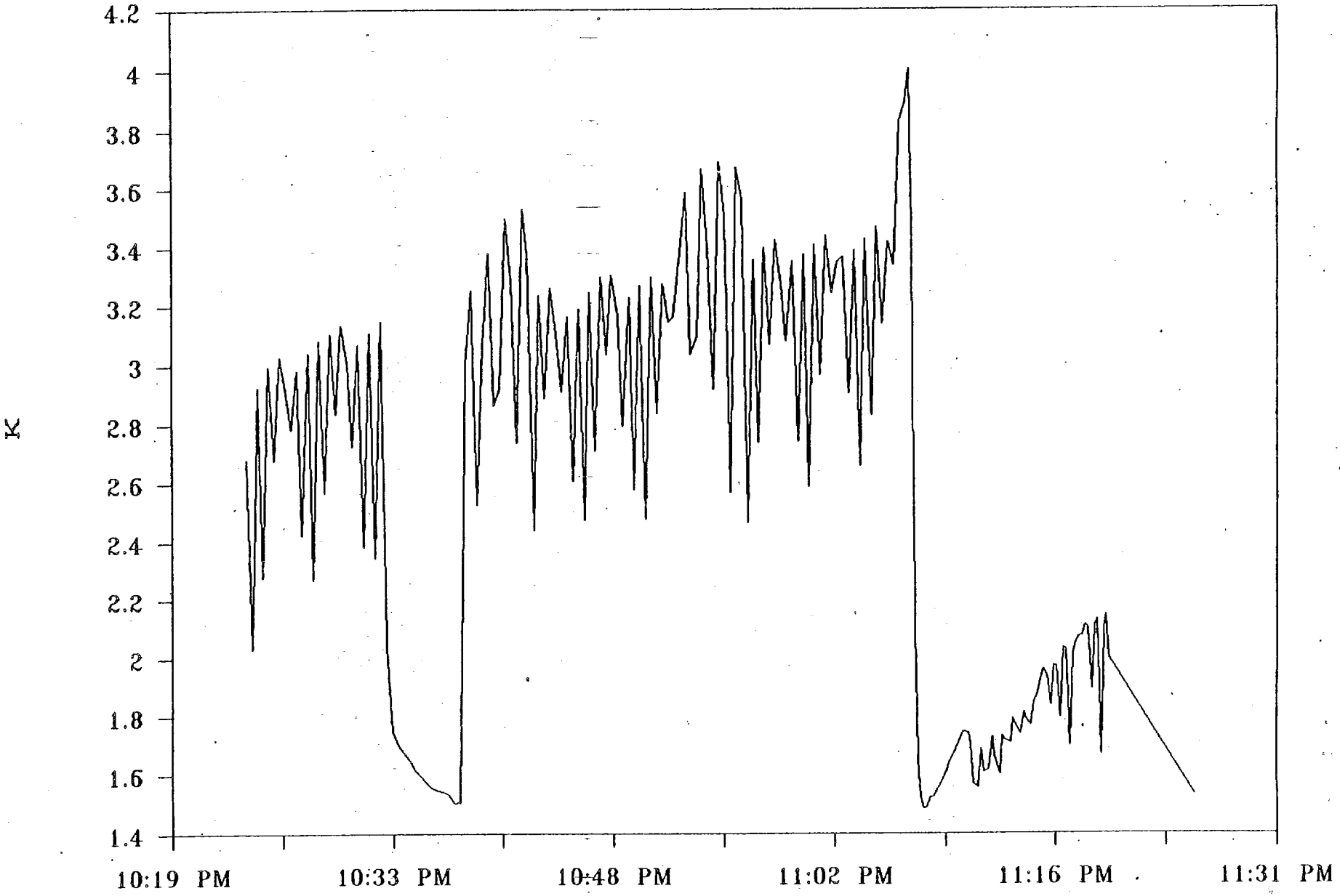
ADATEK LOGGING

26-Jul-89



ADATEK LOGGING

26-Jul-89



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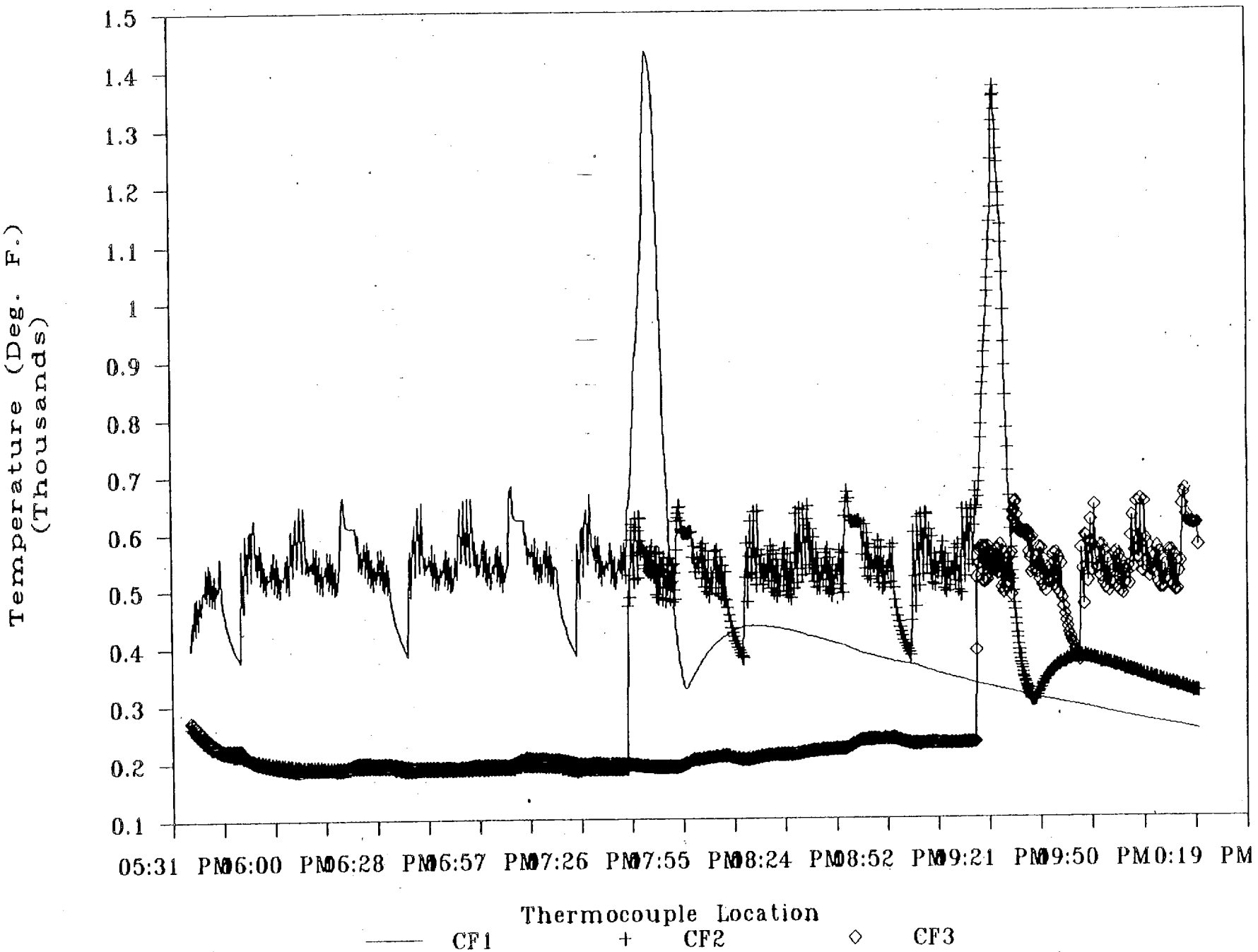
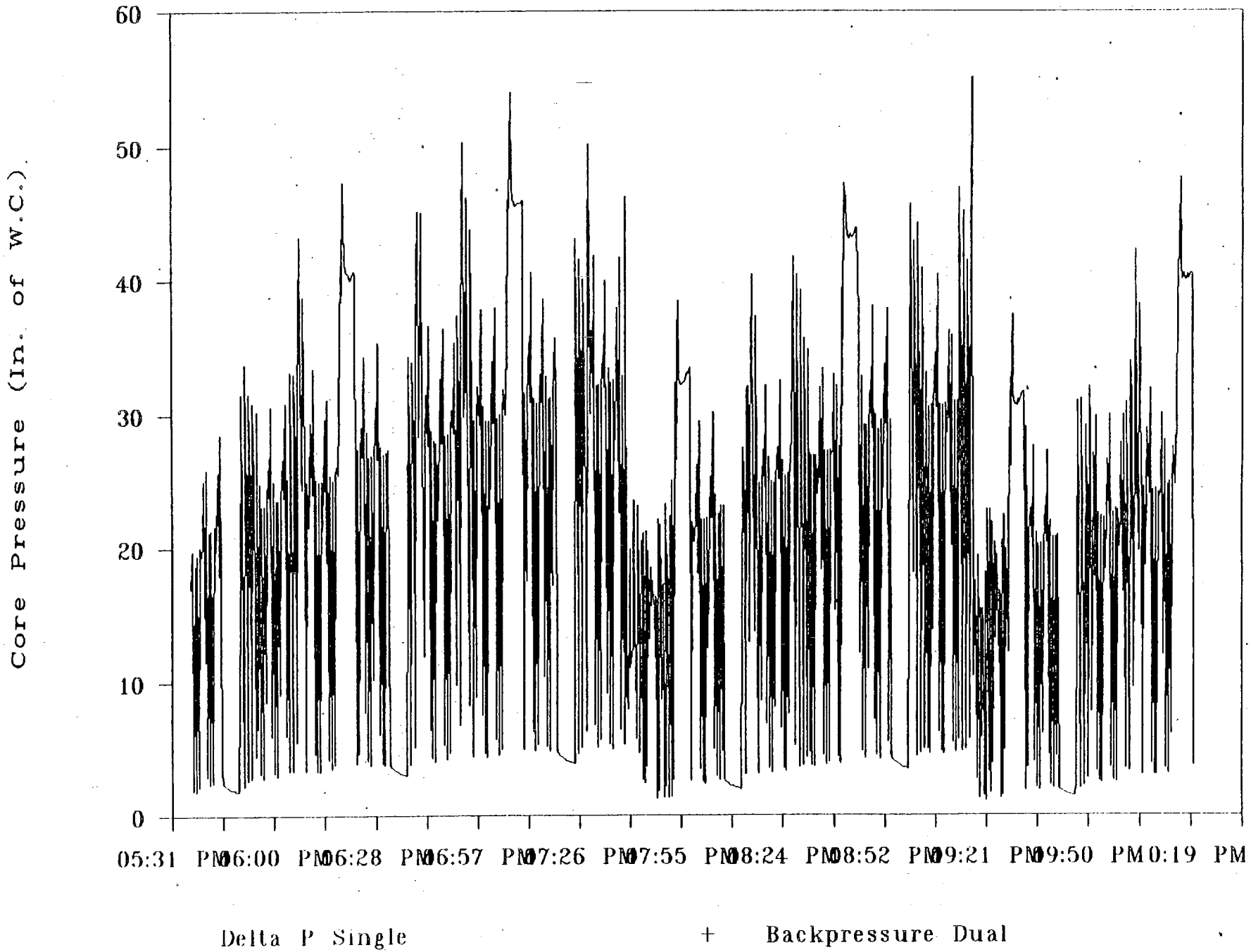
26-Jul-89



ADATEK LOGGING

26-Jul-89



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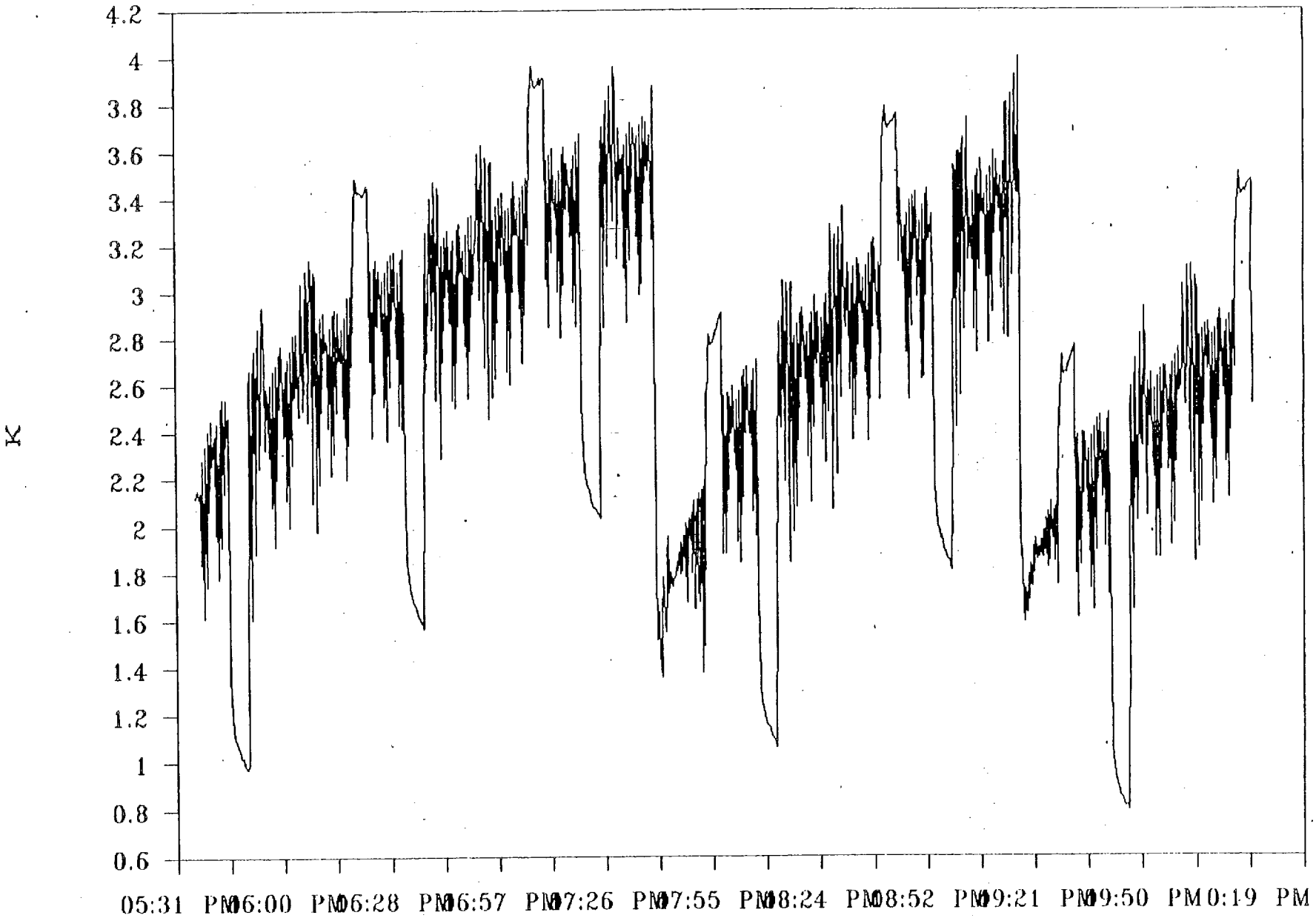
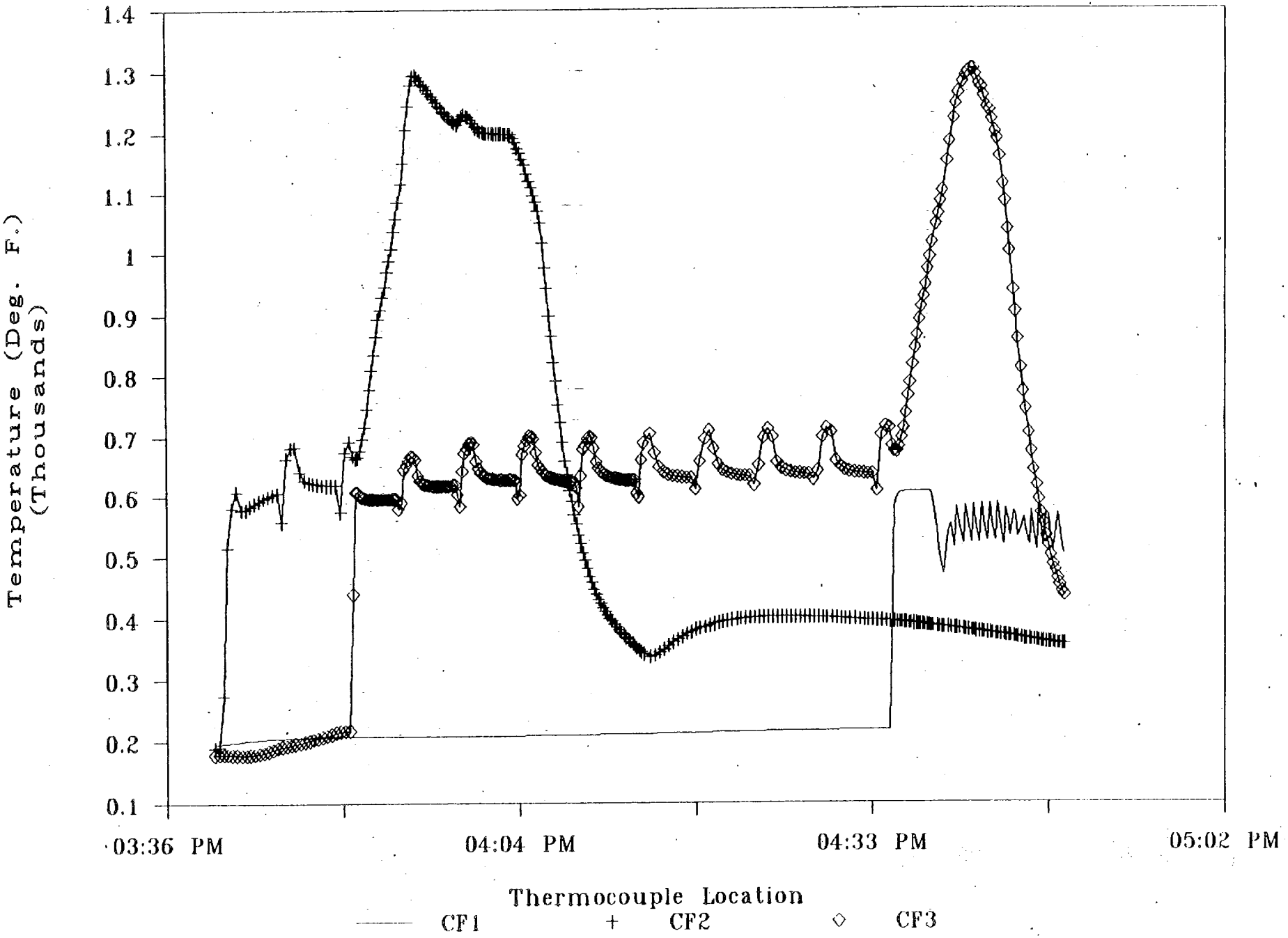


ADATEK LOGGING

-26-Jul-89



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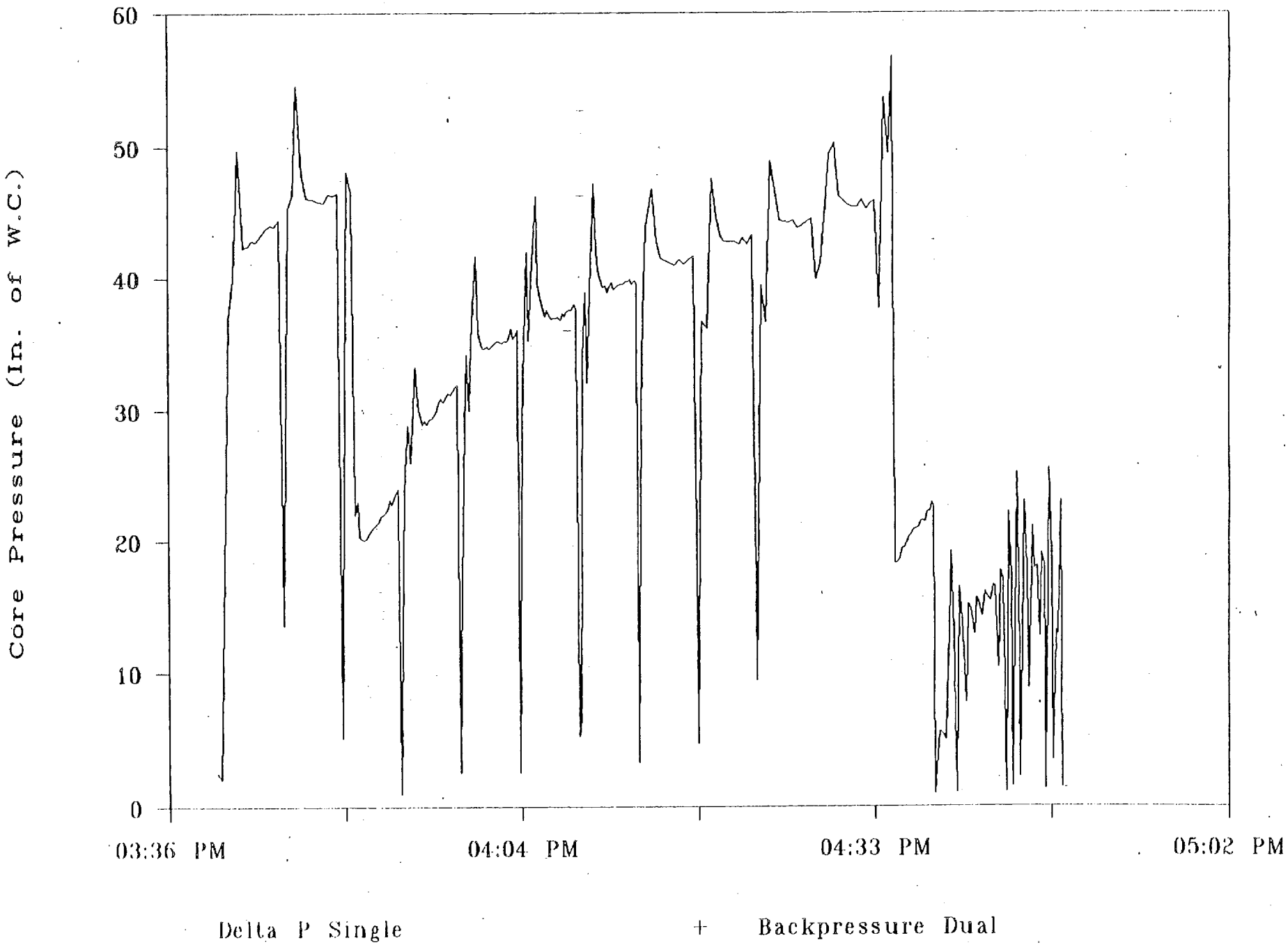
26-Jul-89



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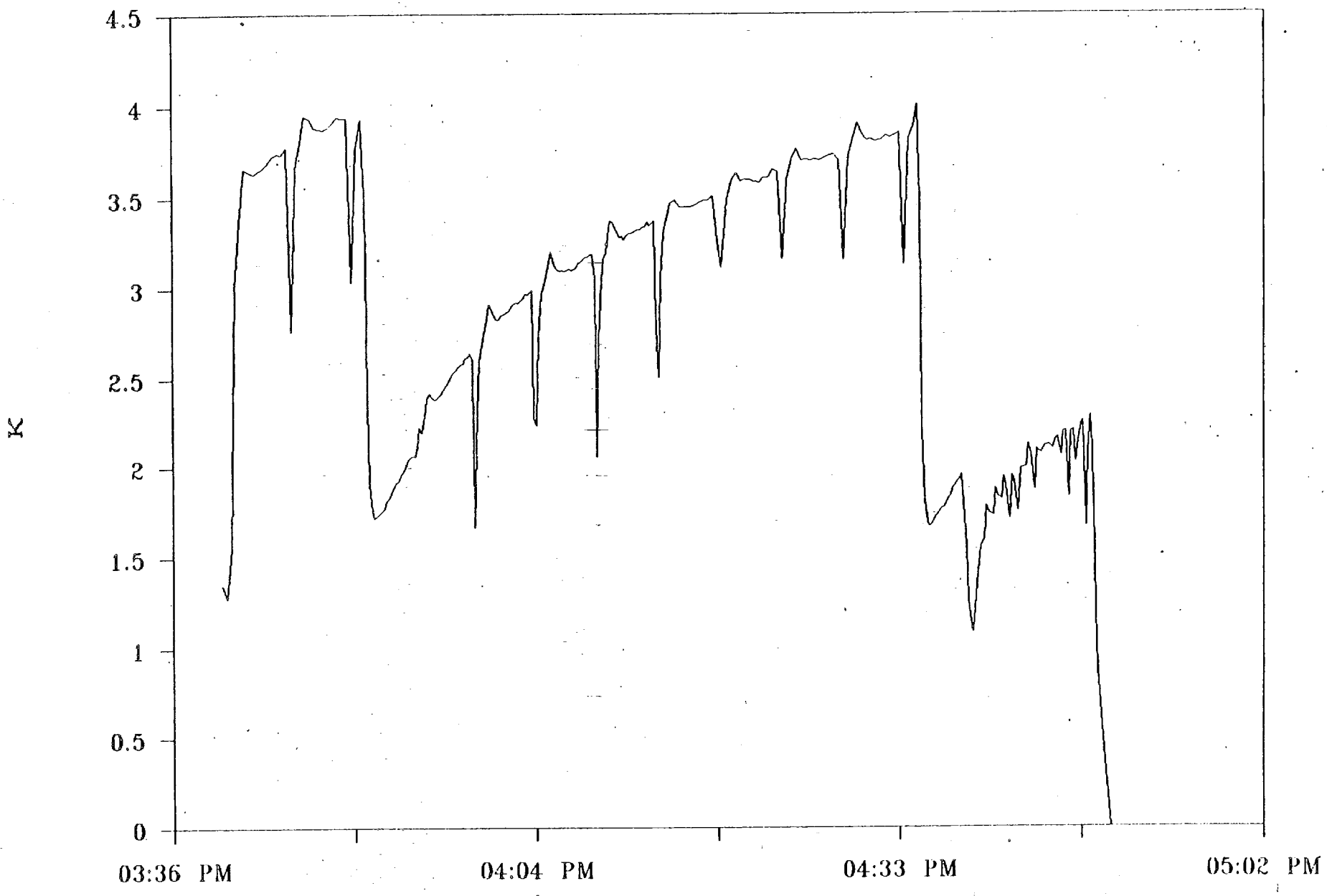

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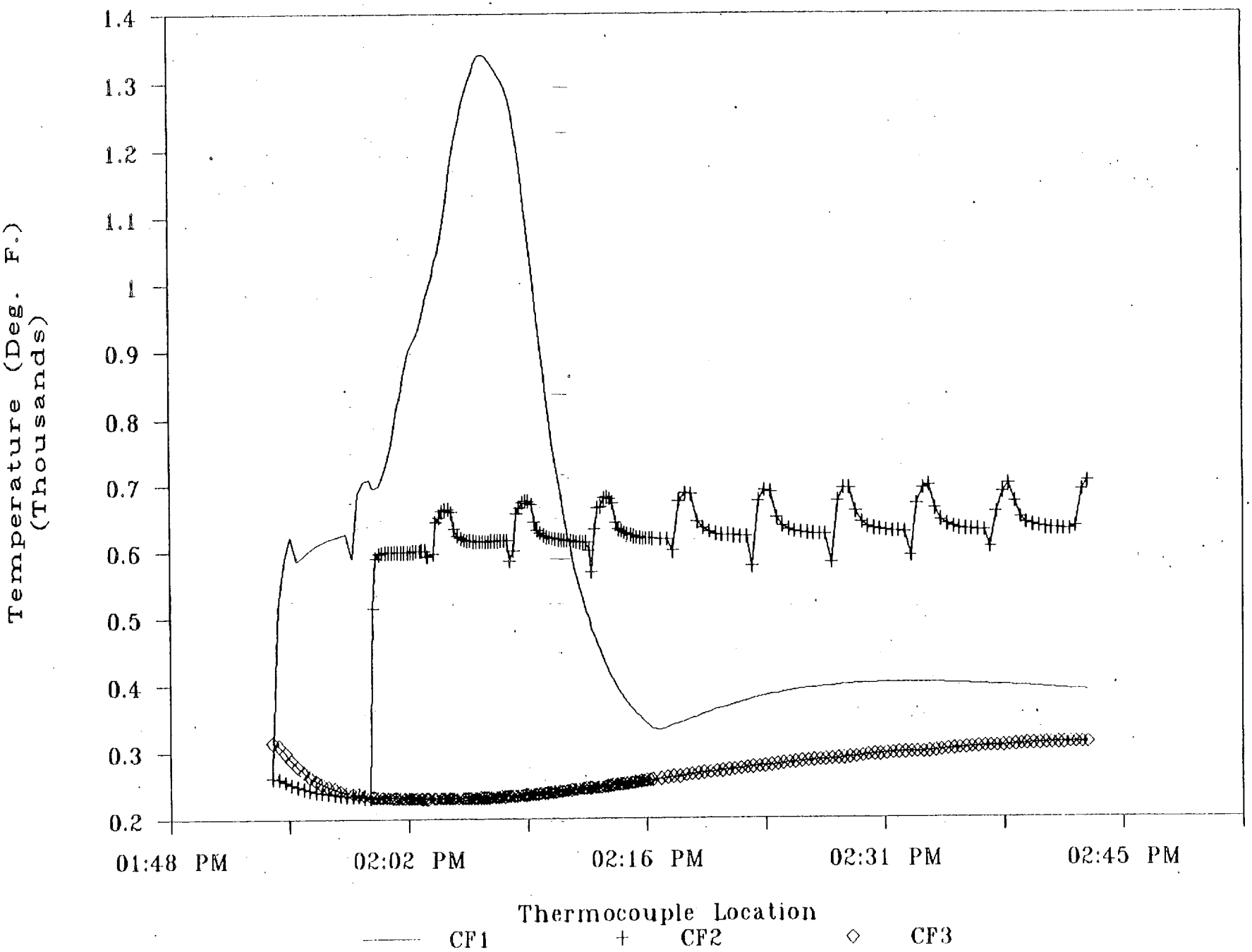

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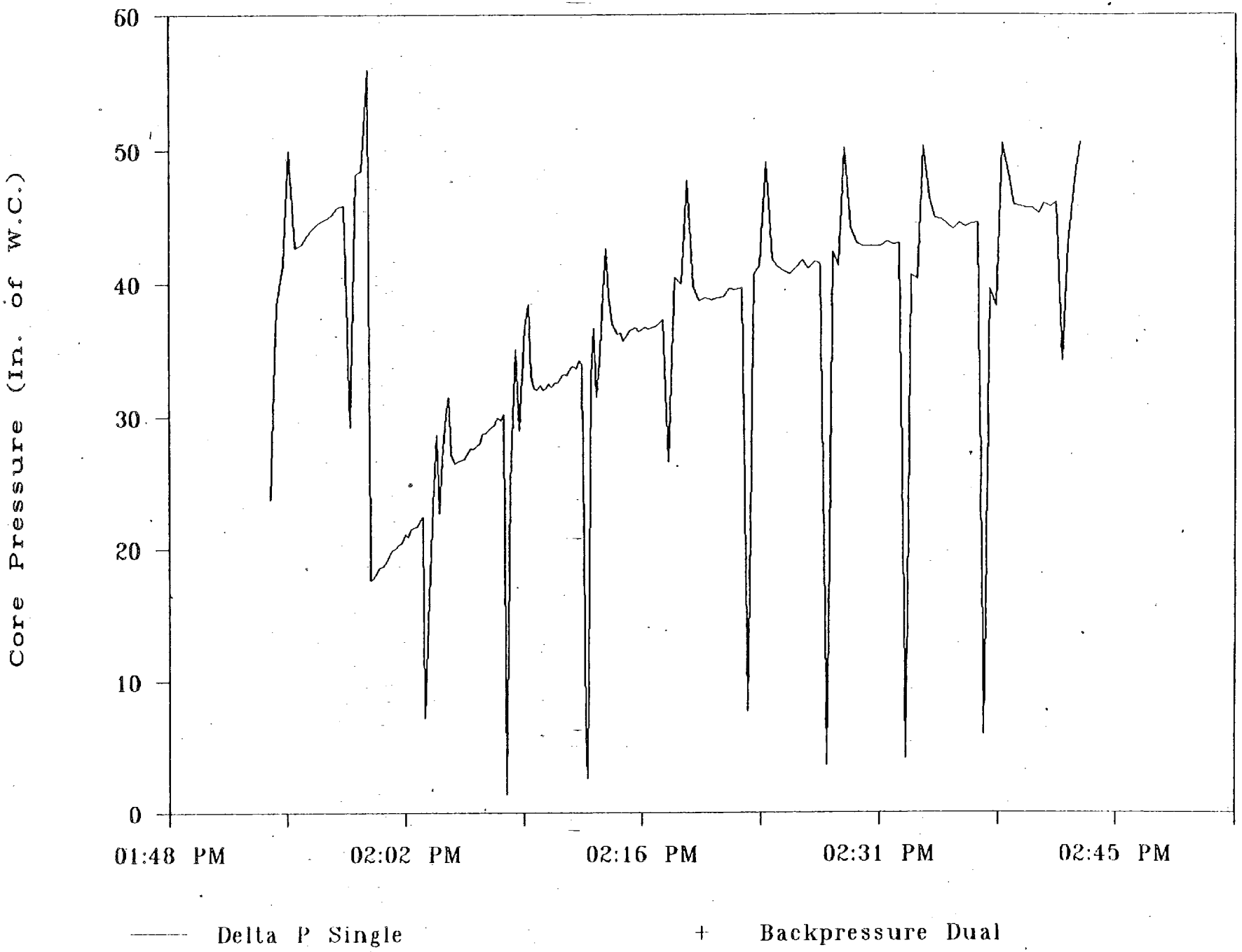

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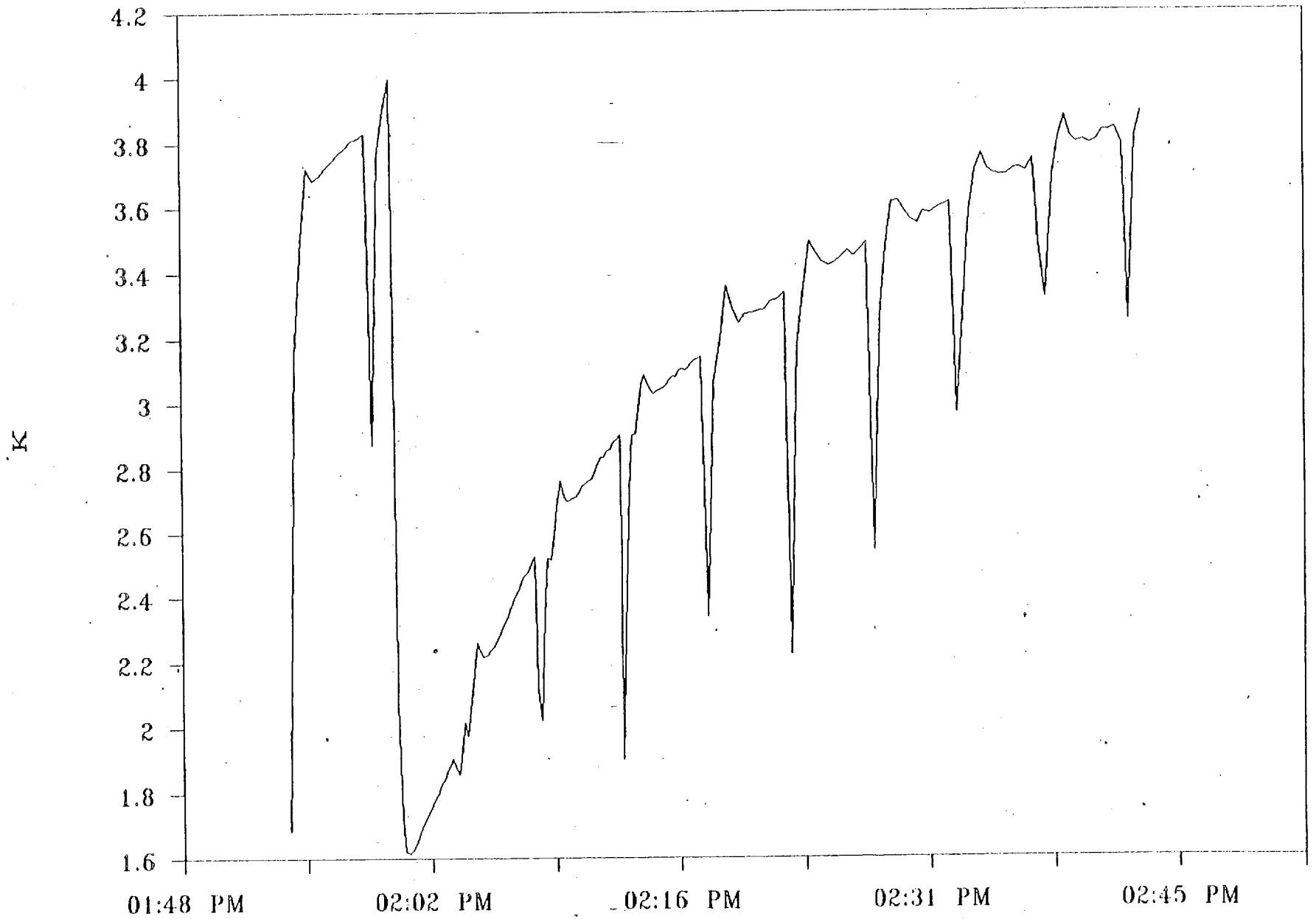

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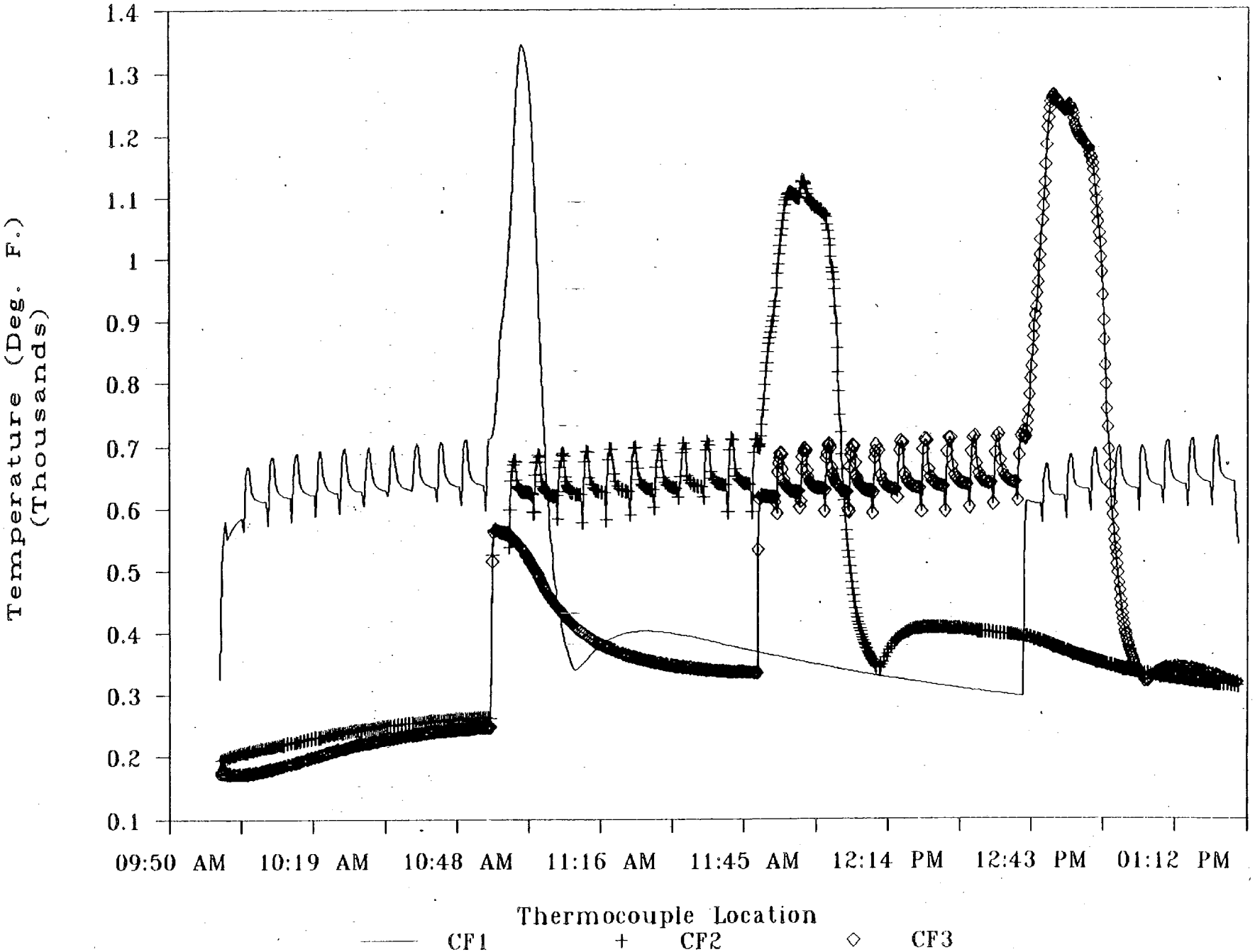

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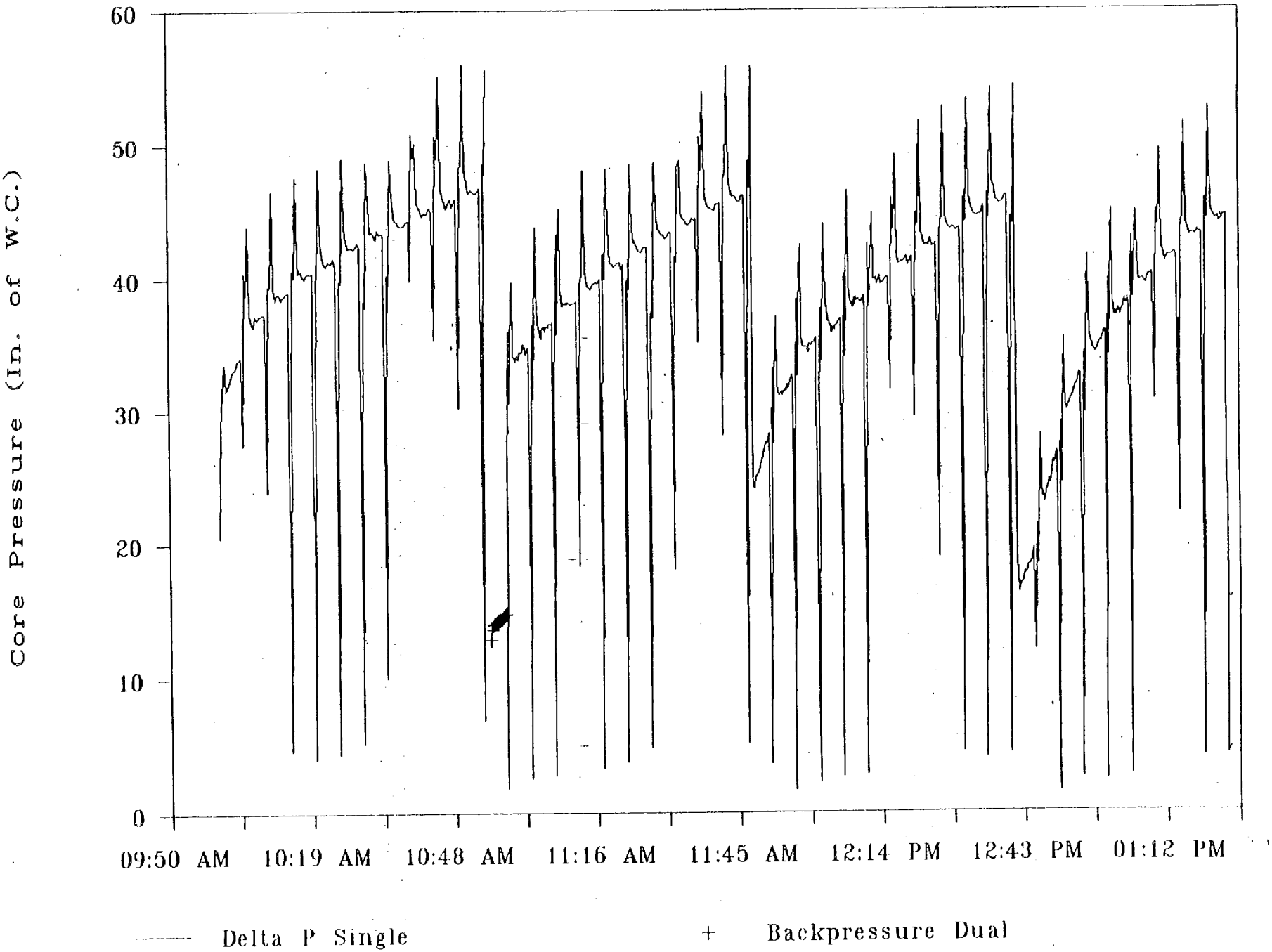

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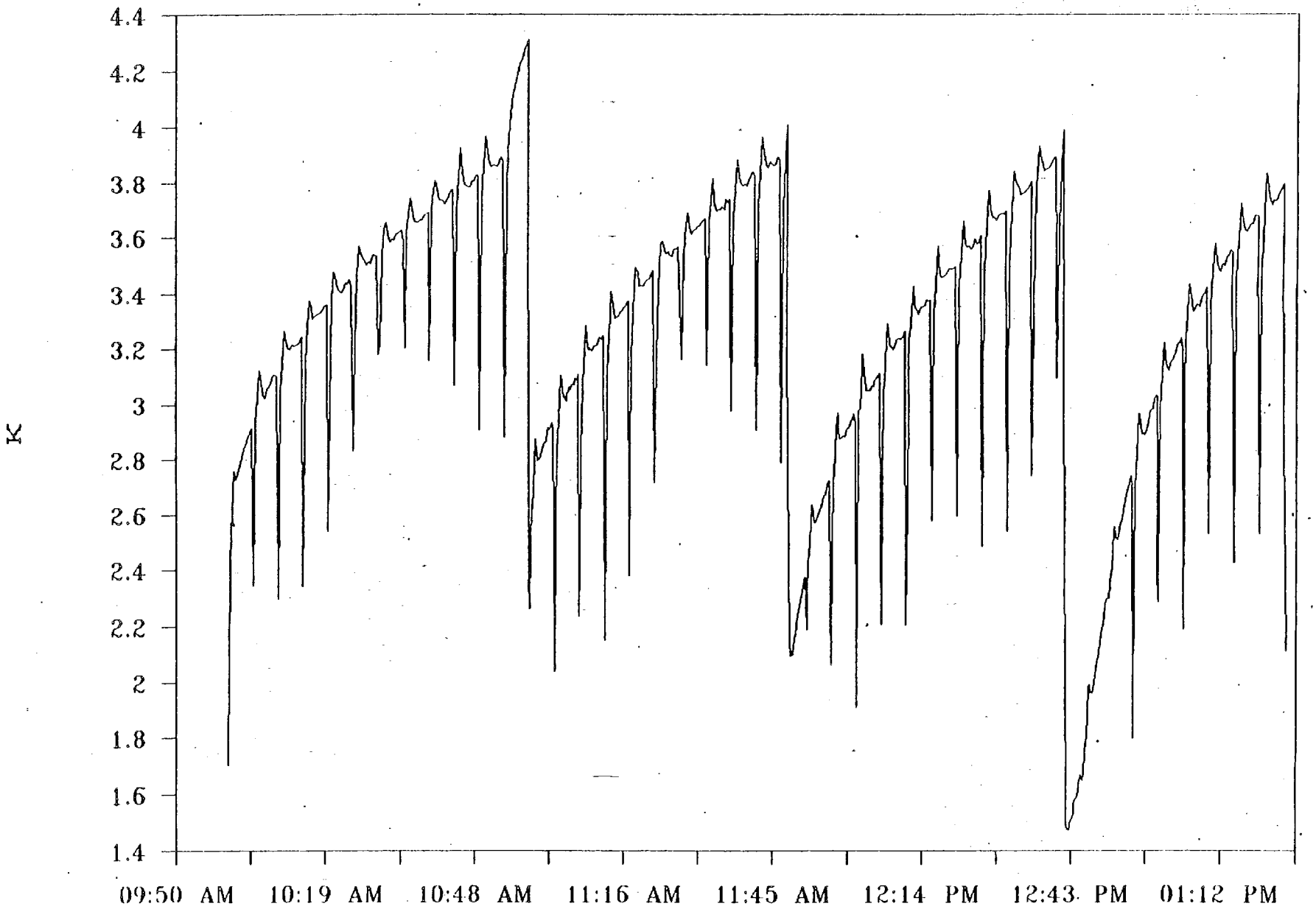

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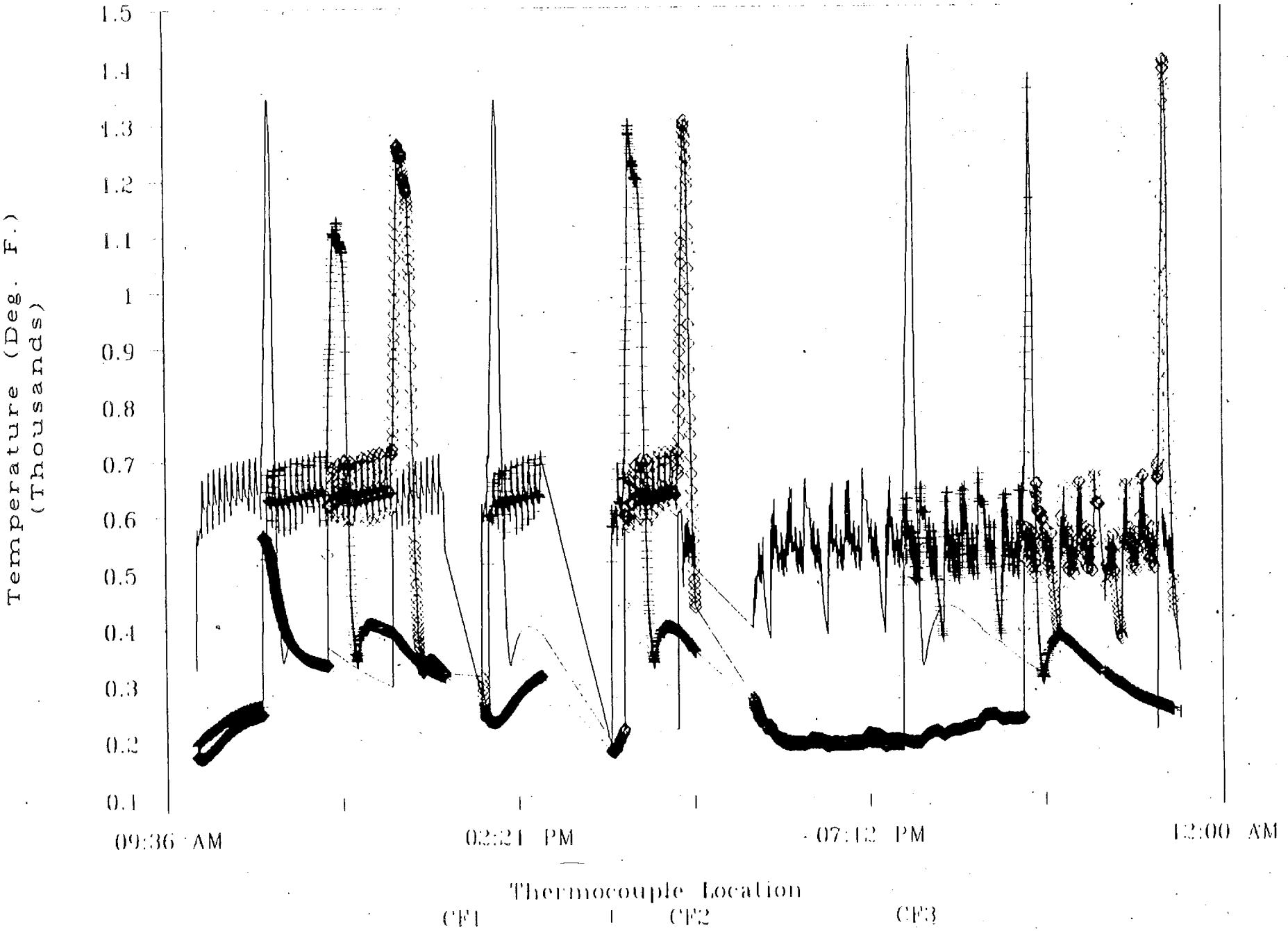
26 Jul 89



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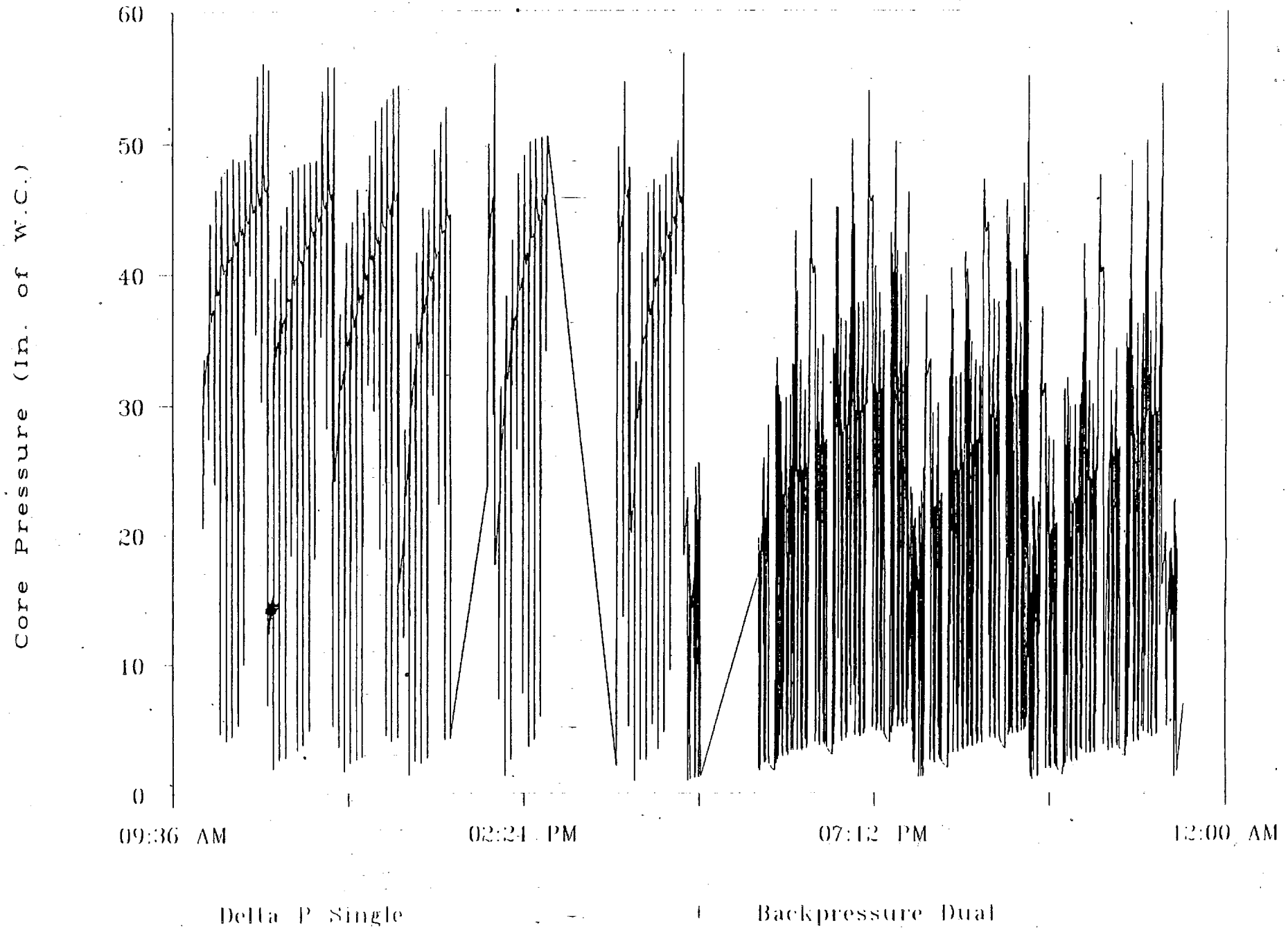
26 Jul 89



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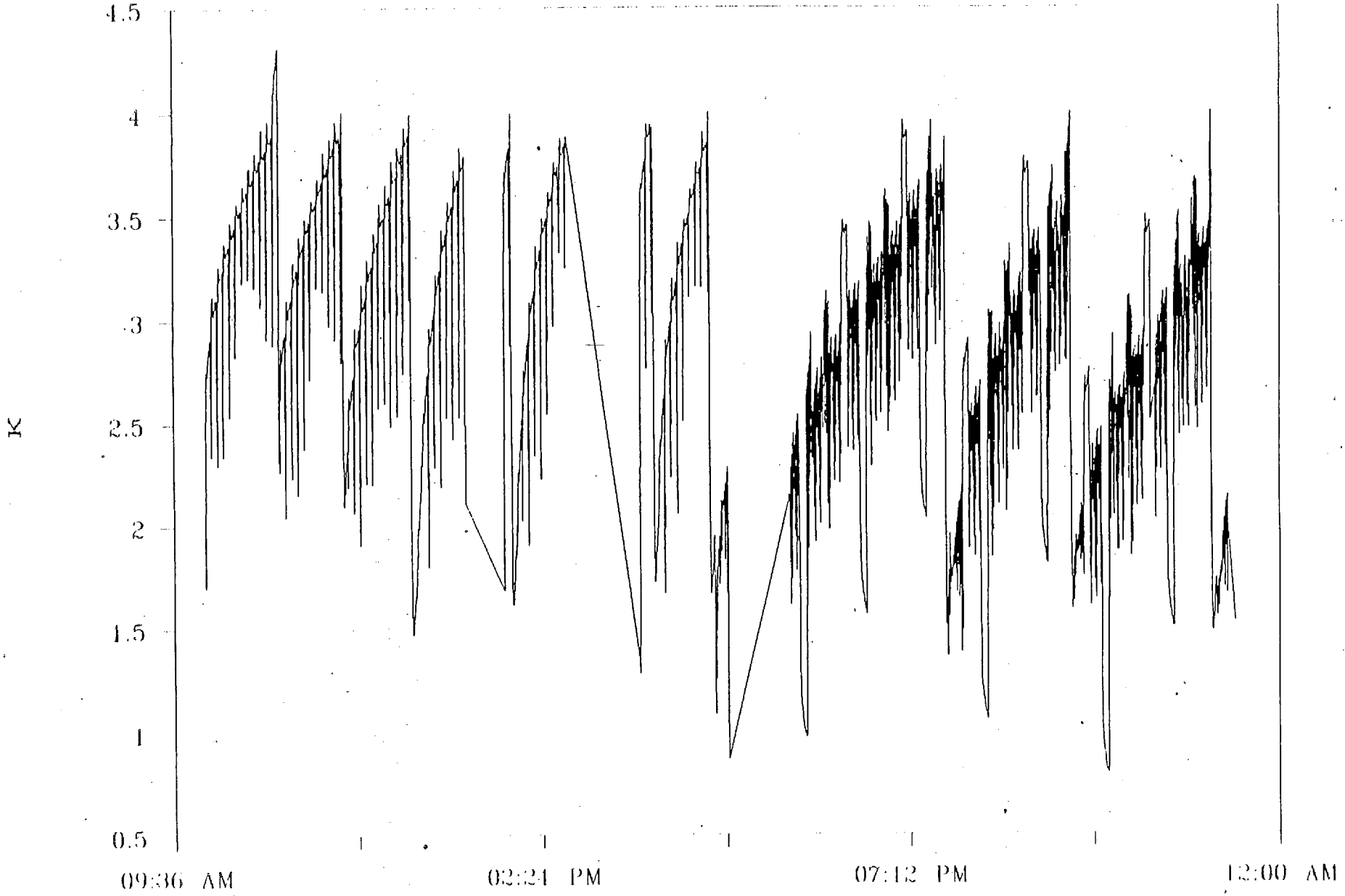

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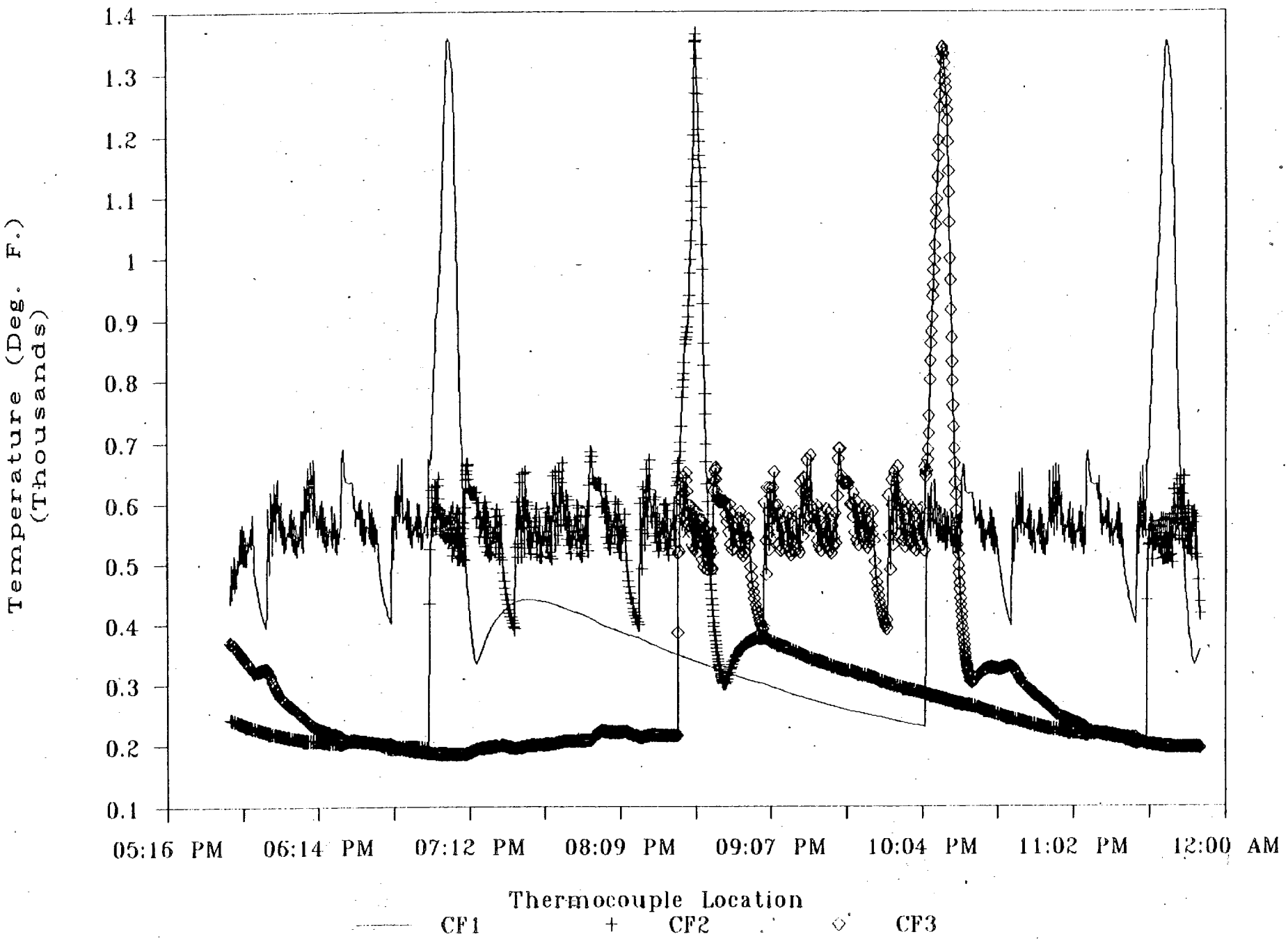

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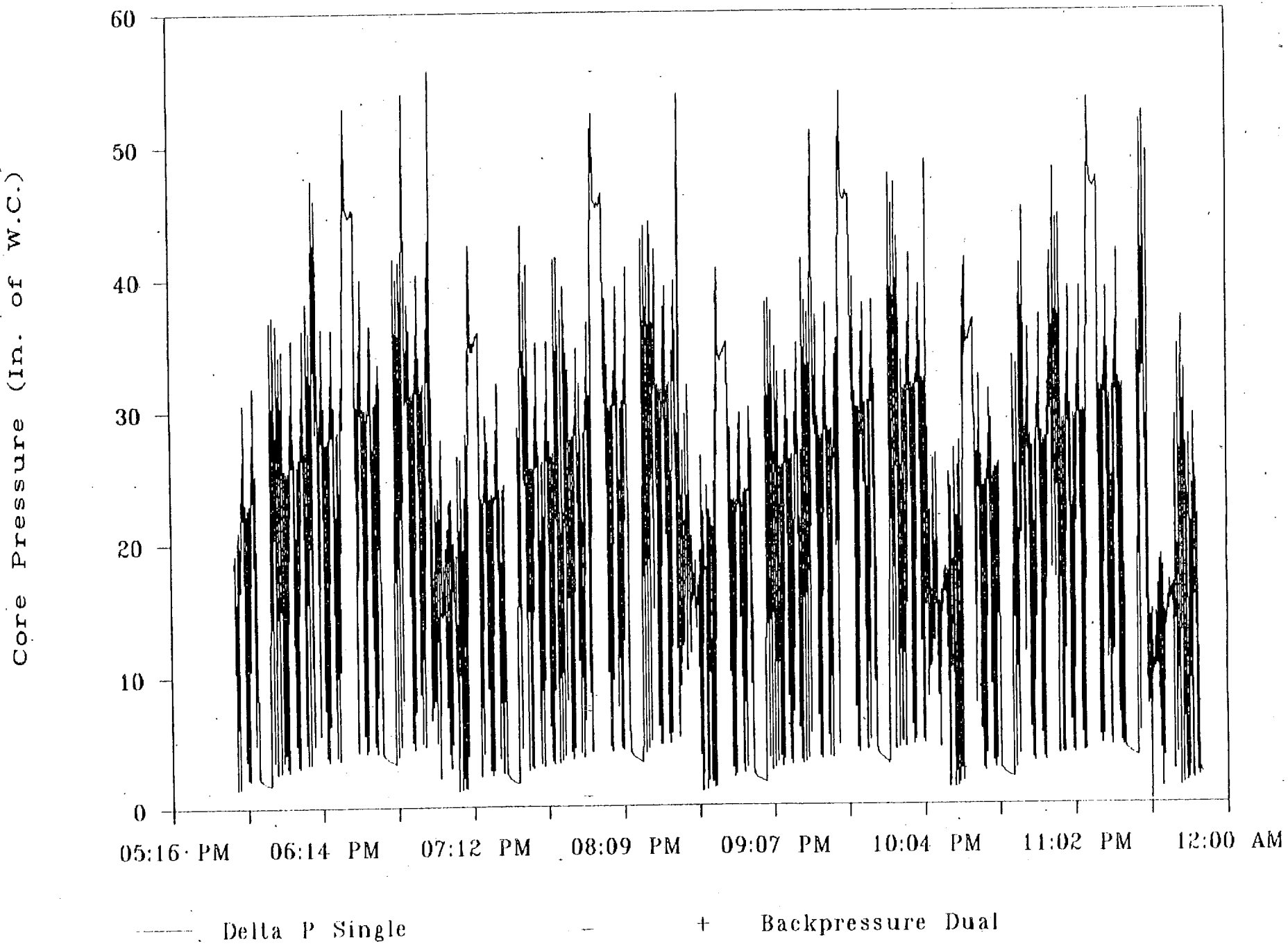

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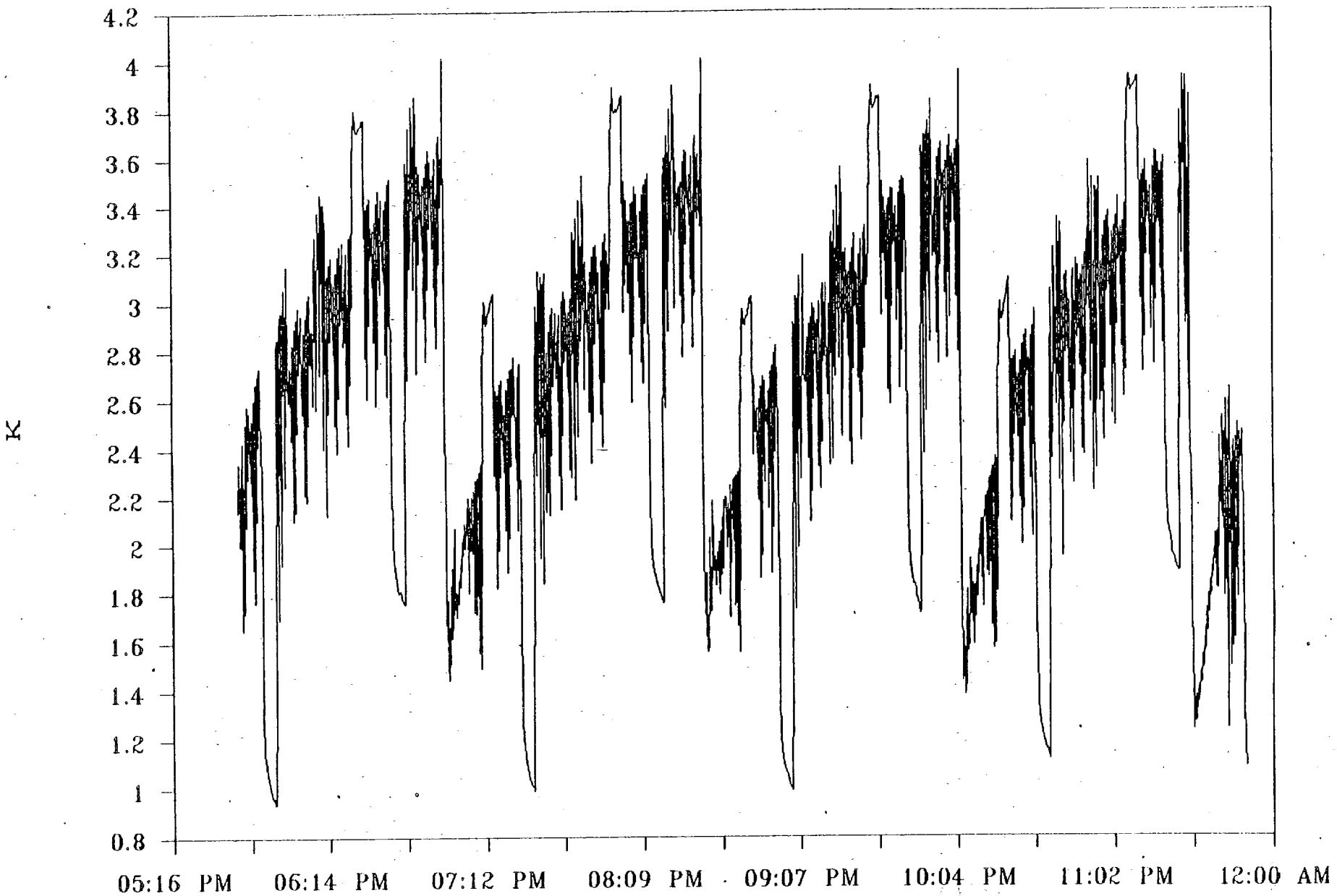

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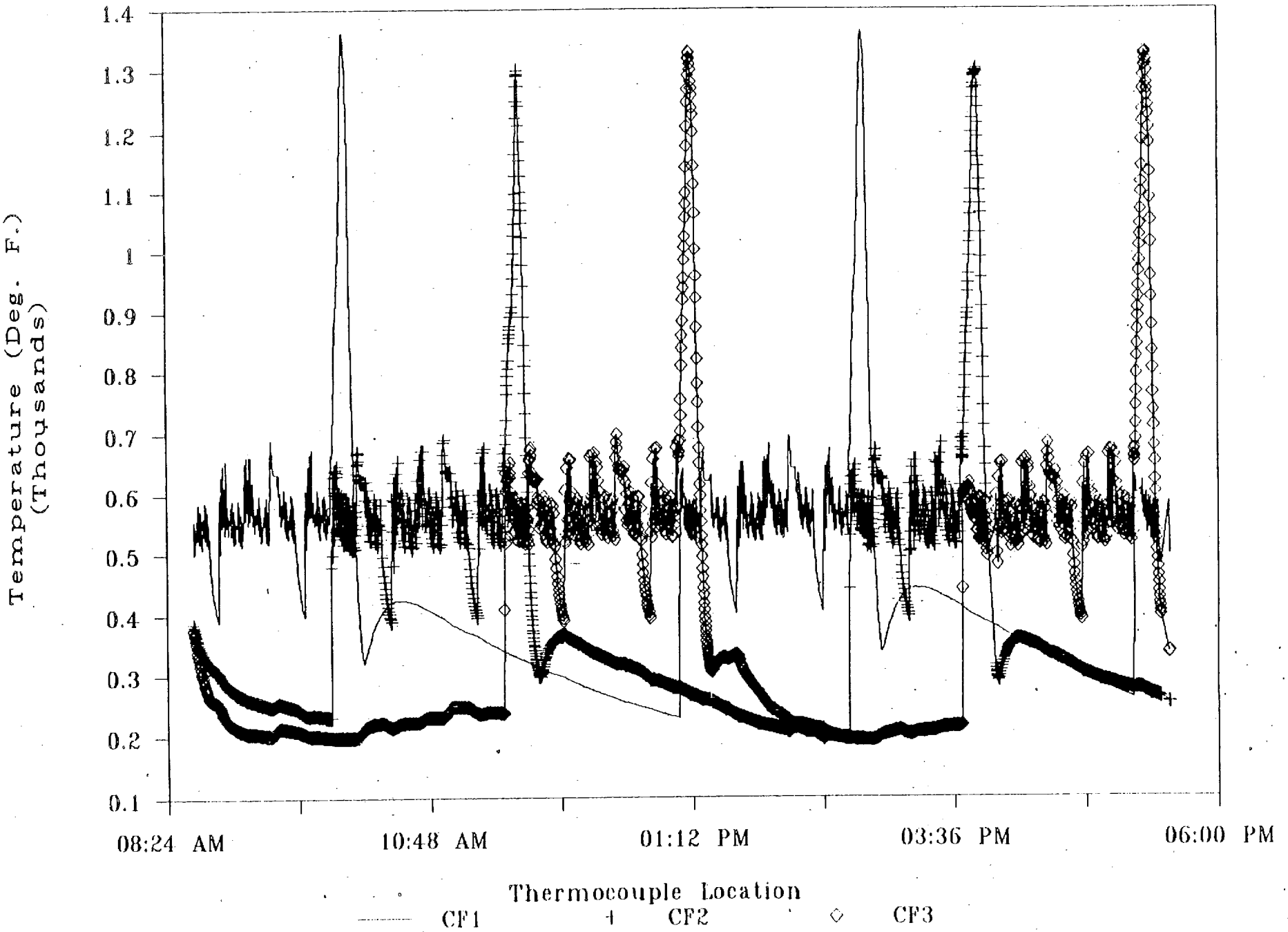

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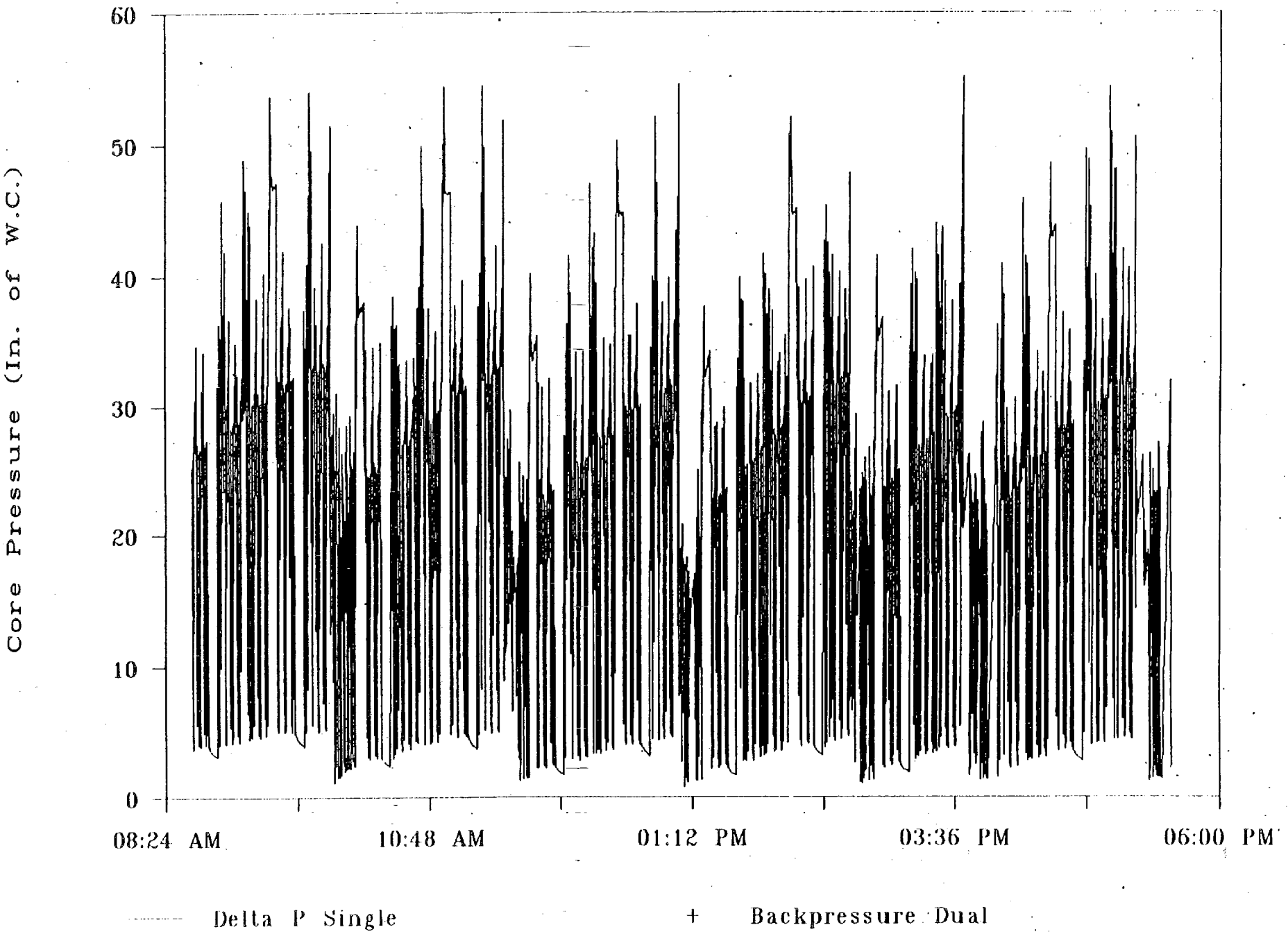

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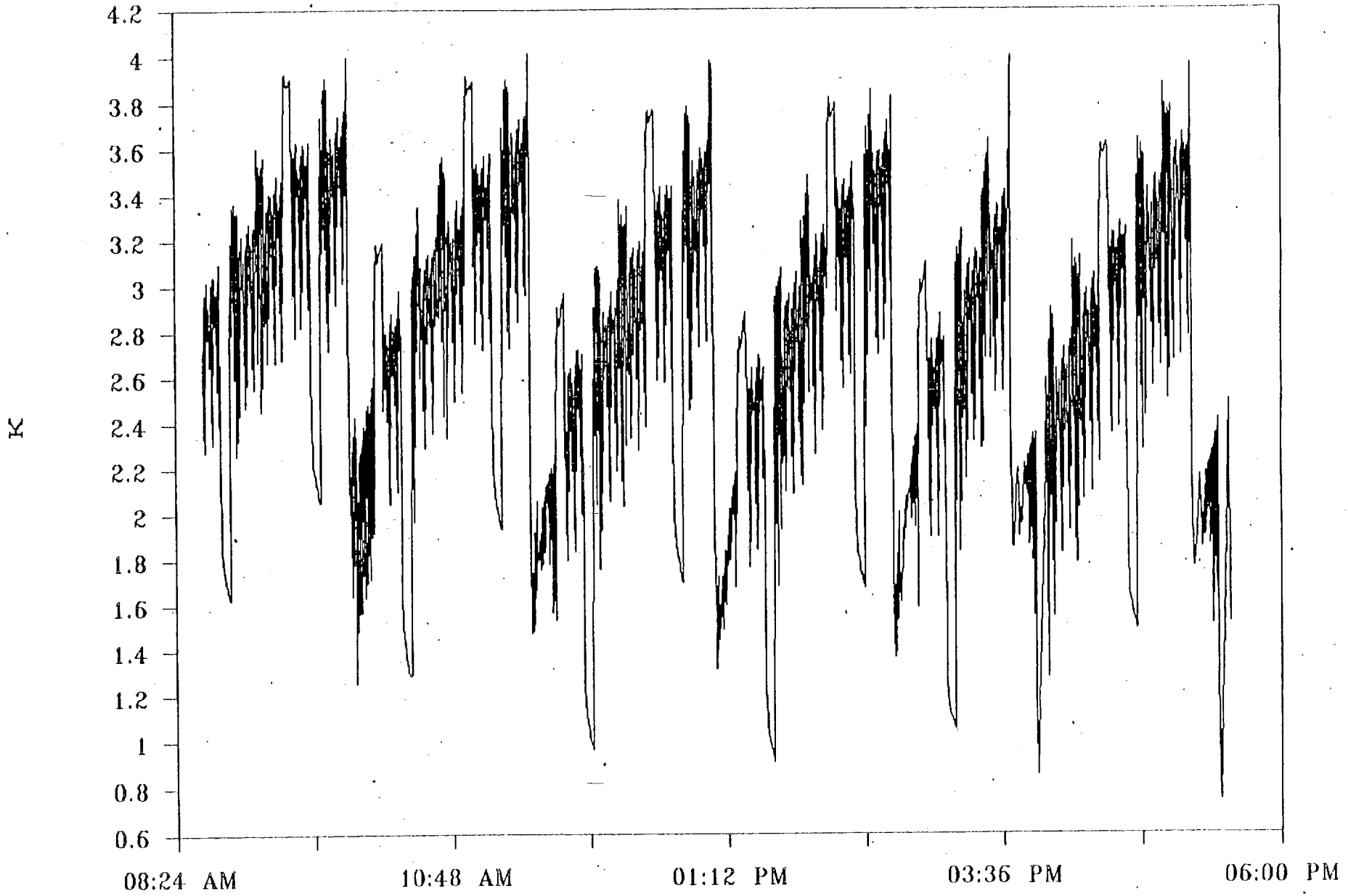

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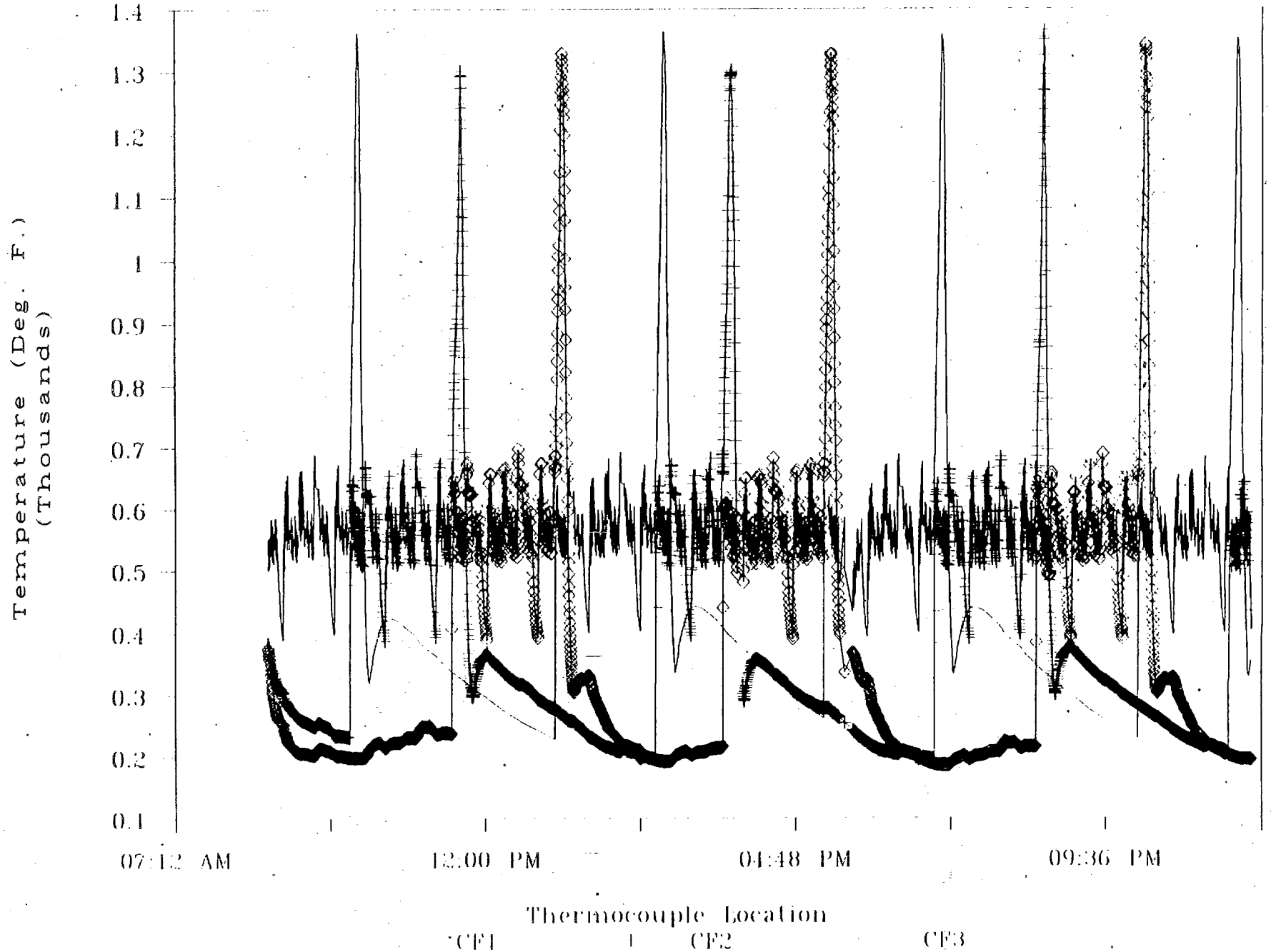

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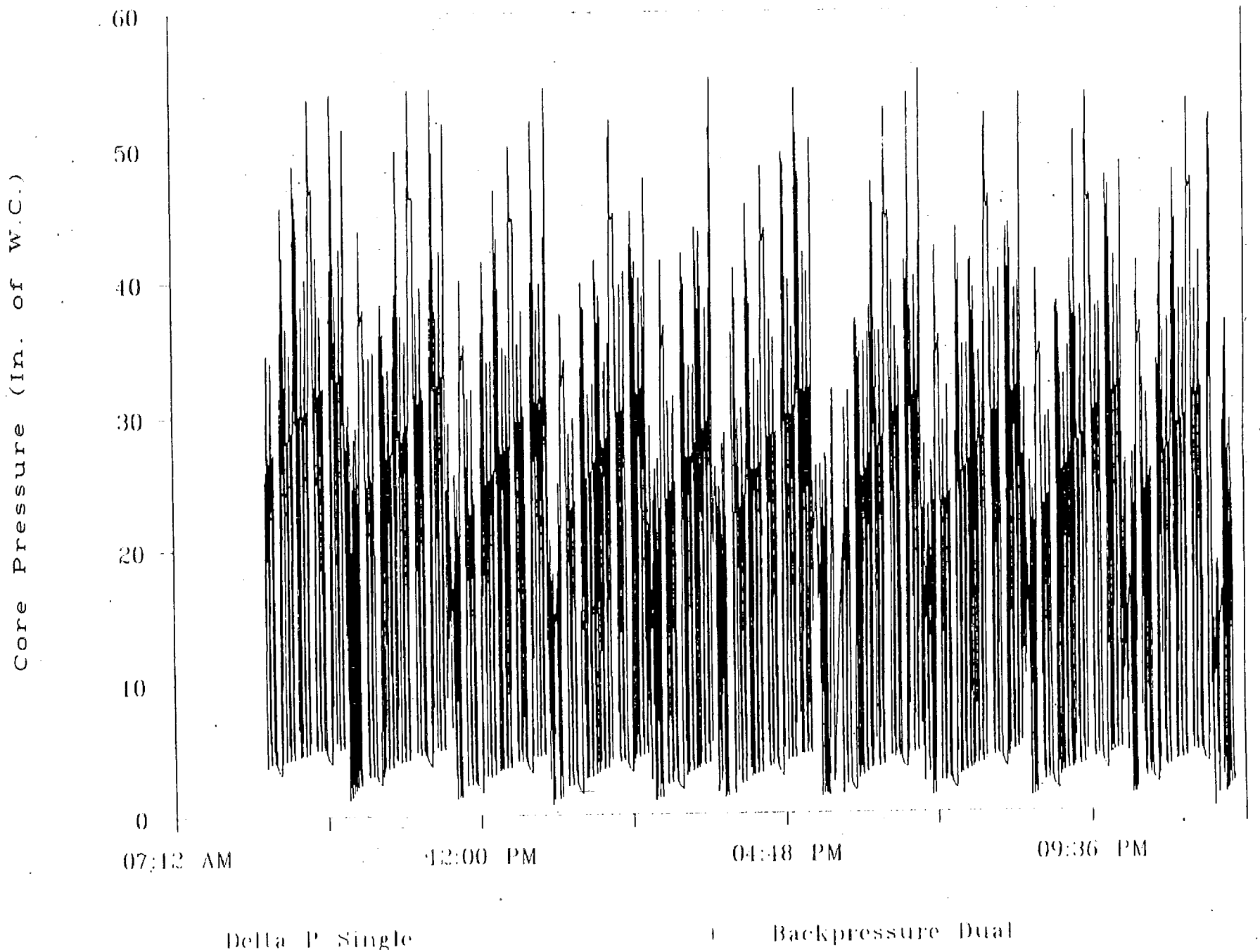

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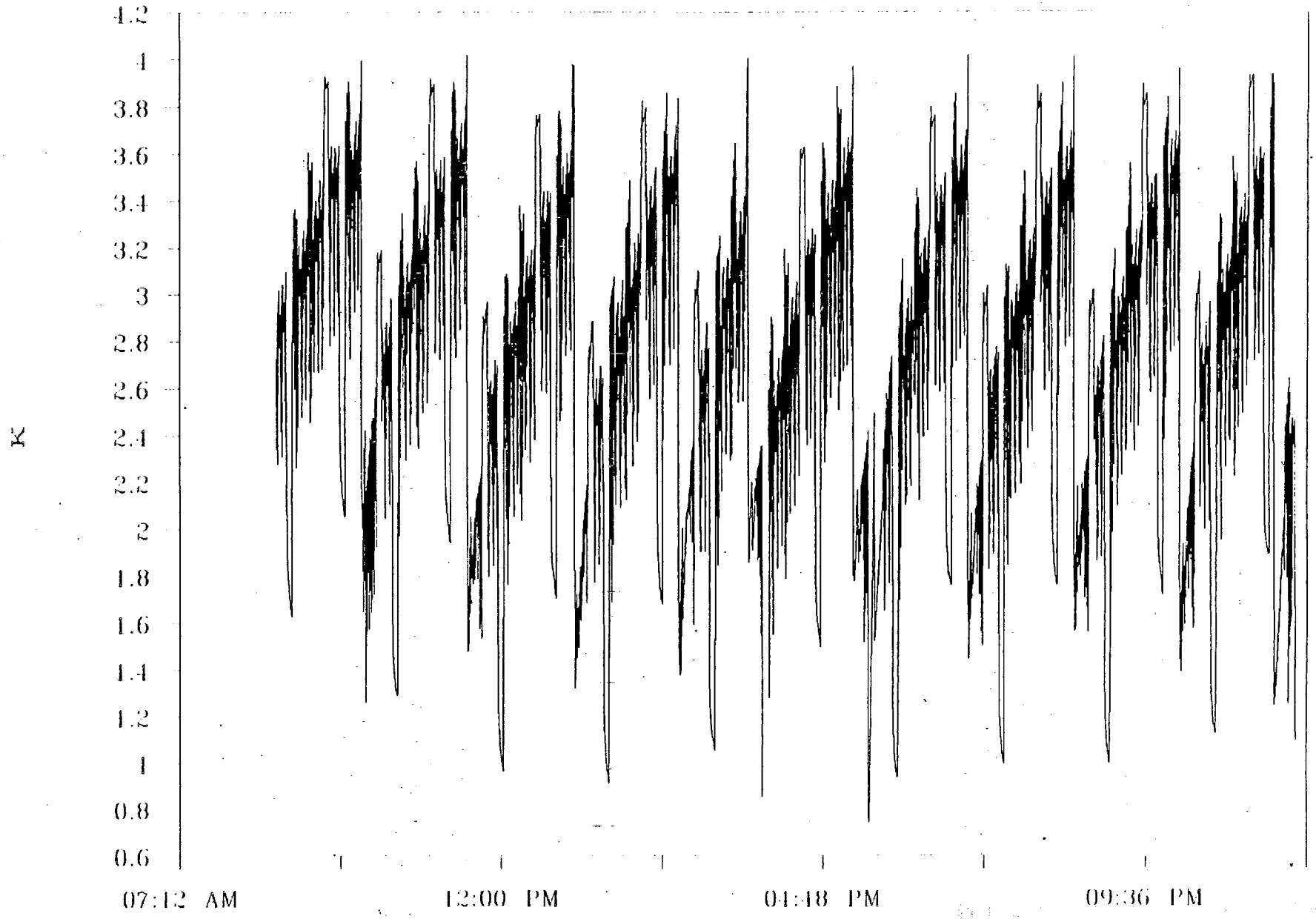

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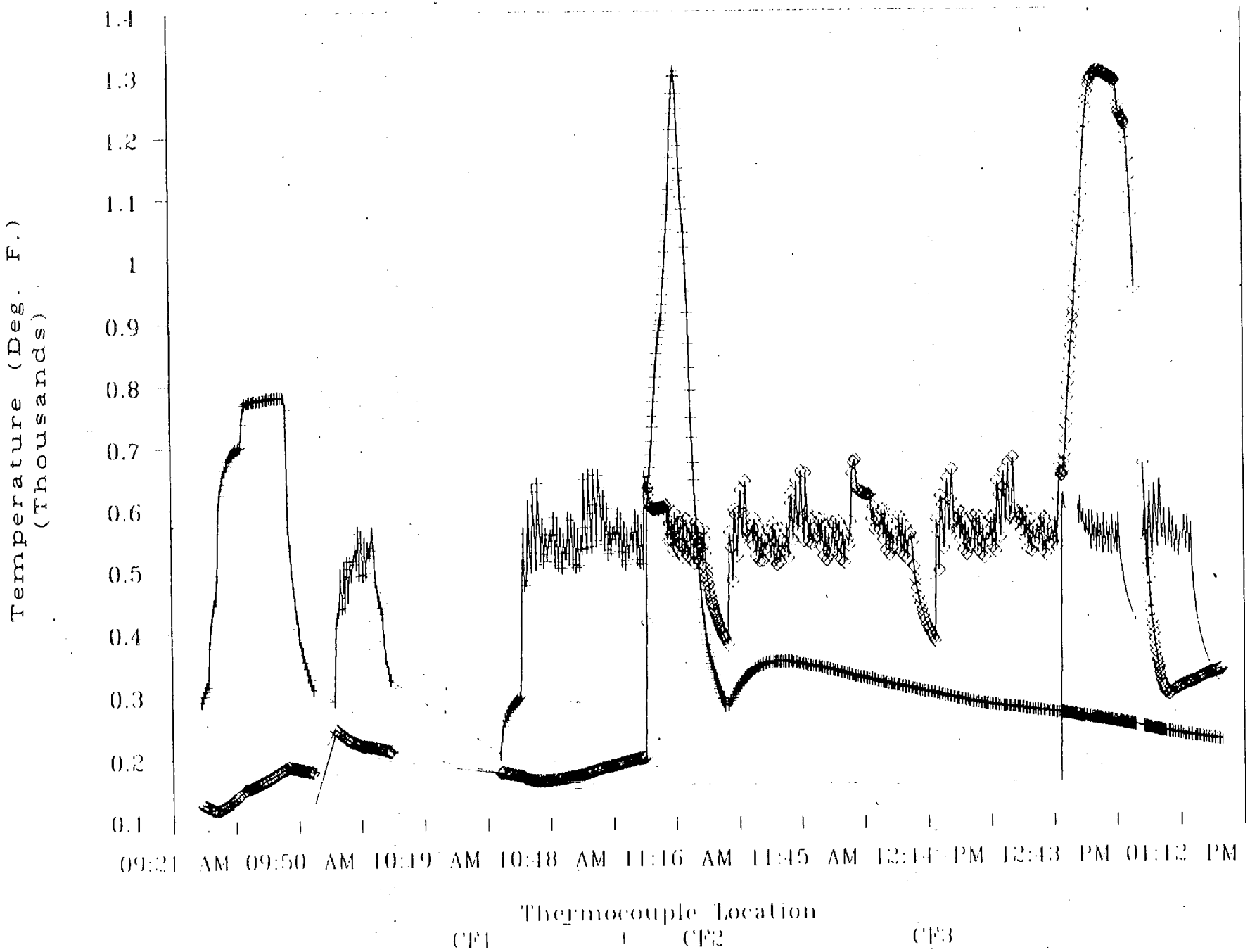
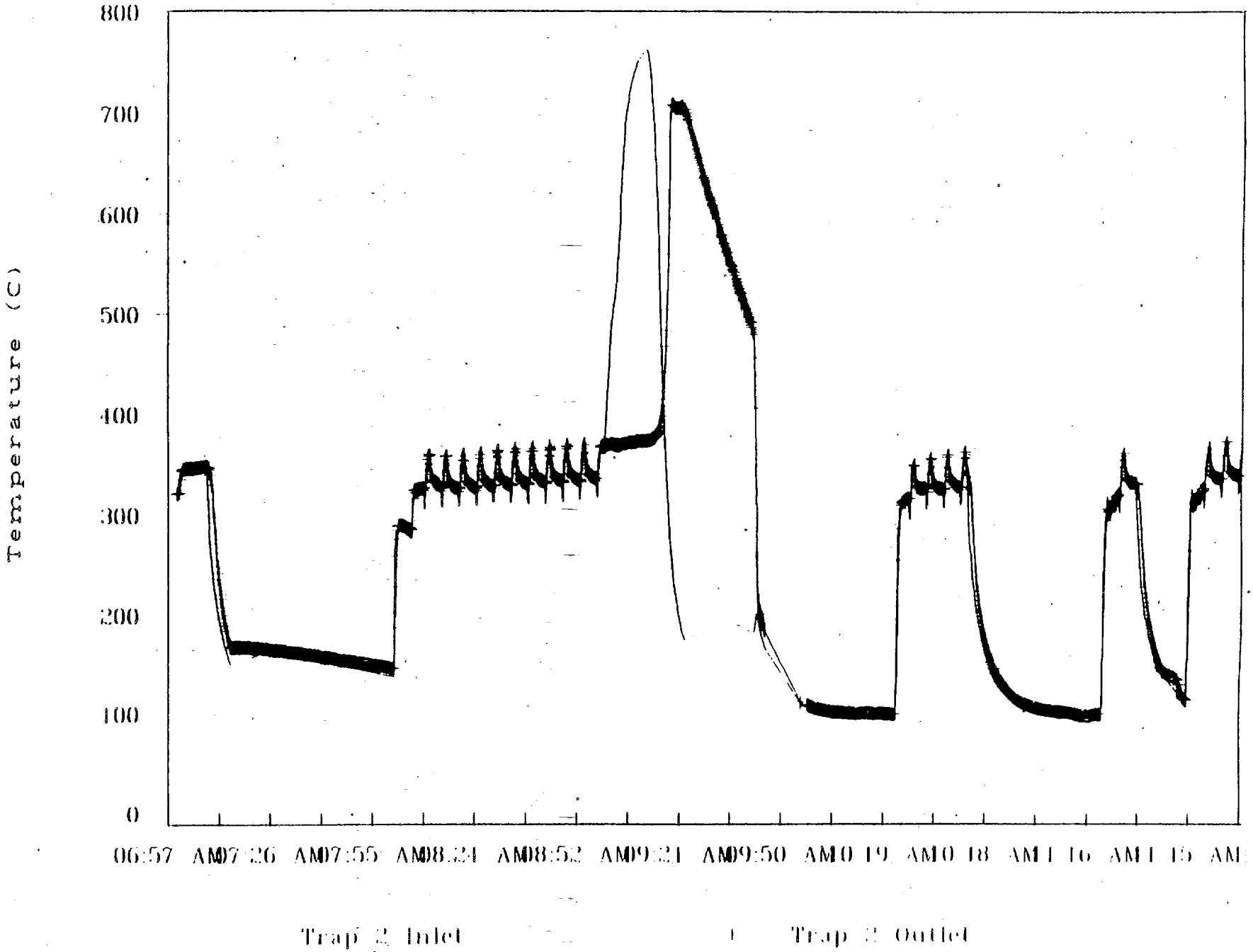
28-Jul-89



ARB BTS Testing

Regeneration Profile (Aug 2, 1989)



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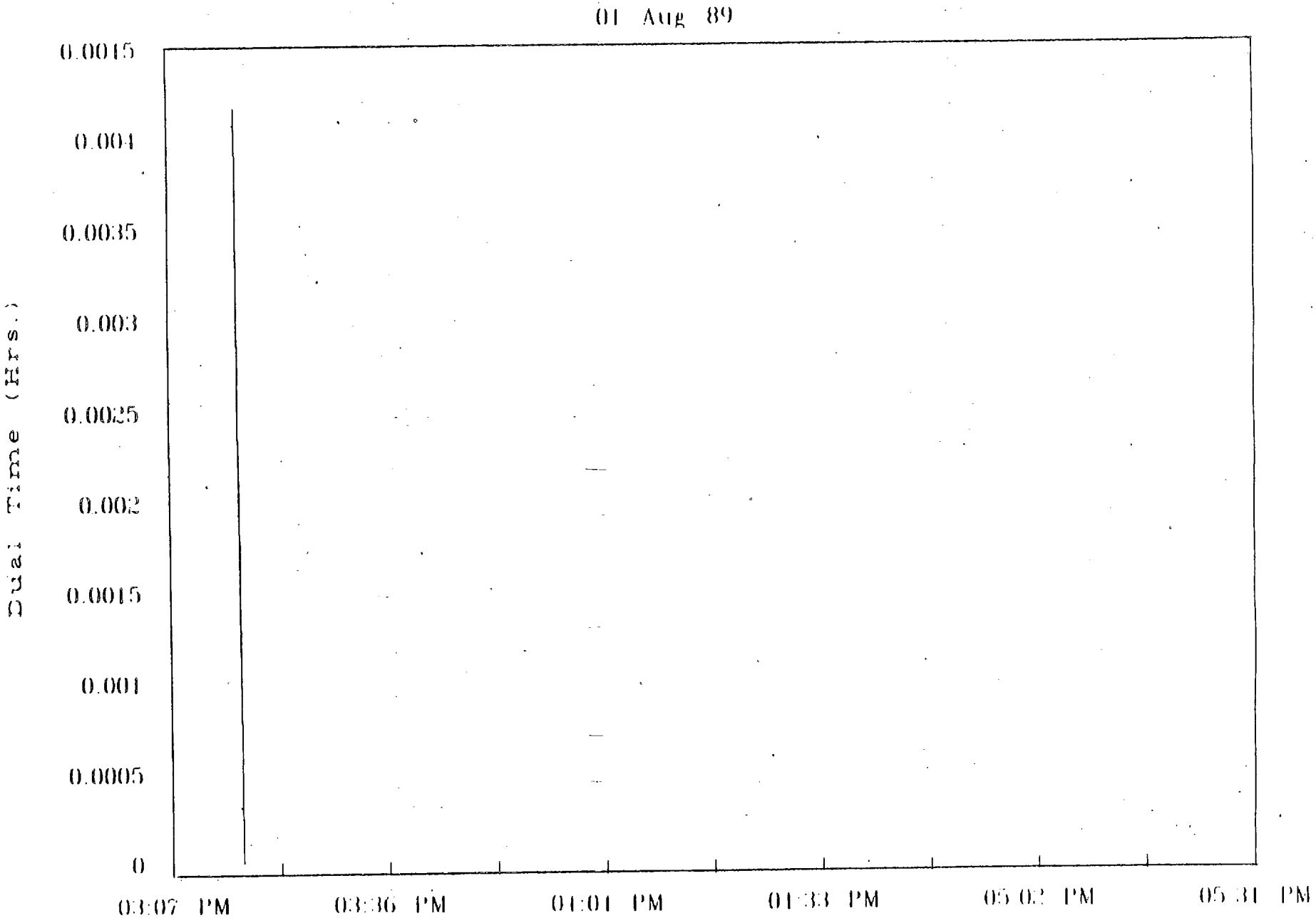

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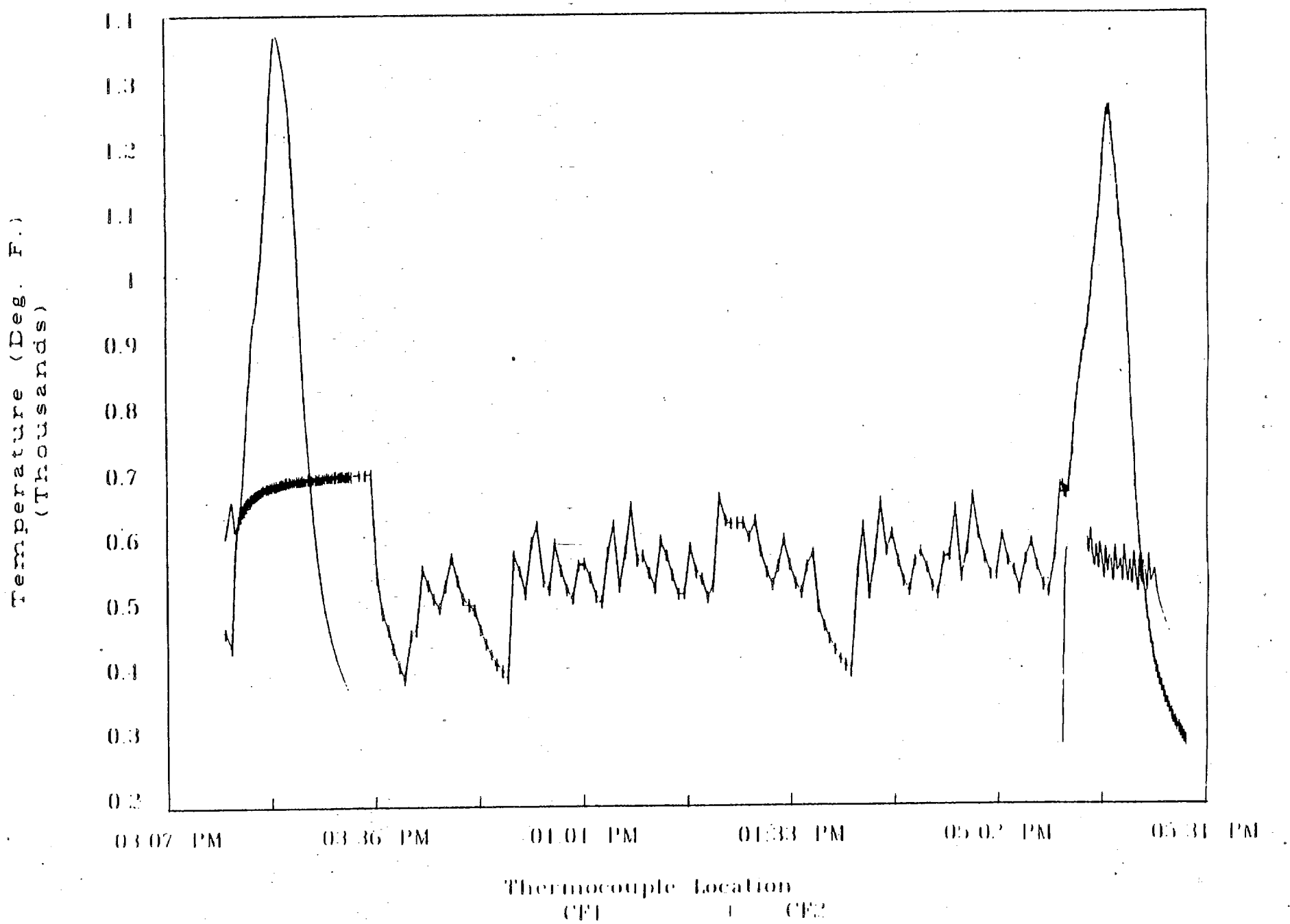
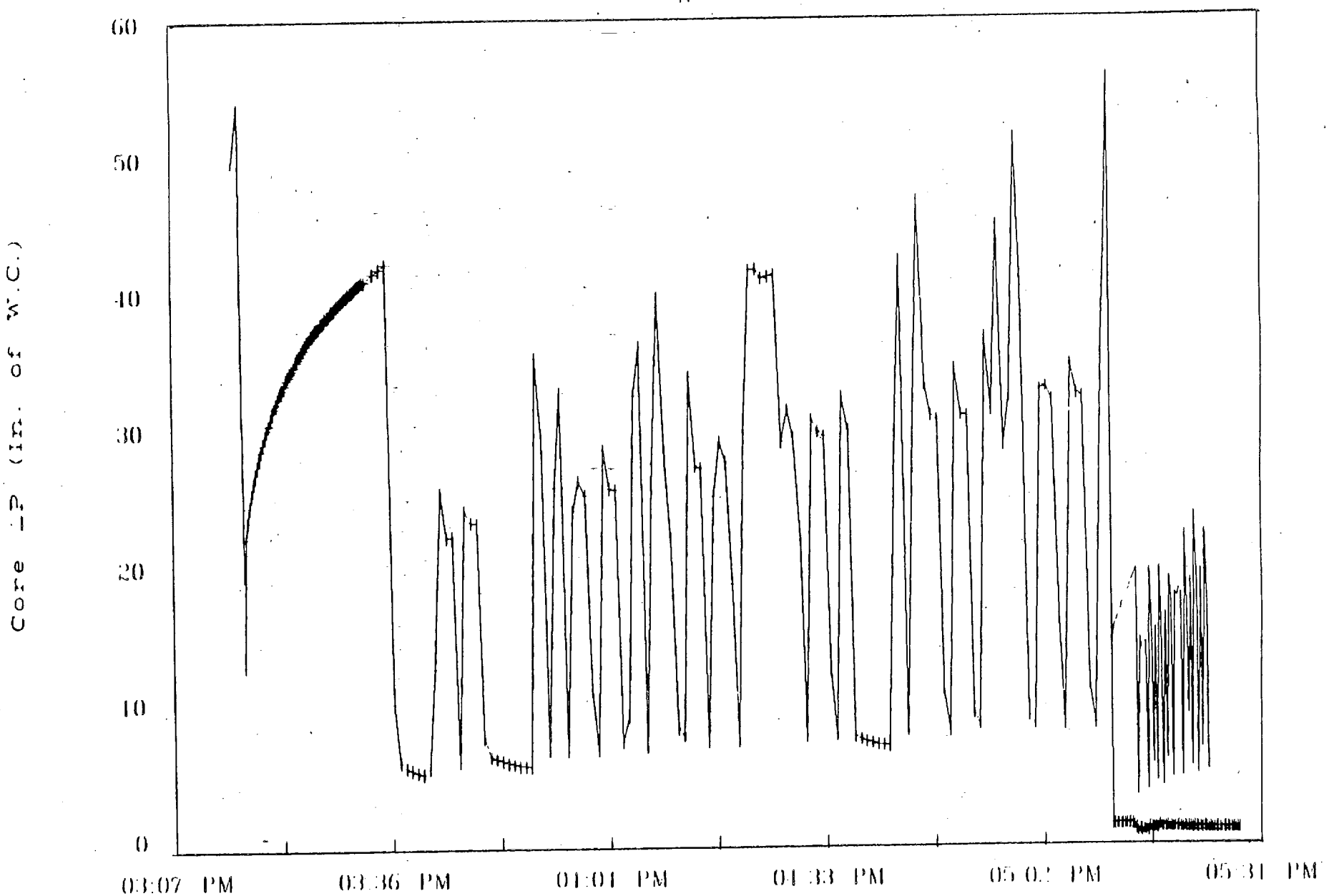
01 Aug 89



ADAPTEK LOGGING

01 Aug 89



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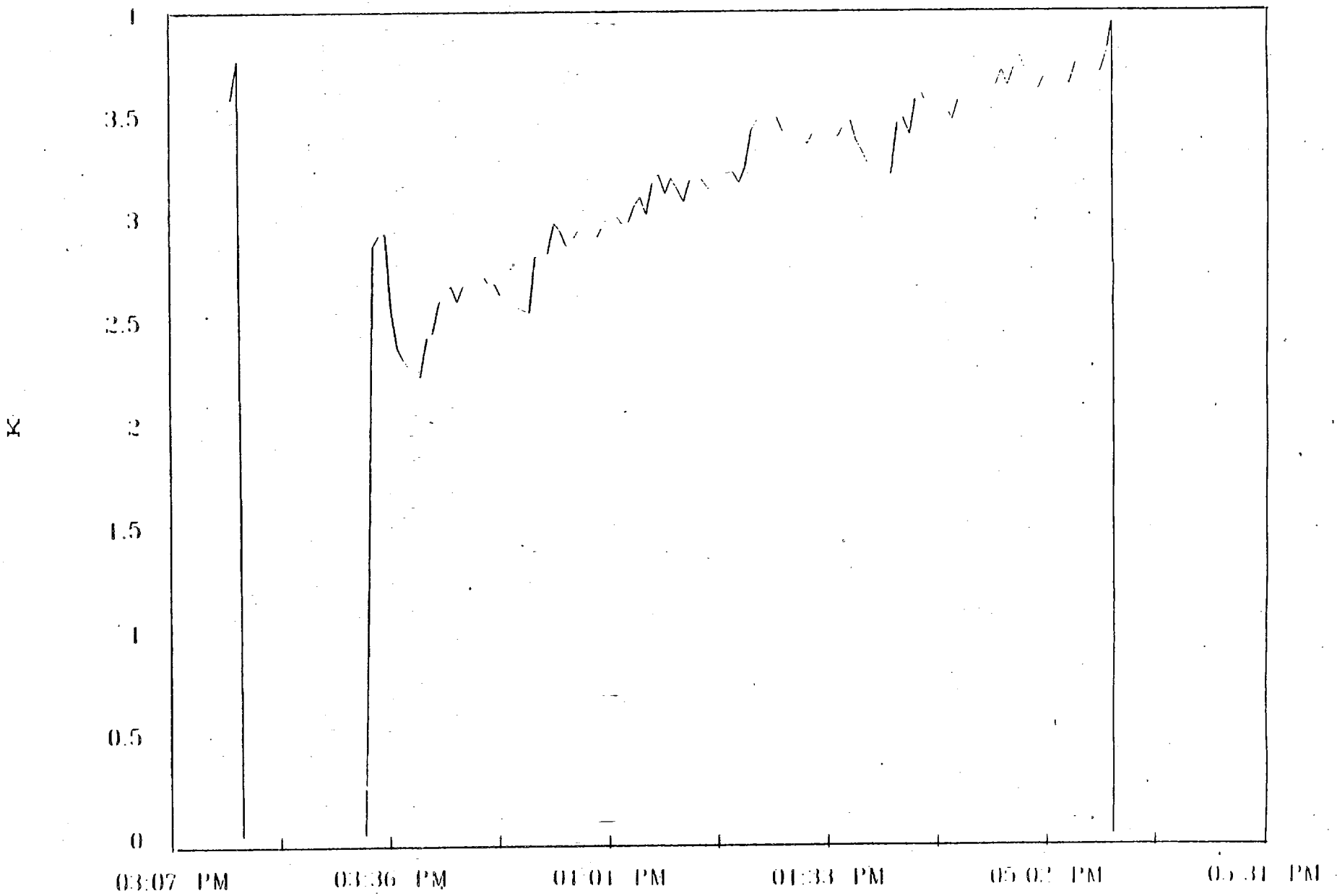

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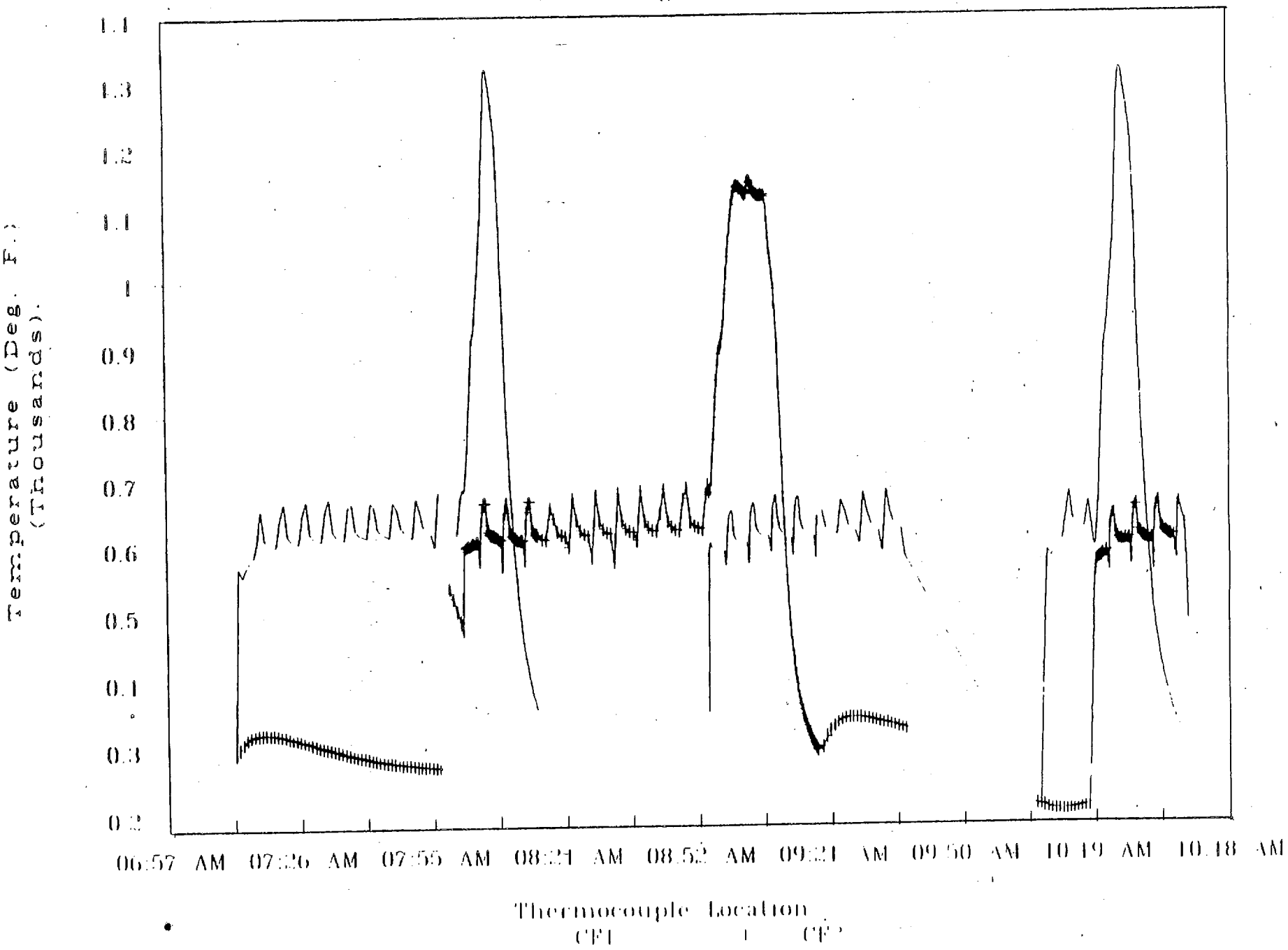
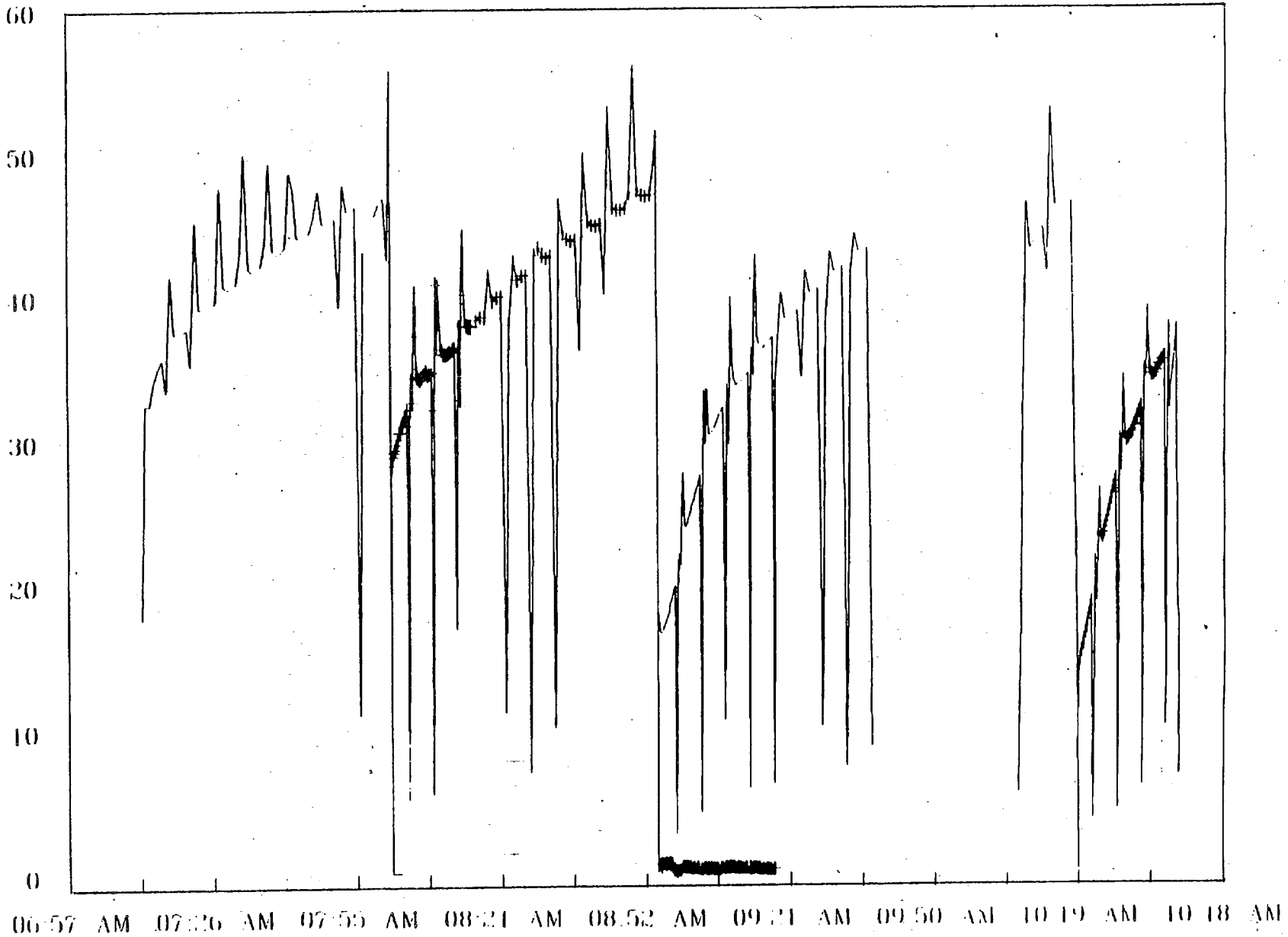


ADAPTER LOGGING

-02 Aug 89



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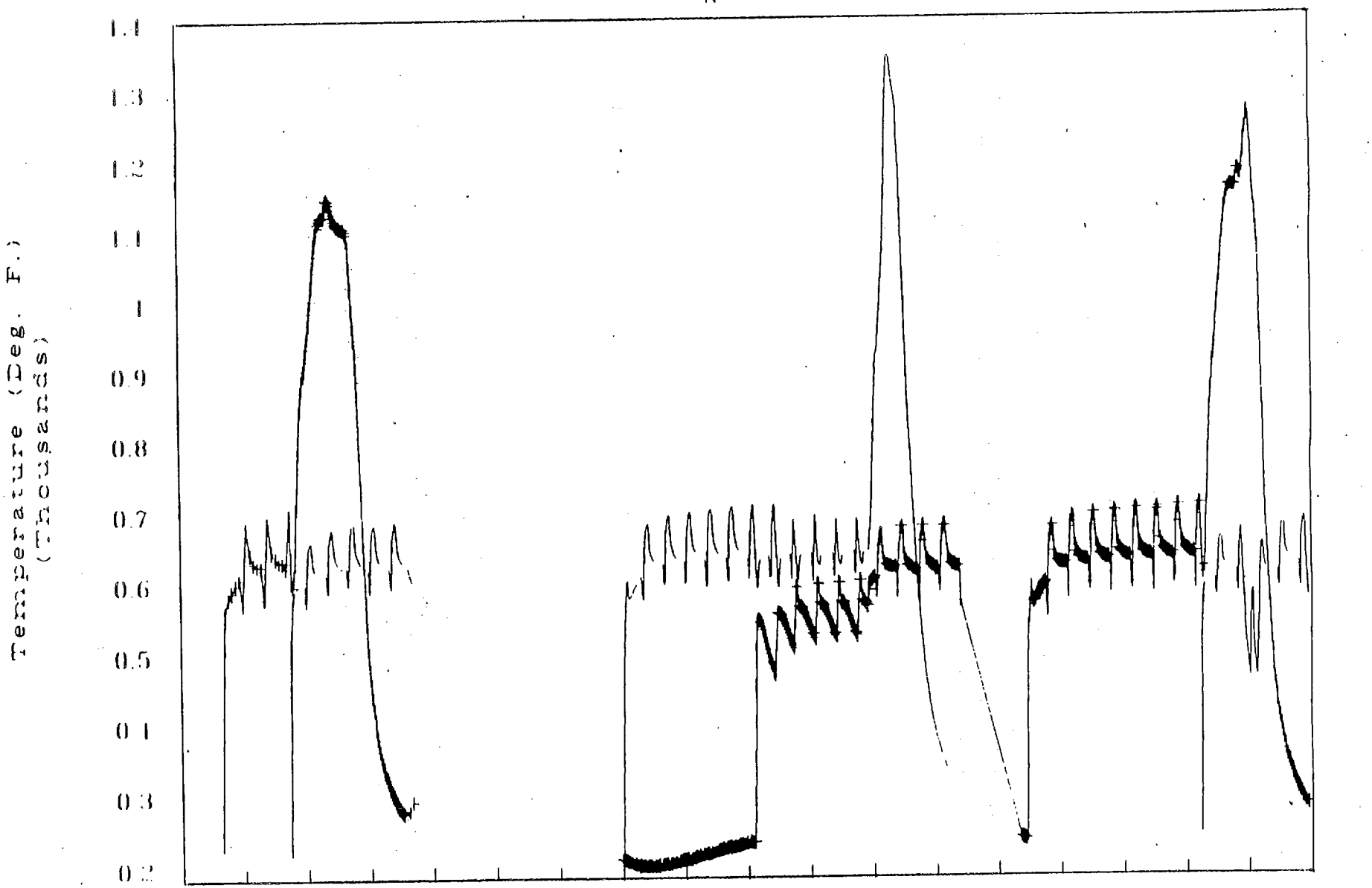
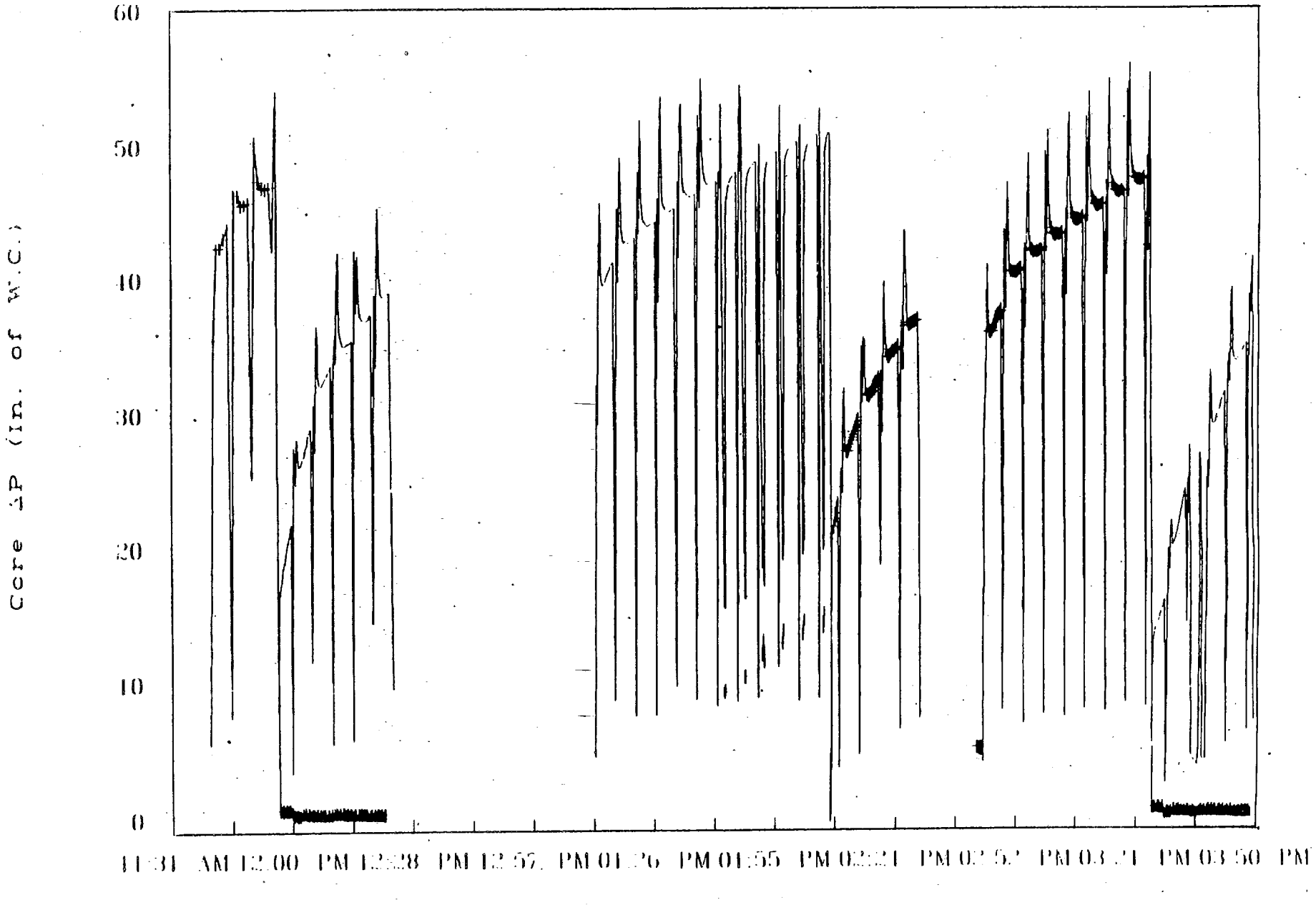


ADAPTEL LOGGING

02 Aug 89



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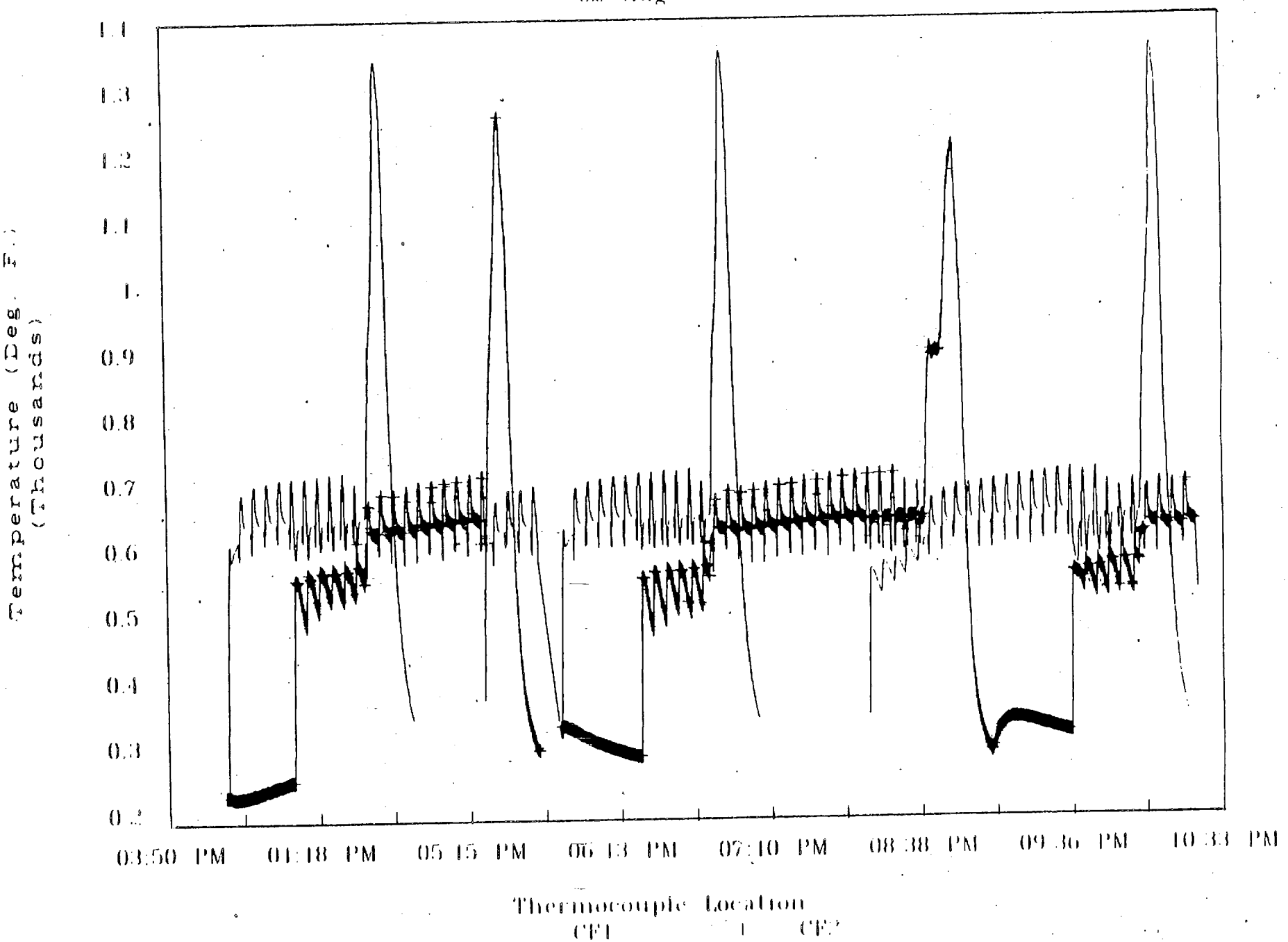
02 Aug 89



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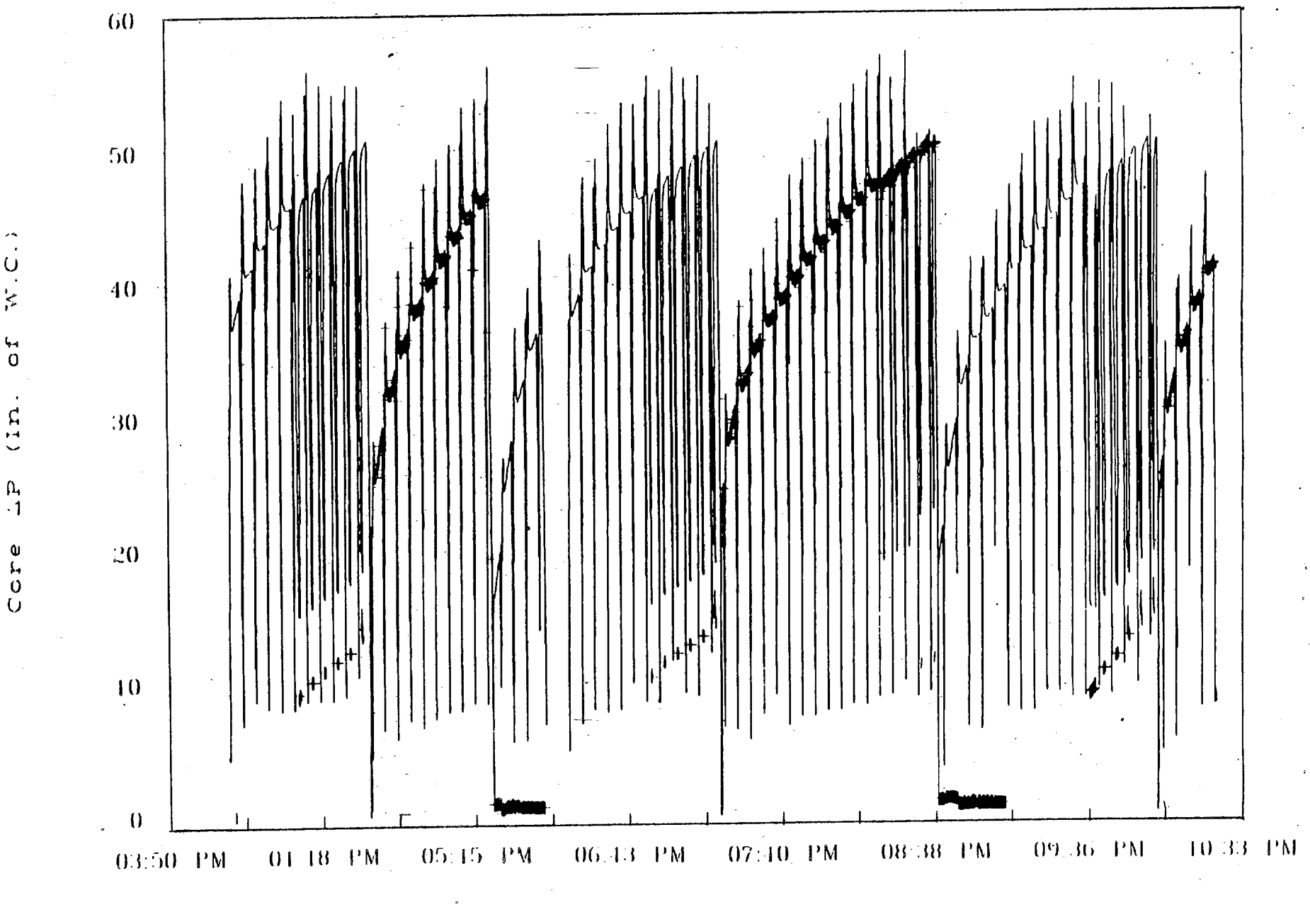

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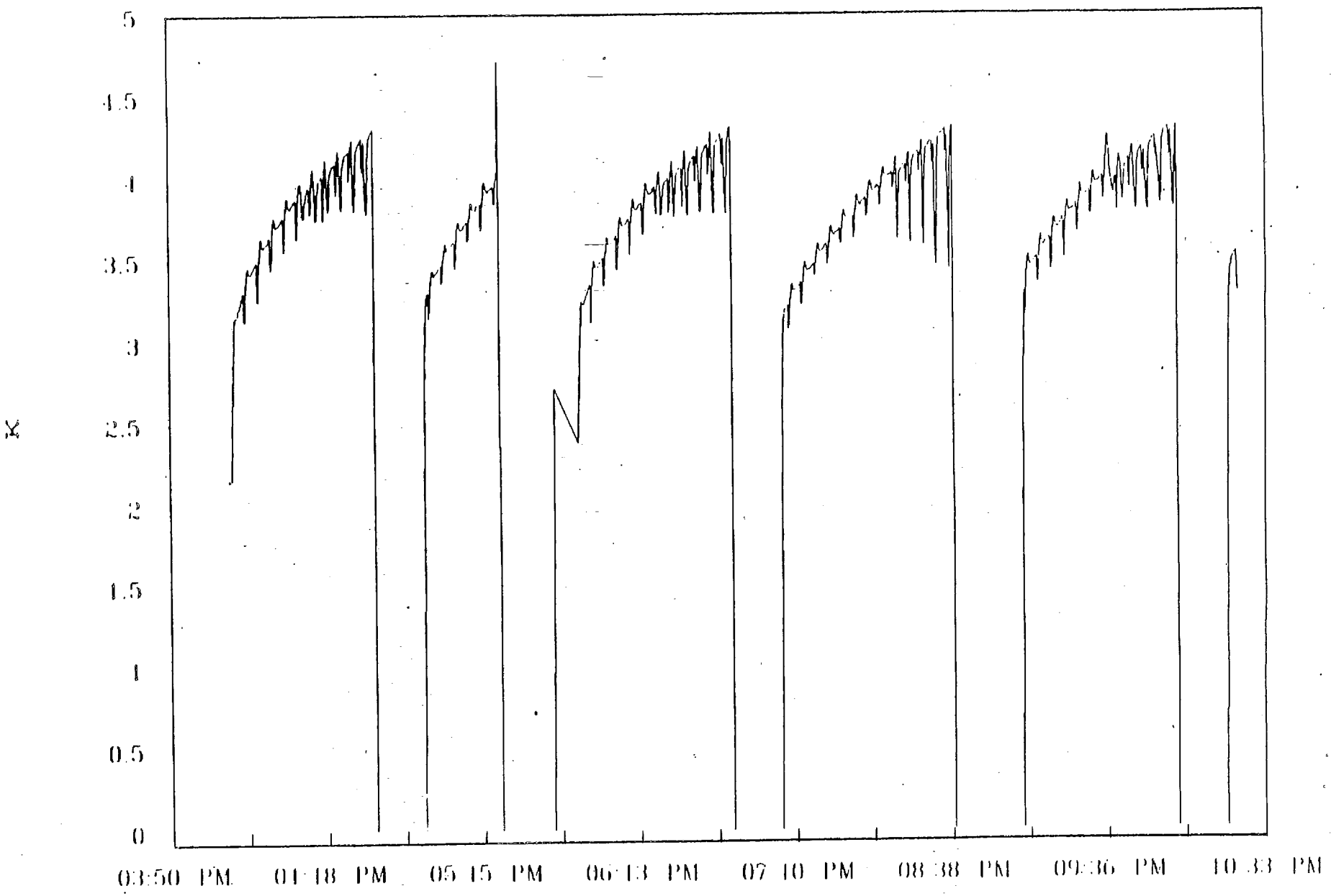

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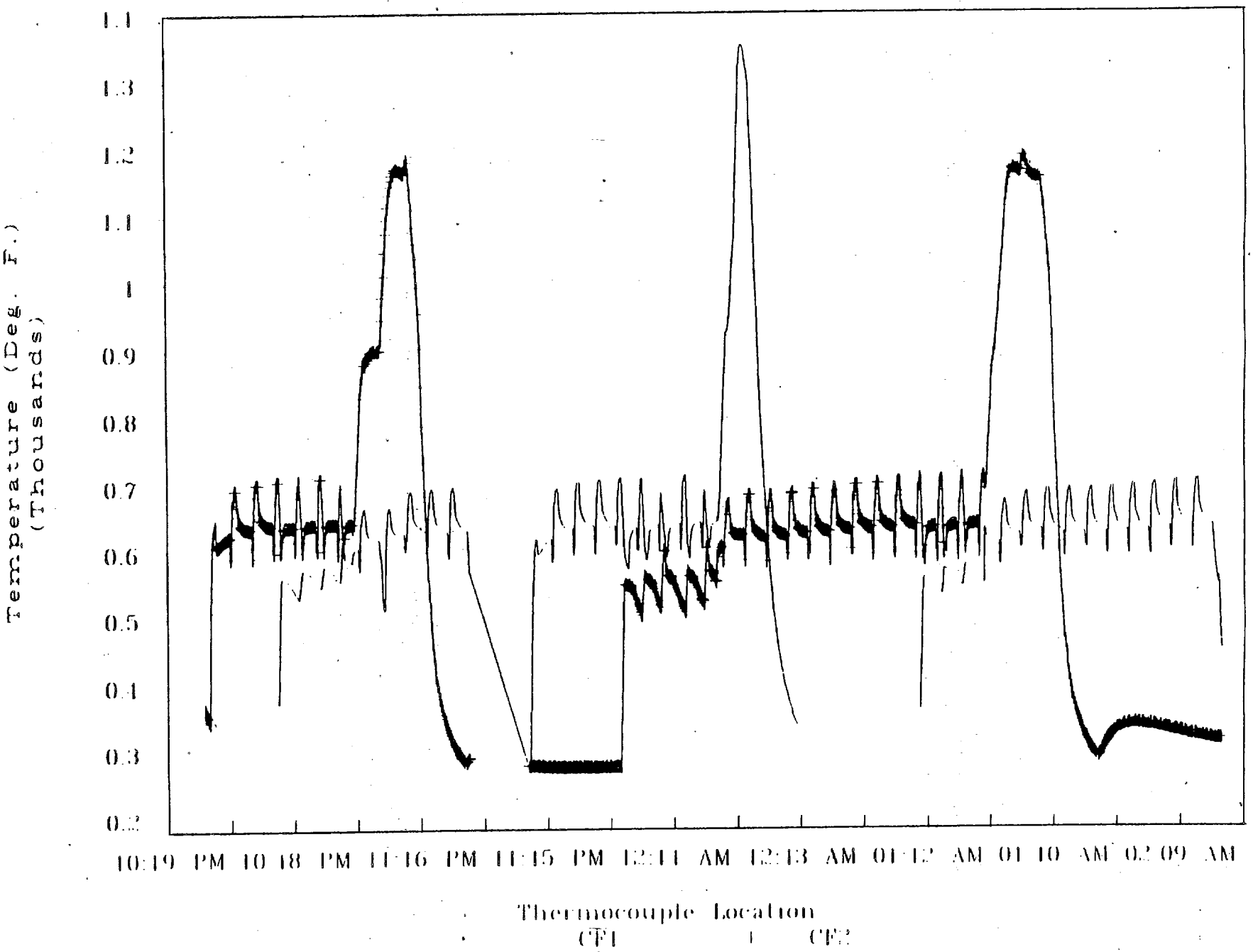
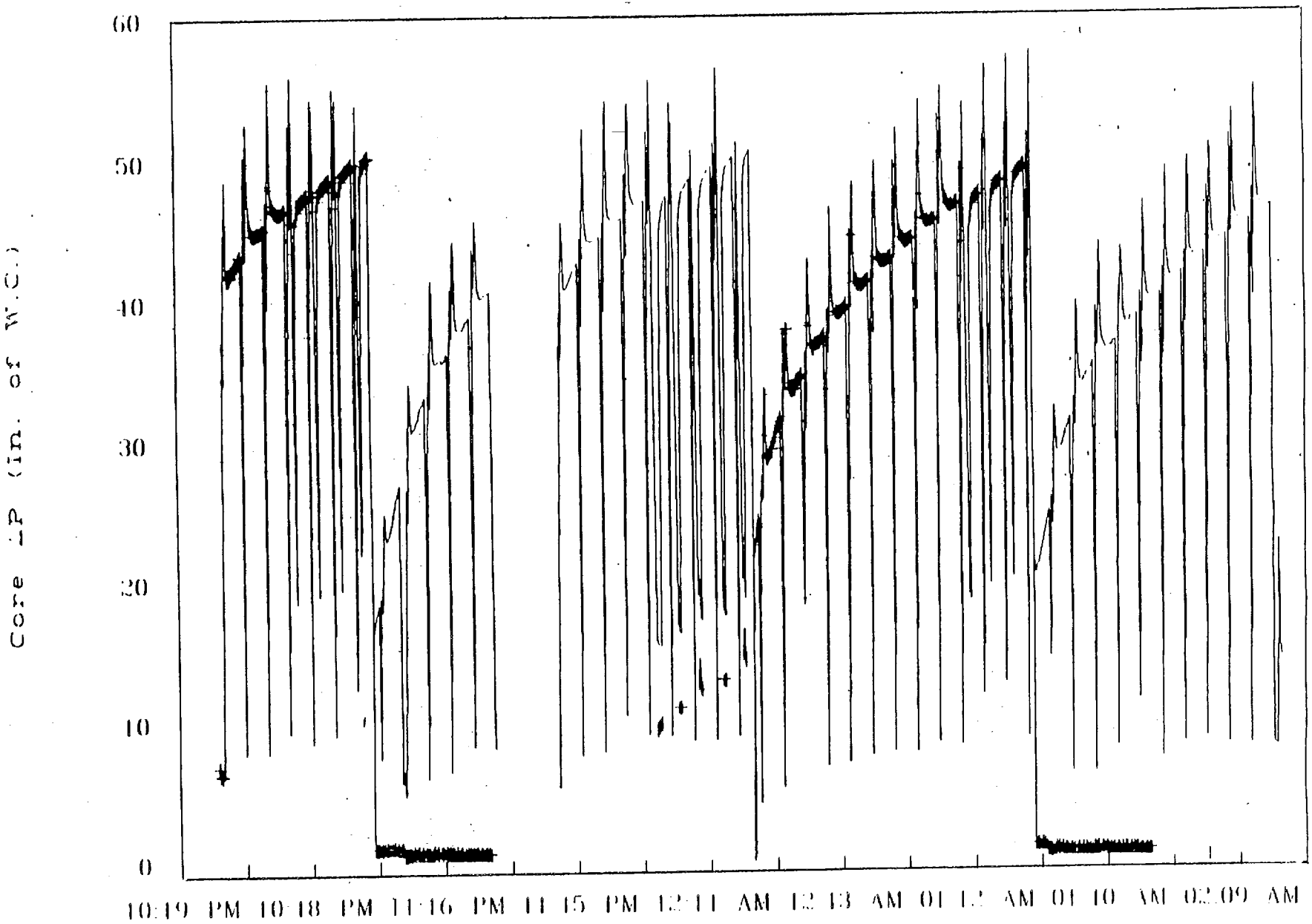


ADATEL LOGGING

02 Aug 89.



Trap 1 Trap 2

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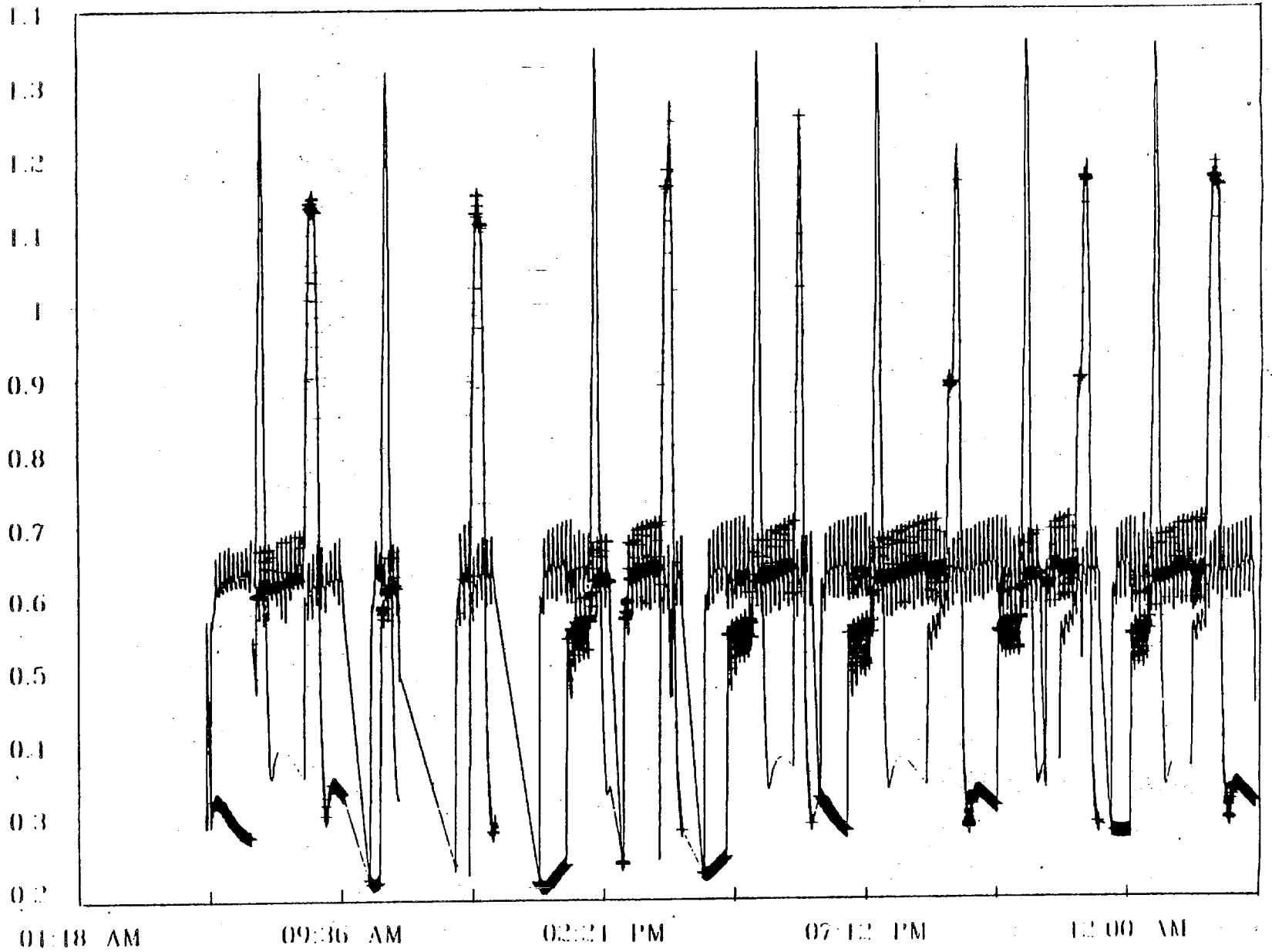

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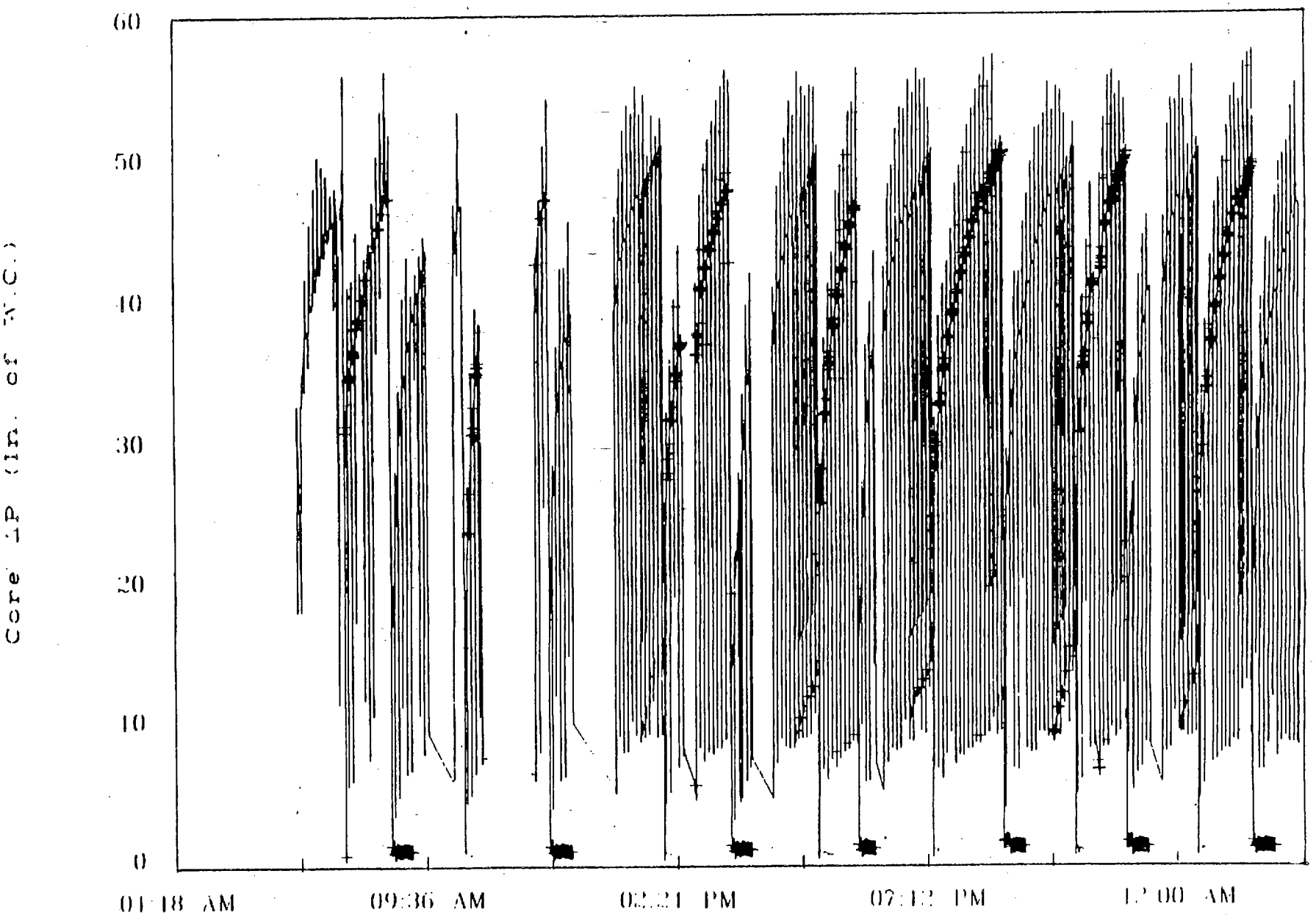

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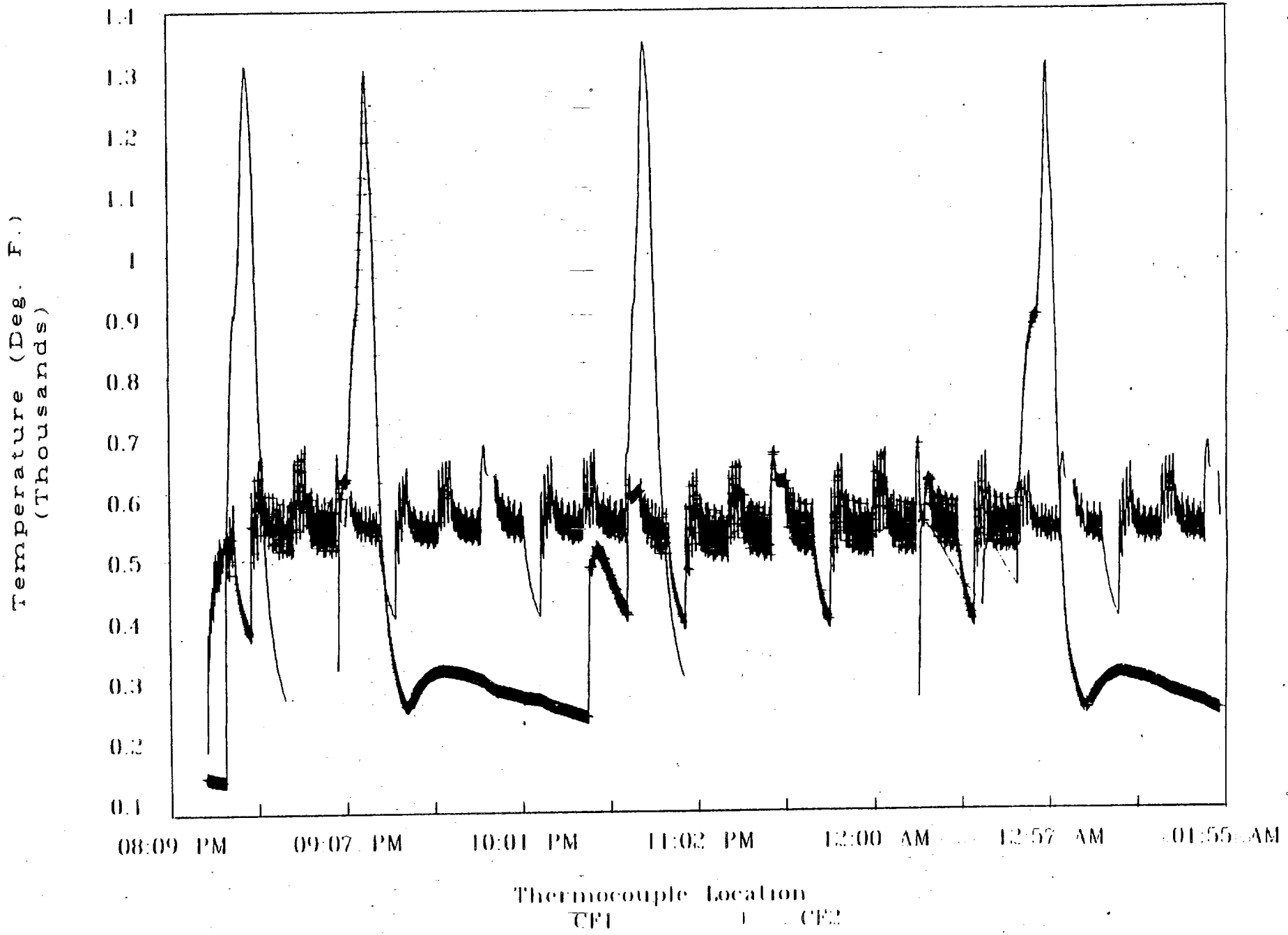

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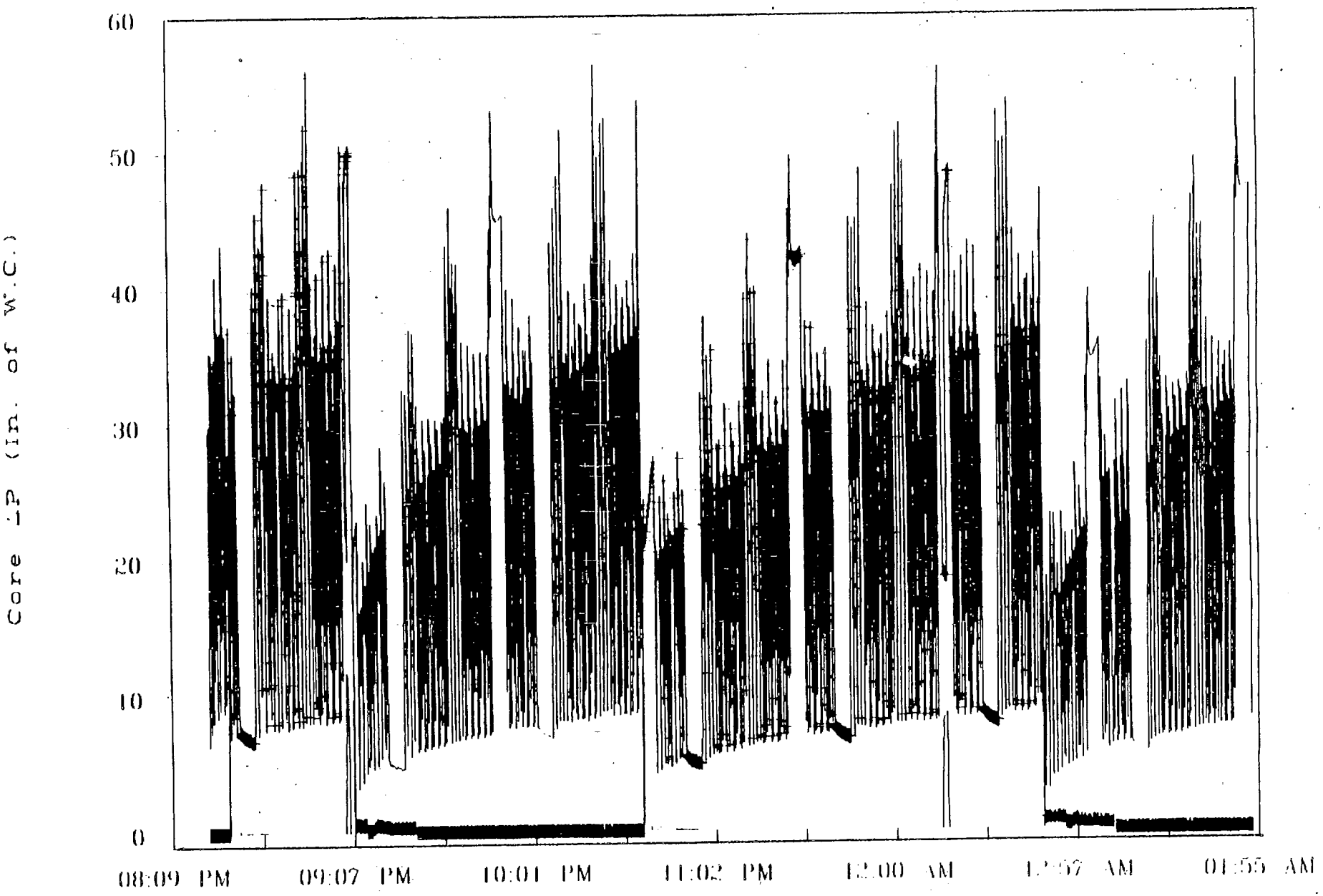

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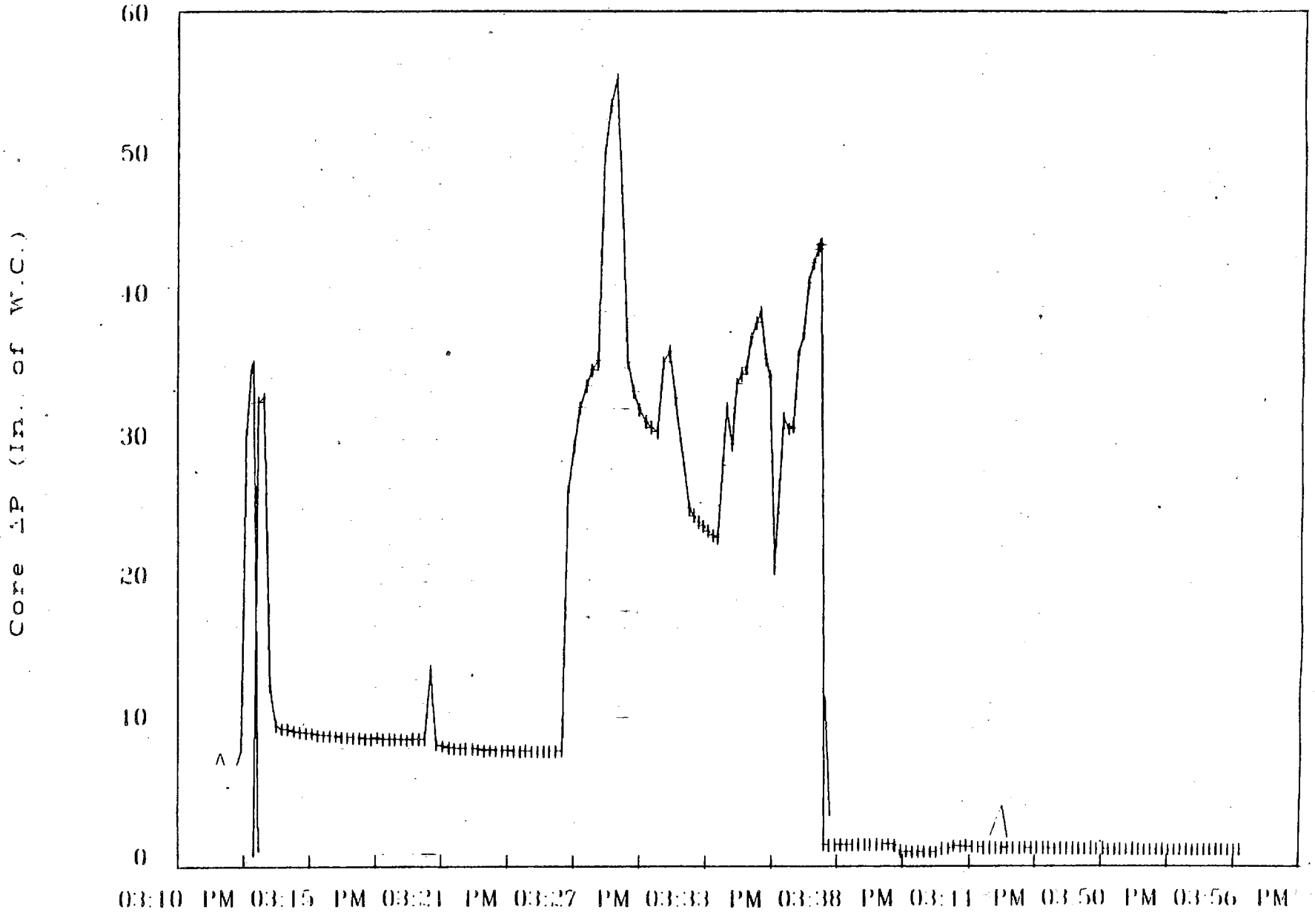

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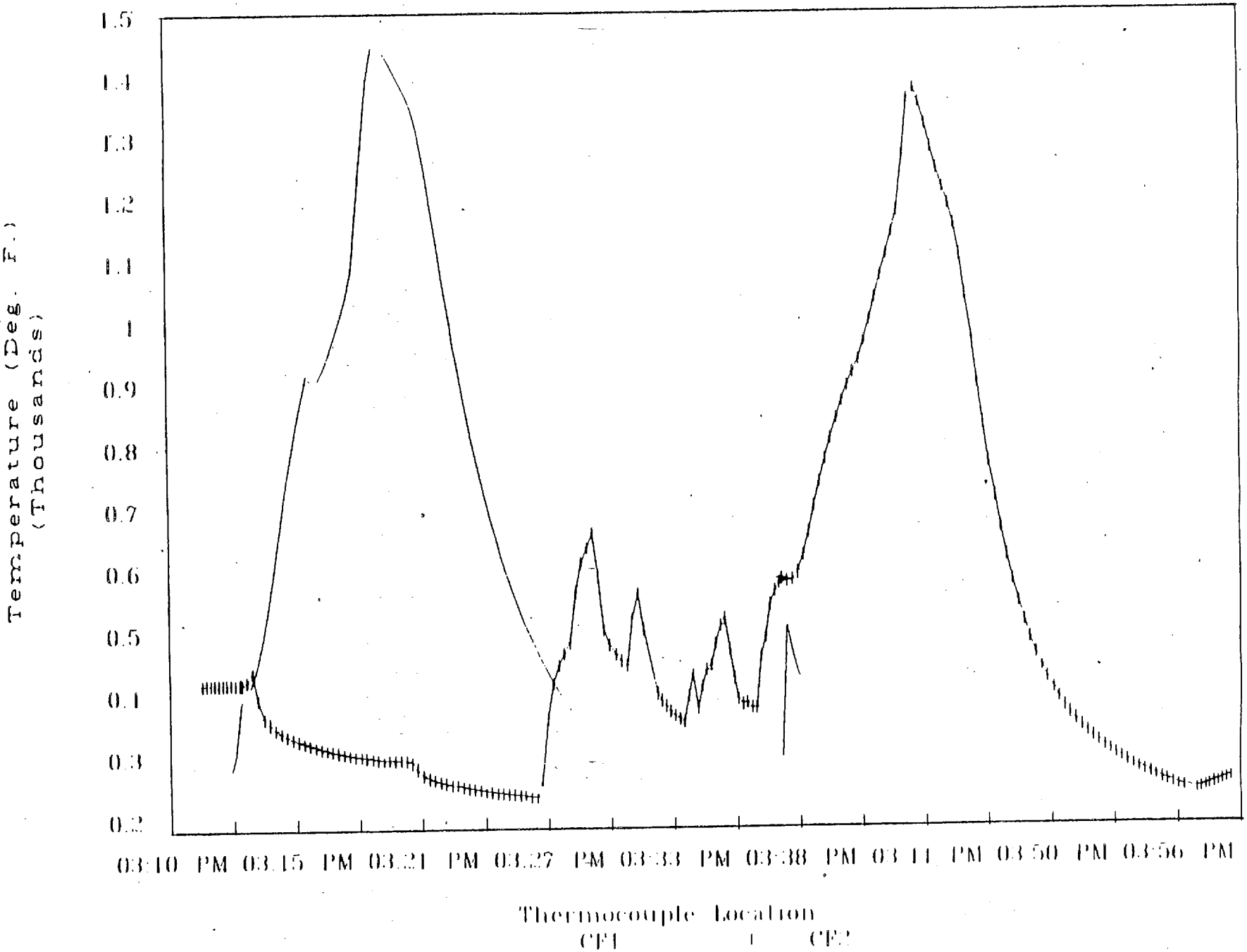

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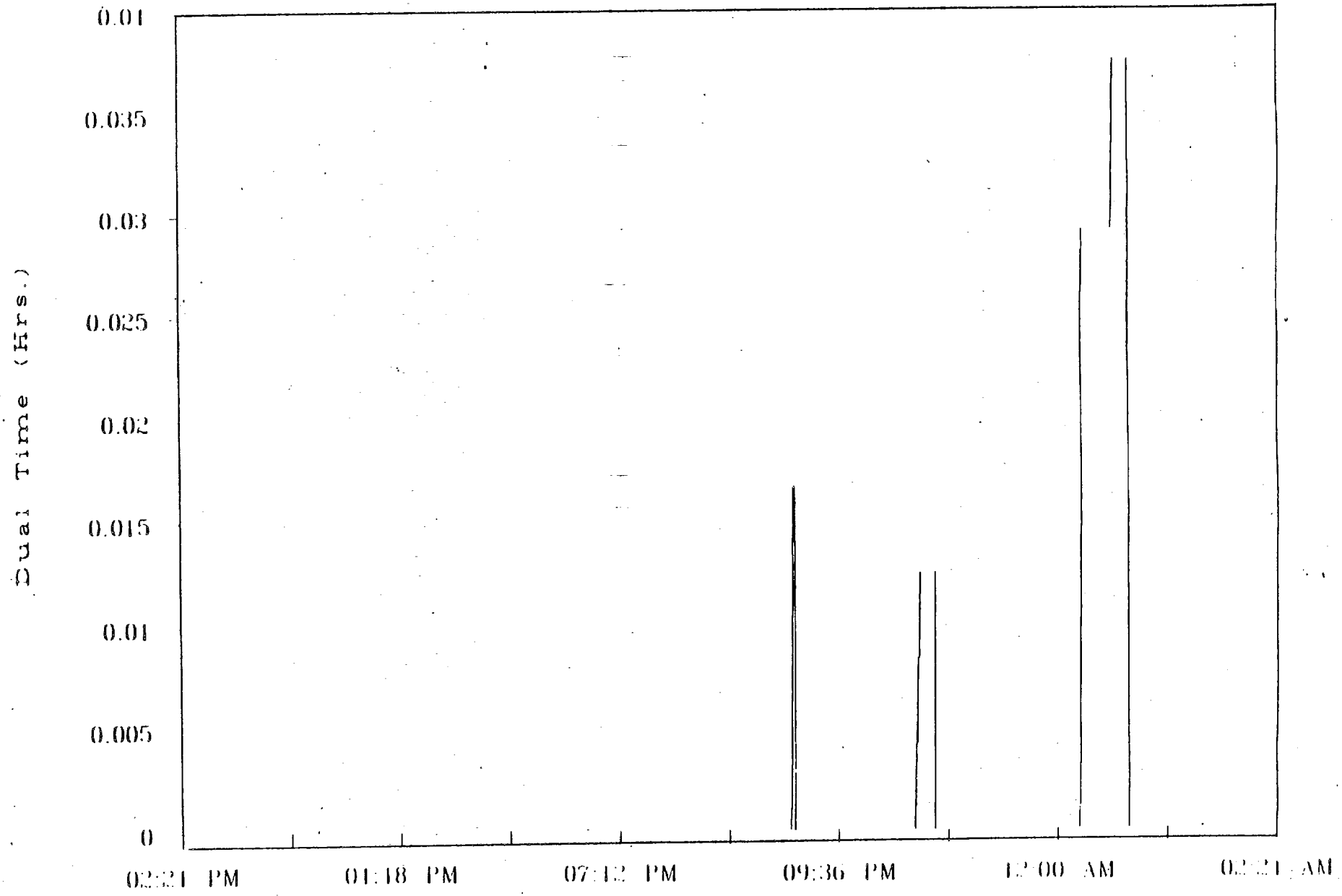

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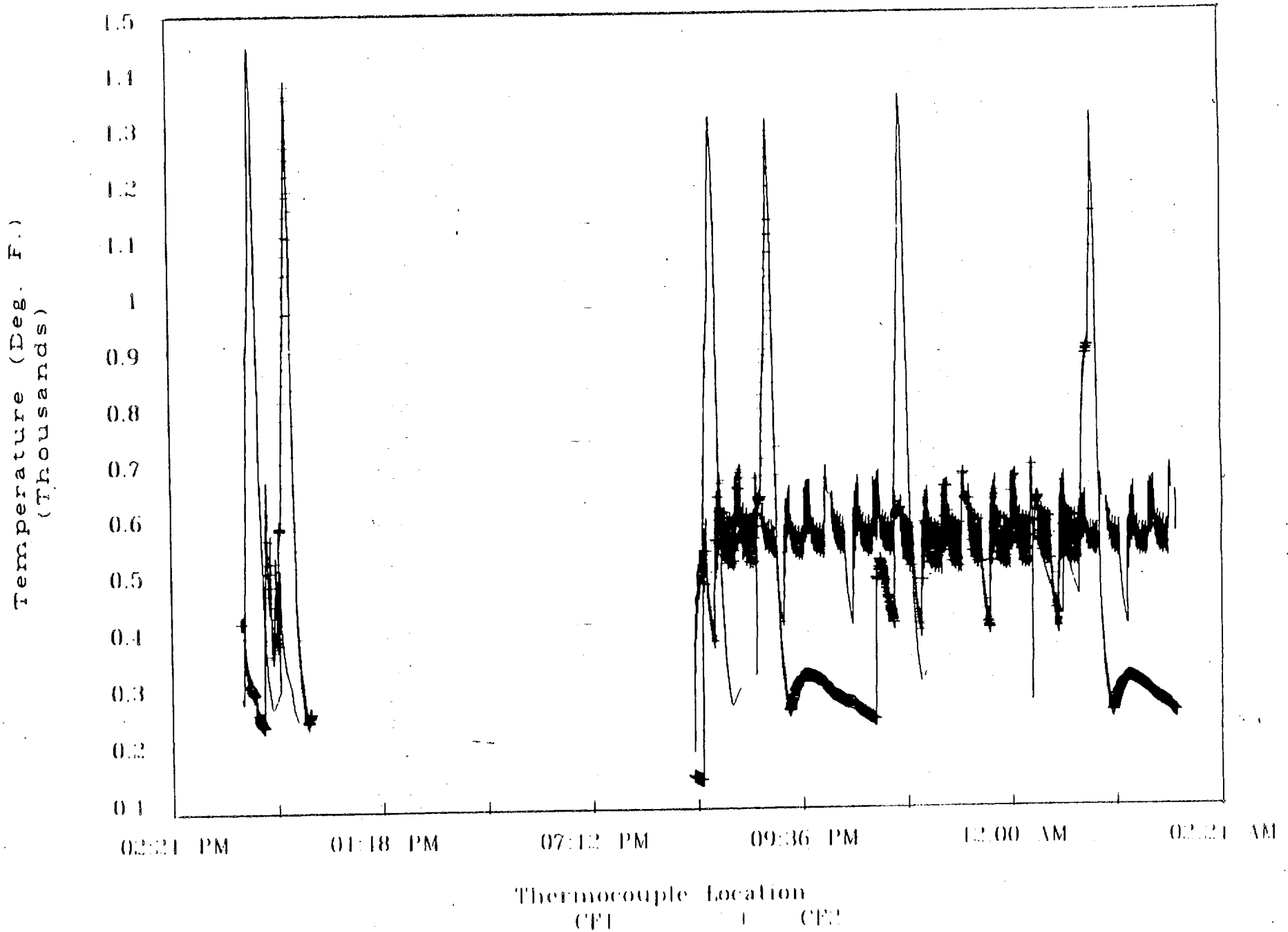

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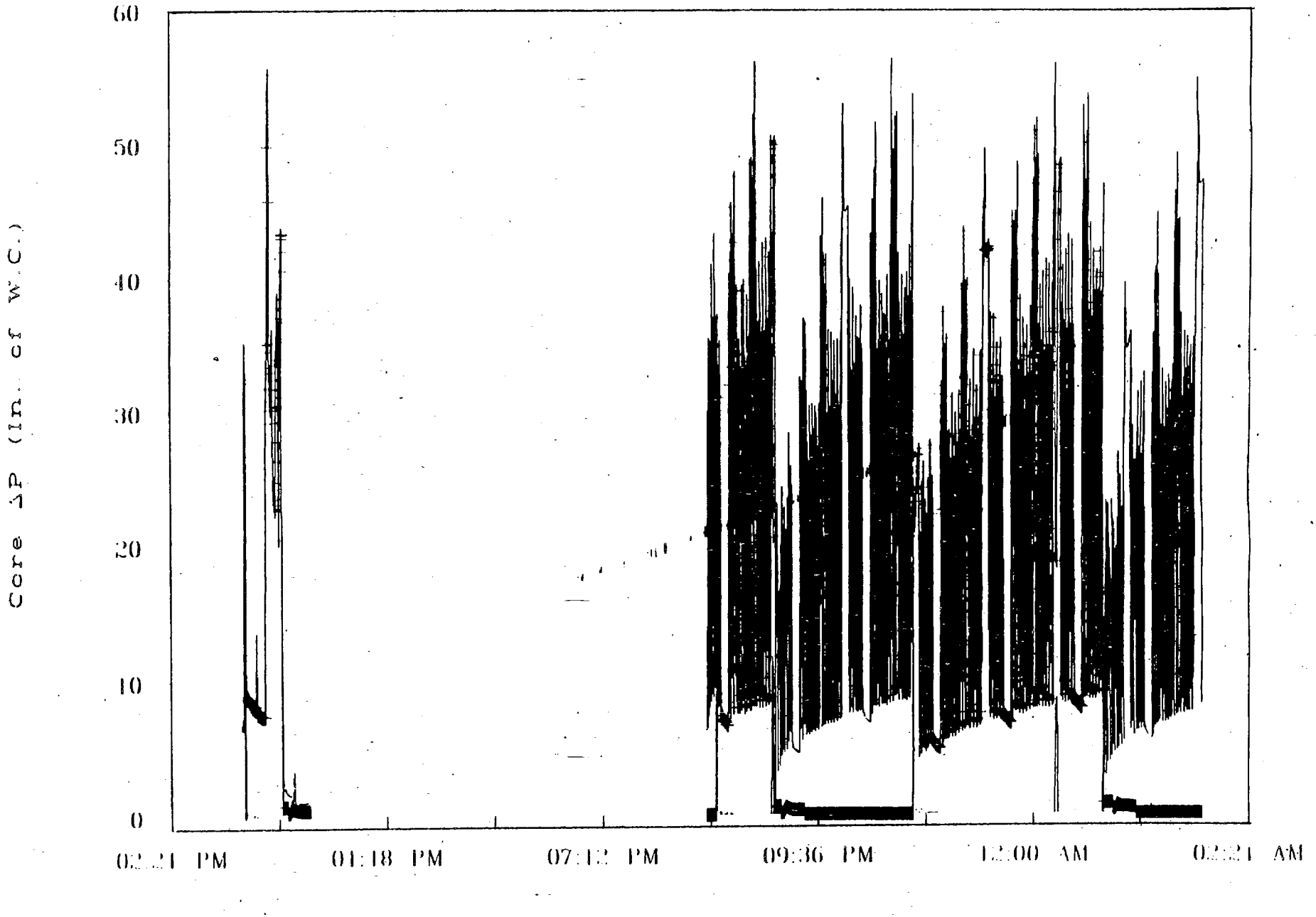

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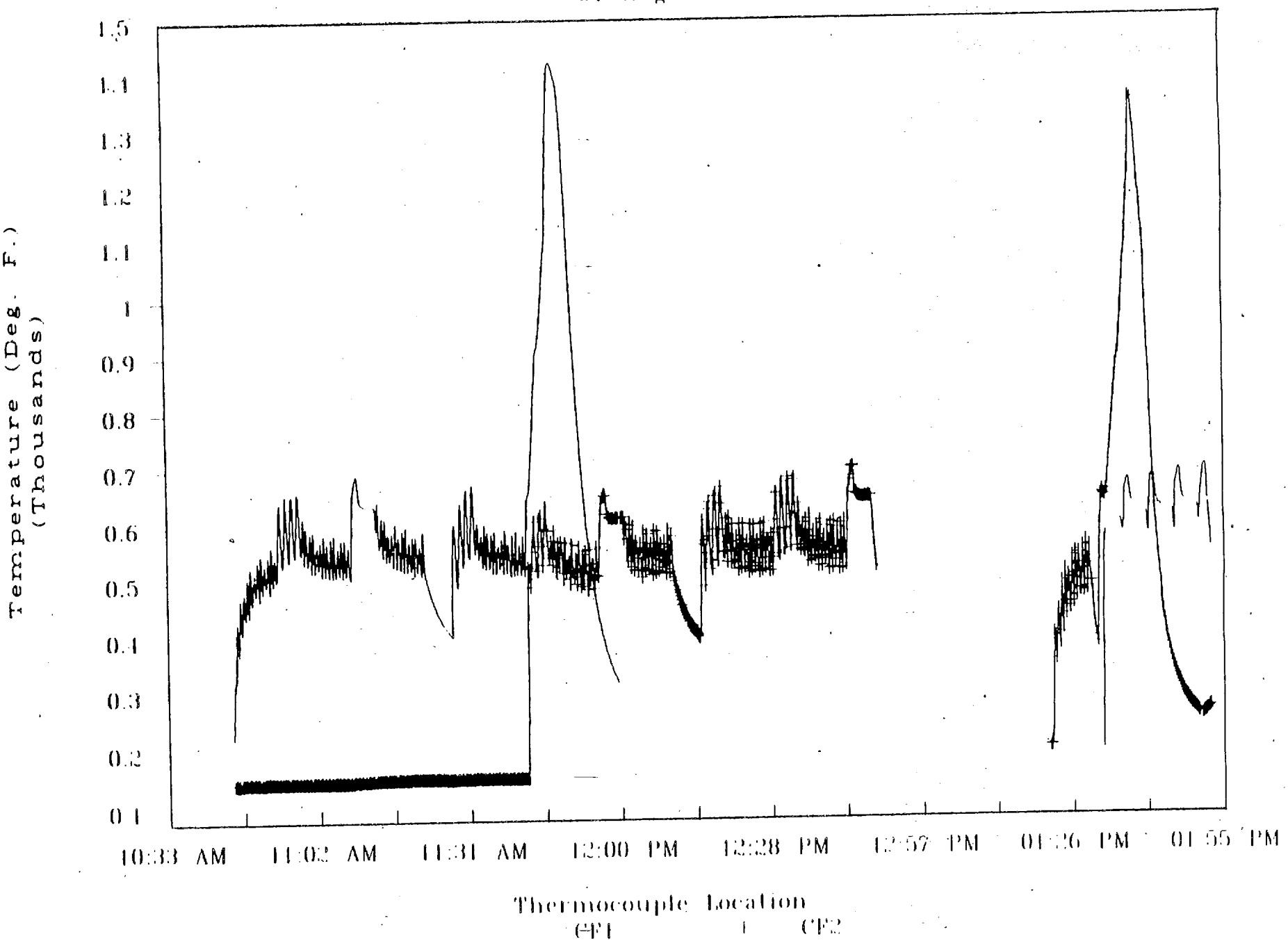

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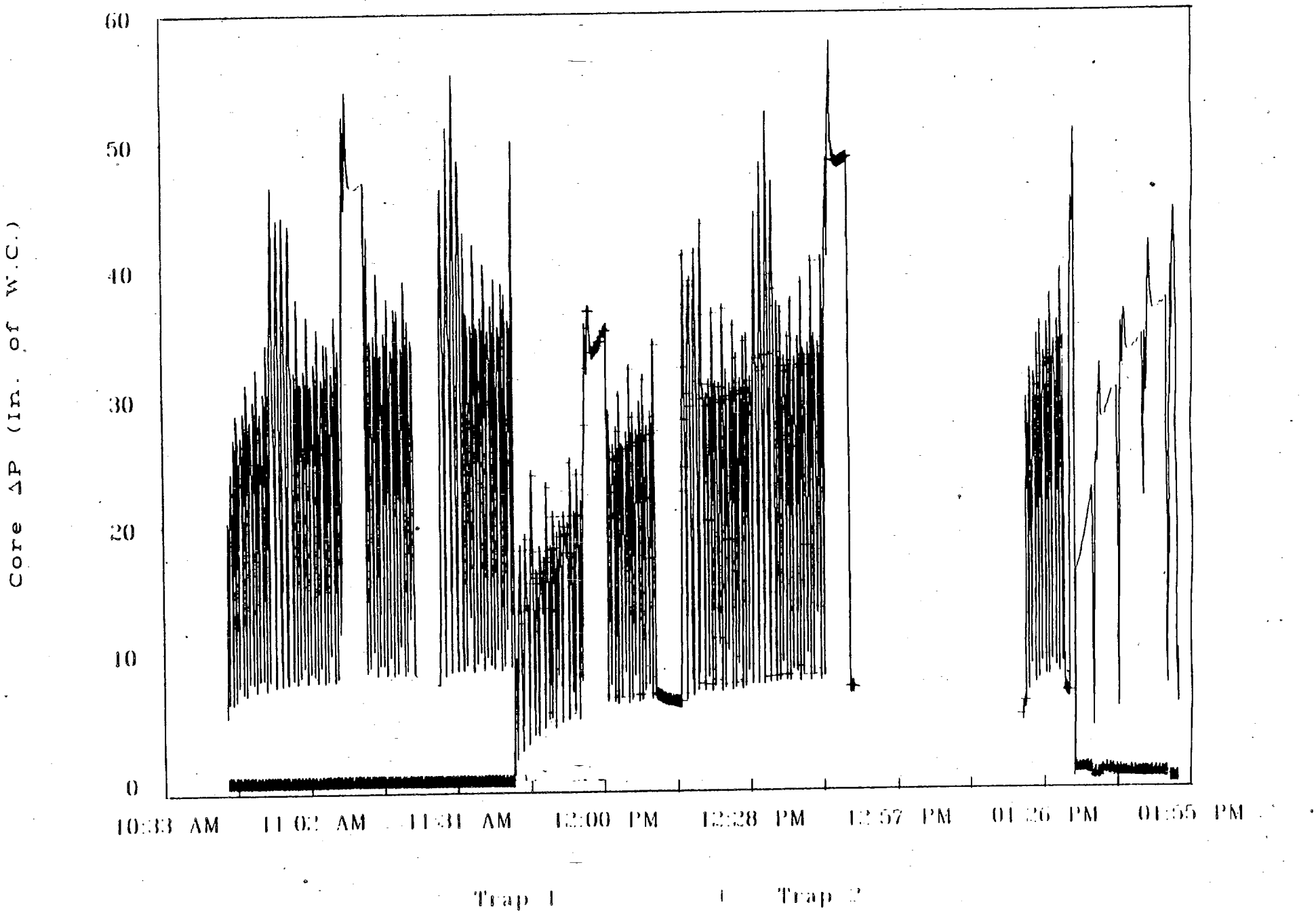

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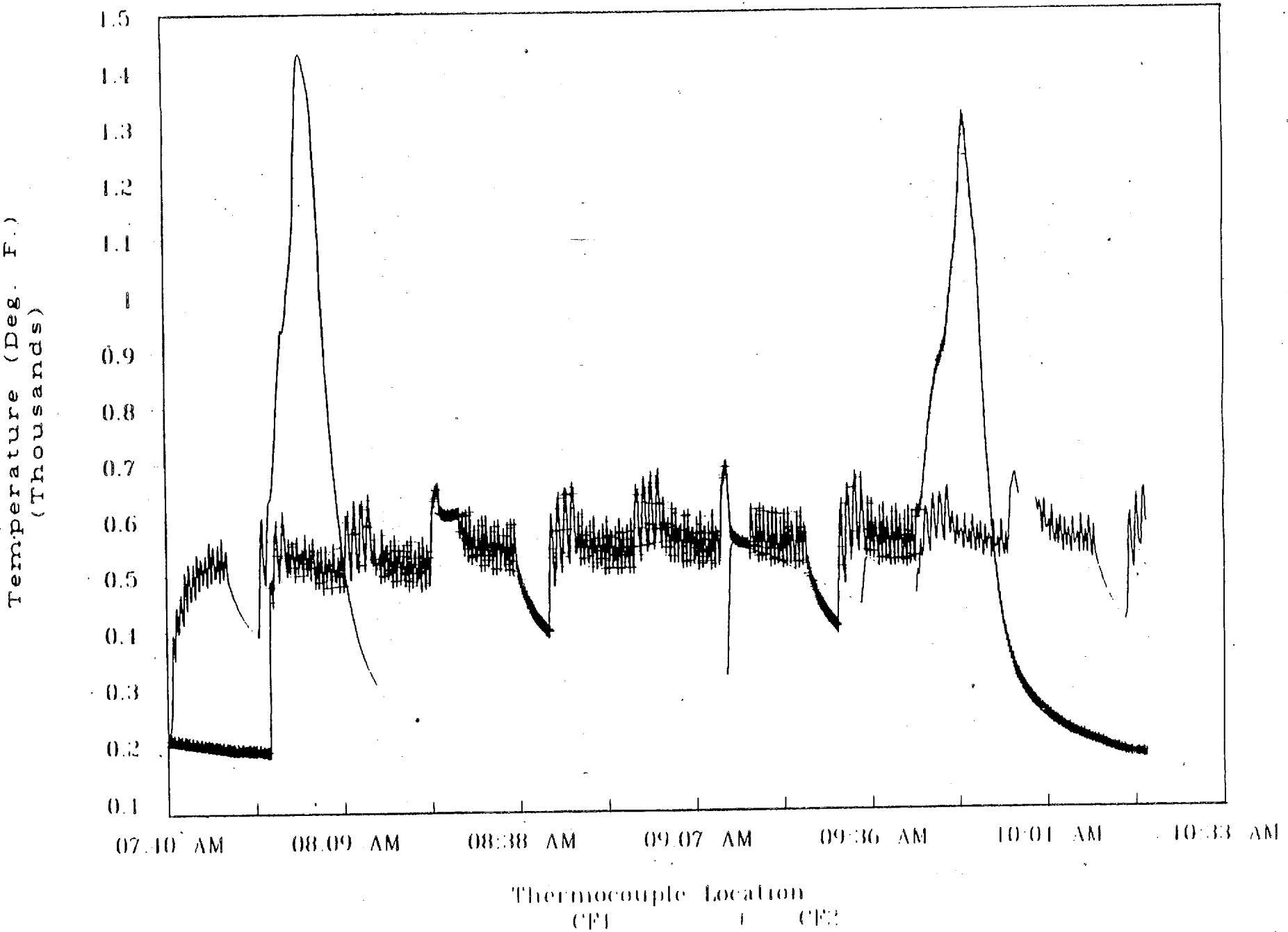

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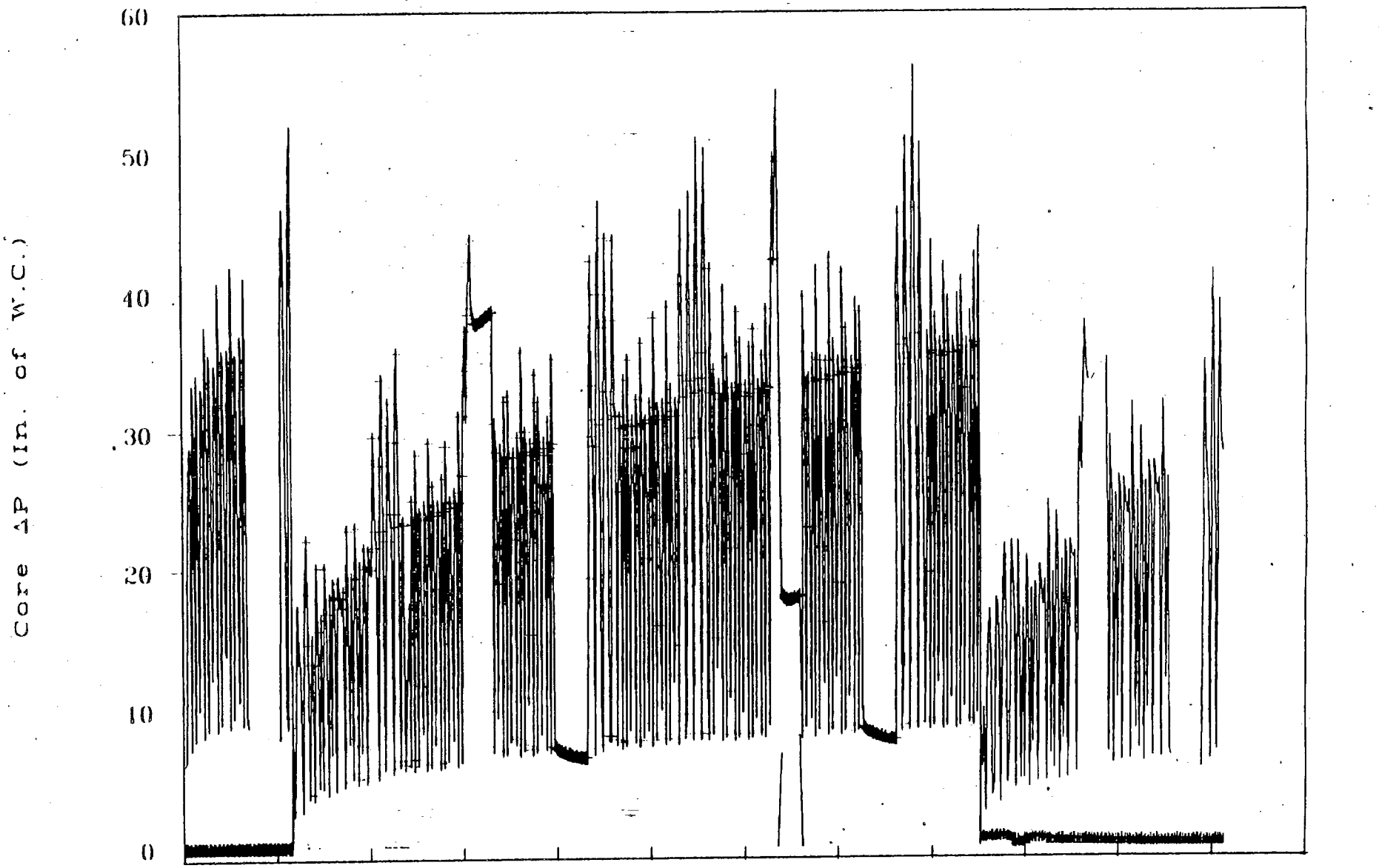

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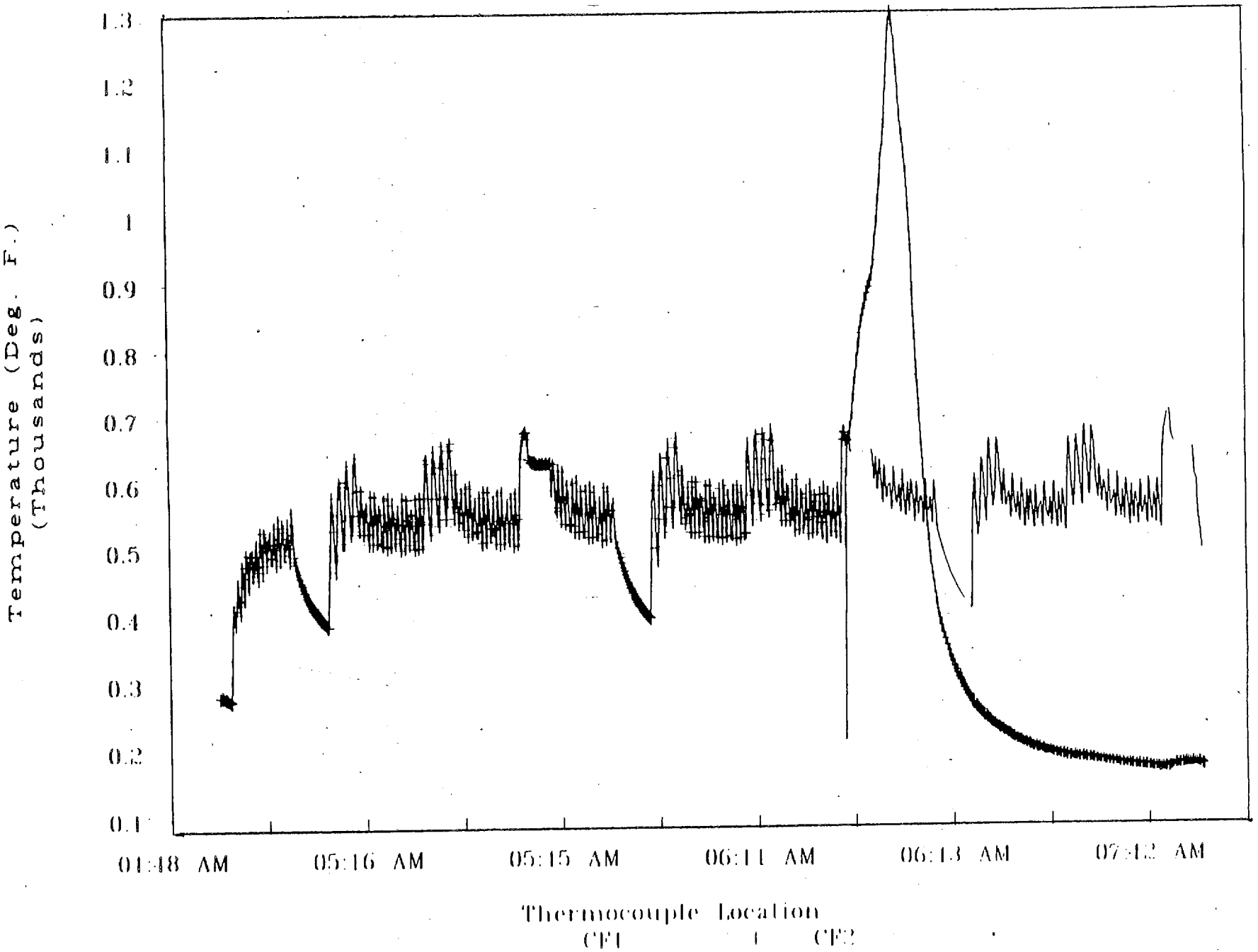

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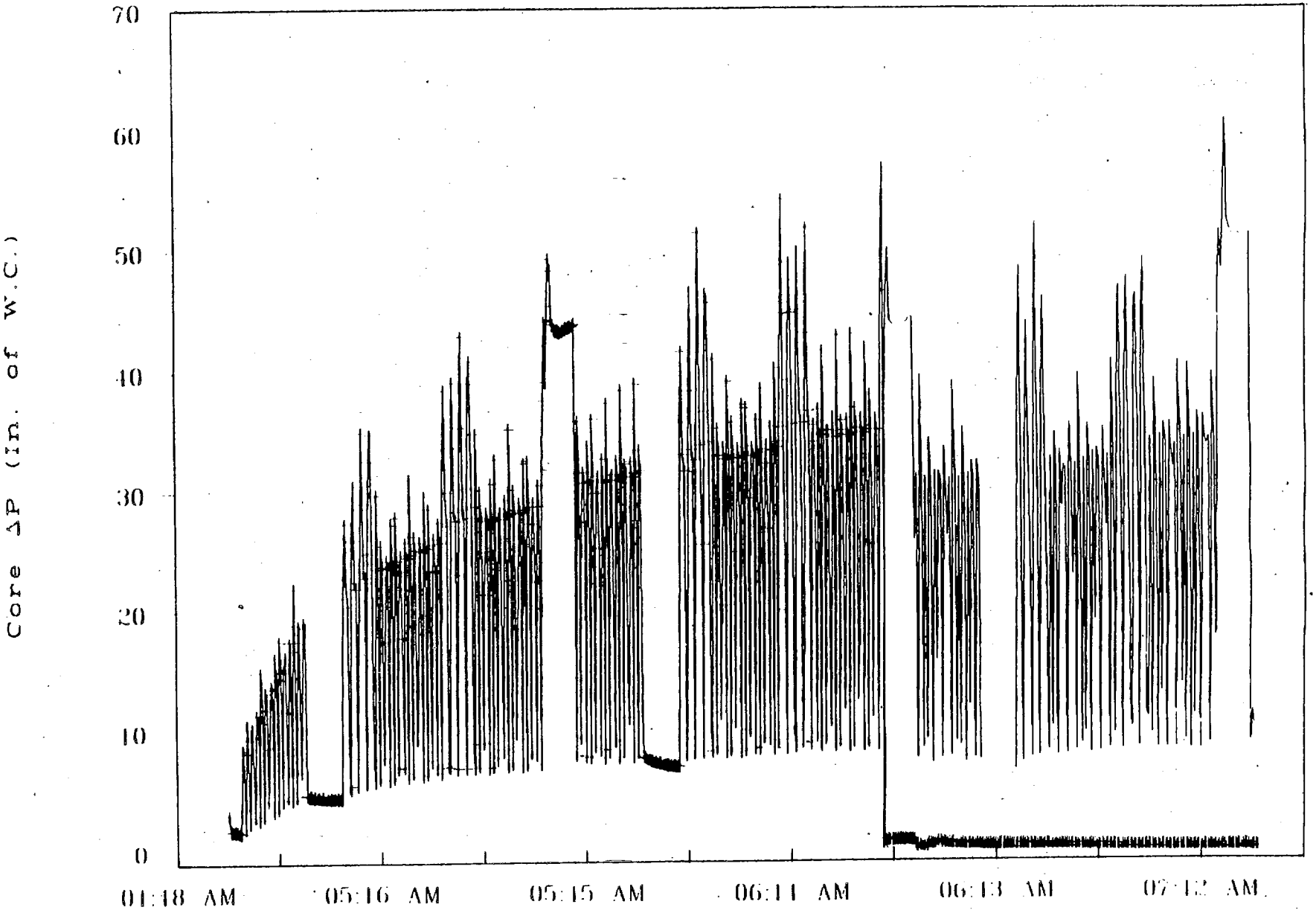

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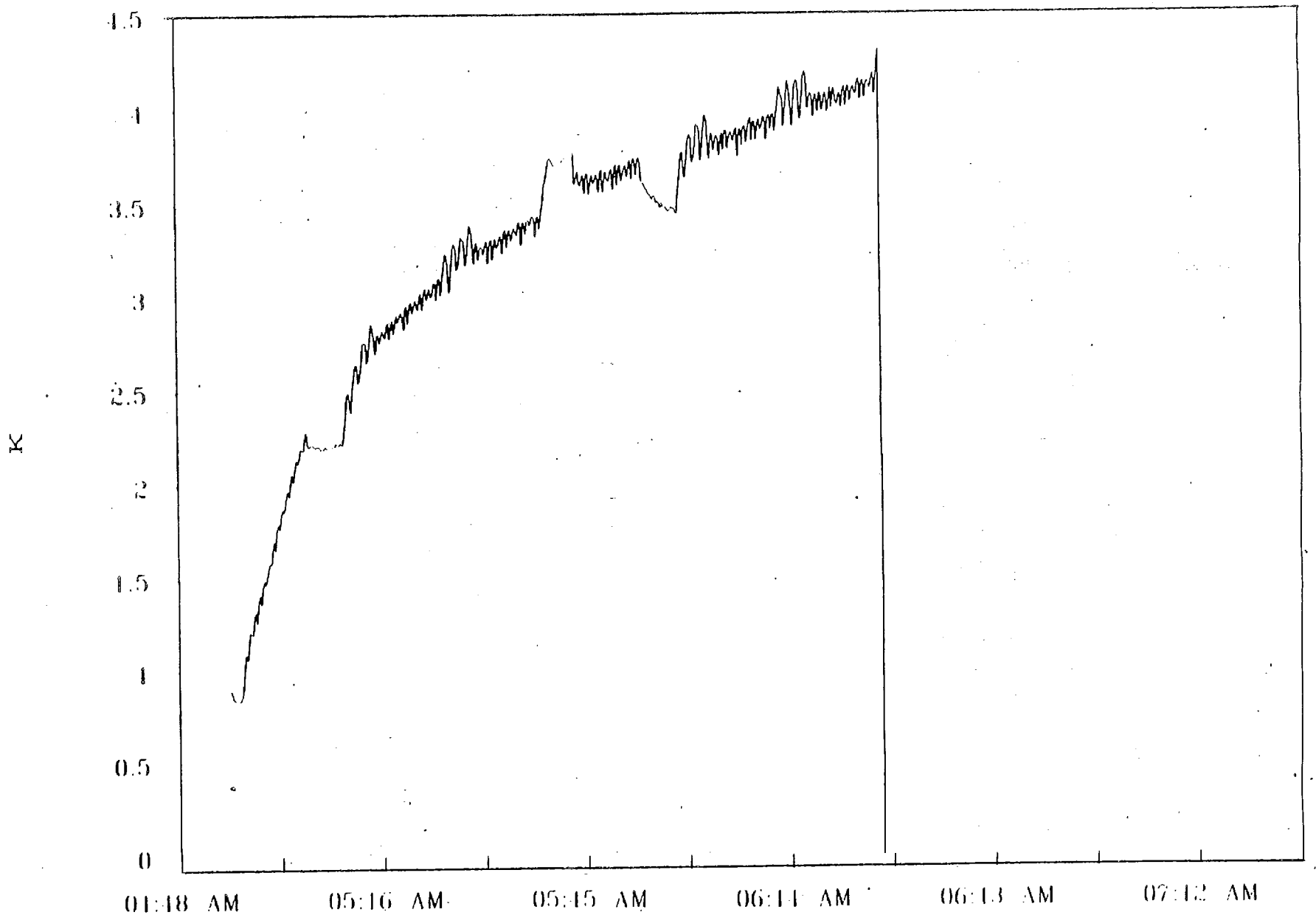

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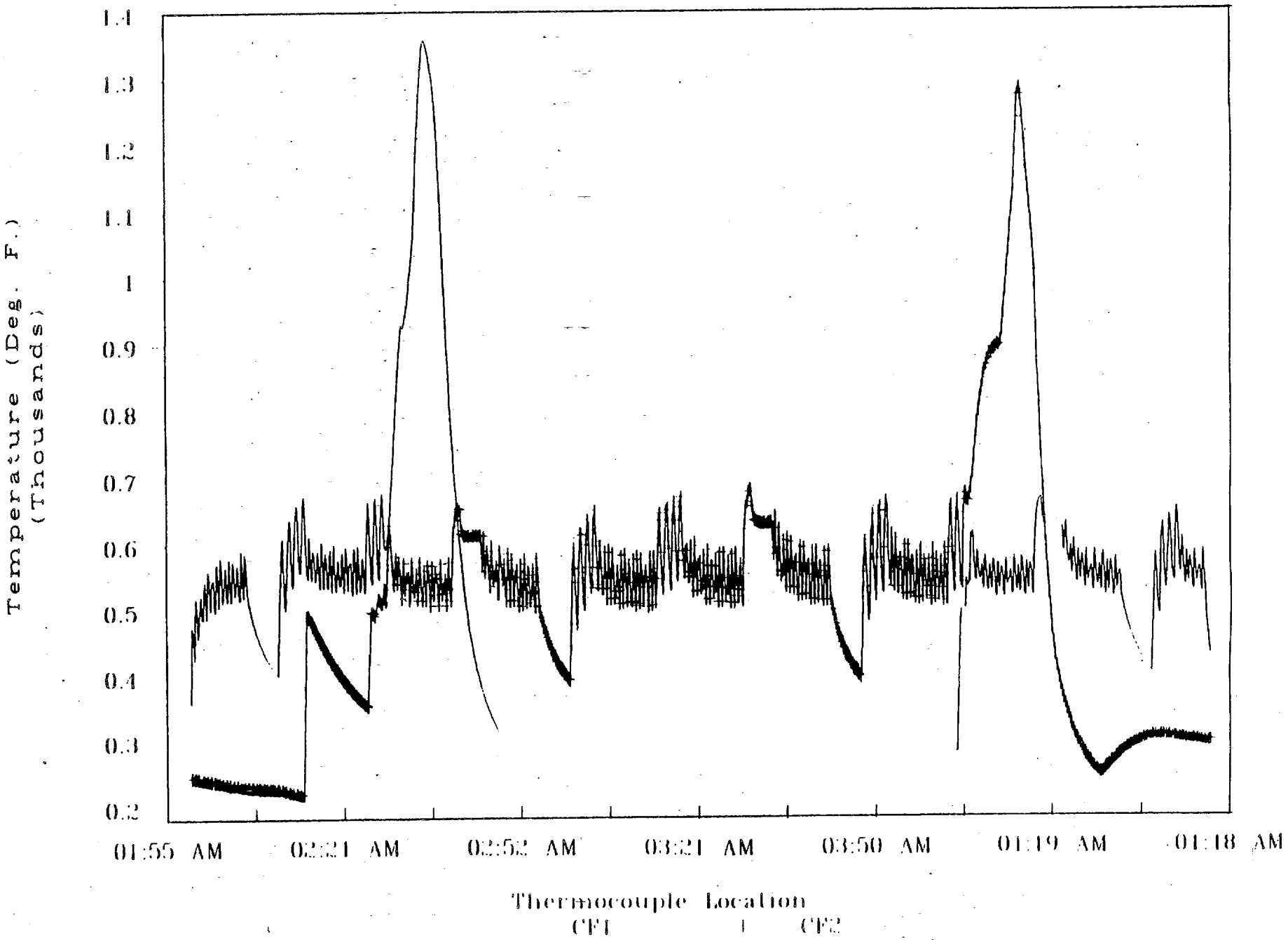

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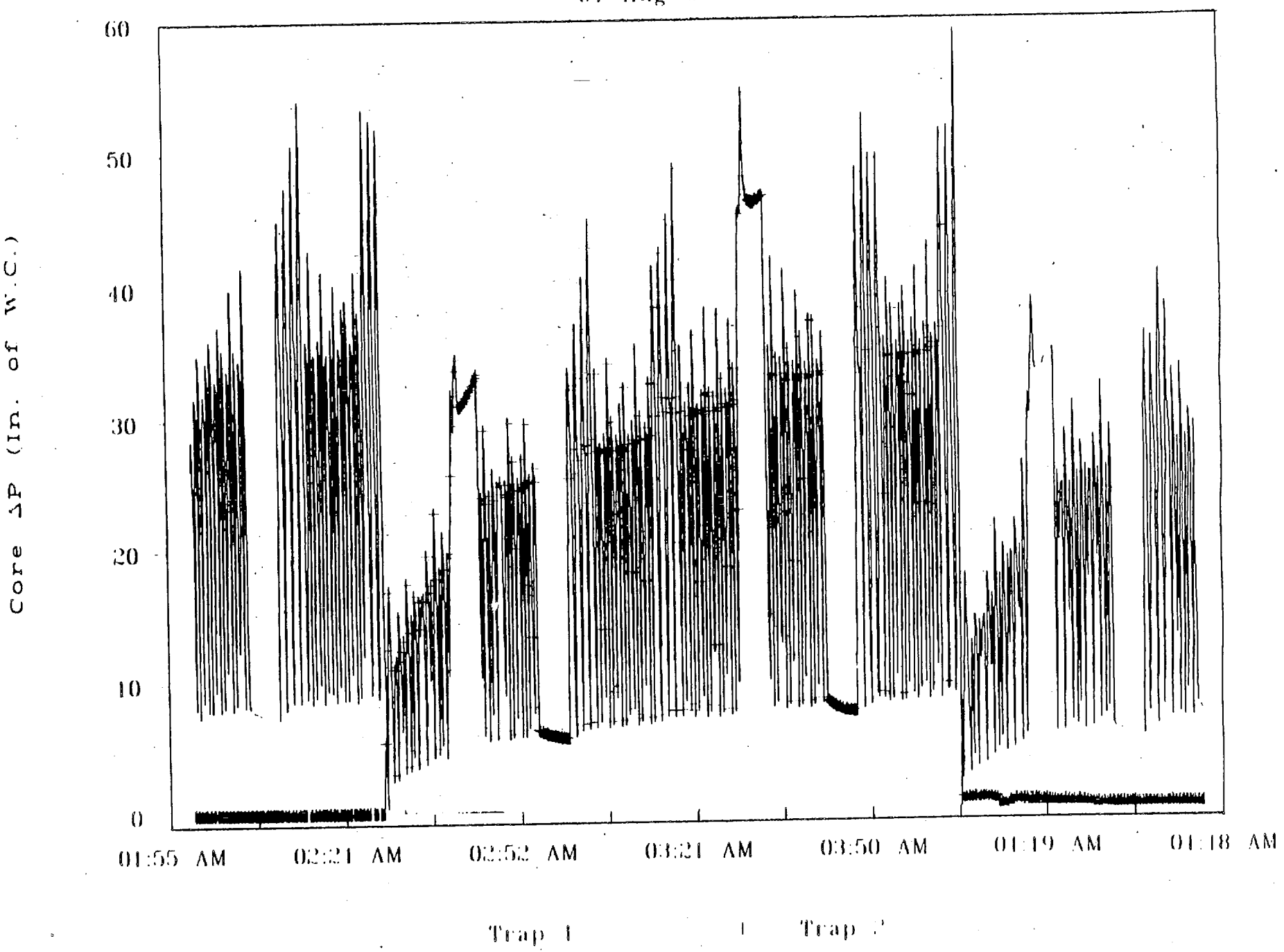

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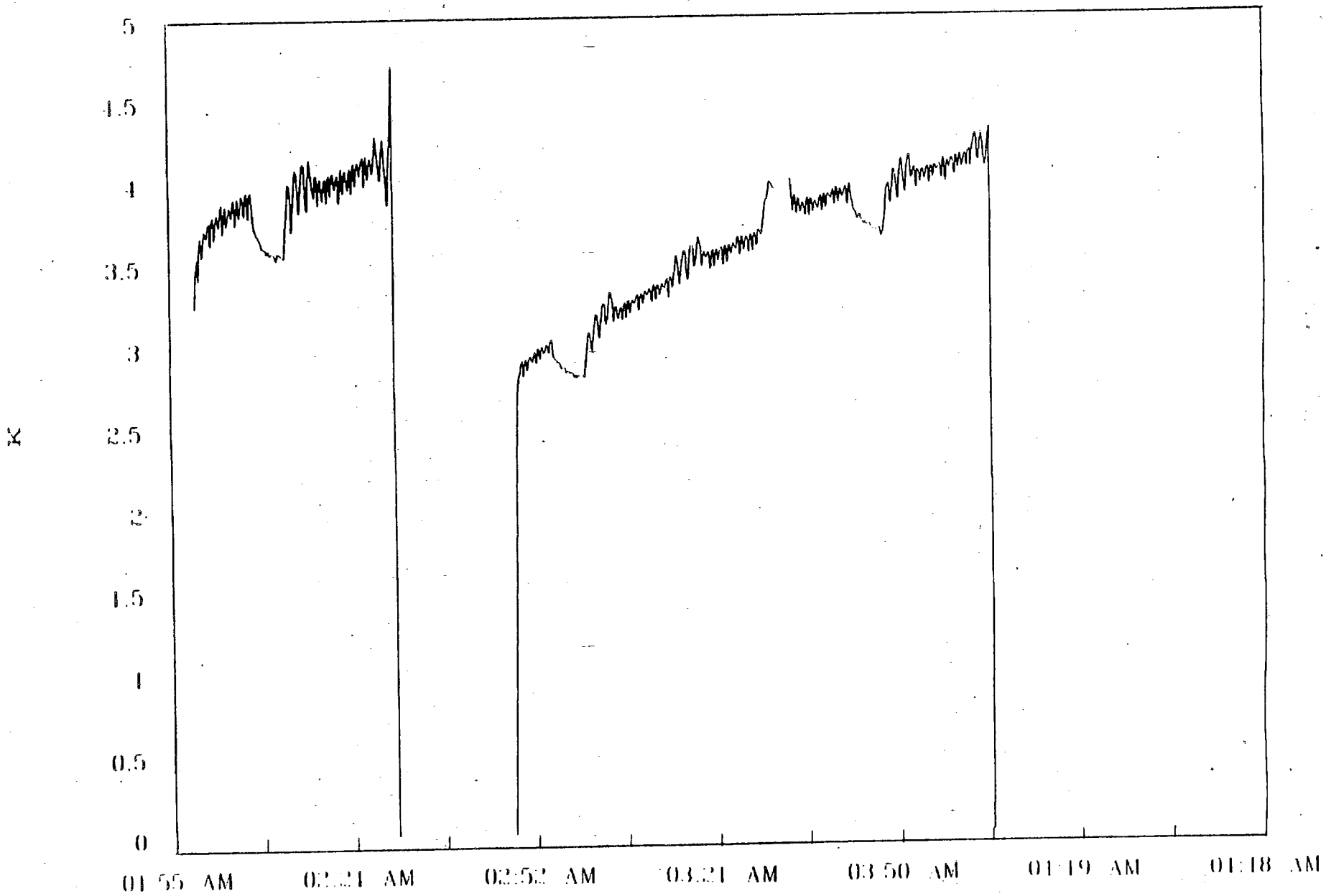

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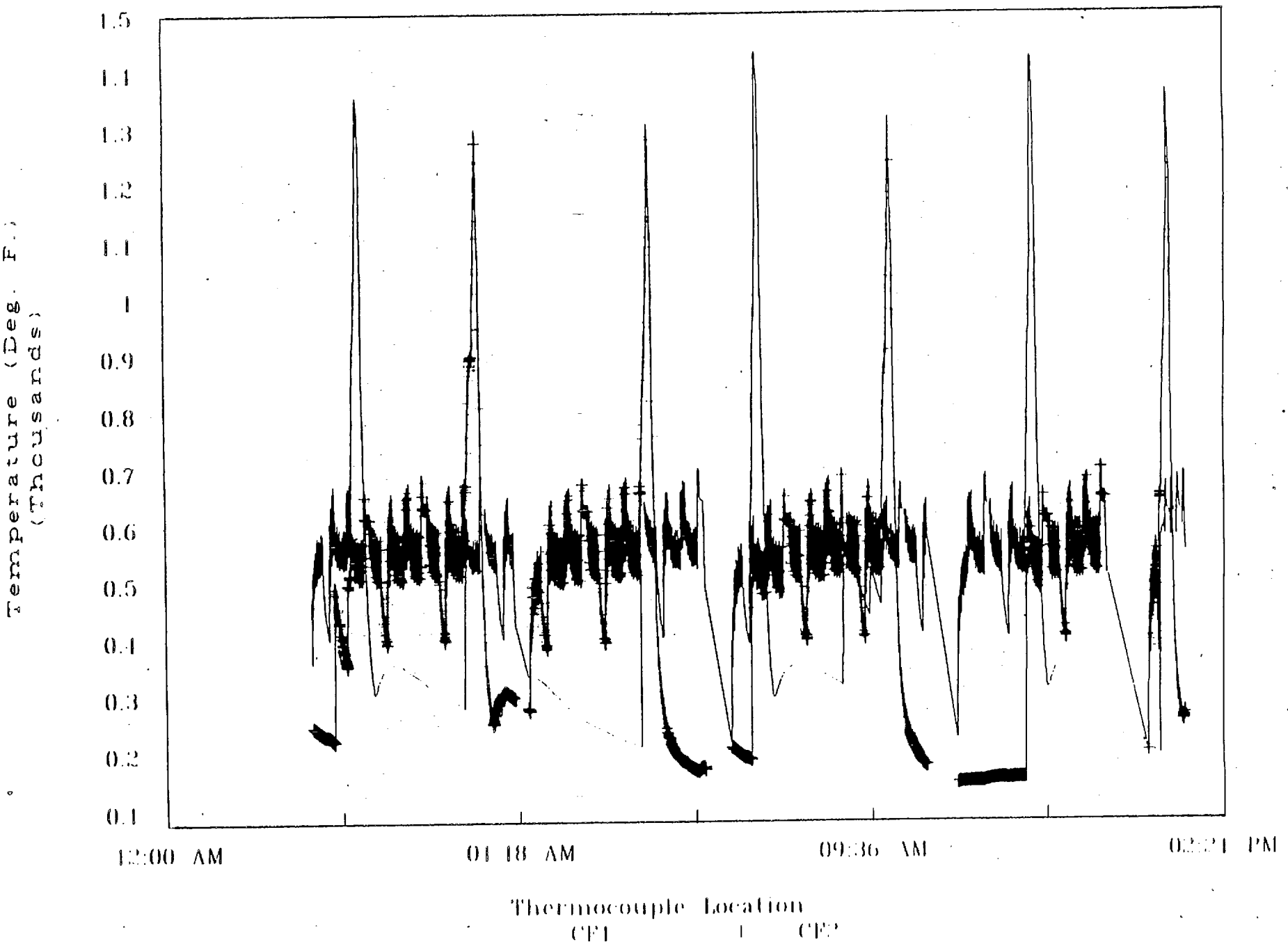

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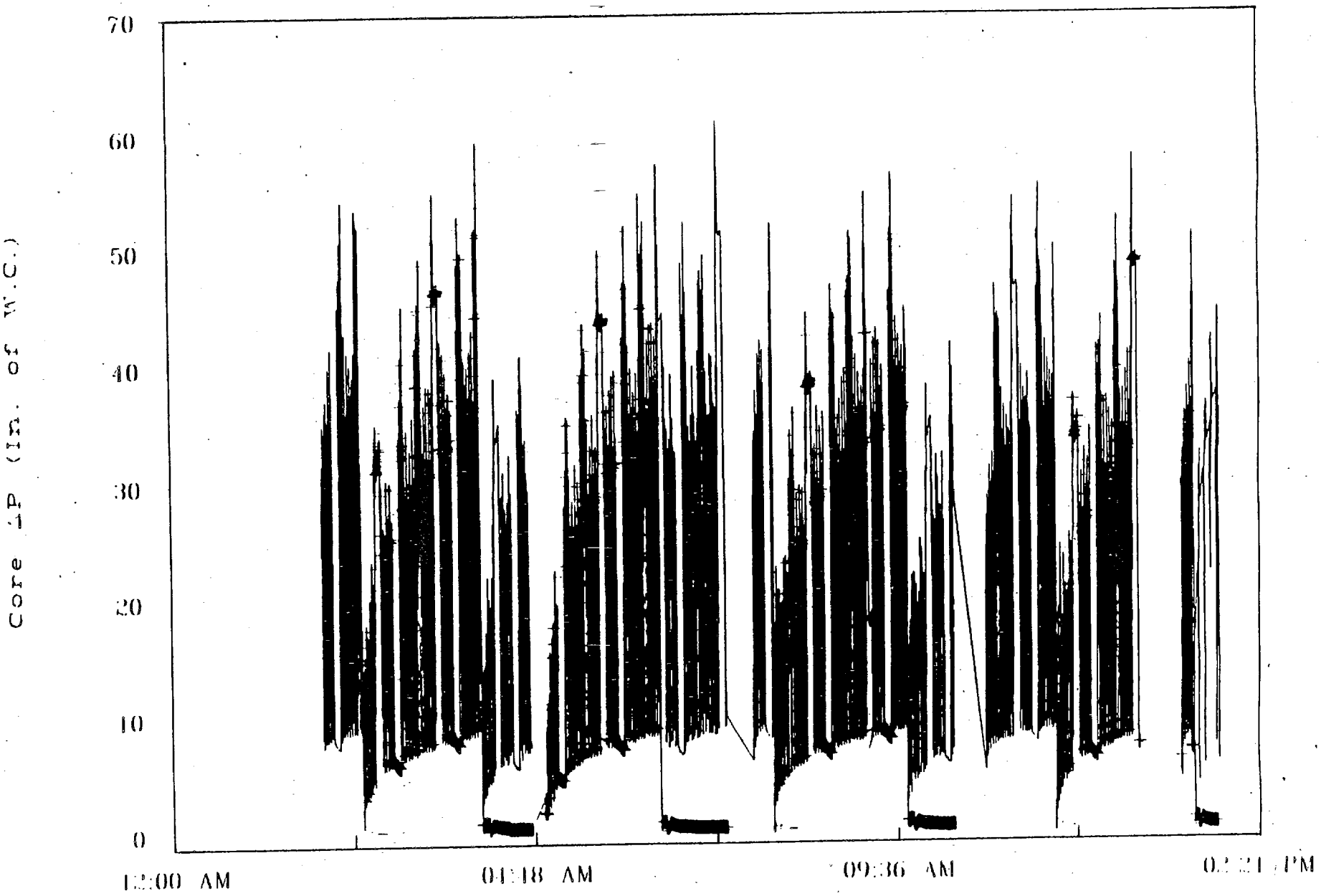

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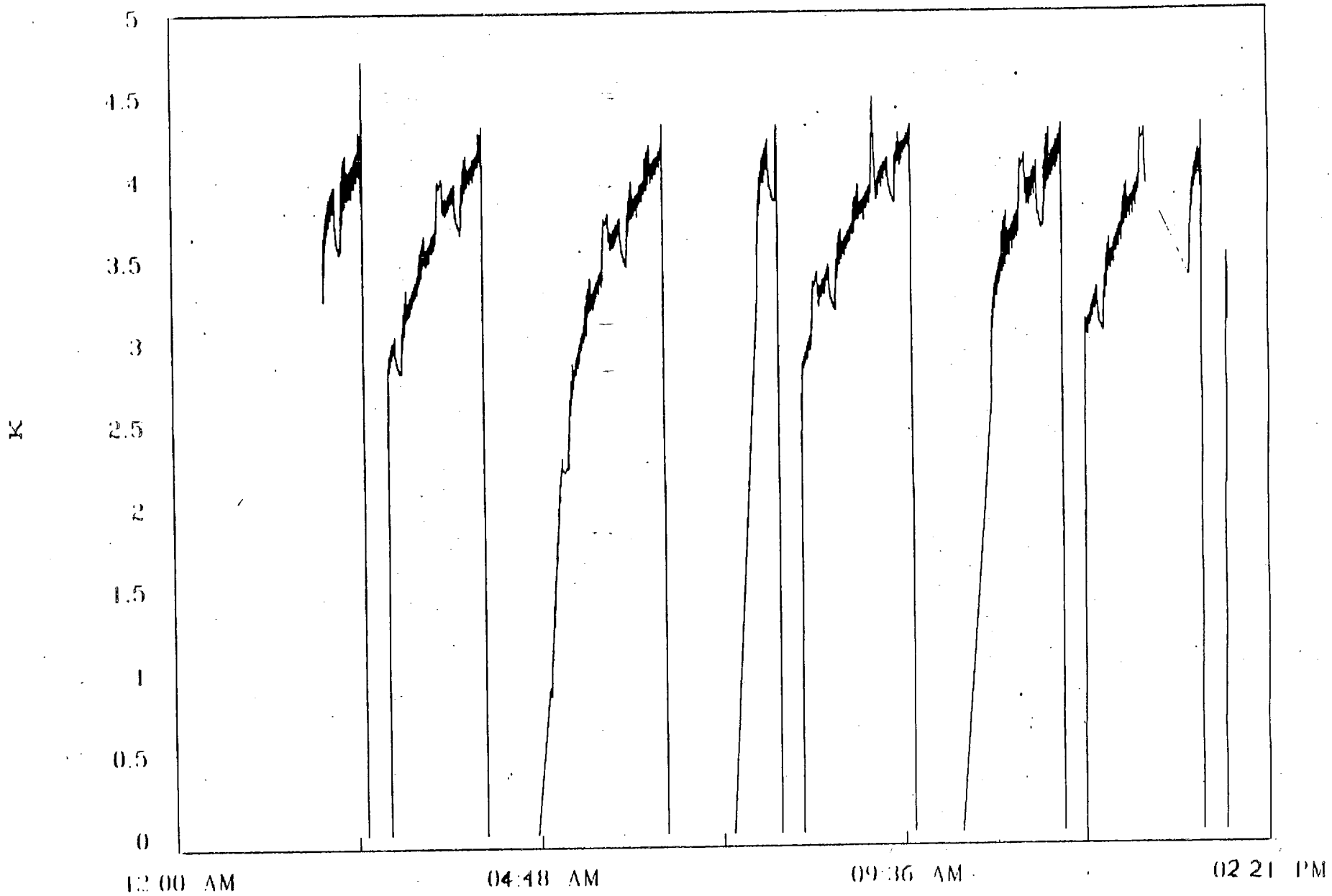

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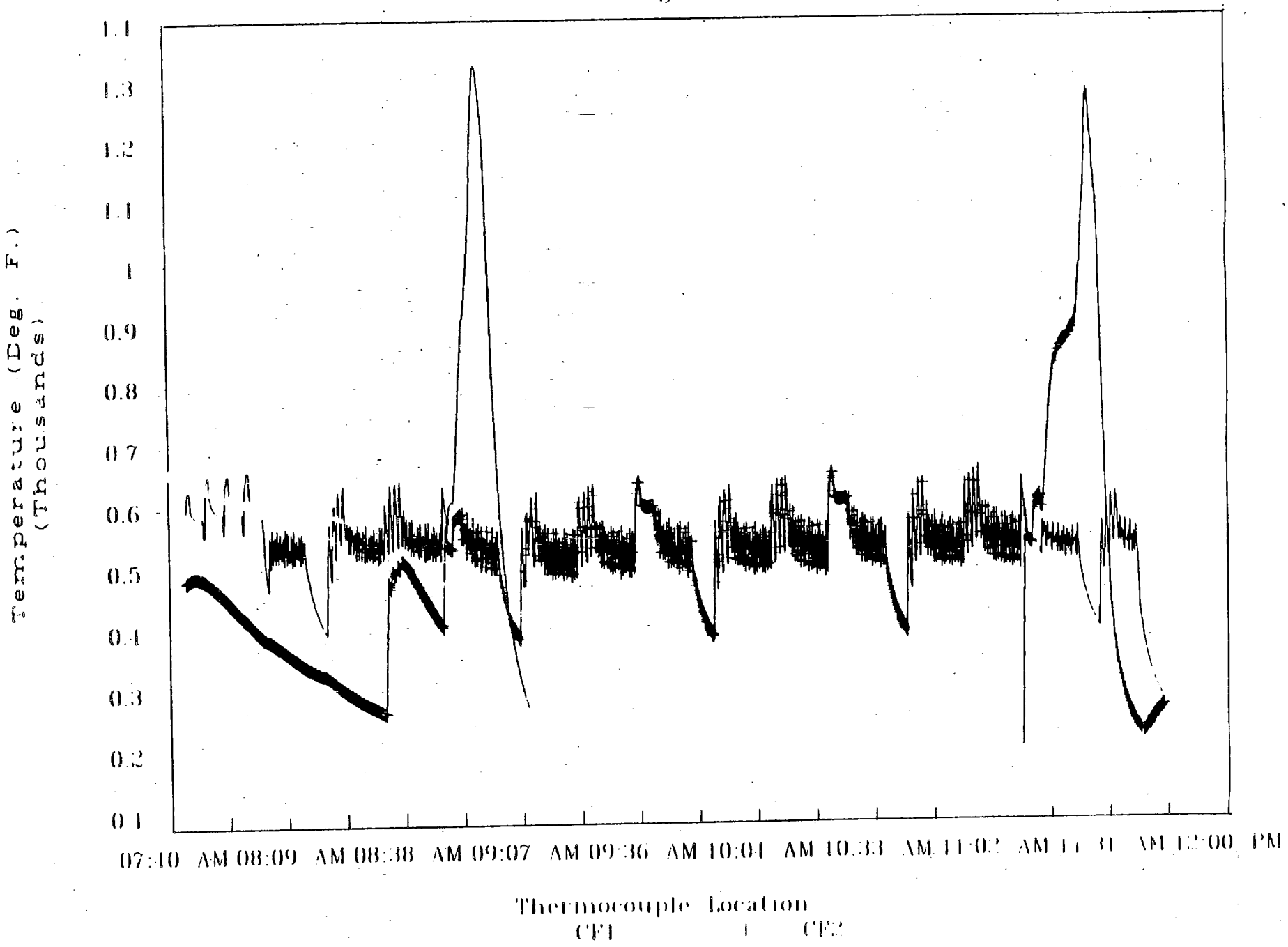

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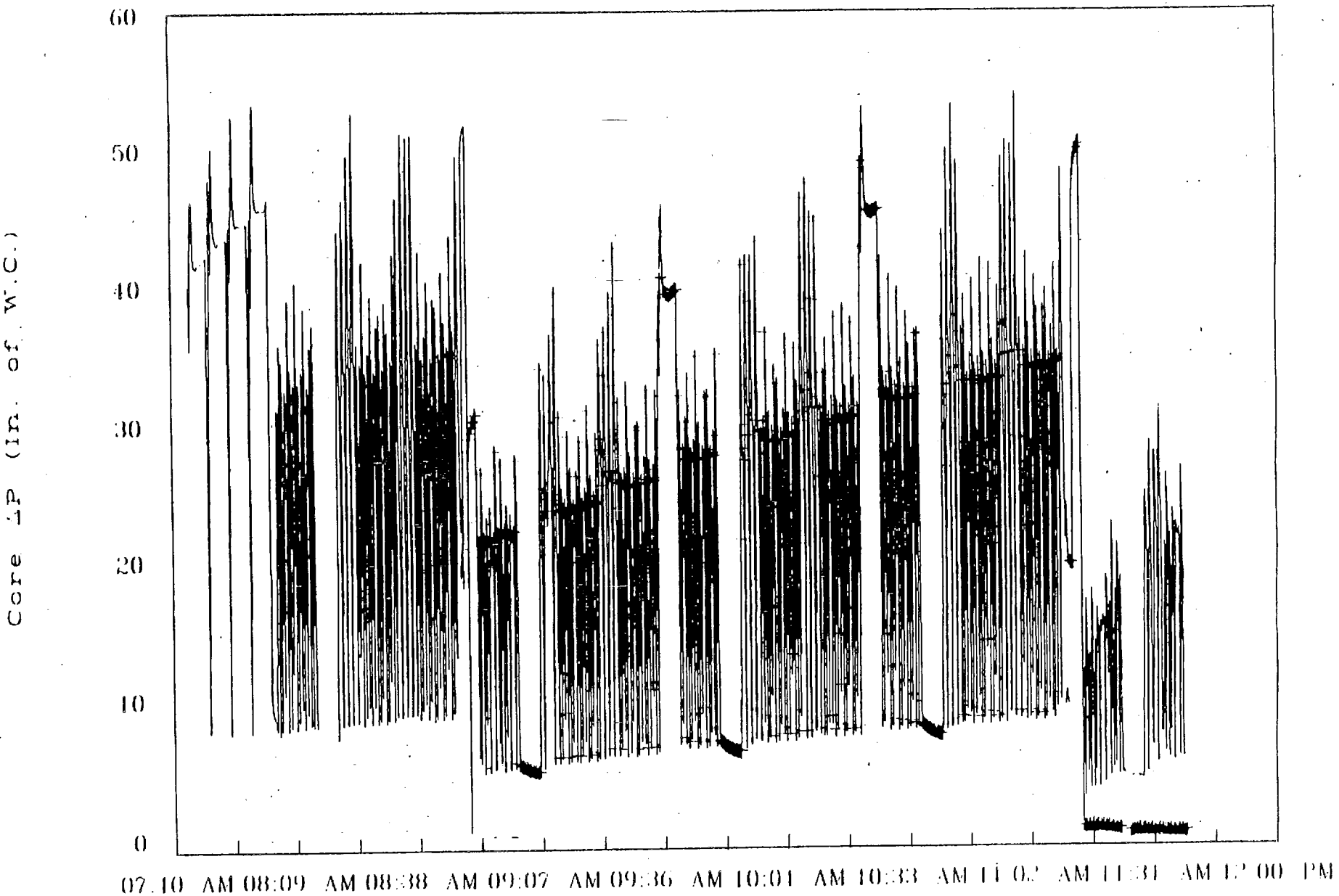

Trap 1 Trap 2

ADATEK LOGGING

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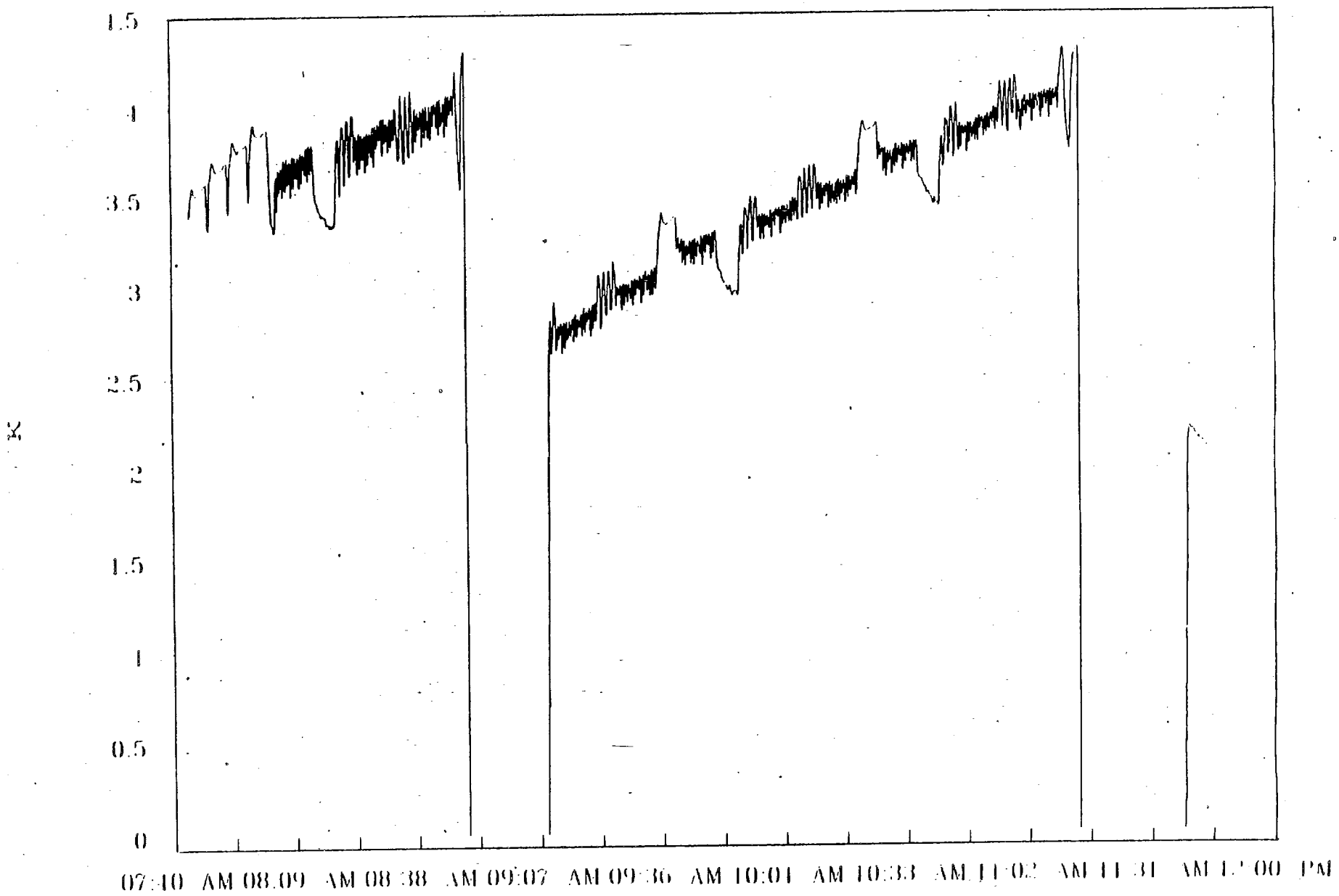

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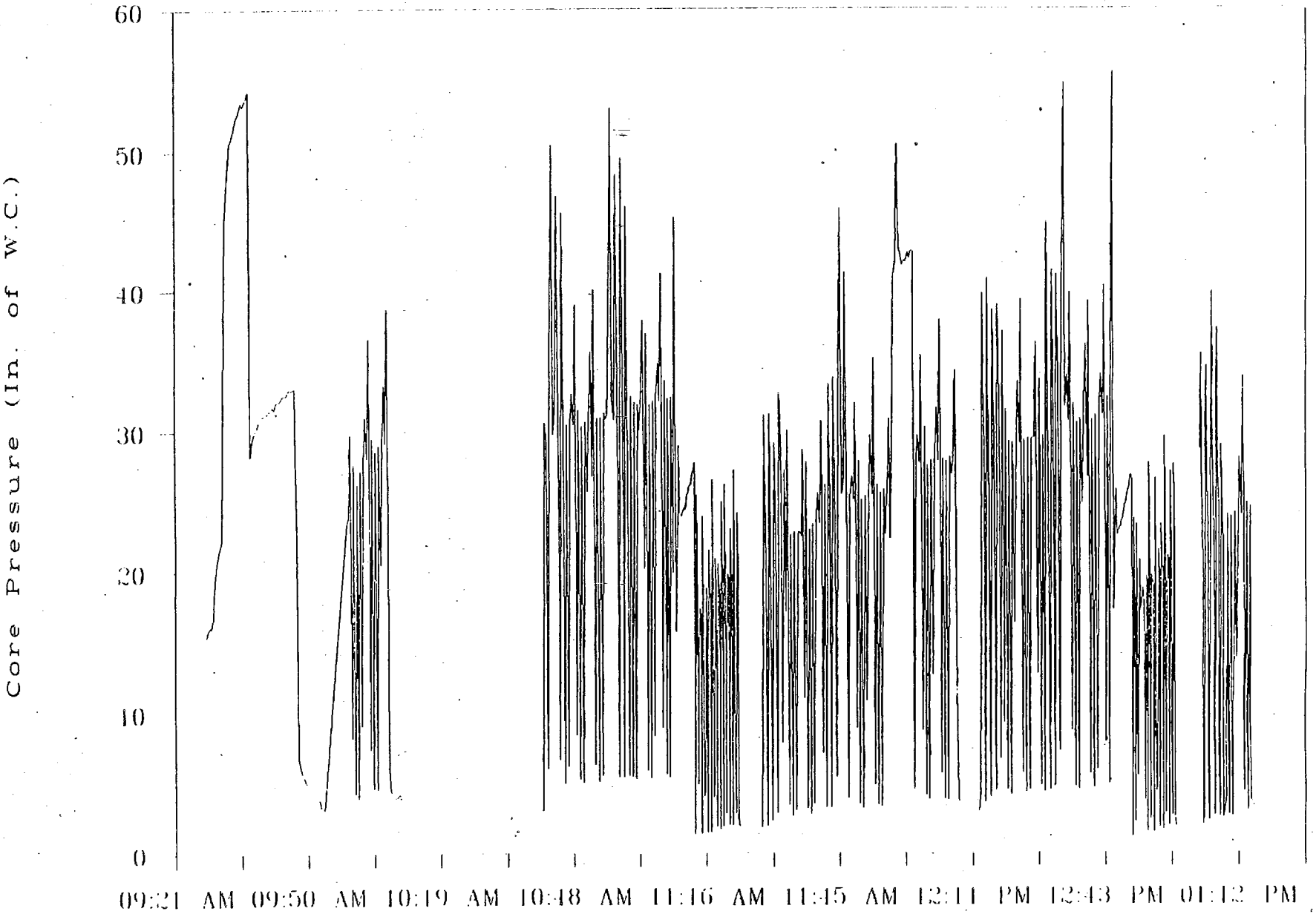
28-Jul-89



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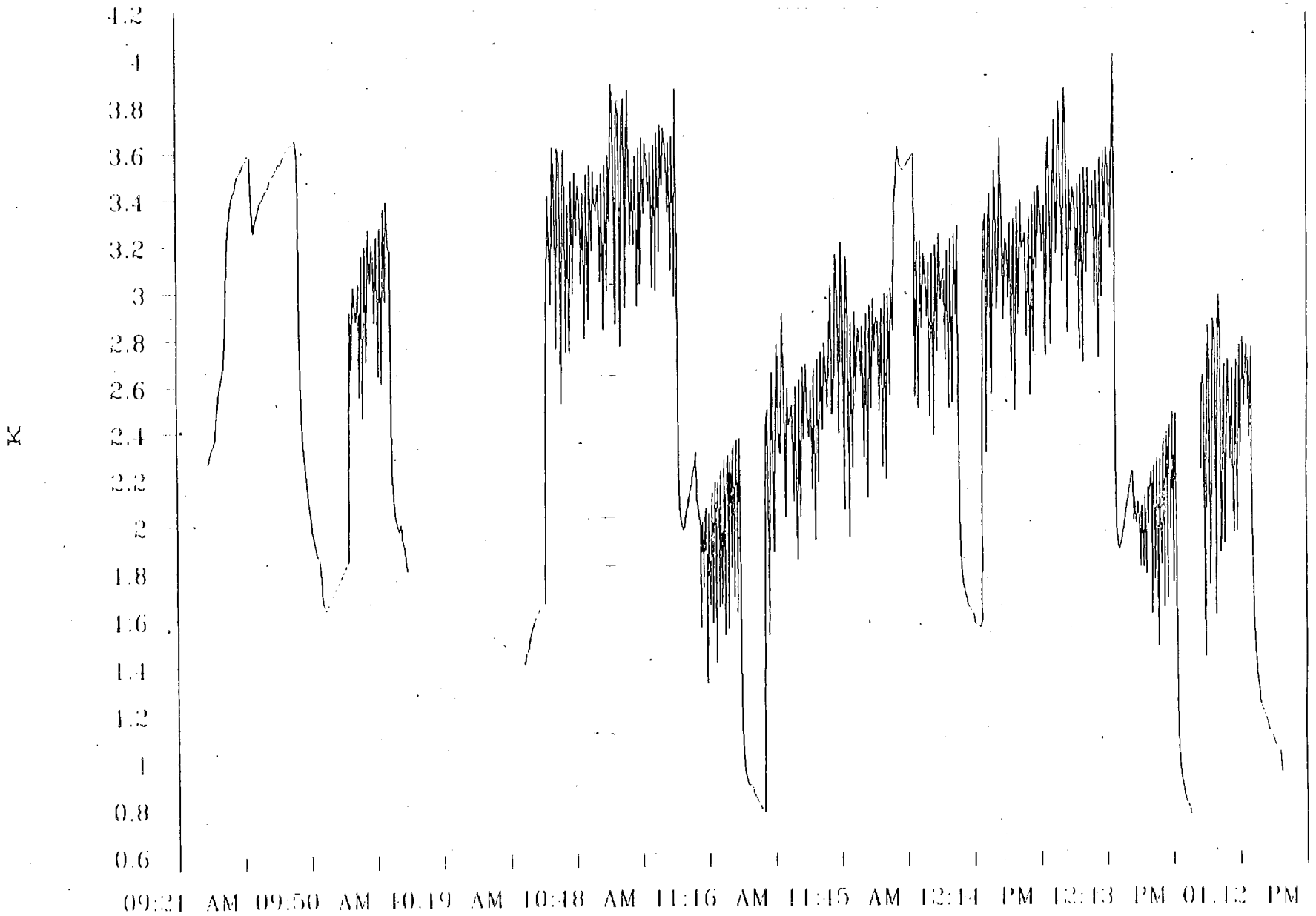
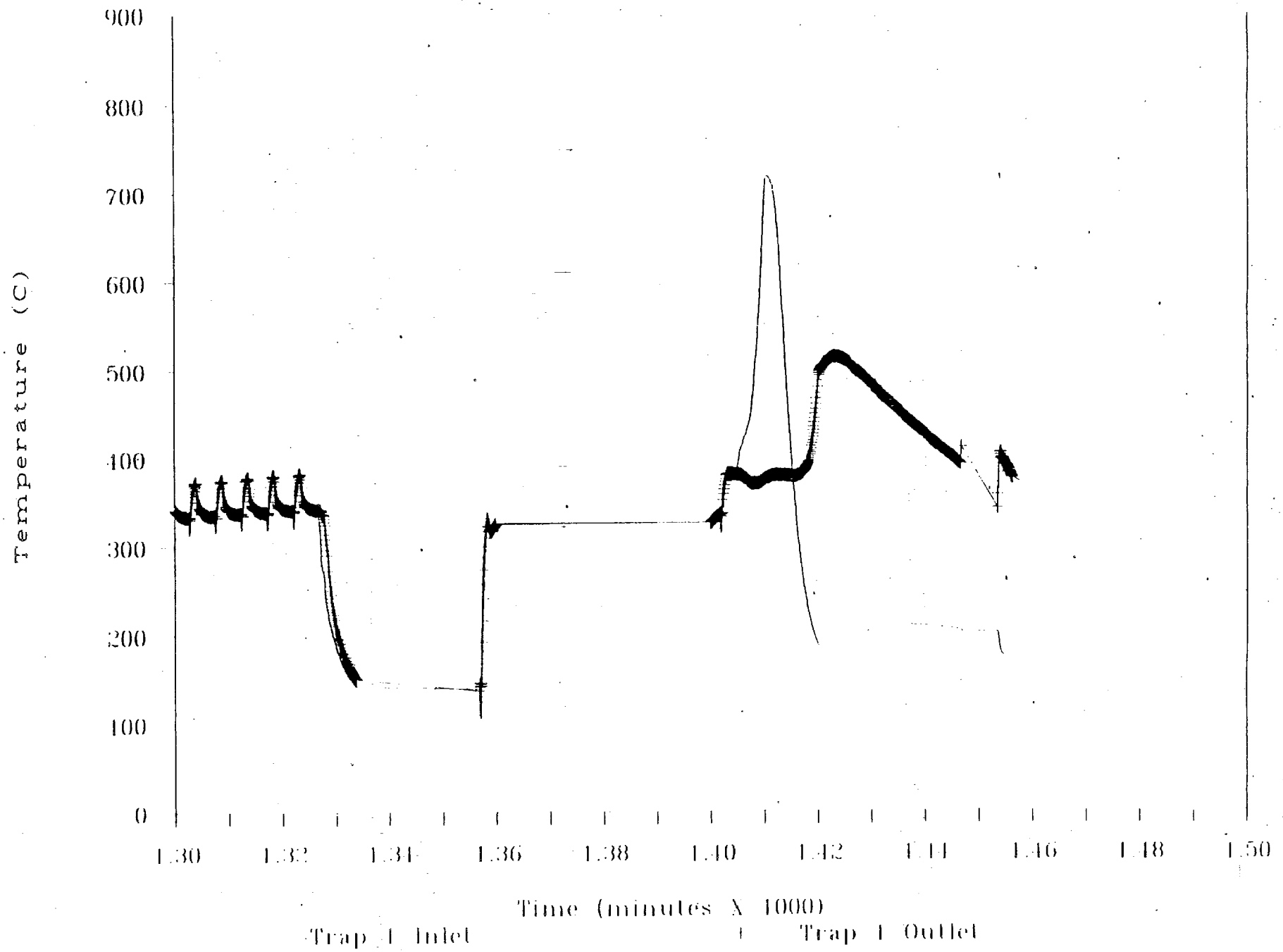
28 Jul 89



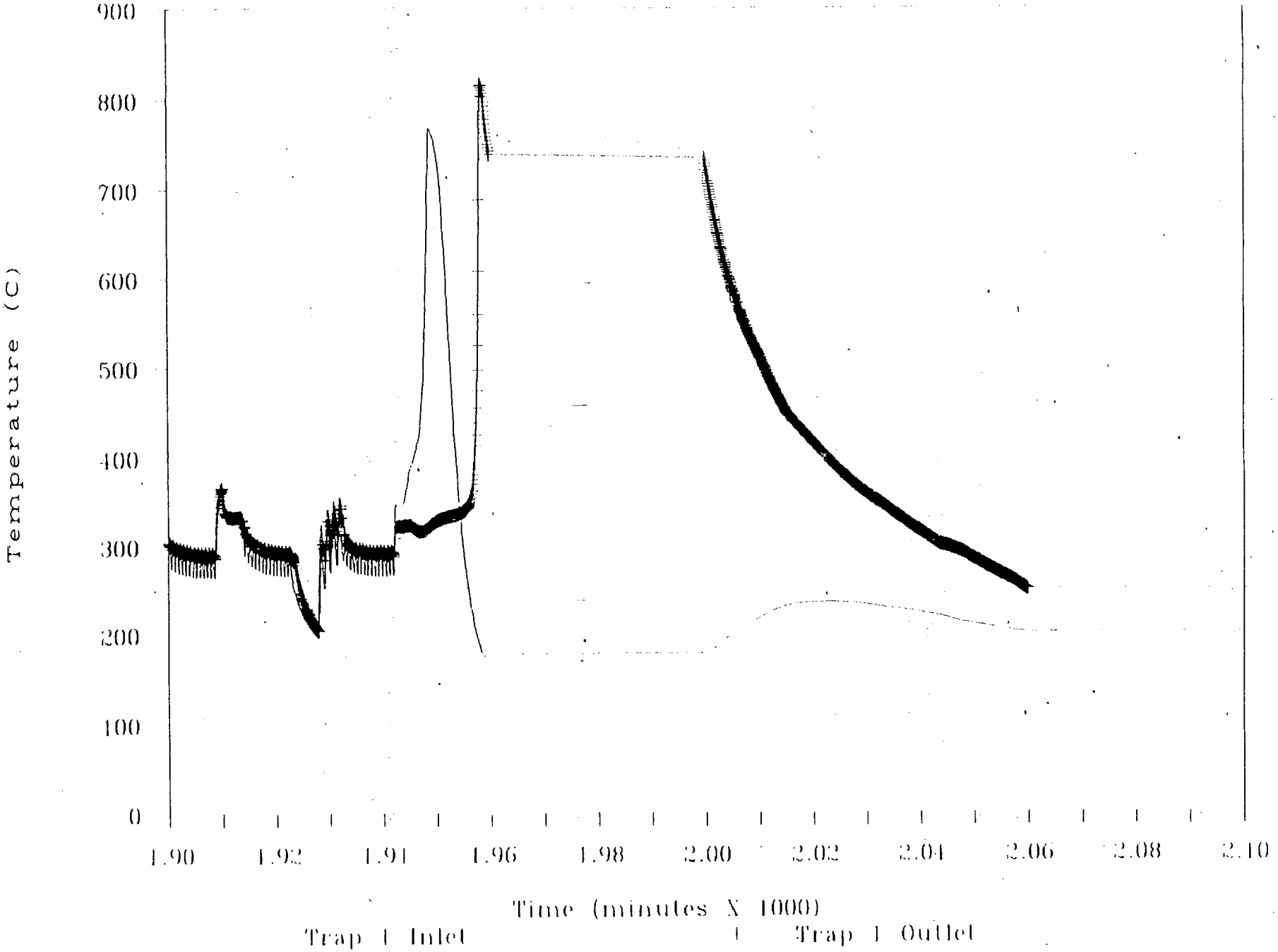
ARB BTS Testing

Regeneration Profile (July 26, 1989)



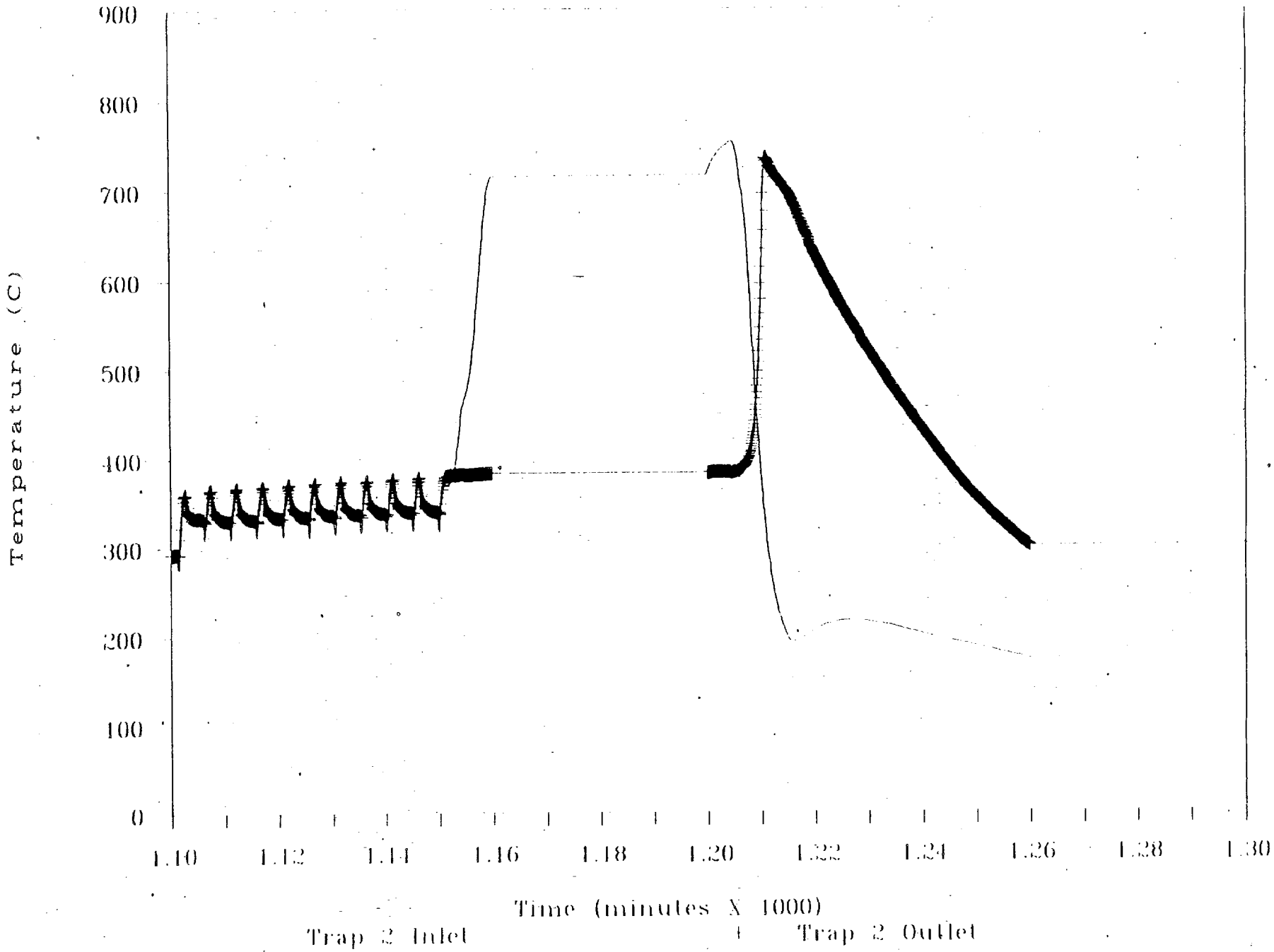
ARB BTS Testing

Regeneration Profile (July 26, 1989)



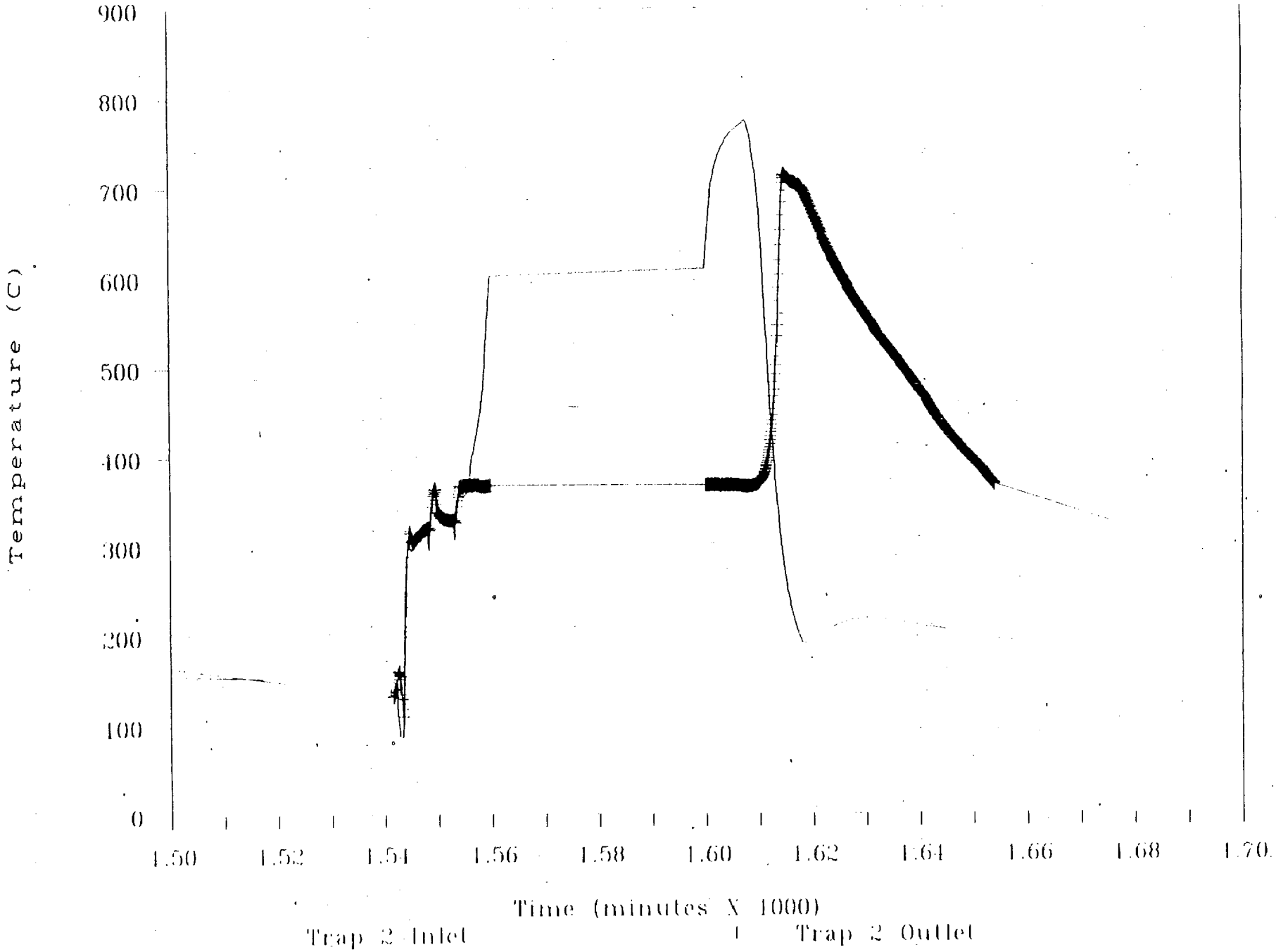
ARB BTS Testing

Regeneration Profile (July 26, 1989)



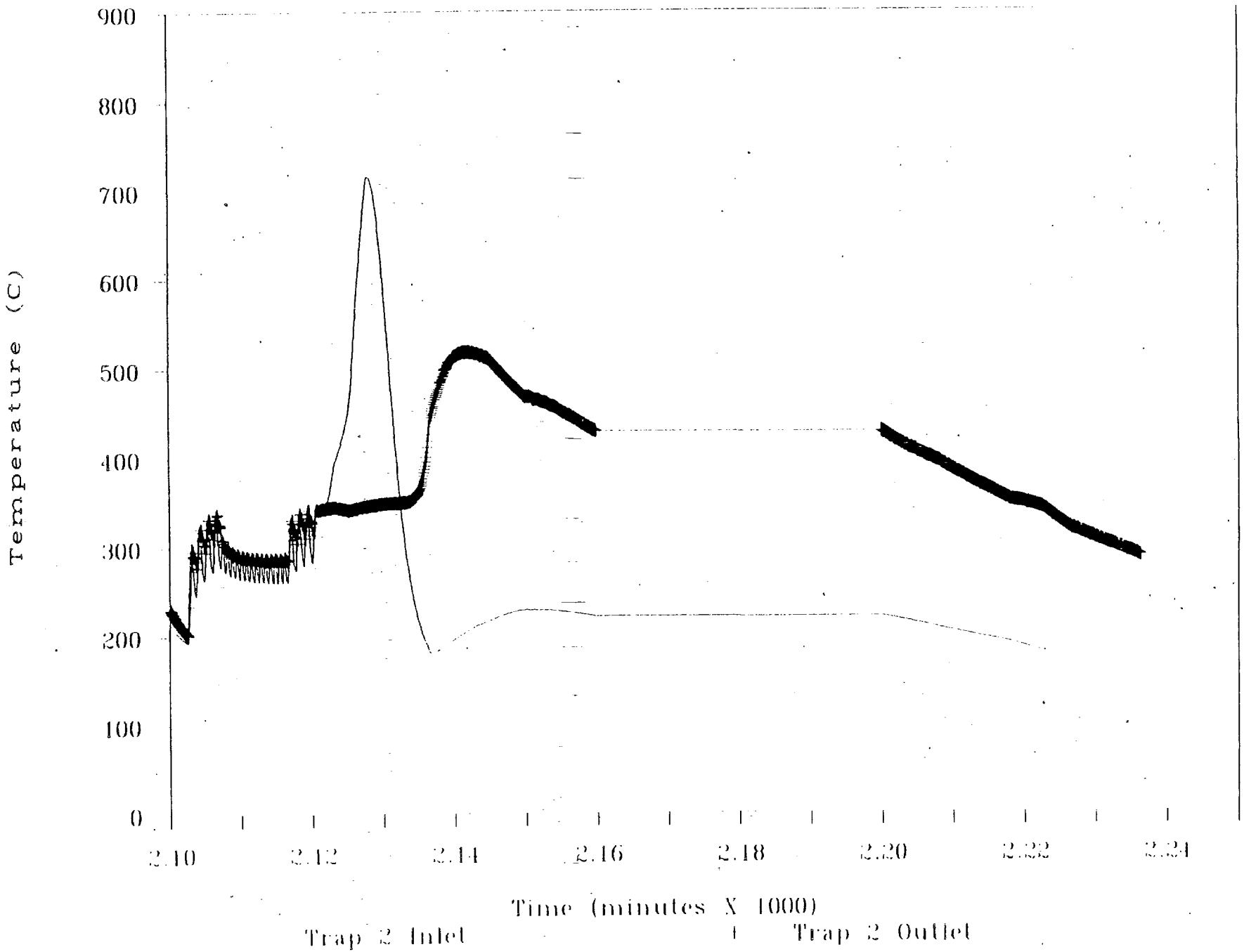
ARB BTS Testing

Regeneration Profile (July 26, 1989)



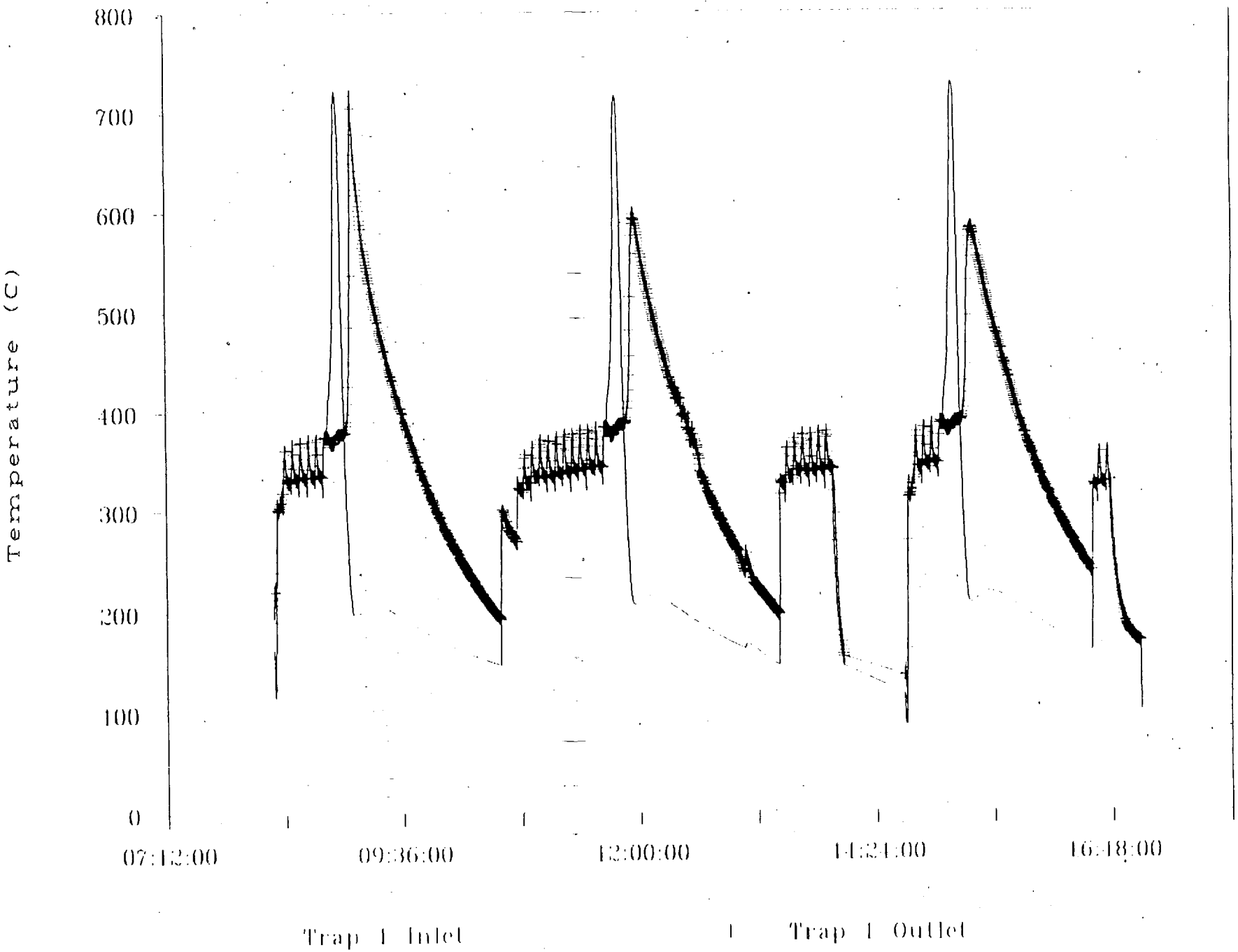
ARB BTS Testing

Regeneration Profile (July 26, 1989)



ARB BTS Testing

Regeneration Profile (July 27, 1989)



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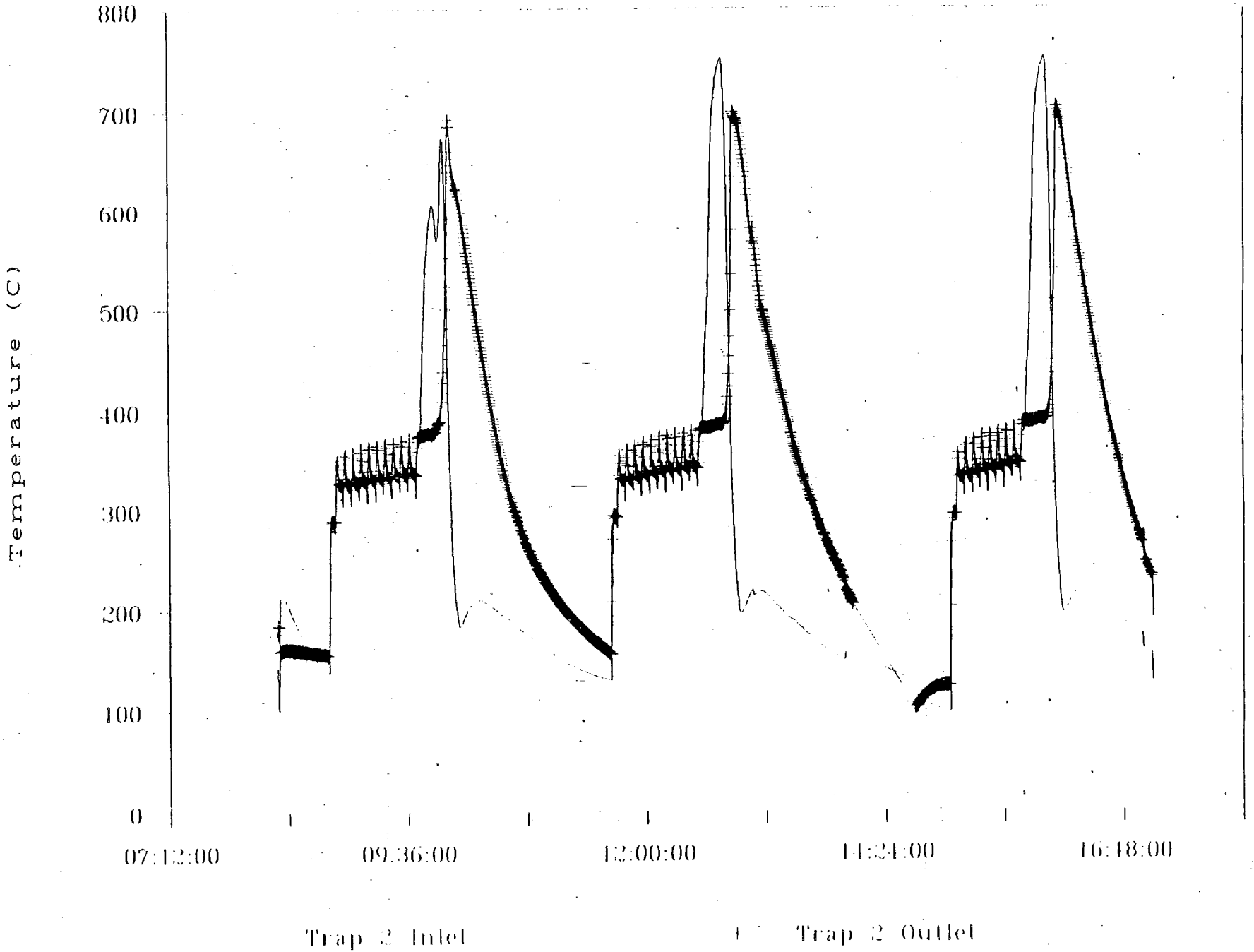
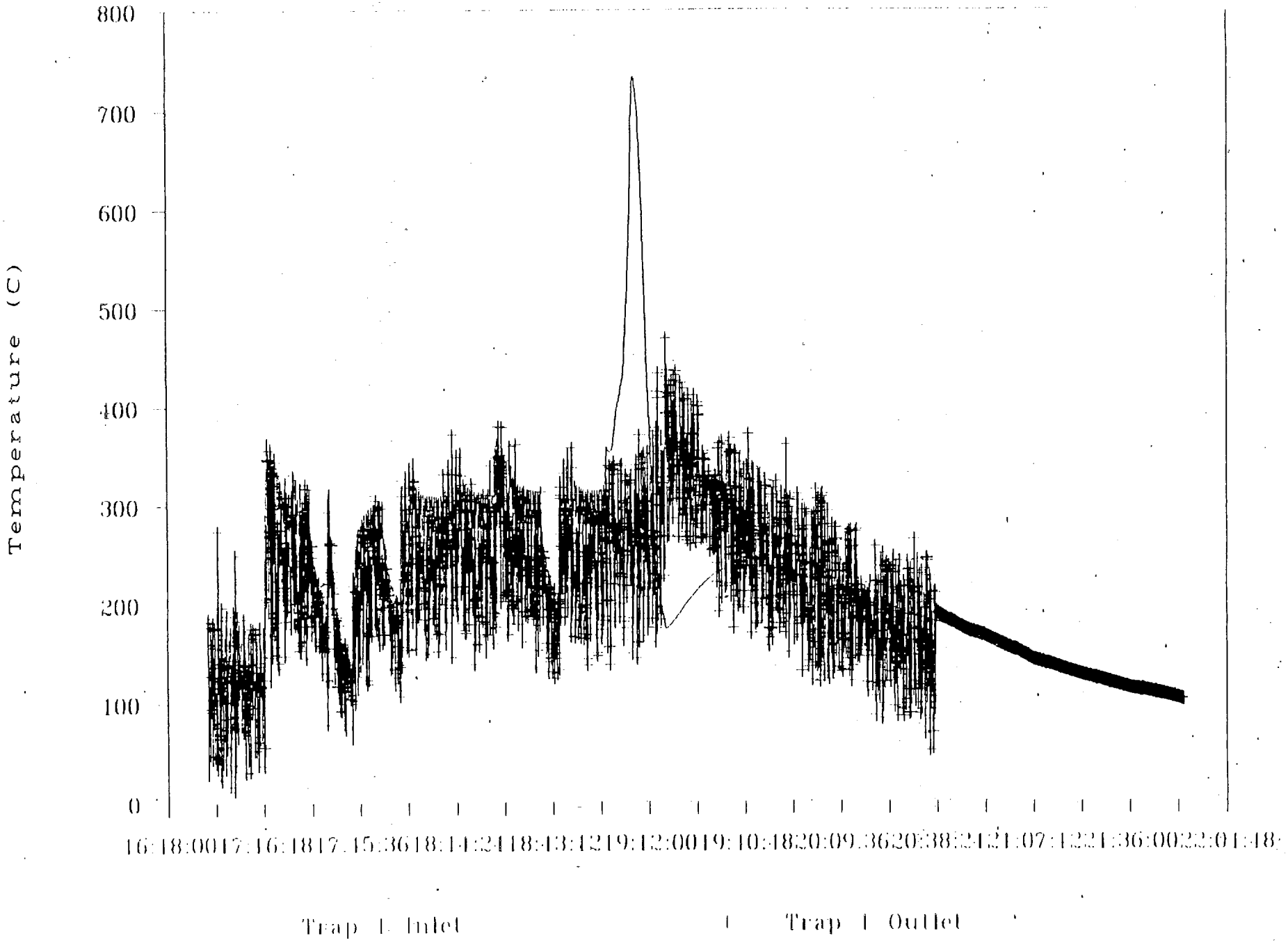
Regeneration Profile (July 27, 1989)

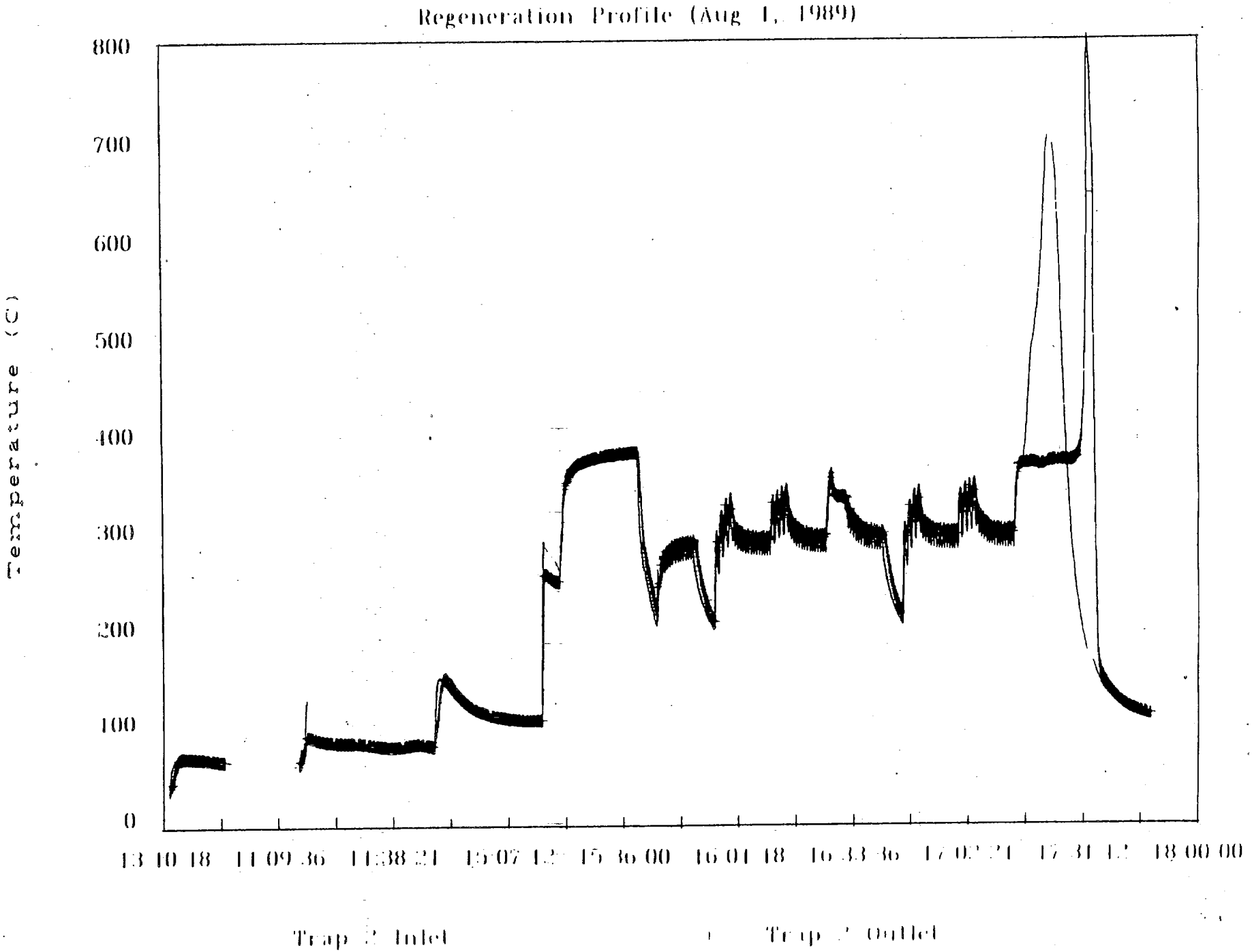


ARB BTS Testing

Regeneration Profile (July 27, 1989)

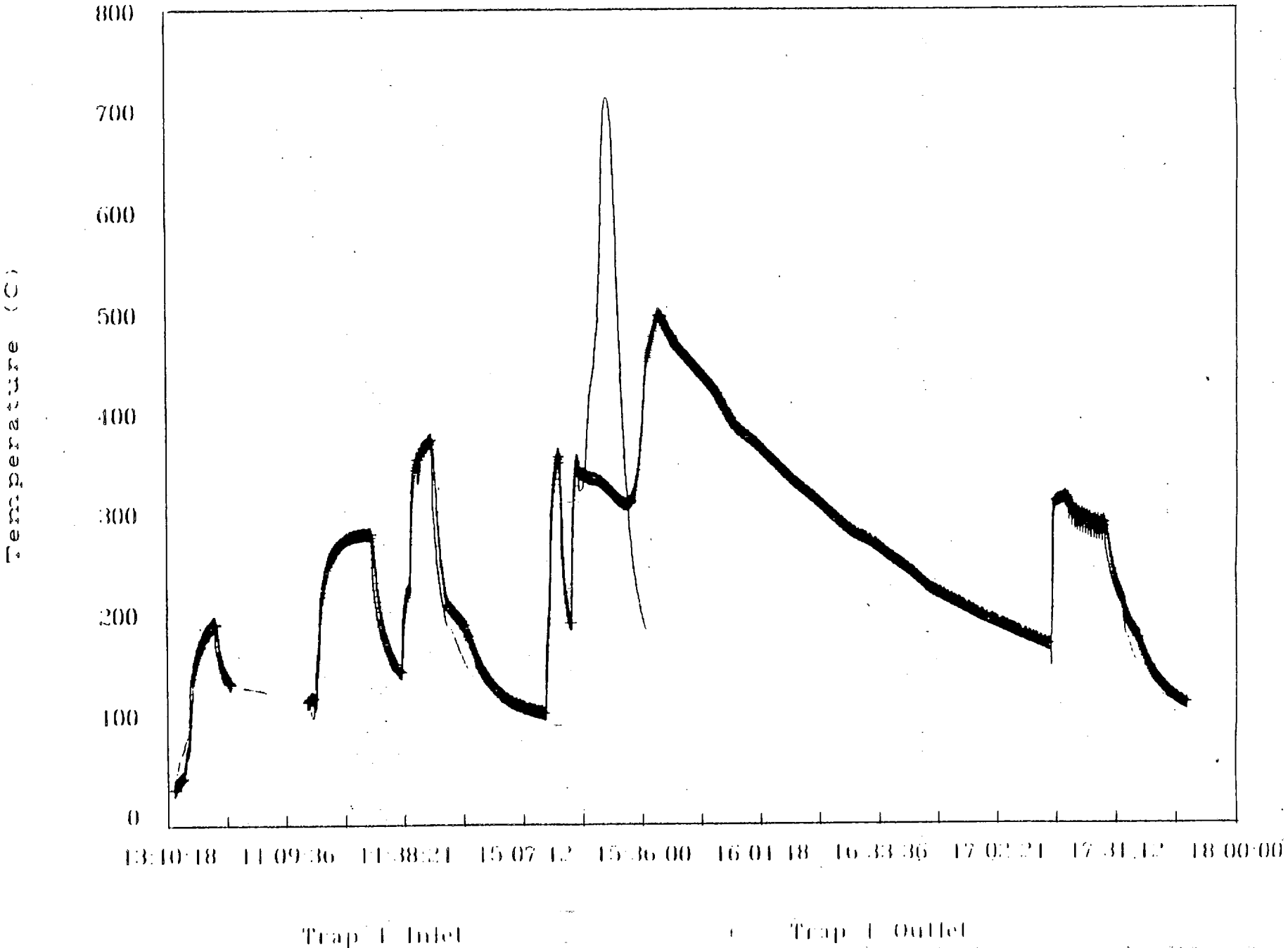


ARB BTX Testing



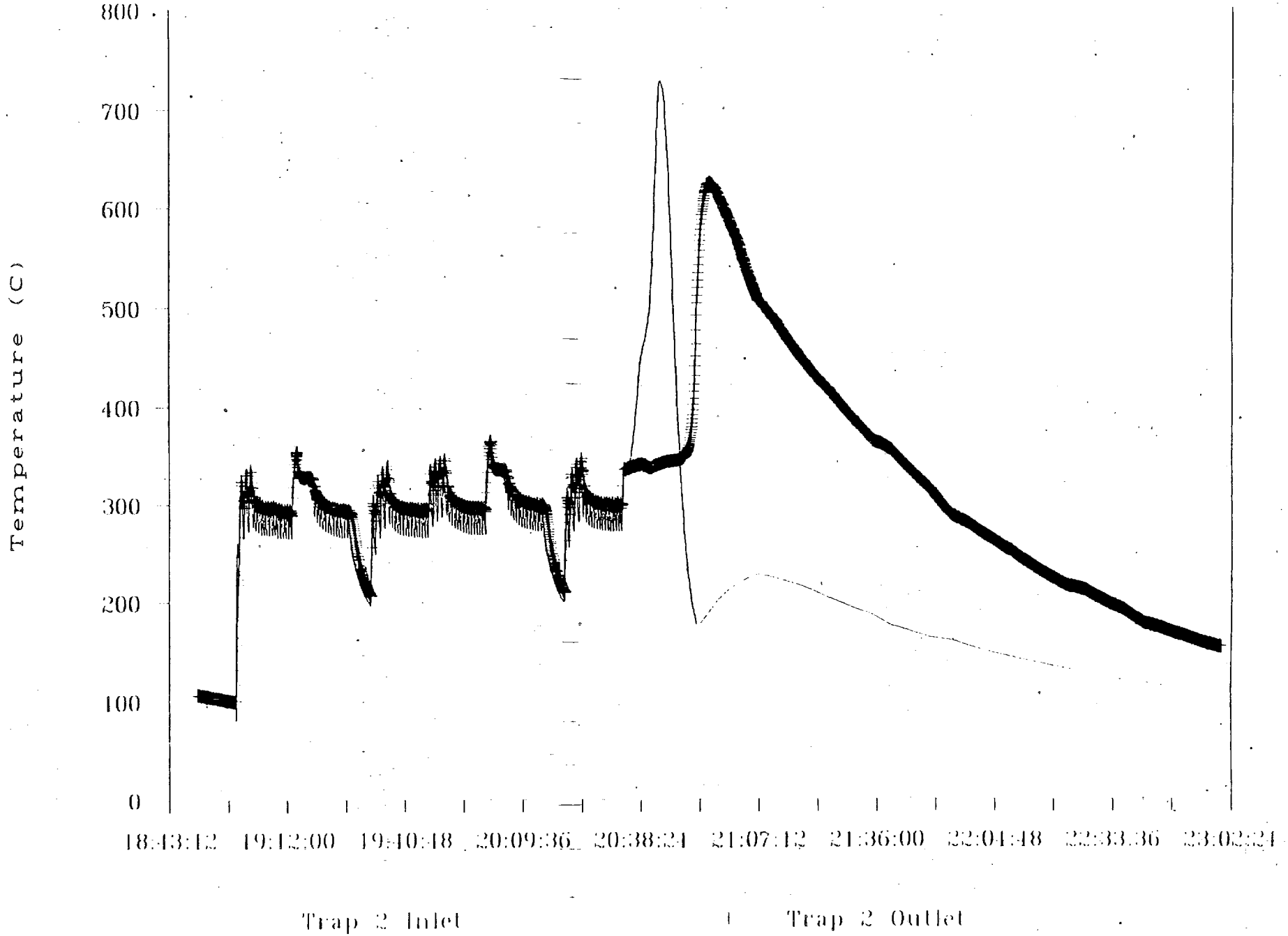
ARB BTS Testing

Regeneration Profile (Aug 1, 1989)



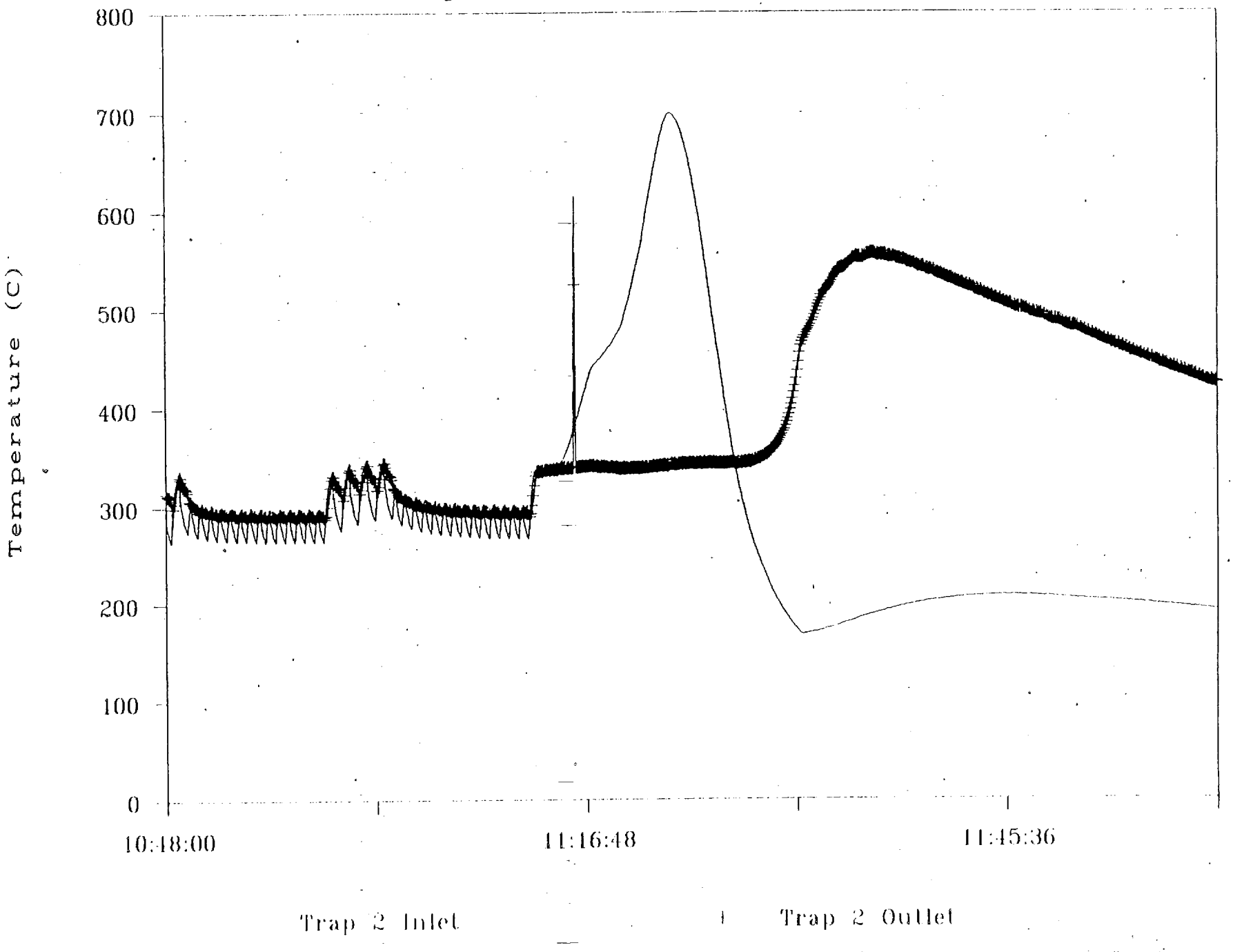
ARB BTI Testing

Regeneration Profile (July 27, 1989)



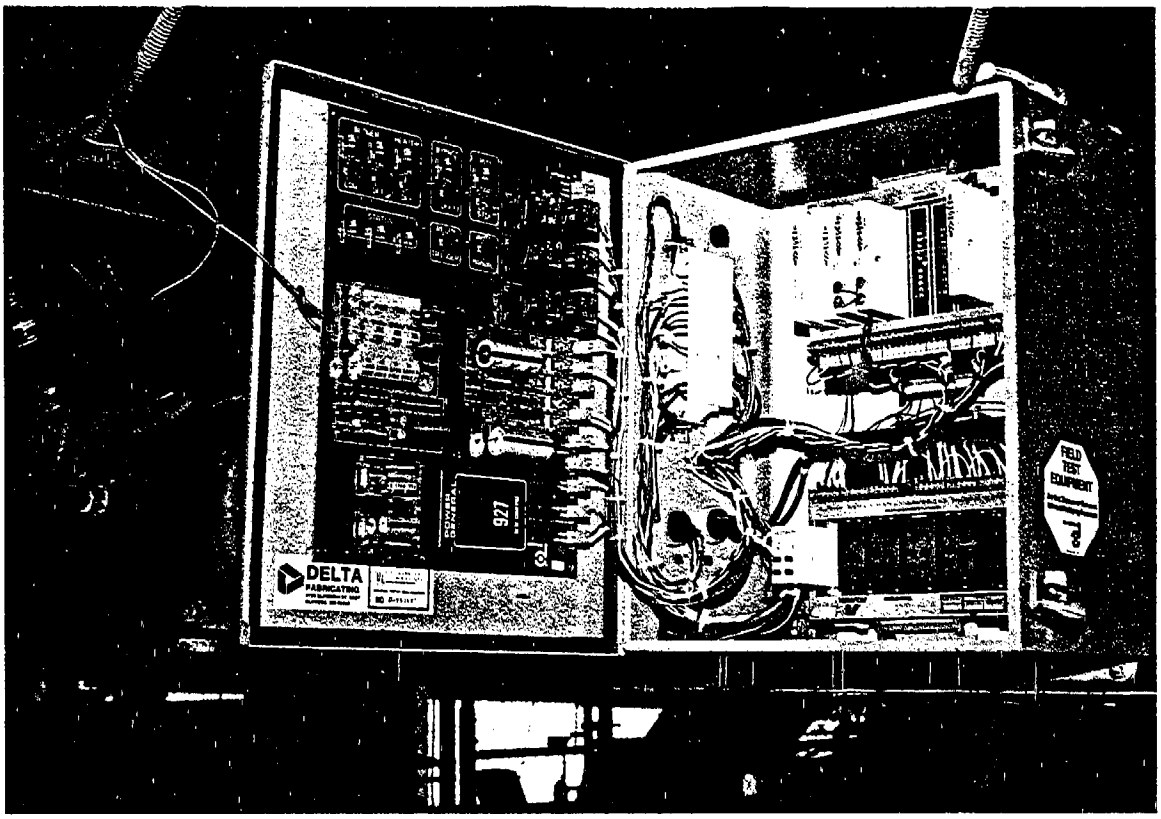
ARB BTS Testing

Regeneration Profile (July 28, 1989)

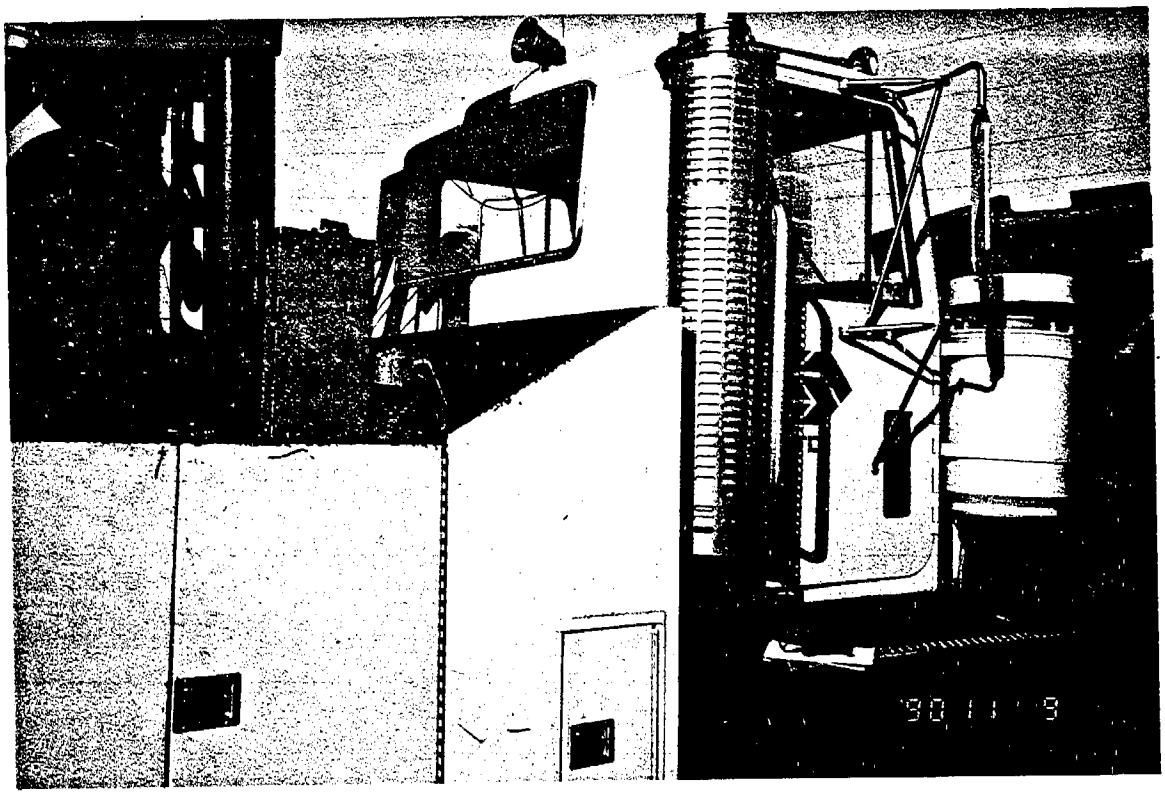


APPENDIX F

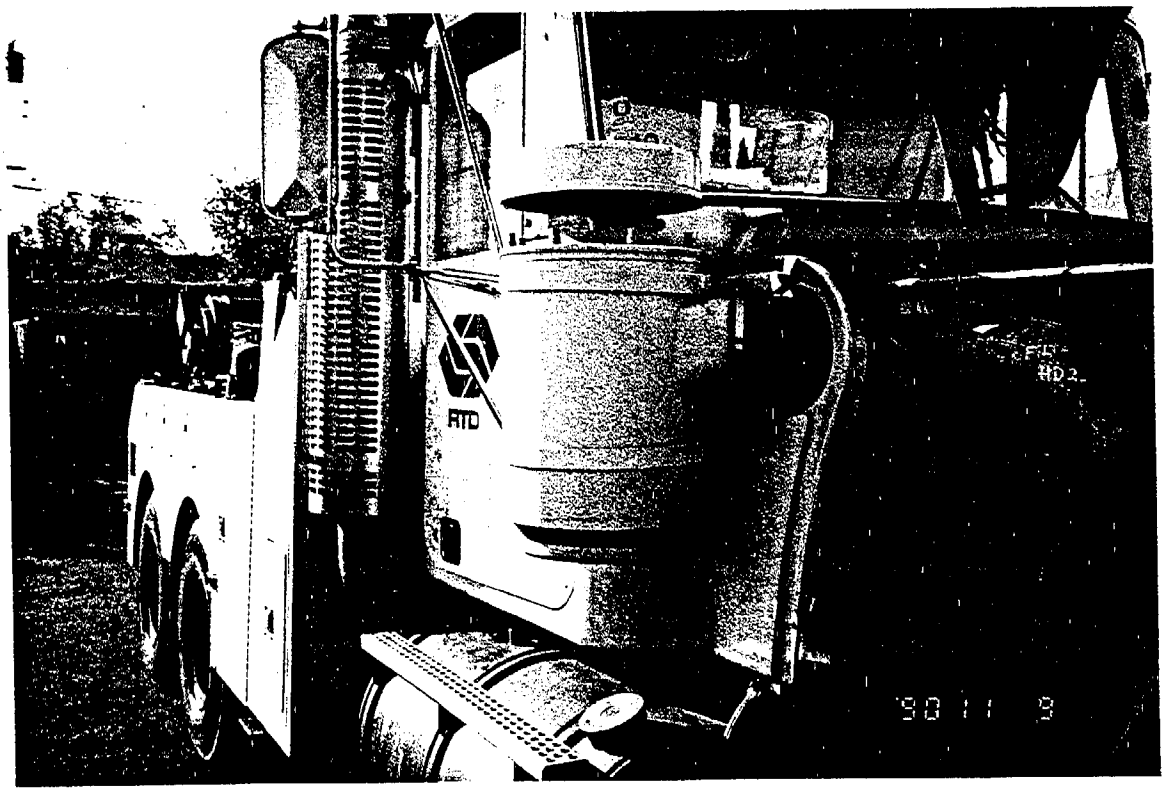
SCRTD Tow Truck Photographs

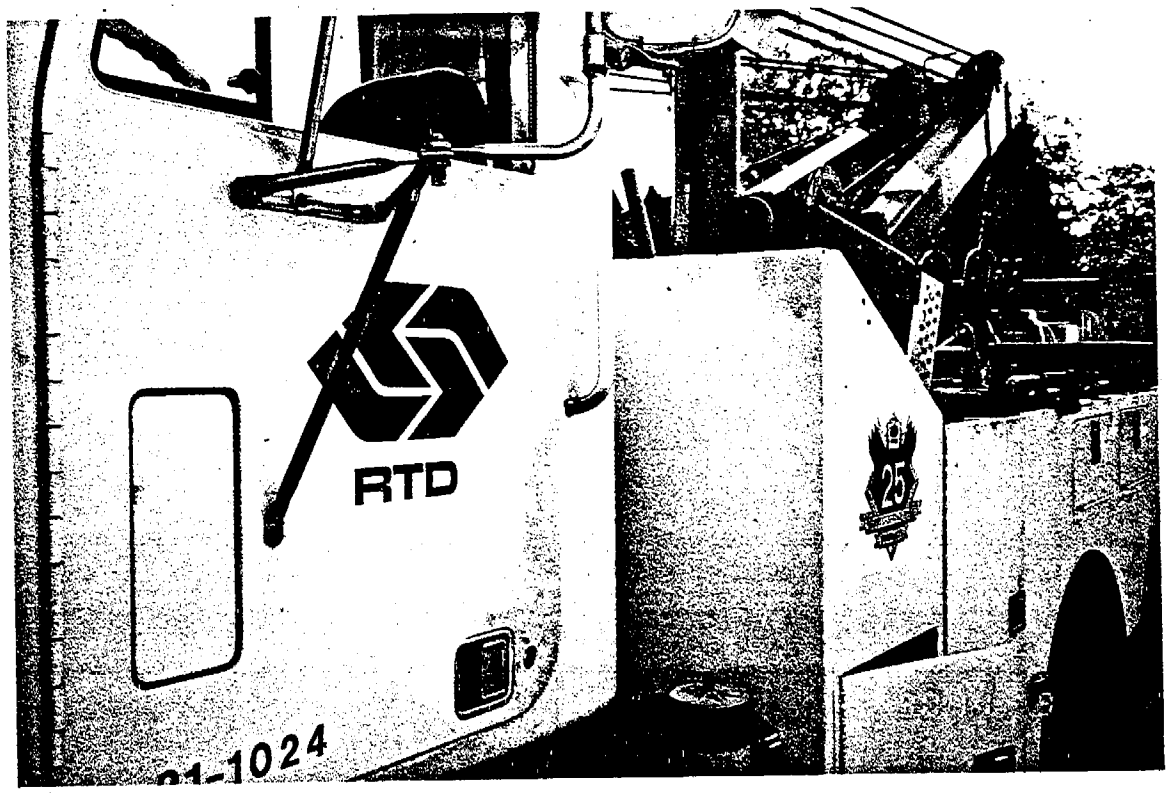


The above photograph shows the Control Box.

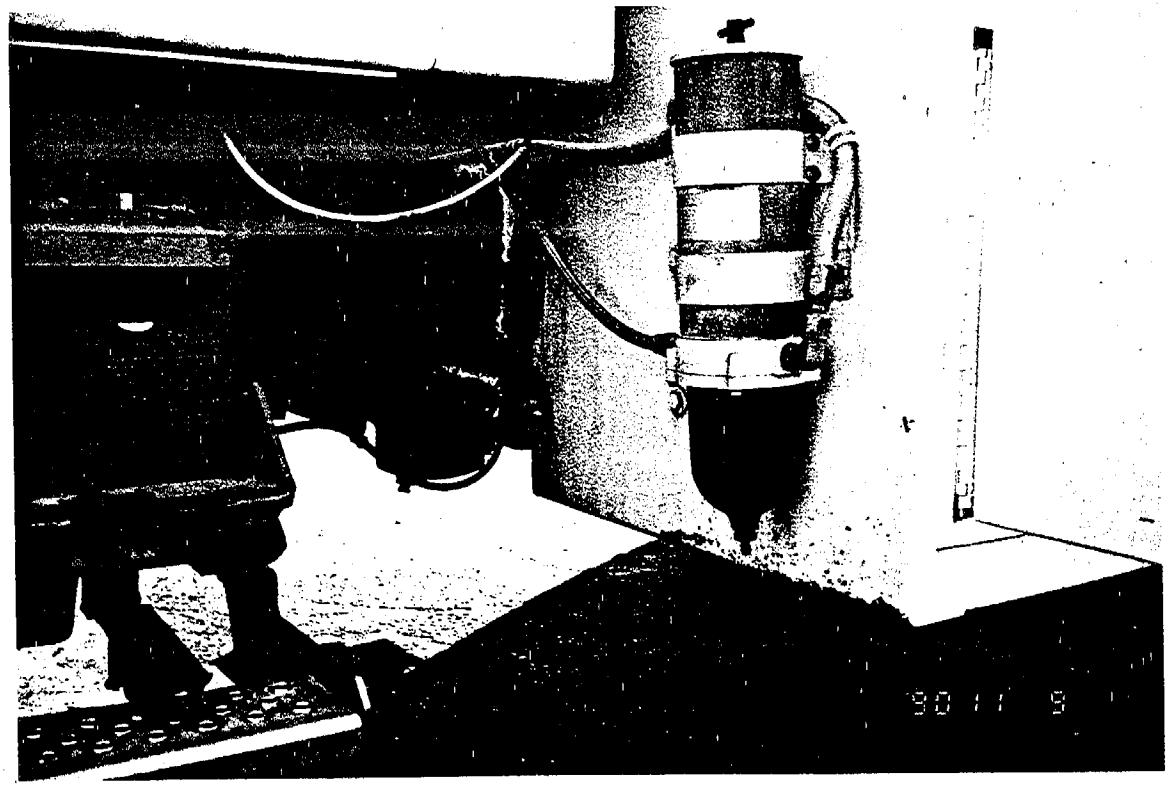


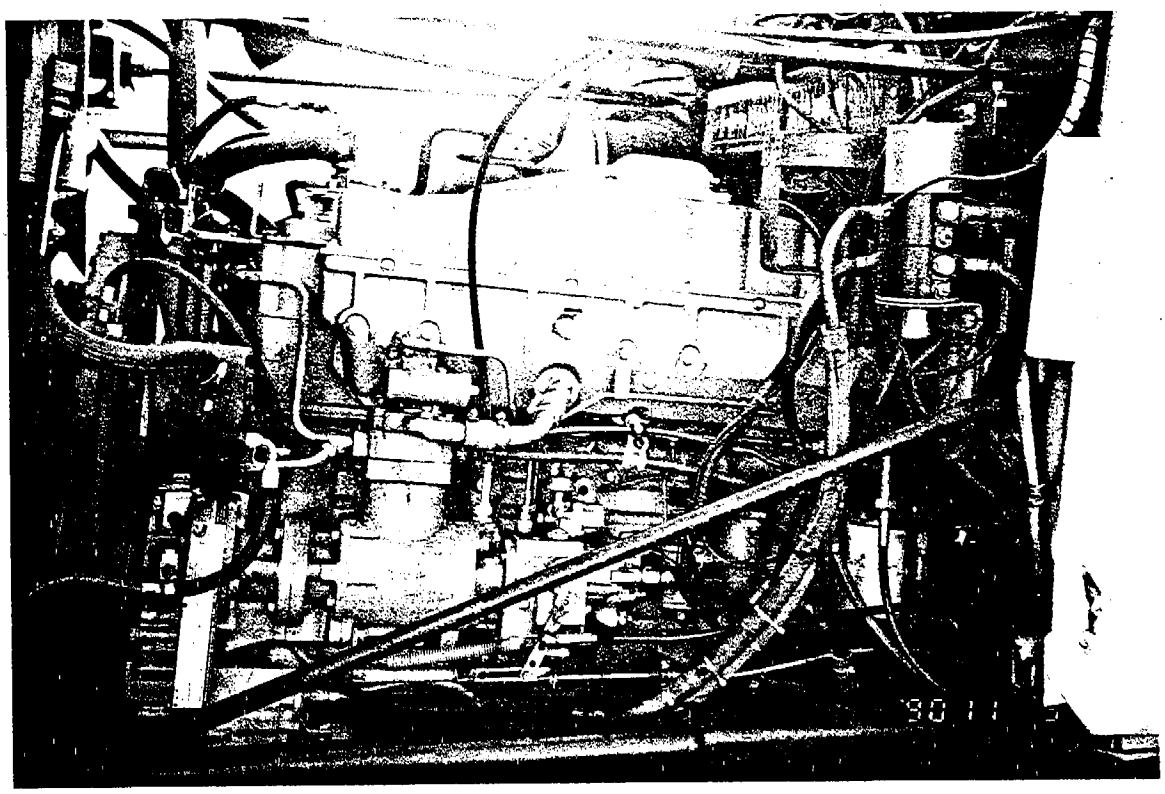
The photographs above and below show the SCRTD Tow Truck. The exhaust muffler would have been replaced by the Donaldson Electric Trap System on either side of the tow truck



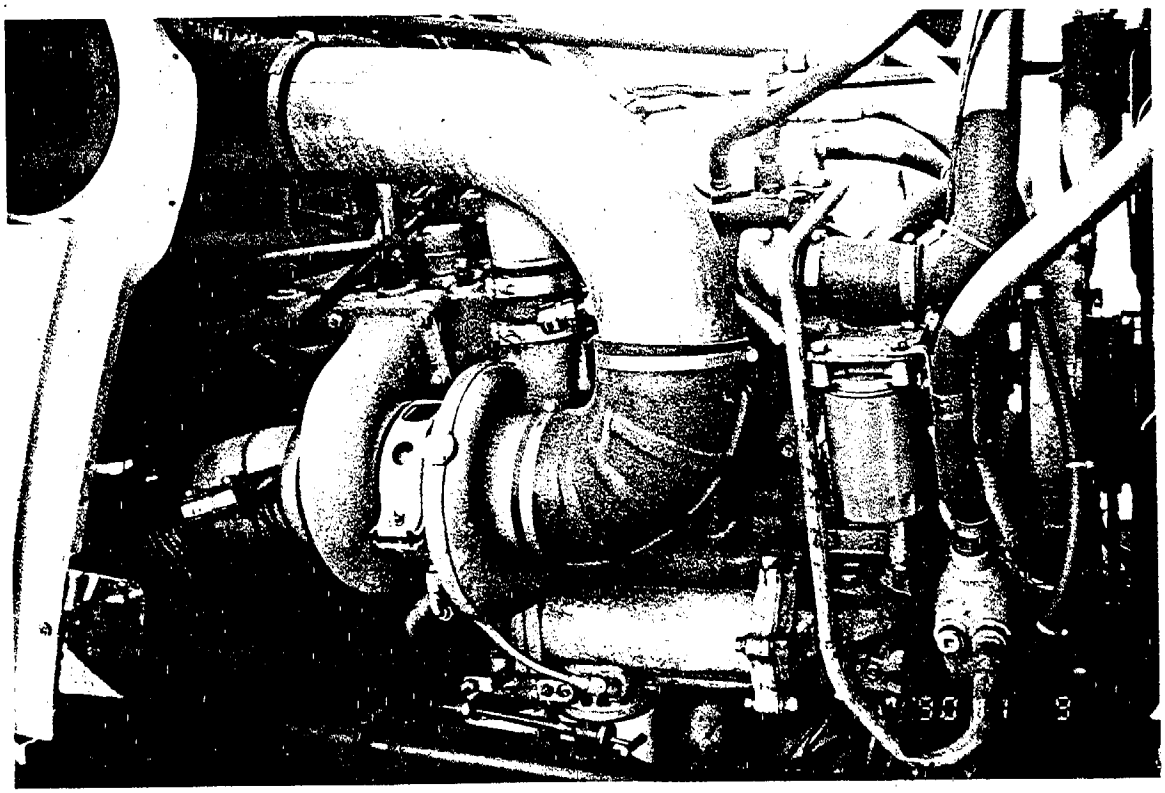


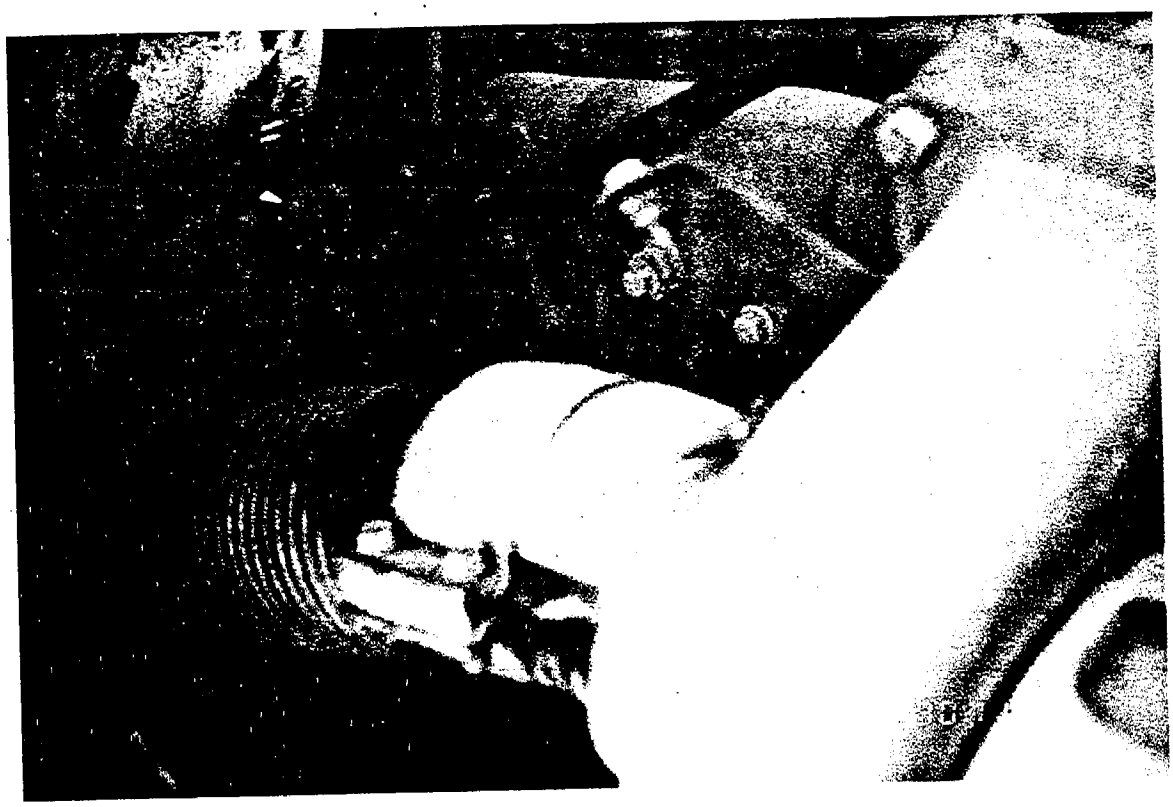
The photographs above and below show the left side of the tow truck where the second trap system would have been mounted.





The photographs above and below show the engine compartment where an additional alternator, air flow sensor and the new location for the oil pump, would have been mounted.



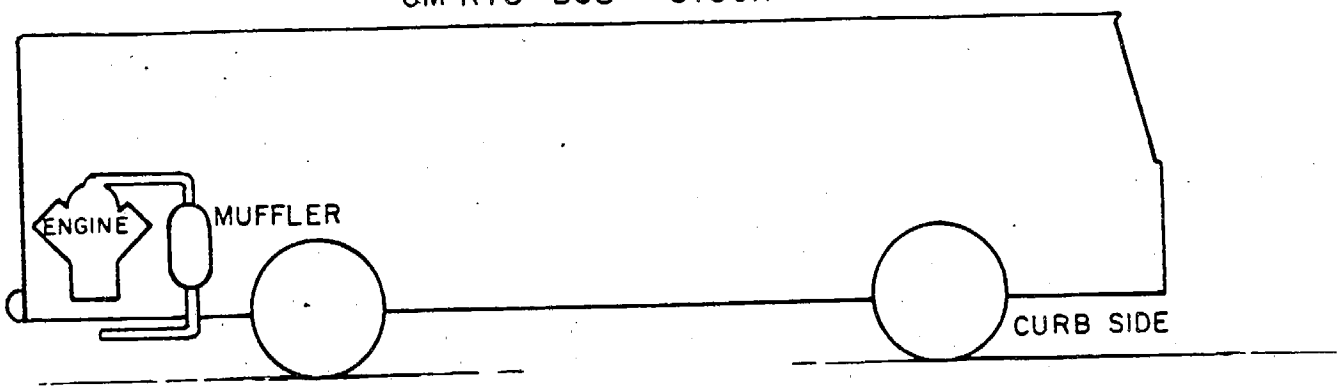


The photographs above and below show the location of the exhaust ducting.

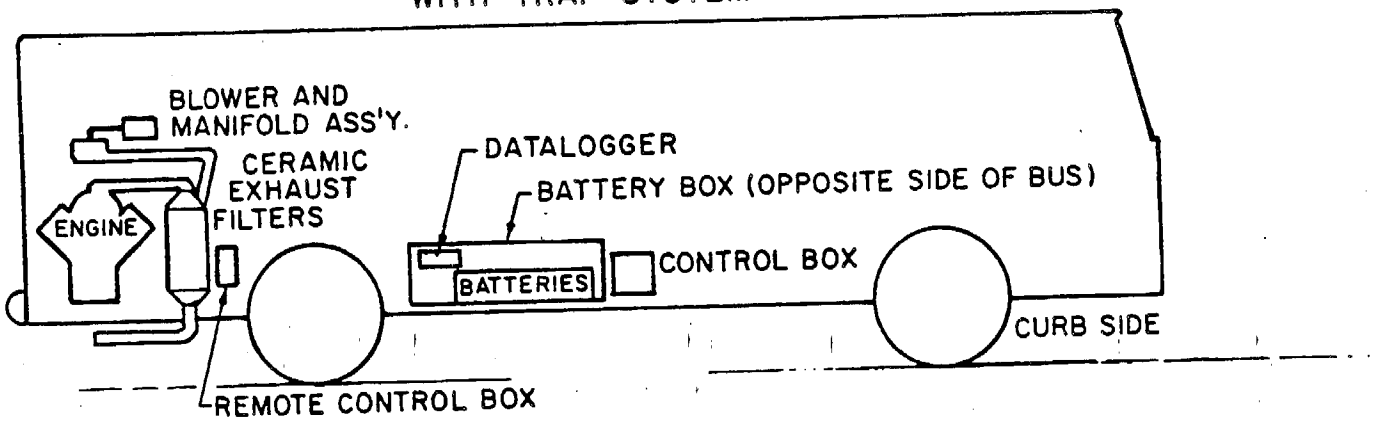
APPENDIX G

Preliminary BTS Installation Flow Chart

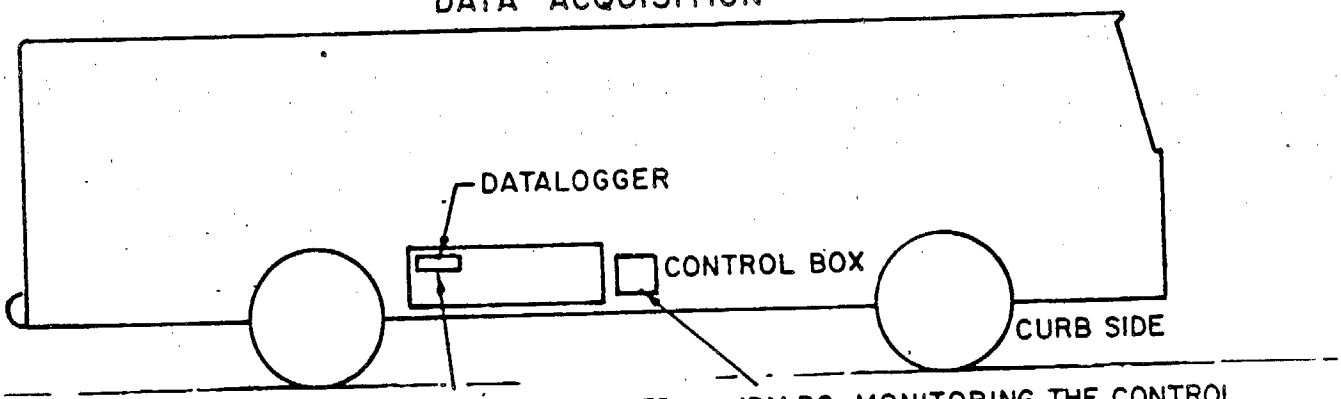
GM RTS BUS - STOCK



WITH TRAP SYSTEM



DATA ACQUISITION



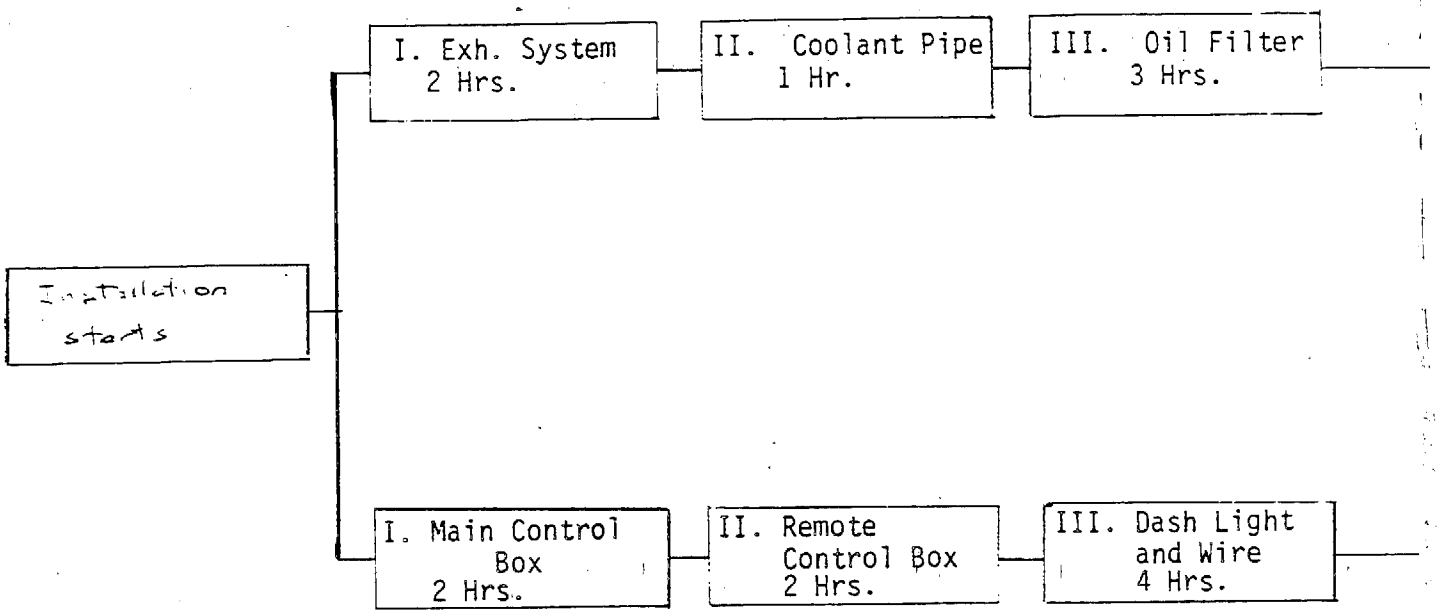
IBM PC MONITORING TRAP TEMPERATURES IN AND OUT AS WELL AS BACKPRESSURE JUST AFTER THE TURBOCHARGER

IBM PC MONITORING THE CONTROL CIRCUIT FOR THE TRAP SYSTEM

PRELIMINARY

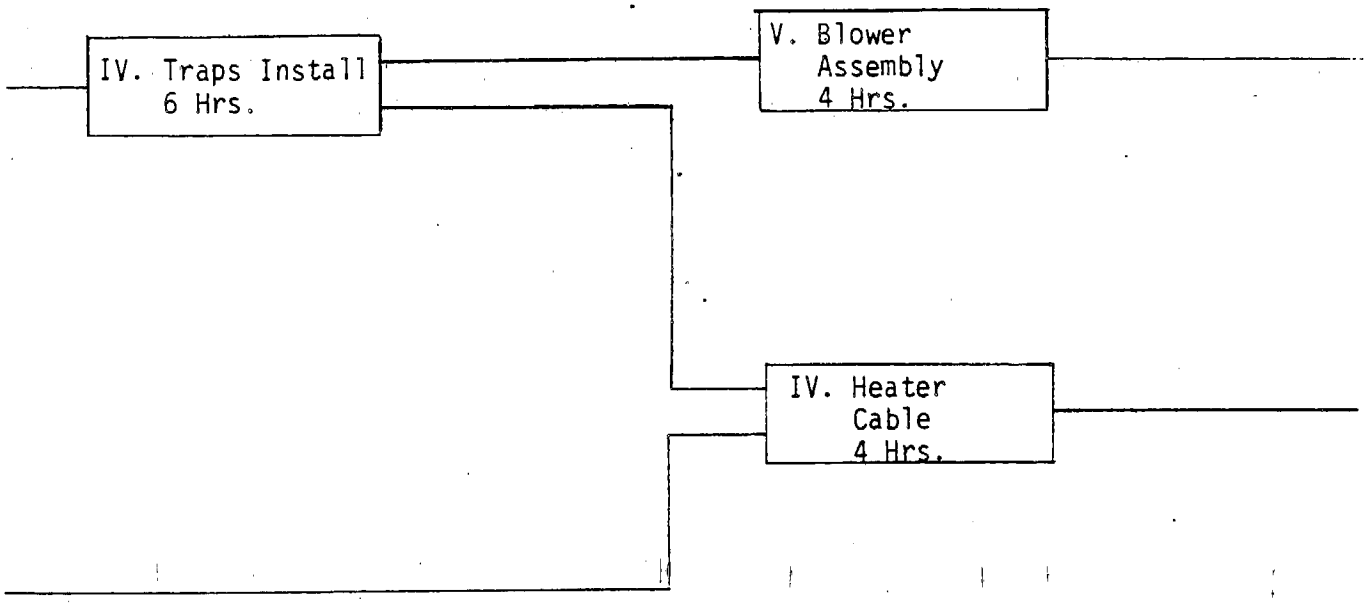
ARB BUS INSTALLATION SCHEDULE CHART

DAY 1



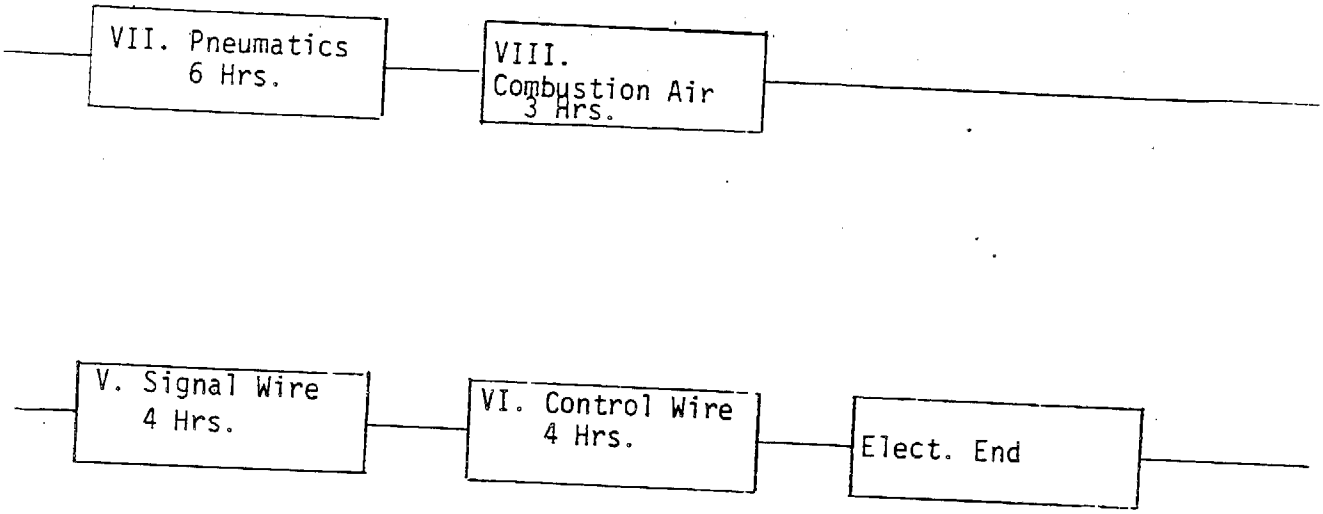
PRELIMINARY
ARB BUS INSTALLATION SCHEDULE CHART

DAY 2



PRELIMINARY
ARB BUS INSTALLATION SCHEDULE CHART

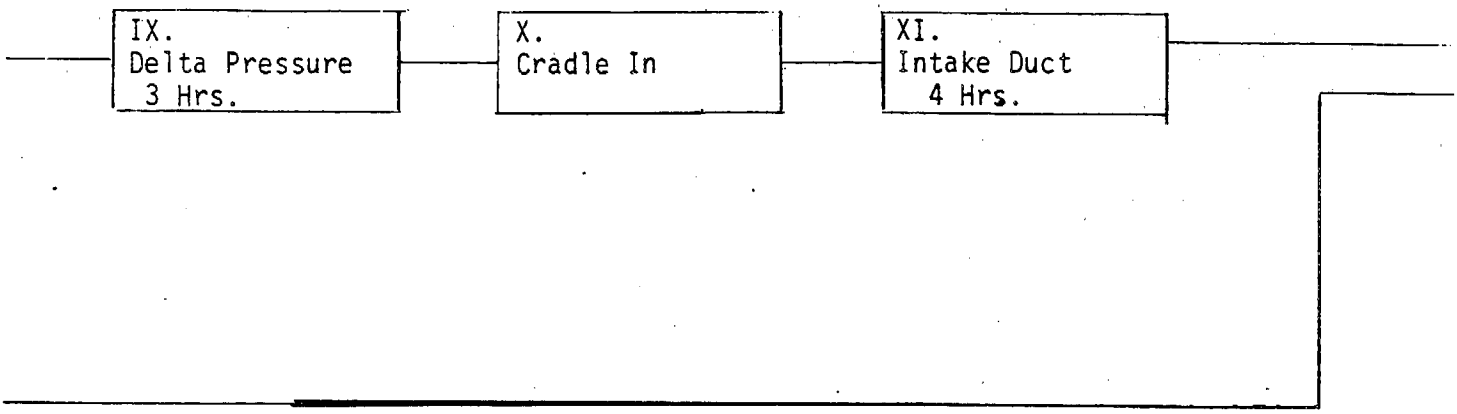
DAY 3



PRELIMINARY

ARB BUS INSTALLATION SCHEDULE CHART

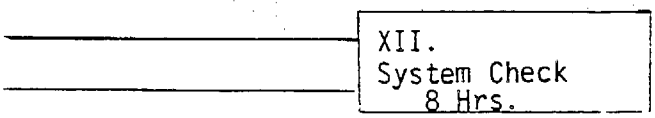
DAY 4



PRELIMINARY

ARB BUS INSTALLATION SCHEDULE CHART

DAY 5



APPENDIX H

Project Presentation (November 13, 1989)

PRESENTATION NO. 3

FOR

AIR RESOURCES BOARD

HEAVY-DUTY
DIESEL PARTICULATE TRAP
DEMONSTRATION

ADVANCED ENGINE TECHNOLOGY

ORTECH INTERNATIONAL

NOVEMBER 1989

ARB TRAP SYSTEM DEMONSTRATION

AGENDA

- 10:00 - PROJECT OBJECTIVES
- 10:15 - RESULTS: TASK 1
  TASK 2
- 11:15 - NYC TRAP PROJECT RESULTS
- 11:30 - TRAP INSTALLATION PLAN AT SCRTD
- 12:30 - GENERAL DISCUSSION

ARB TRAP SYSTEM DEMONSTRATION

PROJECT OBJECTIVES

- DEMONSTRATE DURABLE RETROFIT TRAP SYSTEMS CAPABLE OF REDUCING PARTICULATE EMISSION (85%+) FROM HEAVY-DUTY DIESEL ENGINES USED BY URBAN BUSES AND TRUCKS.

- ONE BUS TRAP SYSTEM FOR 2-STROKE 6V92TA ENGINE ON AN URBAN BUS.

- ONE TRUCK SYSTEM FOR A 4-STROKE ENGINE ON A CLASS 8 TRUCK.

ARB TRAP SYSTEM DEMONSTRATION

PROJECT OUTLINE

- TASK 1 - INVESTIGATION OF STATE OF THE ART TRAP OXIDIZER SYSTEMS.

  1A - LIST SYSTEMS AND EVALUATE
  1B - REPORT RECOMMENDATIONS AND FINALIZE TASK 2 AND TASK 3

- TASK 2 - PRELIMINARY TEST BED EVALUATION OF SELECTED TRAP SYSTEMS

  2A - BUS DUTY CYCLE GENERATION
  2B - TRAP SYSTEMS AND ENGINES PROCUREMENT
  2C - DATA ACQUISITION SYSTEMS DESIGN AND TESTING
  2D - BUS ENGINES EMISSION BASELINE
  2E - BUS TRAP SYSTEM INSTALLATION AND BASELINE
  2F - BUS TRAP SYSTEM DURABILITY (400 HRS) AND PERFORMANCE EVALUATION
  2G - PROCUREMENT OF TRUCK TRAP SYSTEM AND ENGINE
  2H - TRUCK ENGINE EMISSION BASELINE
  2I - TRUCK TRAP SYSTEM INSTALLATION AND BASELINE
  2J - BTS DURABILITY (400 HRS) AND PERFORMANCE EVALUATION

ARB TRAP SYSTEM DEMONSTRATION

PROJECT OUTLINE

- TASK 3 - ON-ROAD DEMONSTRATION TESTING

  3A - FLEET NEGOTIATION AND SELECTION

  3B - BUS TRAP SYSTEM INSTALLATION AND MAINTENANCE

  3C - TRUCK TRAP SYSTEM INSTALLATION AND MAINTENANCE

  3D - DATA COLLECTION AND ANALYSIS

  3E - MONTHLY EMISSION TESTING

  3F - FINAL REPORT

ARB TRAP SYSTEM DEMONSTRATION

TASK 1A

DCI SYSTEM SELECTED

A) THREE CGW EX 54/100/17 FILTERS

B) 10-1/2" DIA. X 12" LONG

C) NON-CATALYZED AND CATALYZED

D) ENGELHARD CATALYST

E) ROTATIONAL ELECTRICAL REGENERATION

ARB TRAP SYSTEM DEMONSTRATION

TASK 1B - REPORT RECOMMENDATIONS AND FINALIZE TASKS 2 AND 3

- DCI ELECTRIC SYSTEMS
- TASK 2 INCLUDES 250 HOURS OF NON-CATALYZED TRAP AND 250 HOURS OF CATALYZED TRAP TESTING FOR THE BUS SYSTEM

ARB TRAP SYSTEM DEMONSTRATION

TASK 2A - BUS DUTY-CYCLE GENERATION

- ADVANCED DESIGN BUS CYCLE SELECTED
- CYCLE LENGTH : 47 MINUTES
- AVERAGE RPM : 1243 RPM
- AVERAGE TORQUE : 296 FT-LB
- AVERAGE HP : 82 HP
- WORK : 65 HP-HR

ARB TRAP SYSTEM DEMONSTRATION

TASK 2B - PROCUREMENT OF BUS TRAP SYSTEM AND ENGINES

- BUS TRAP SYSTEM (3 FILTER CONFIGURATION)
- 6V92TA WITH INJECTORS PROVIDED BY SCRTD
- LOW SULPHUR FUEL PROCURED (<.05%)
- LOW ASH OIL PROCURED

ARB TRAP SYSTEM DEMONSTRATION

TASK 2C - DATA ACQUISITION DESIGN AND TESTING

- CAMPBELL SCIENTIFIC DATA ACQUISITION UNIT

- DATA TO BE COLLECTED
  - ENGINE EXHAUST TEMPERATURE
  - BACKPRESSURE
  - TRAP IN TEMPERATURES (2)
  - TRAP OUT TEMPERATURES (2)
  - DATA COLLECTION AT .05 HZ

- PROGRAMMING COMPLETED

- USER MANUAL COMPLETED

ARB TRAP SYSTEM DEMONSTRATION

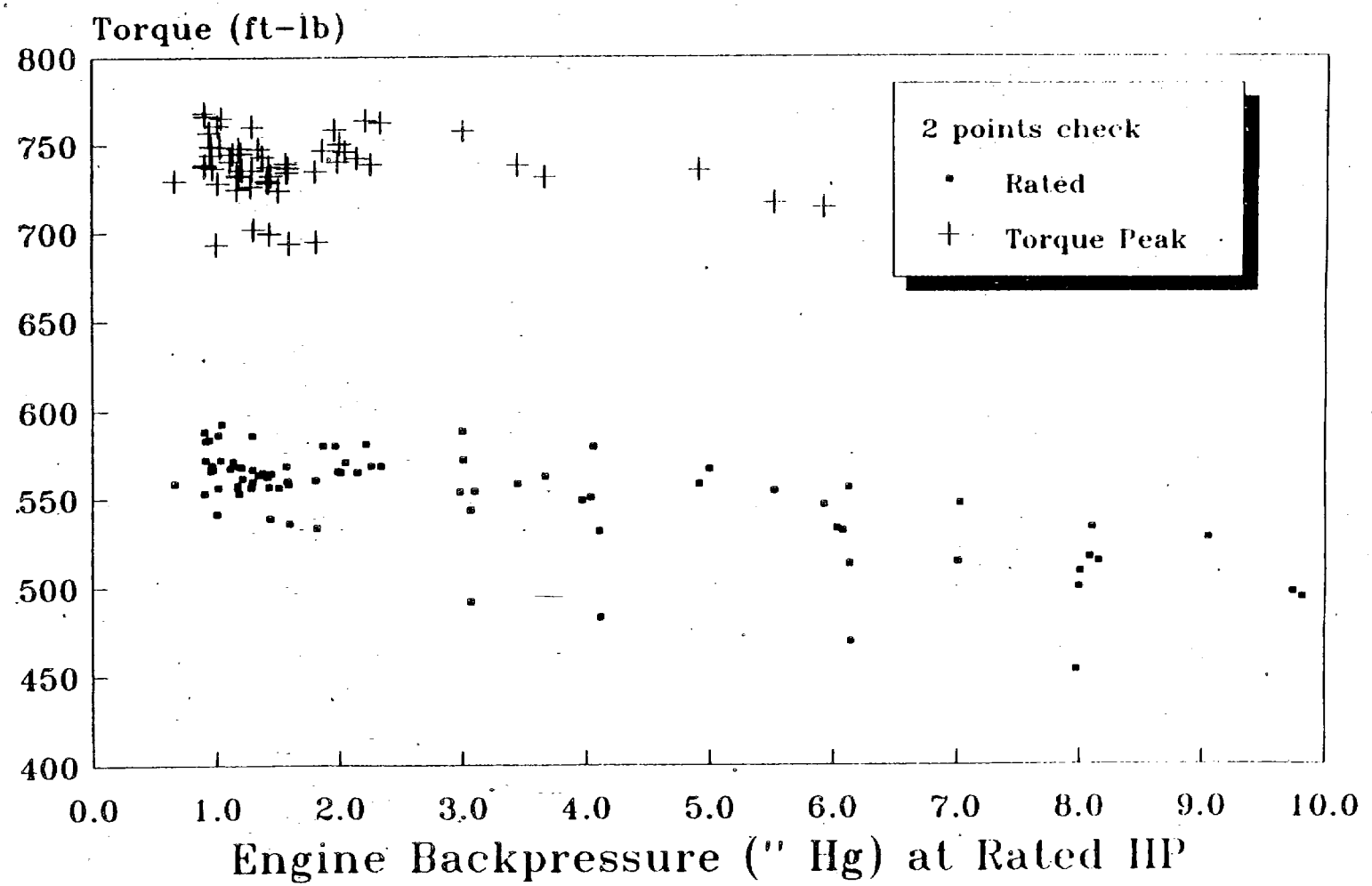
TASK 2D - BUS ENGINE EMISSION BASELINE

- ENGINE INSTALLED AND PERFORMANCE VERIFIED
- QUALITY ASSURANCE ESTABLISHED, DAILY PERFORMANCE CHECK

Table 4.2.6.1
ARB Project Quality Control
Bus Trap System Testing
DDC 6V92TA Performance Data

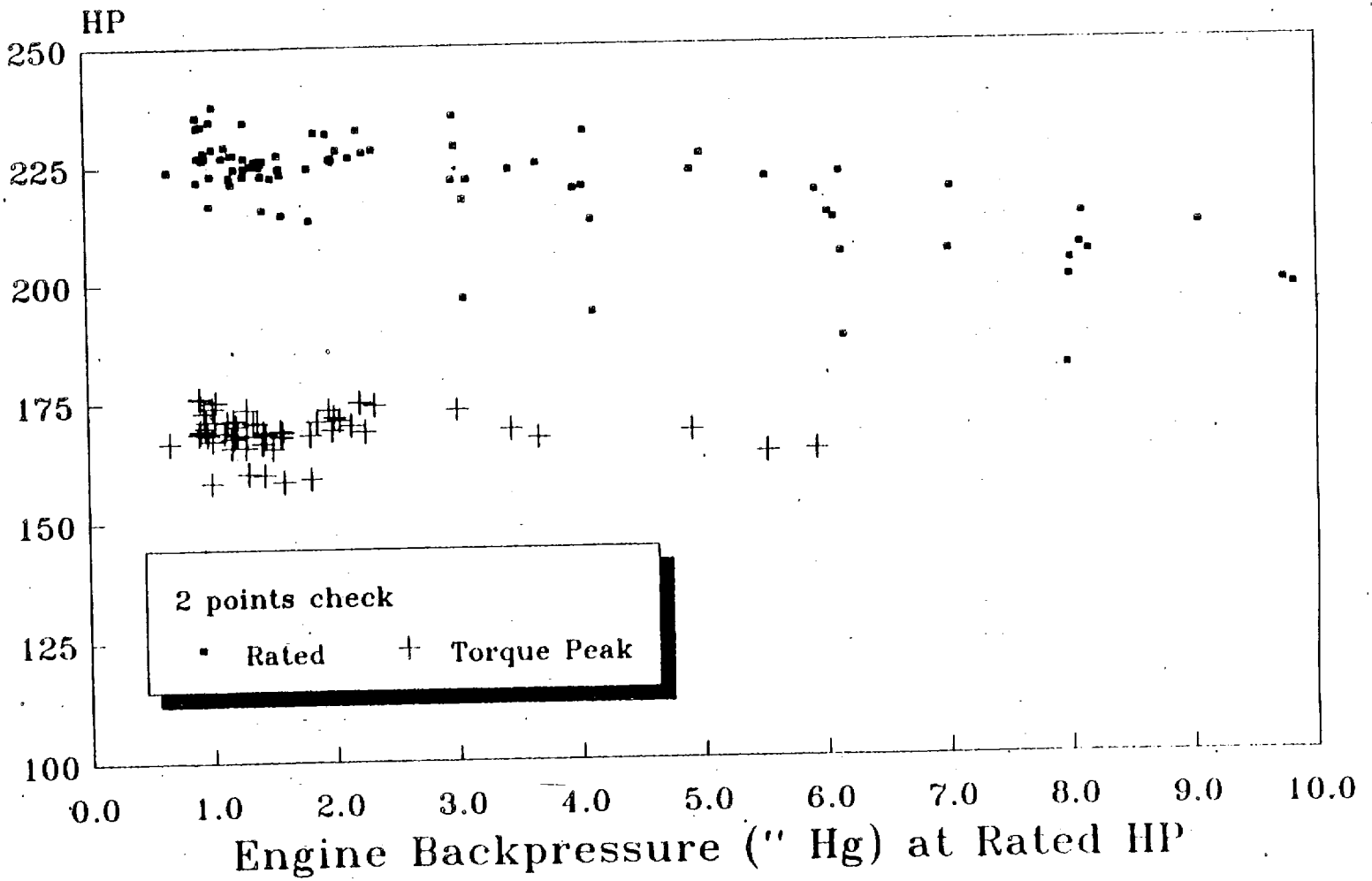
Date	rpm	torq ft-lb	hp	fuel lb/hr	BSFC	BP " Hg	rpm	torq ft-lb	hp	fuel lb	BSFC	BP " Hg	Comment
16-Mar-89	2100	572	228.7	97.5	0.426	3.0	1200	758	173.1	63.4	0.366	1.6	Baseline
26-Apr-89	2100	514	205.5			7.0							
27-Apr-89	2100	508	203.1			8.0							
28-Apr-89	2100	565	225.9			2.0							
03-May-89	2105	565	226.4			2.0	1202	751	171.7				
04-May-89	2102	561	224.3	95.5	0.426	1.8	1202	735	168.2				
05-May-89	2100	558	223.1			1.6	1203	737	168.7			1.0	
07-May-89	2100	571	228.1			2.0	1205	746	171.2			1.3	
08-May-89	2102	565	225.9	98.2	0.435	1.4	1205	743	170.5	65.3	0.383	0.9	
08-May-89	2105	558	223.7	96.1	0.430	3.4	1202	738	168.9	64.2	0.380	1.7	
09-May-89	2101	562	224.9	99.8	0.444	3.7	1201	731	167.2	65.3	0.390	1.9	
09-May-89	2101	554	221.6	96.9	0.437	3.1							
09-May-89	2101	549	219.5	98.2	0.447	4.0							
09-May-89	2101	531	212.5	98.2	0.462	6.1							
09-May-89	2101	516	206.4	99.5	0.482	8.1							
09-May-89	2101	493	197.3	95.8	0.485	9.8							
12-May-89	2097	564	224.9	98.5	0.438	1.3	1200	748	170.8	65.4	0.383	0.9	
15-May-89	2100	566	226.1	98.2	0.434	2.0	1200	740	169.1	64.5	0.381	1.3	
15-May-89	2097	564	224.9	98.5	0.438	1.3	1200	748	170.8	65.4	0.383	0.9	
16-May-89	2105	556	222.9	95.2	0.427	1.0	1205	728	167.0	63.7	0.381	0.8	
17-May-89	2106	571	229.1	95.9	0.419	1.1	1205	745	170.9	64.6	0.378	0.8	
18-May-89	2103	567	226.8	97.1	0.428	1.0	1200	737	168.3	63.3	0.376	0.7	
19-May-89	2100	566	226.3	95.9	0.424	1.0	1199	744	169.8	63.8	0.376	0.7	
24-May-89	2107	560	224.4			1.3							
24-May-89	2102	554	221.6			3.0							
24-May-89	2100	550	220.0			4.0							
24-May-89	2107	533	213.6			6.0							
24-May-89	2095	514	204.9			8.2							
24-May-89	2097	497	198.2			9.7							
24-May-89	2095	558	222.3	96.9	0.436	1.2	1200	725	165.5	64.3	0.388	0.7	
29-May-89	2102	568	227.2	96.8	0.426	1.2	1199	745	170.1	64.1	0.377	0.8	
30-May-89	2099	562	224.4	95.8	0.427	1.2	1202	736	168.3	63.2	0.375	0.8	
31-May-89	2102	556	222.6	95.8	0.430	1.2	1201	733	167.5	63.2	0.377	0.8	
01-Jun-89	2104	564	226.0	96.3	0.426	1.4	1206	732	168.1	64.3	0.382	1.0	
01-Jun-89	2100	533	213.1	95.8	0.449	1.8	1202	695	159.0	64.7	0.407	1.1	140A 28 v
02-Jun-89	2100	562	224.8	96.3	0.428	1.4	1199	729	166.4	64.1	0.385	1.1	
05-Jun-89	2100	569	227.3	97.5	0.429	1.6	1201	739	169.0	64.4	0.381	1.1	
07-Jun-89	2100	539	215.4	97.5	0.452	1.4	1201	699	159.9	64.2	0.401	1.1	145 A 28 v
08-Jun-89	2102	536	214.4	96.2	0.449	1.6	1200	694	158.5	63.4	0.400	1.1	140 A 28 v
09-Jun-89	2100	542	216.5	96.5	0.446	1.0	1200	693	158.3	63.1	0.398	0.8	140 A 28 v
12-Jun-89	2106	564	226.1	97.5	0.431	1.4	1202	738	168.8	63.1	0.374	1.0	
13-Jun-89	2103	557	222.8	96.8	0.434	1.4	1200	729	166.4	64.2	0.386	1.1	

ARB Bus Trap System Testing
DDC 6V92TA



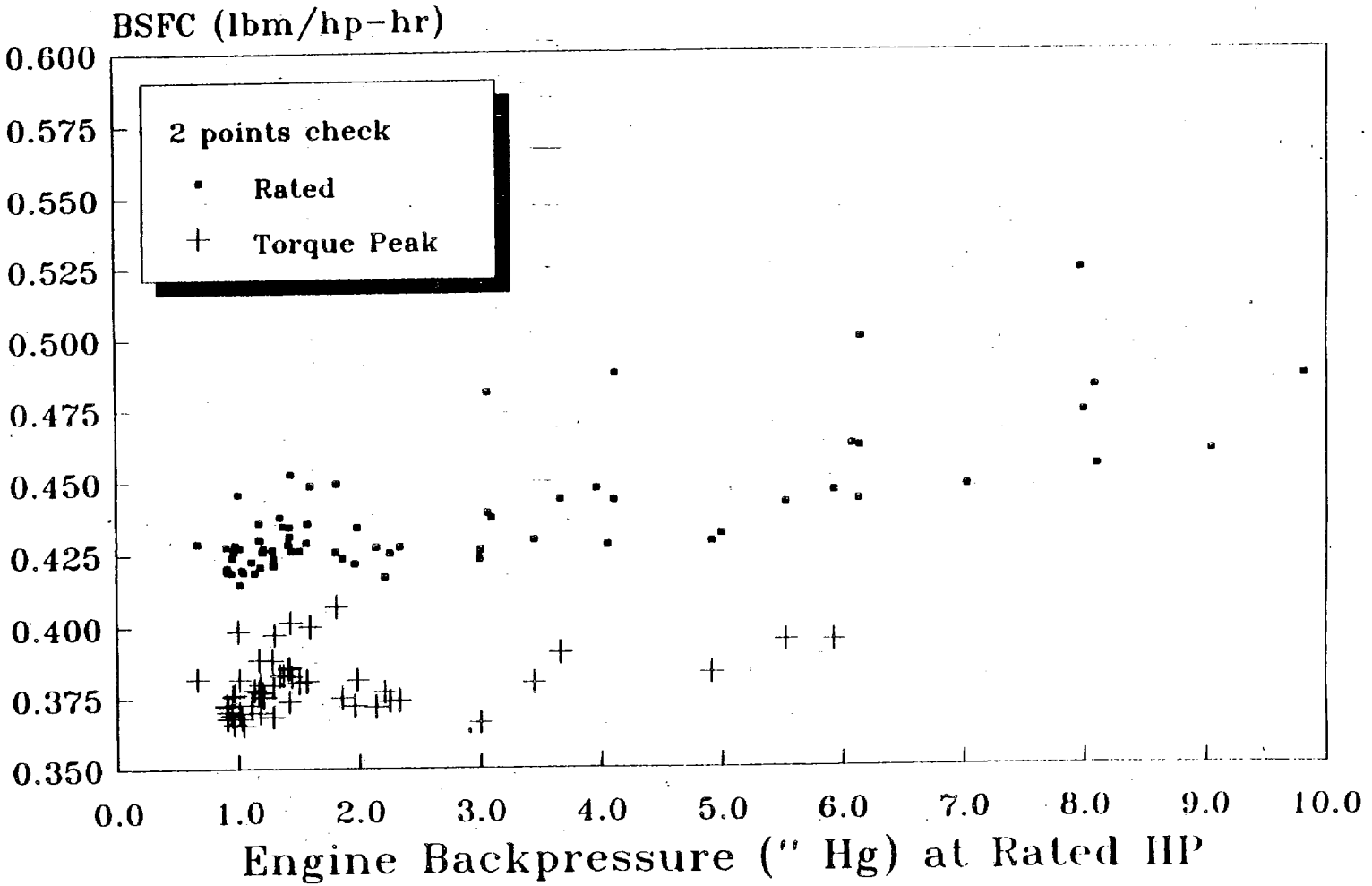
AET-ORTECH International

ARB Bus Trap System Testing
DDC 6V92TA



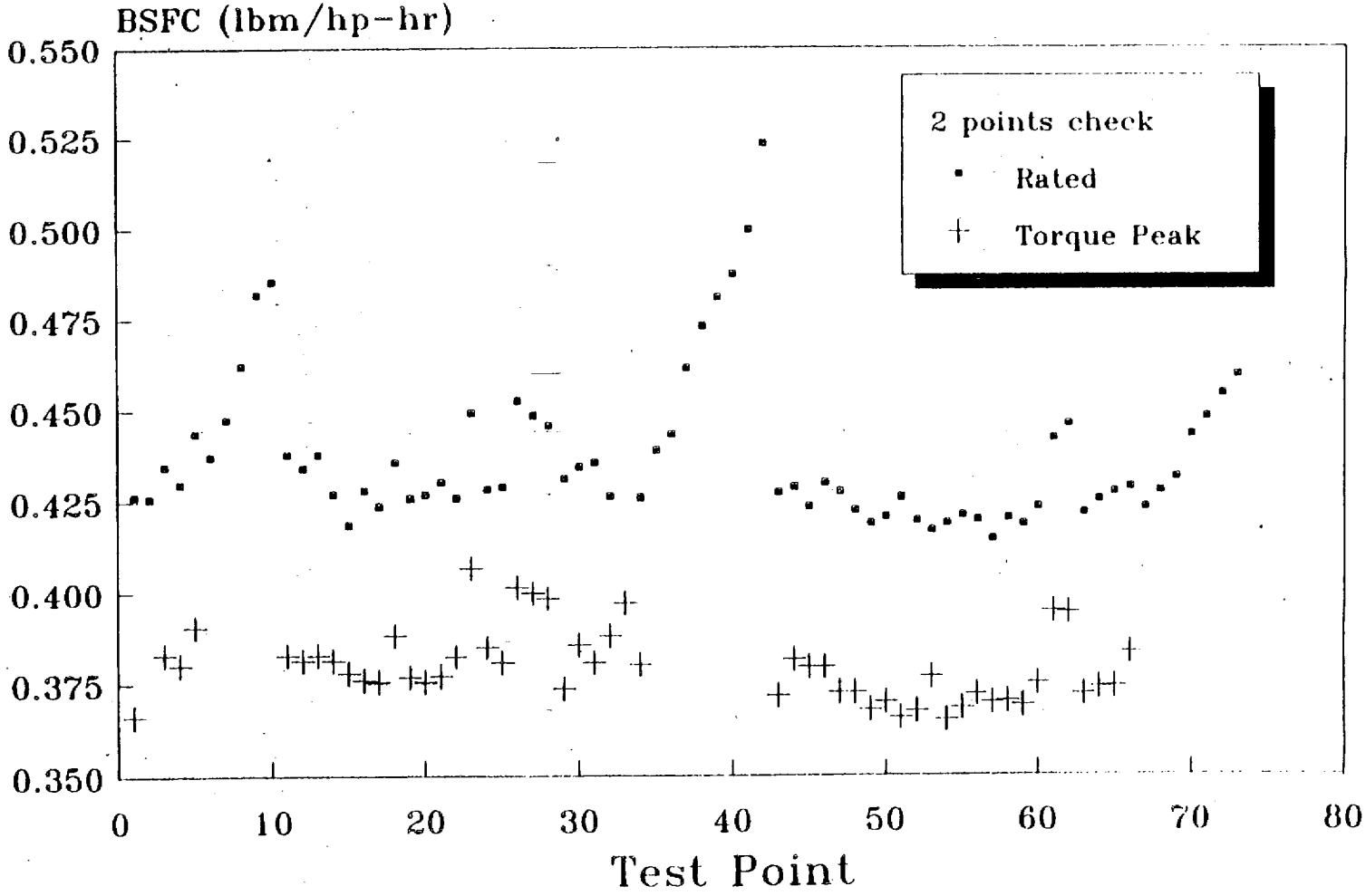
AET-ORTECH International

ARB Bus Trap System Testing
DDC 6V92TA



AET-ORTECH International

ARB Bus Trap System Testing
DDC 6V92TA



AET-ORTECH International

ARB TRAP SYSTEM DEMONSTRATION

TASK 2D

- ADB CYCLE

- EMISSION DATA COLLECTED AT 3" AND 7" HG ENGINE BACKPRESSURE

- CO
  NO_X
  THC
  PARTICULATE

- 7 CYCLE DATA

ARB TRAP SYSTEM DEMONSTRATION

TASK 2D

BASLINE EMISSION USING ADB CYCLE

EMISSION (gr/bhp-hr)	RATED BACKPRESSURE 3" HG	7" HG
CO	1.15	1.54
NO_x	4.77	4.77
THC	.56	.54
PARTICULATE	.18	.20

ARB TRAP SYSTEM DEMONSTRATION

TASK 2E - BUS TRAP SYSTEM INSTALLATION AND BASELINE

- NON-CATALYZED TRAP SYSTEM INSTALLED
- DCI AND ORTECH PERSONNEL COMMISSIONED THE SYSTEM

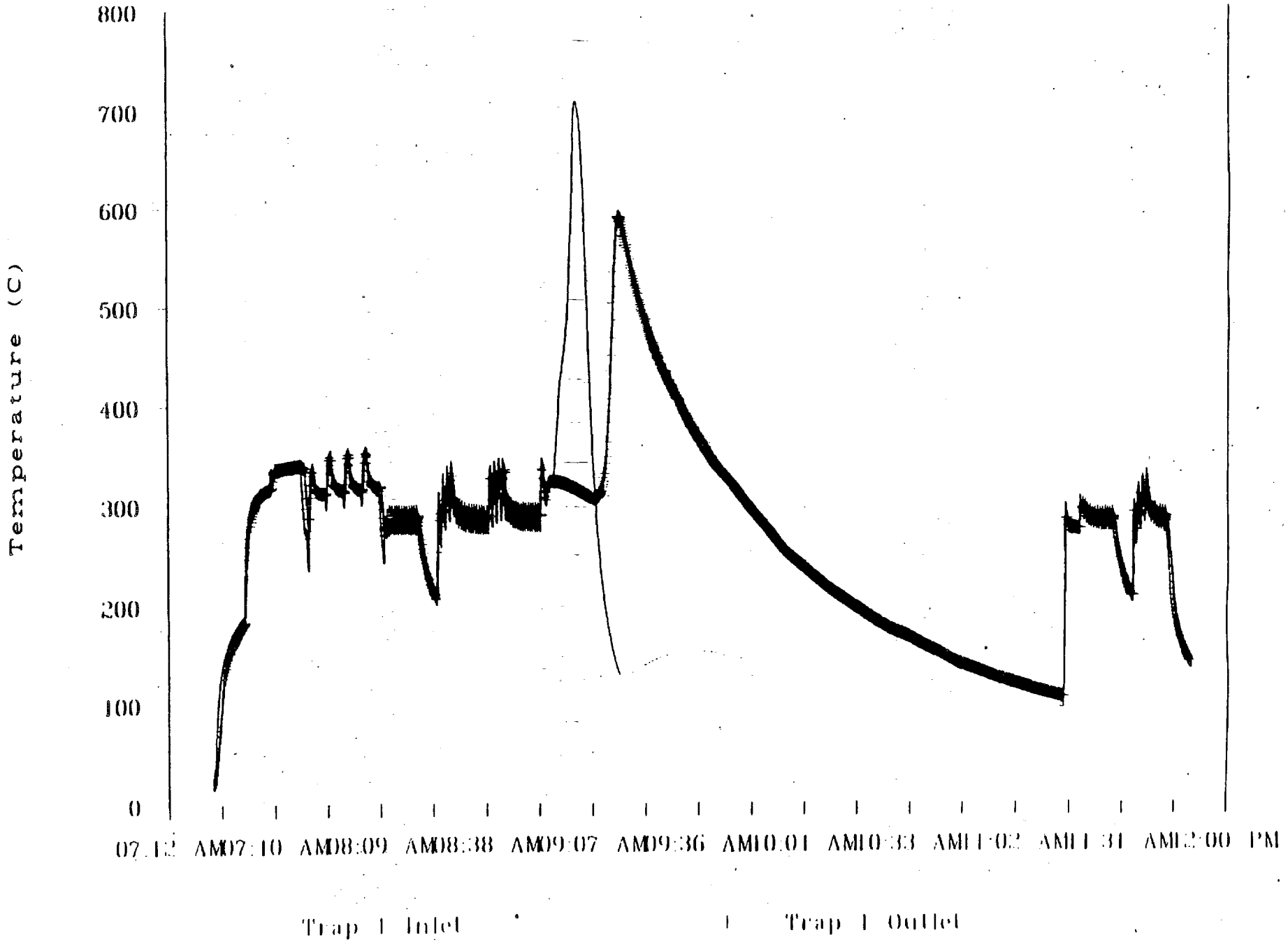
ARB TRAP SYSTEM DEMONSTRATION

TASK 2F - BTS DURABILITY AND PERFORMANCE EVALUATION

- BTS OPTIMIZATION USING DCI CONTROLLER OUTPUT
  - BACKPRESSURE
  - TRAP INLET AND OUTLET TEMPERATURES
  - ENGINE FLOW
- OPTIMIZED CONTROL FACTOR K FOR BOTH CATALYZED AND NON CATALYZED TRAP

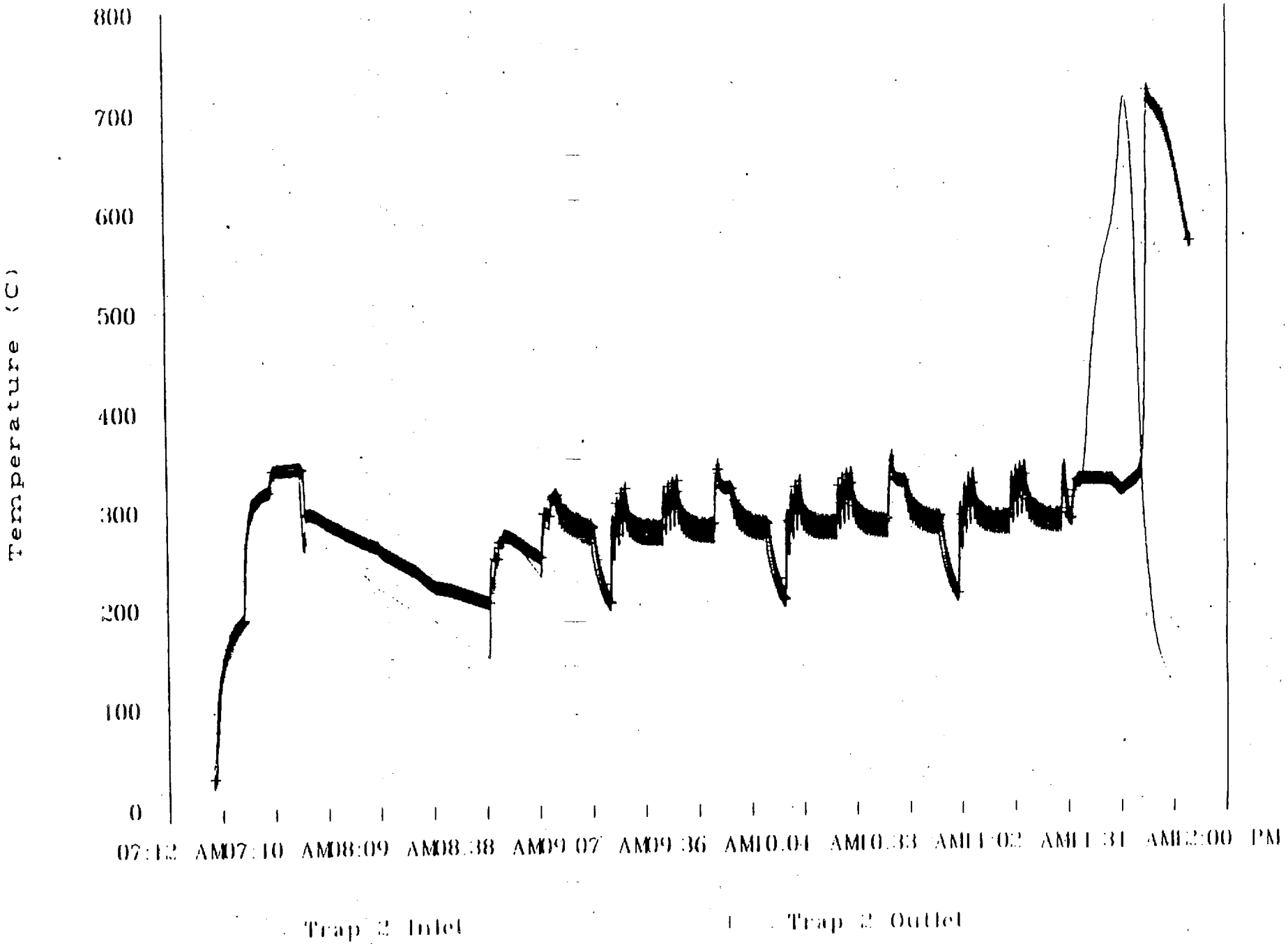
ARB BTX Testing

Regeneration Profile (Aug 8, 1989)



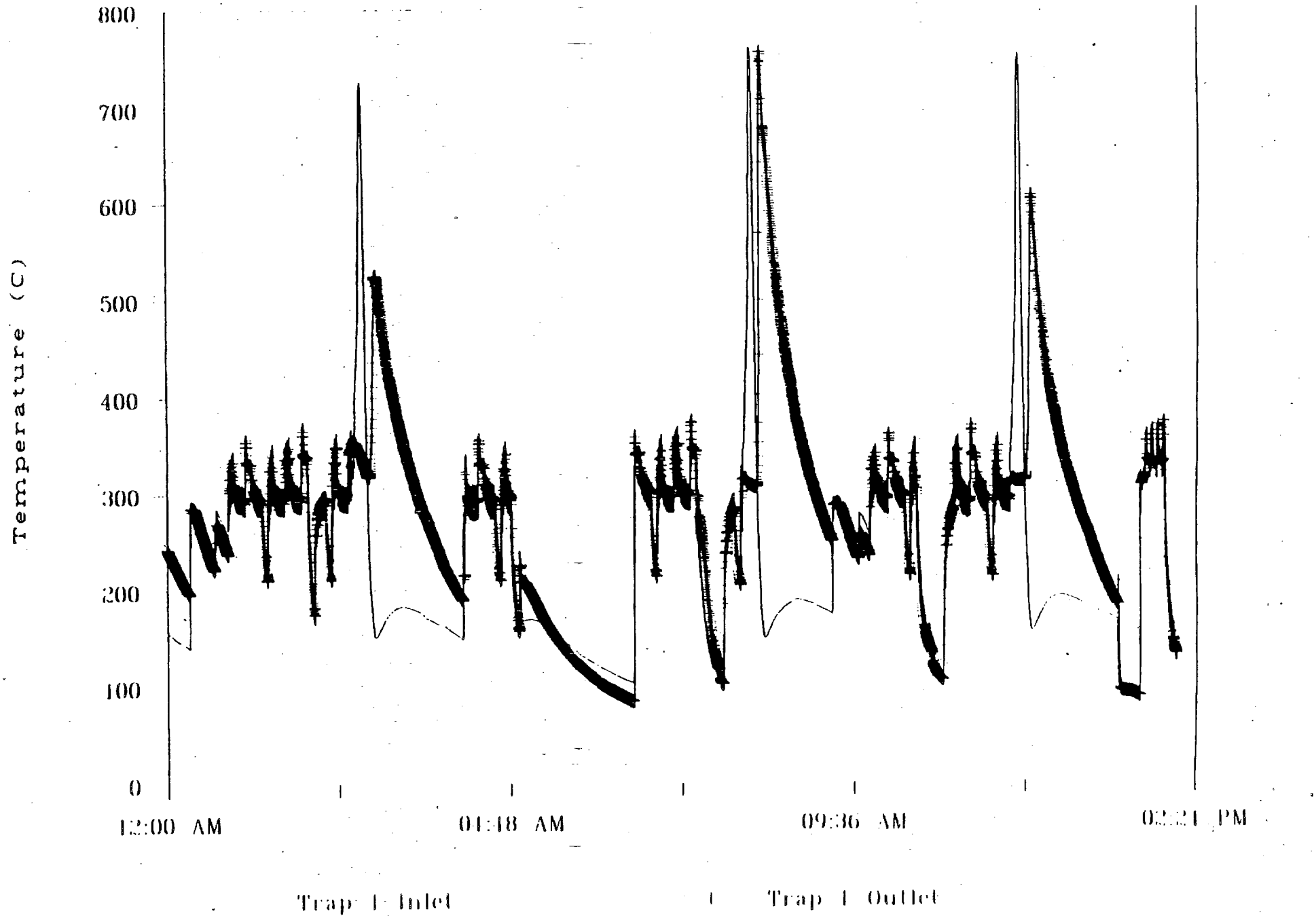
ARB BTS Testing

Regeneration Profile (Aug 8, 1989)



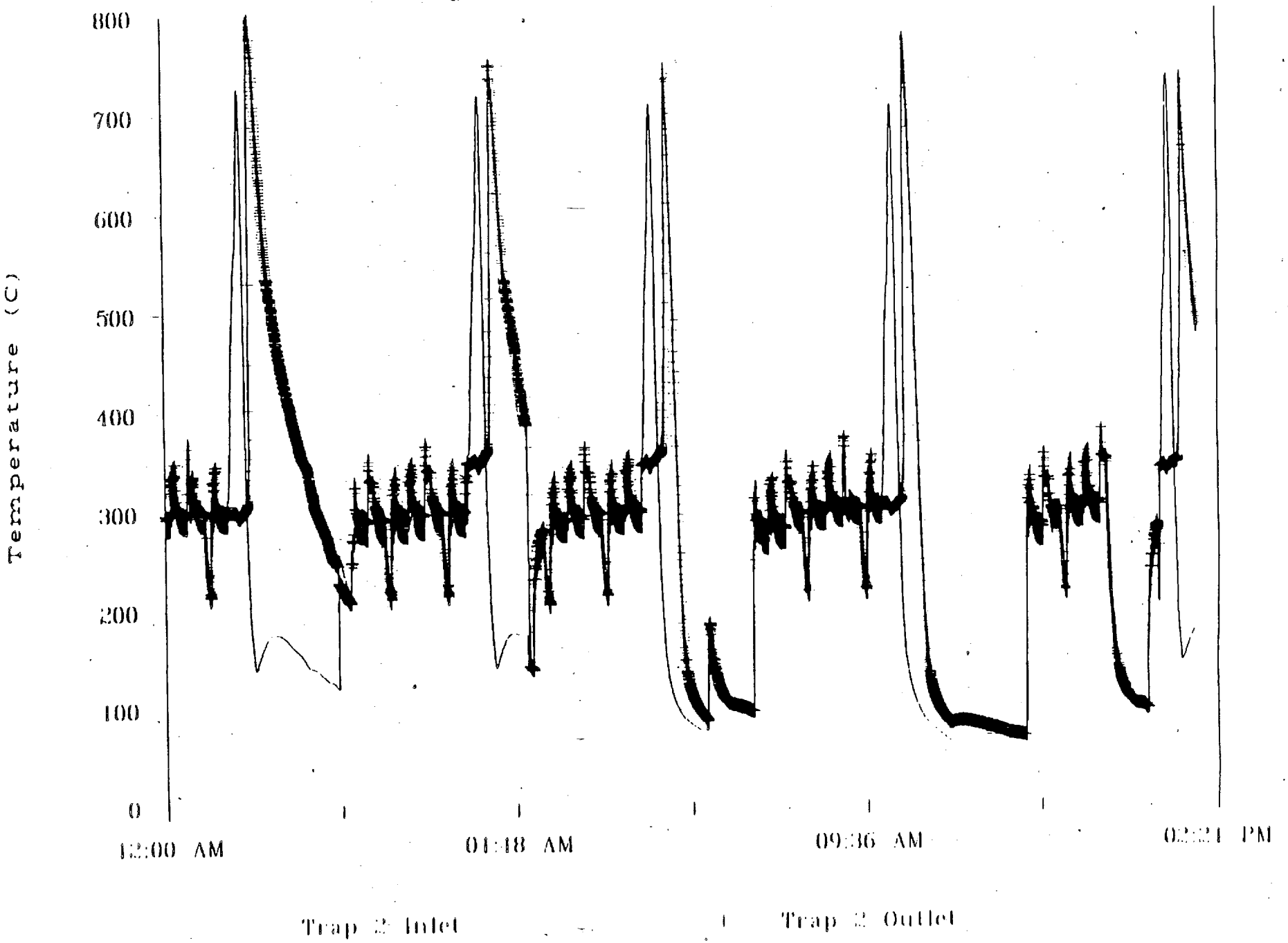
ARB BTS Testing

Regeneration Profile (Aug 4, 1989)



ARB BTX Testing

Regeneration Profile (Aug 4, 1989)



ARB BTI Testing

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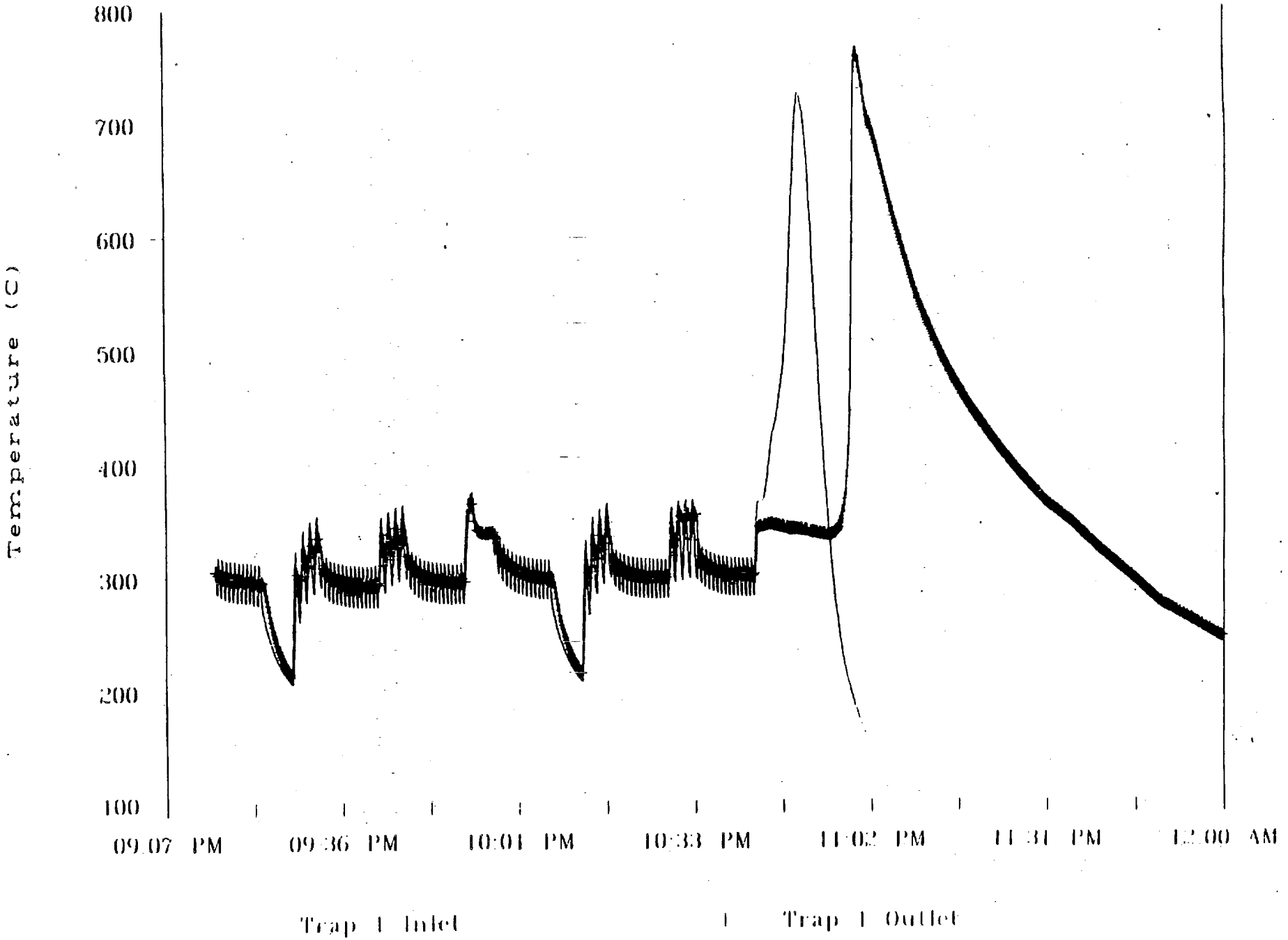

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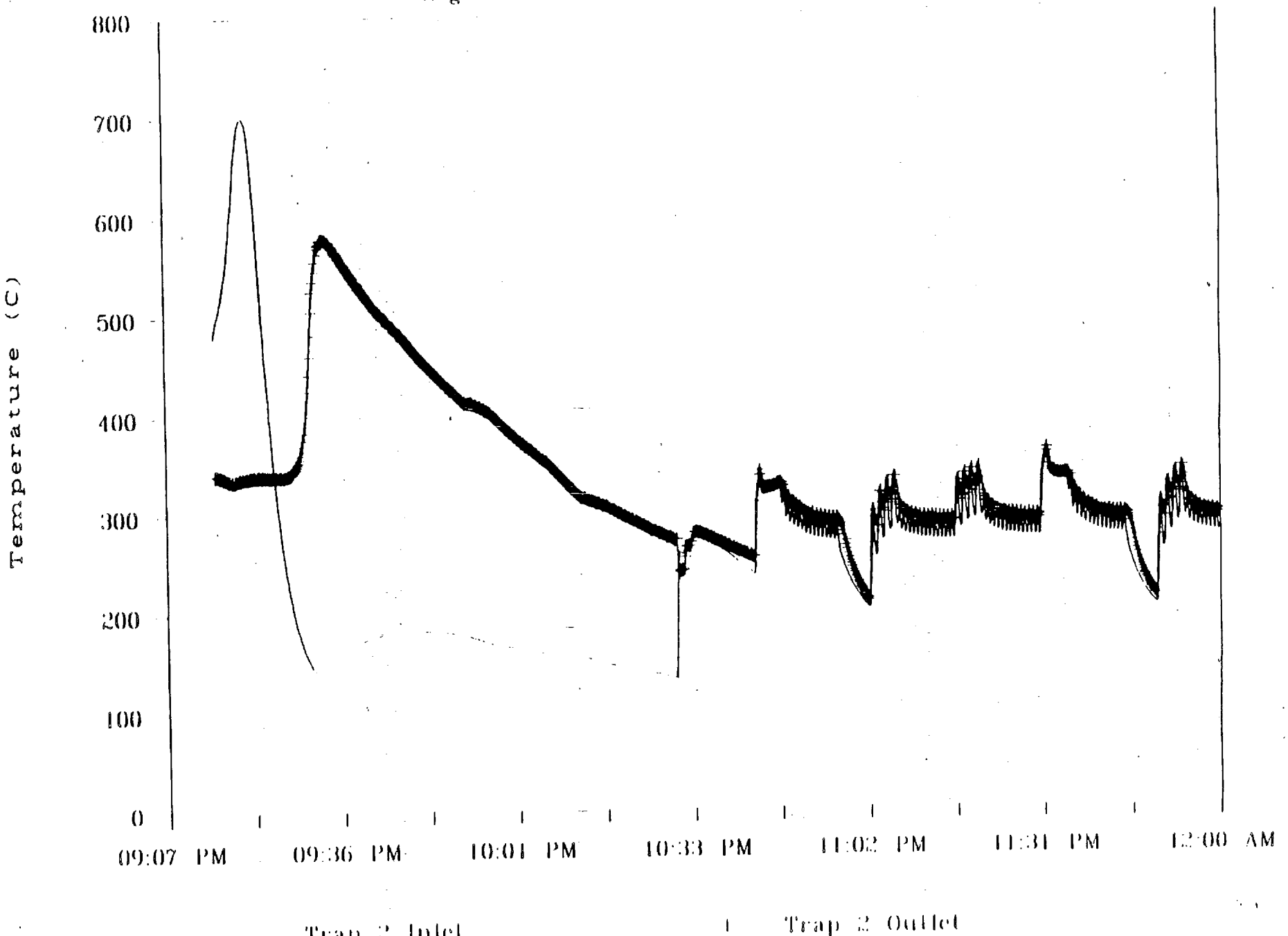

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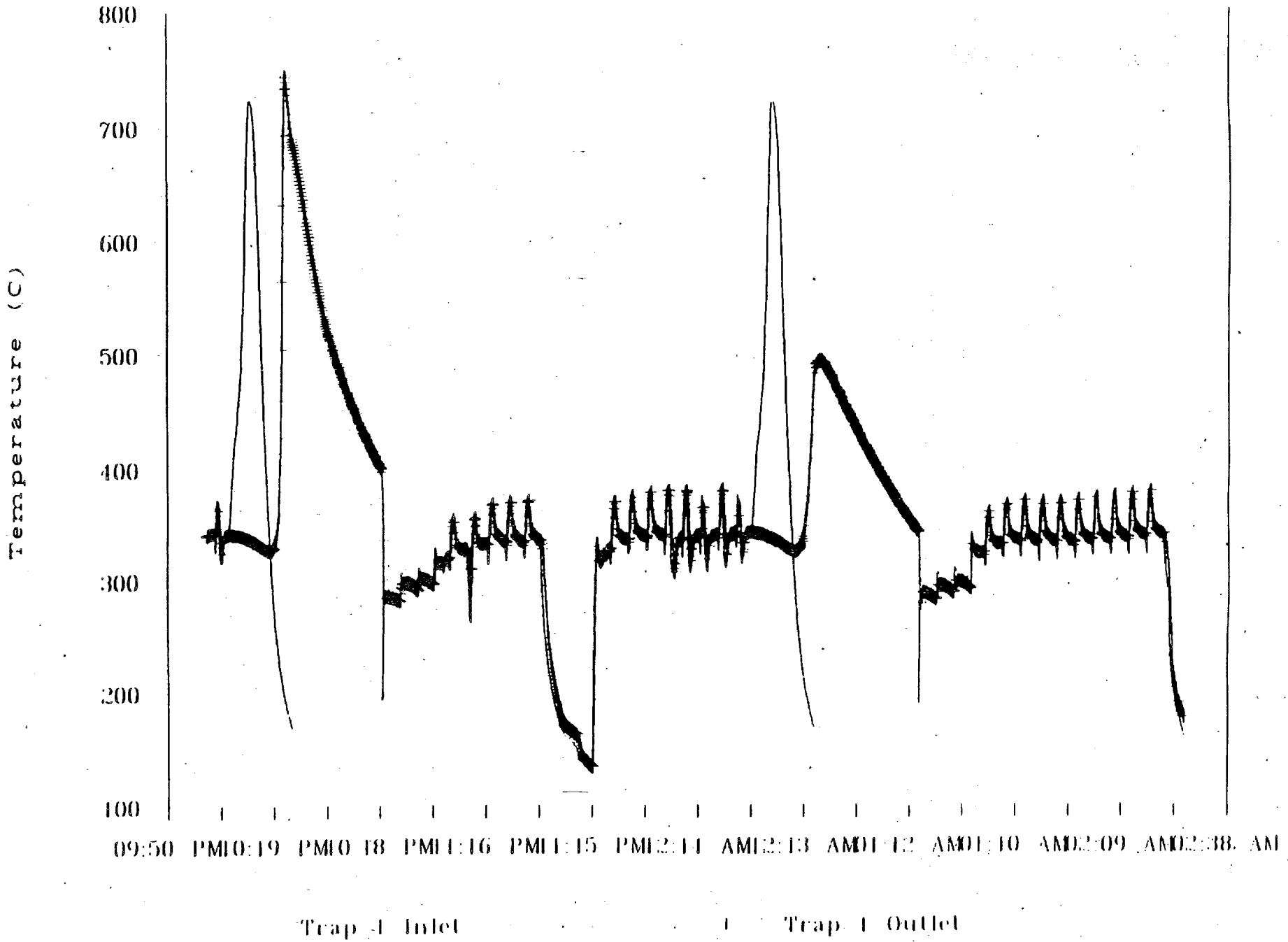

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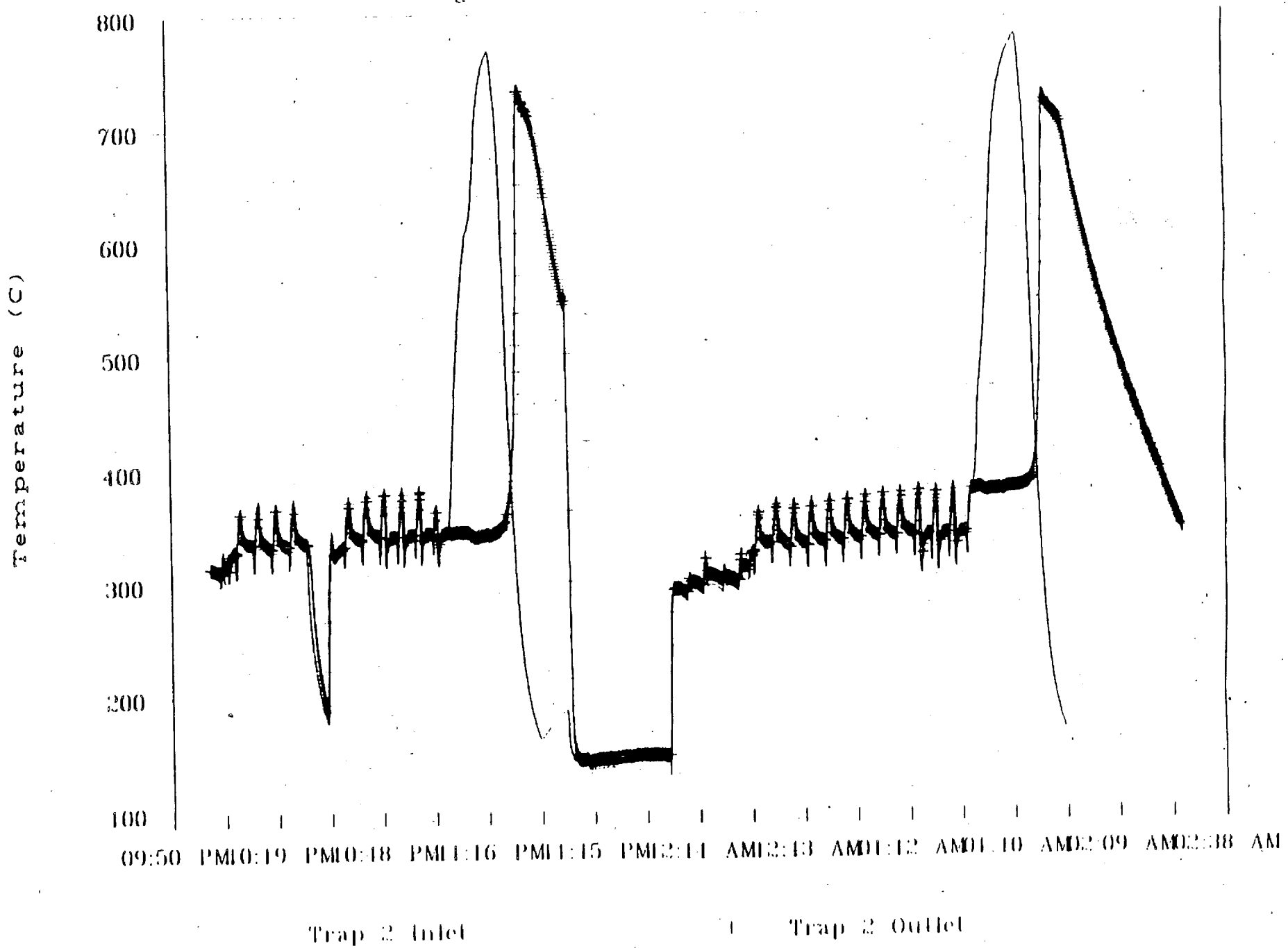

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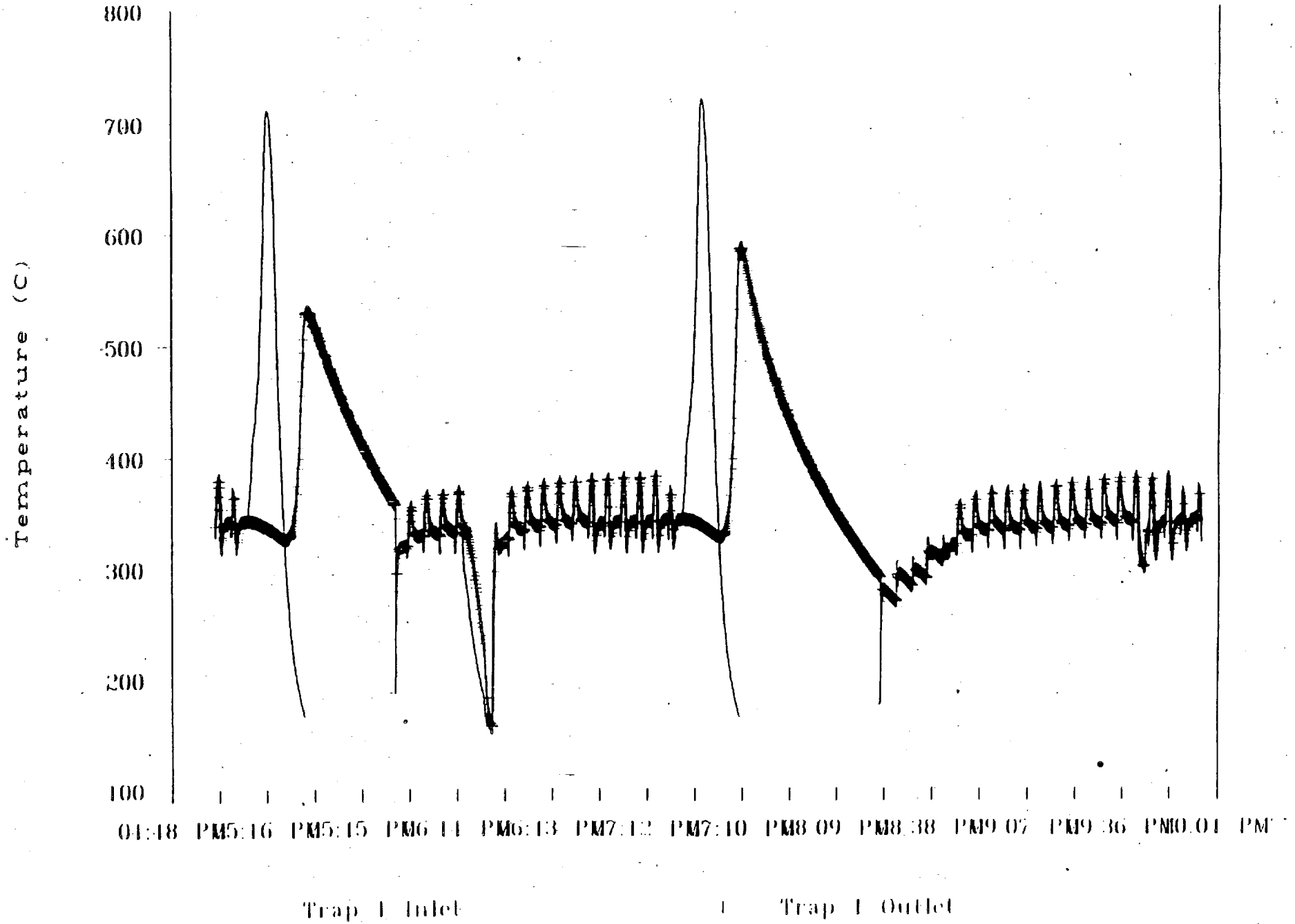
Regeneration Profile (Aug 2, 1989)



ARB BTI Testing

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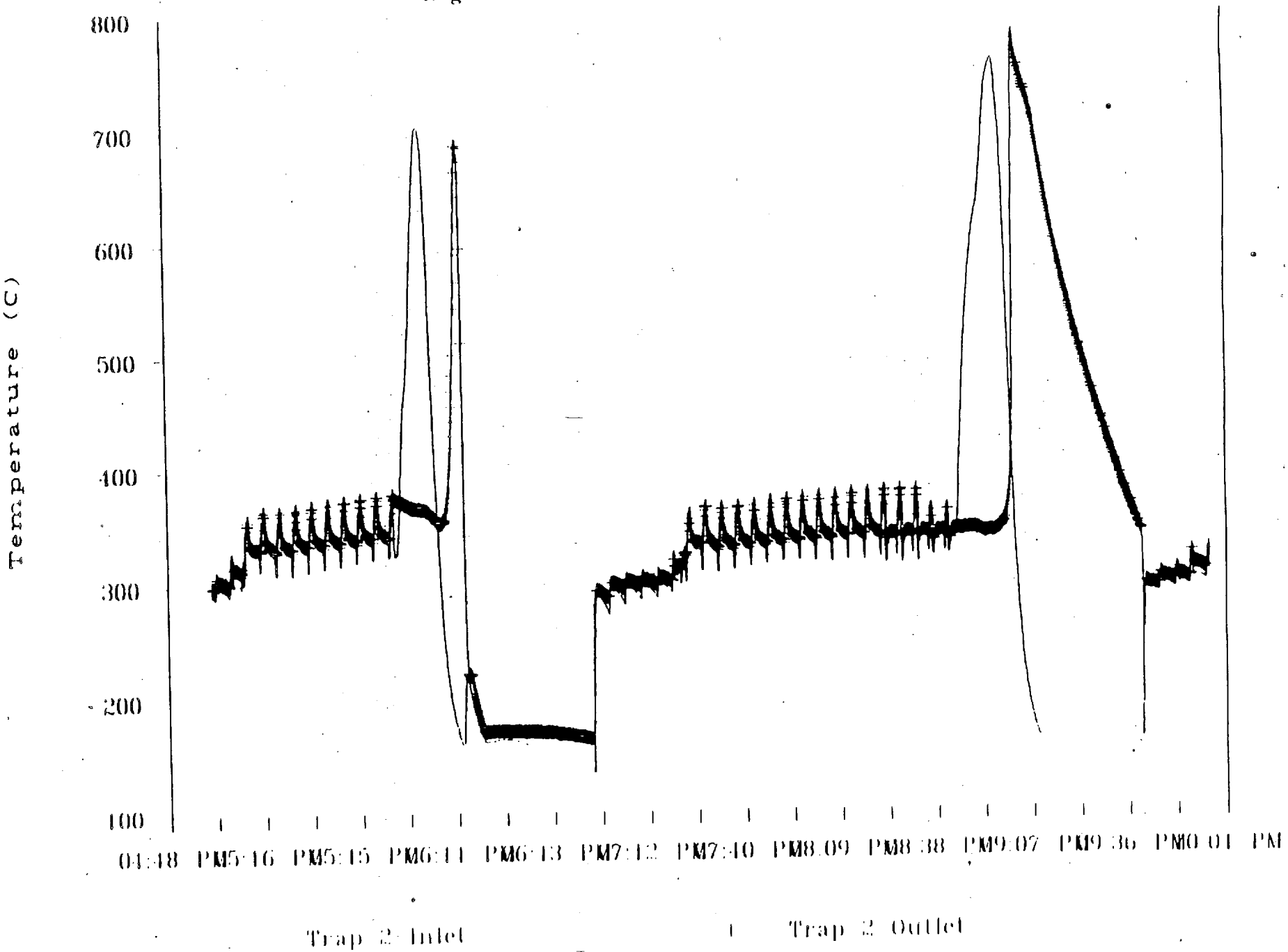

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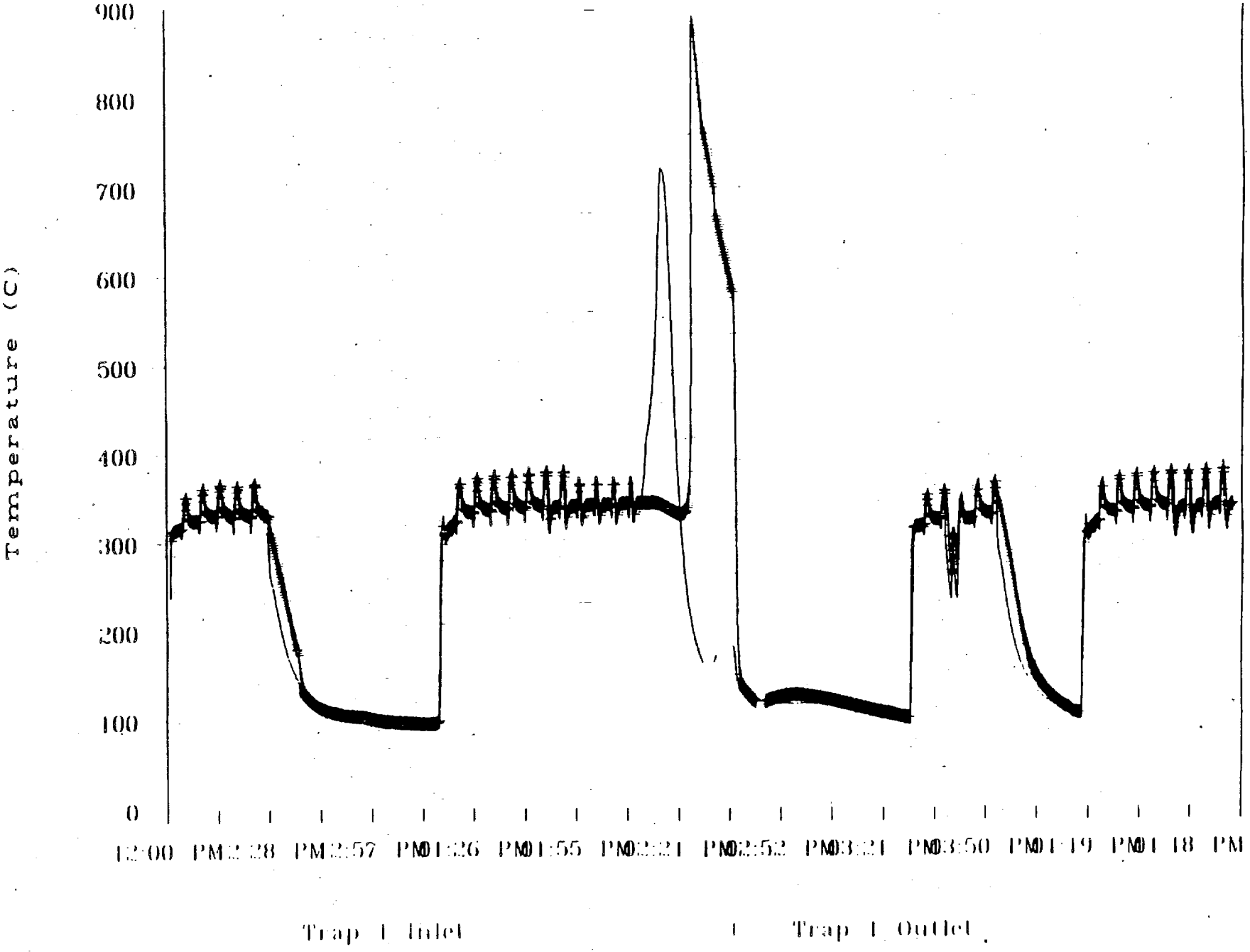

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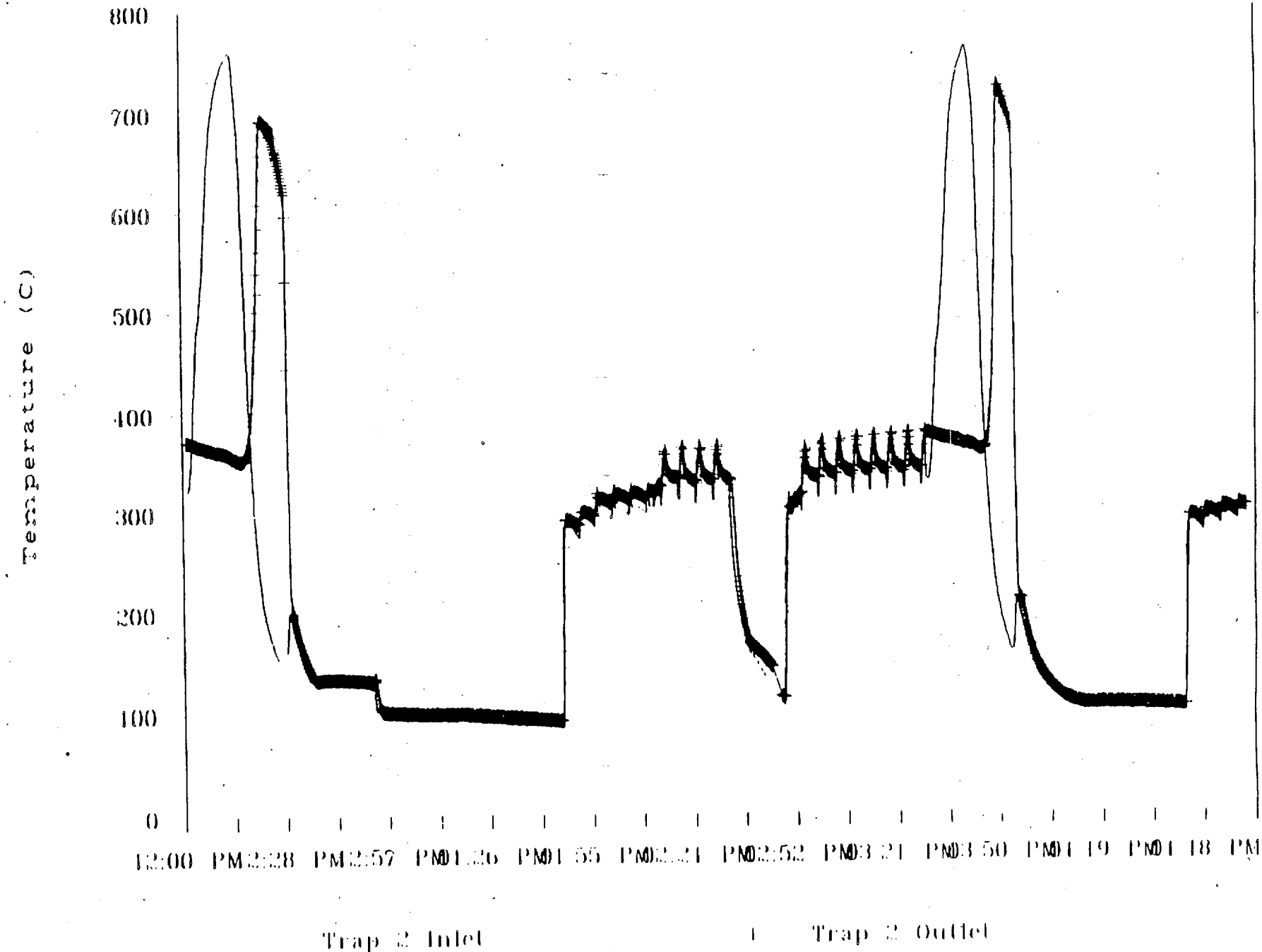
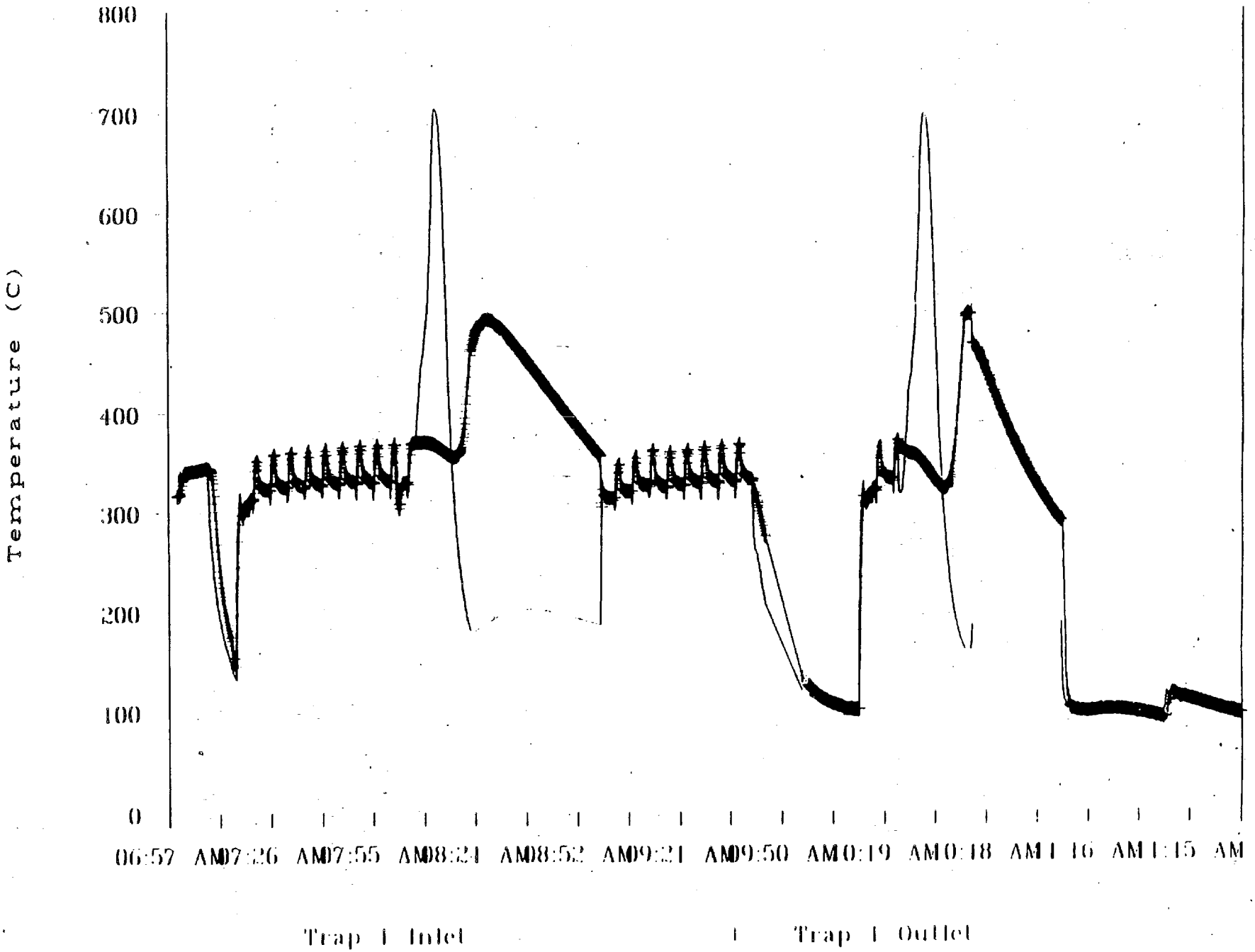


ARB BTS Testing

Regeneration Profile (Aug 2, 1989)



ARB TRAP SYSTEM DEMONSTRATION

TASK 3B - BUS TRAP SYSTEM INSTALLATION AND MAINTENANCE

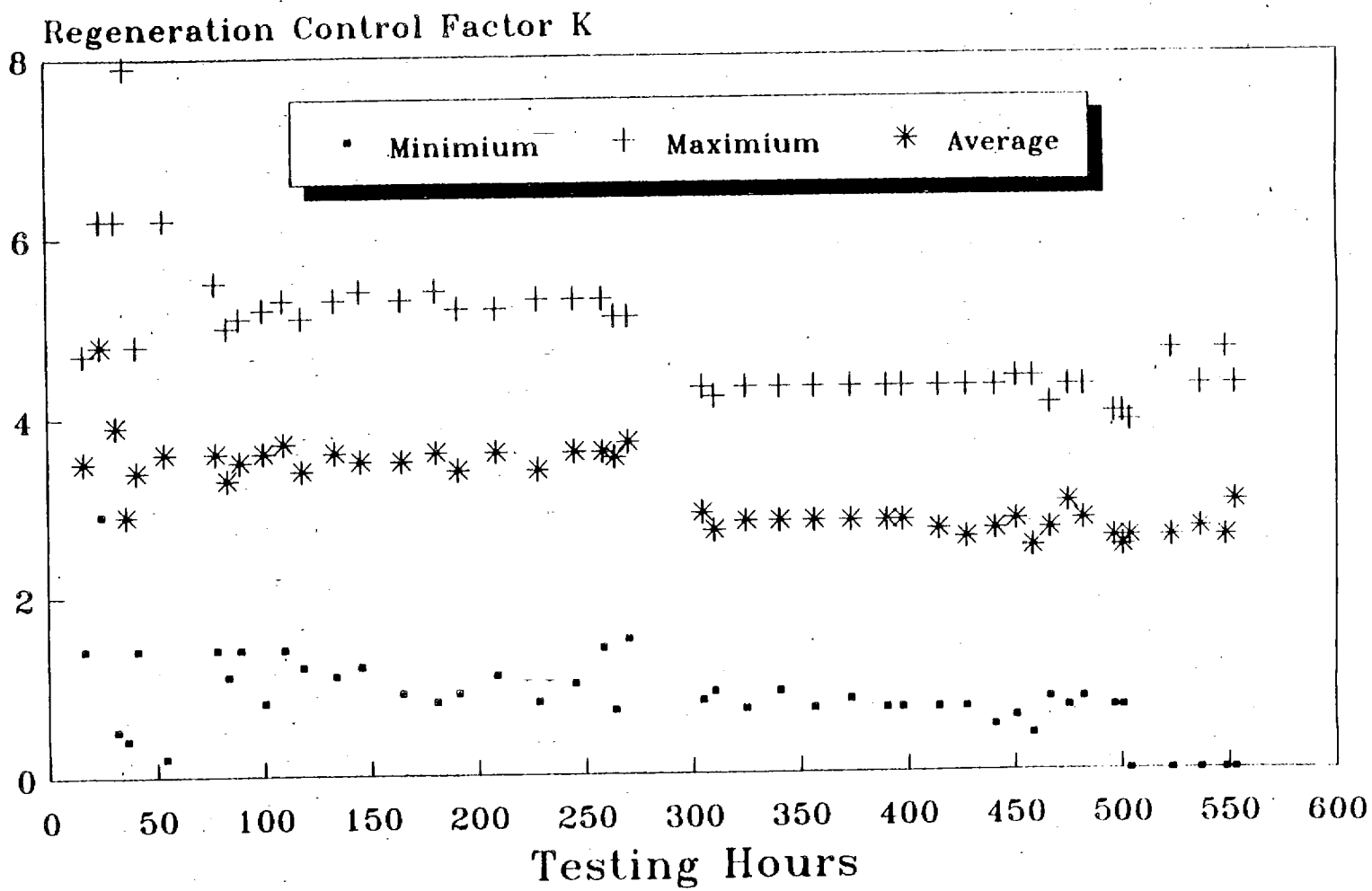
- TRAP INSTALLATION, COMMISSIONING BY ORTECH, DCI AND SCRTD
- DATA ACQUISITION INSTALLATION BY ORTECH (1 DAY)
- DATA ACQUISITION COMMISSIONING BY ORTECH AND ACUREX
- REVENUE SERVICE COMMISSIONING BY ORTECH AND SCRTD (2 DAYS)
- PRELIMINARY INSTALLATION MANUAL COMPLETED

ARB TRAP SYSTEM DEMONSTRATION

TASK 3B

- MAJOR TRAP SYSTEM COMPONENTS
- FILTER CORE AND HEATER ASSEMBLY (2)
- ELECTRIC CONTROL BOX (2)
- FLOW METER BOX (1)
- BLOWER + VALVE ASSEMBLY (1)
- ELECTRICAL CONNECTIONS
- DATA ACQUISITION UNIT BOX (1)

ARB Bus Trap System Testing
DDC 6V92TA + ADB Cycle



AET-ORTECH International

ARB TRAP SYSTEM DEMONSTRATION

TASK 2F

EMISSION TESTING CONDUCTED AT:

- BASELINE WITHOUT TRAP (3" AND 7" HG)
- BASELINE WITH NON-CATALYZED TRAP
- AT 125 HOURS WITH NON-CATALYZED TRAP
- AT 250 HOURS WITH NON-CATALYZED TRAP
- AT 258 HOURS WITH CATALYZED TRAP
- AT 530 HOURS WITH CATALYZED TRAP
- BASELINE WITHOUT TRAP (3" AND 7")

ARB TRAP SYSTEM DEMONSTRATION

TASK 2F

STEADY-STATE ELECTRIC REGENERATION

RPM	HP LOSS	% LOSS	FUEL (LB)
2100	11	4.8	.56
1200	9	5.2	.46

ARB TRAP SYSTEM DEMONSTRATION

TASK 2F

- RESULTS INDICATED A TWO CATALYZED TRAP SYSTEM WILL GIVE SATISFACTORY PERFORMANCE

- TRAP SYSTEM MODIFIED TO A 2 TRAP SYSTEM

- ADDITIONAL 70 HOURS OF TESTING

ARB TRAP SYSTEM DEMONSTRATION

TASK 2F

TRAP SYSTEM PERFORMANCE (2 FILTERS)

ADB CYCLE

◆ TRAP INLET TEMPERATURE	660°C
◆ TRAP OUTLET TEMPERATURE	500-750°C
◆ MAXIMUM BACKPRESSURE	5.0" HG
◆ AVERAGE BACKPRESSURE	1.5" HG
◆ AVERAGE REGENERATION FREQUENCY	90 MINUTES

HIGHWAY CYCLE

◆ MAXIMUM BACKPRESSURE	5.0" HG
◆ AVERAGE BACKPRESSURE	2.2" HG
◆ AVERAGE REGENERATION FREQUENCY	30 MINUTES

ARB TRAP SYSTEM DEMONSTRATION

TASK 3B

- MAJOR TRAP SYSTEM COMPONENTS
- FILTER CORE AND HEATER ASSEMBLY (2)
- ELECTRIC CONTROL BOX (2)
- FLOW METER BOX (1)
- BLOWER + VALVE ASSEMBLY (1)
- ELECTRICAL CONNECTIONS
- DATA ACQUISITION UNIT BOX (1)

ARB TRAP SYSTEM DEMONSTRATION

TASK 3B - BUS TRAP SYSTEM INSTALLATION AND MAINTENANCE

- TRAP INSTALLATION, COMMISSIONING BY ORTECH, DCI AND SCRTD
- DATA ACQUISITION INSTALLATION BY ORTECH (1 DAY)
- DATA ACQUISITION COMMISSIONING BY ORTECH AND ACUREX
- REVENUE SERVICE COMMISSIONING BY ORTECH AND SCRTD (2 DAYS)
- PRELIMINARY INSTALLATION MANUAL COMPLETED

ARB BUS
DIESEL PARTICULATE SYSTEM
PARTS LIST

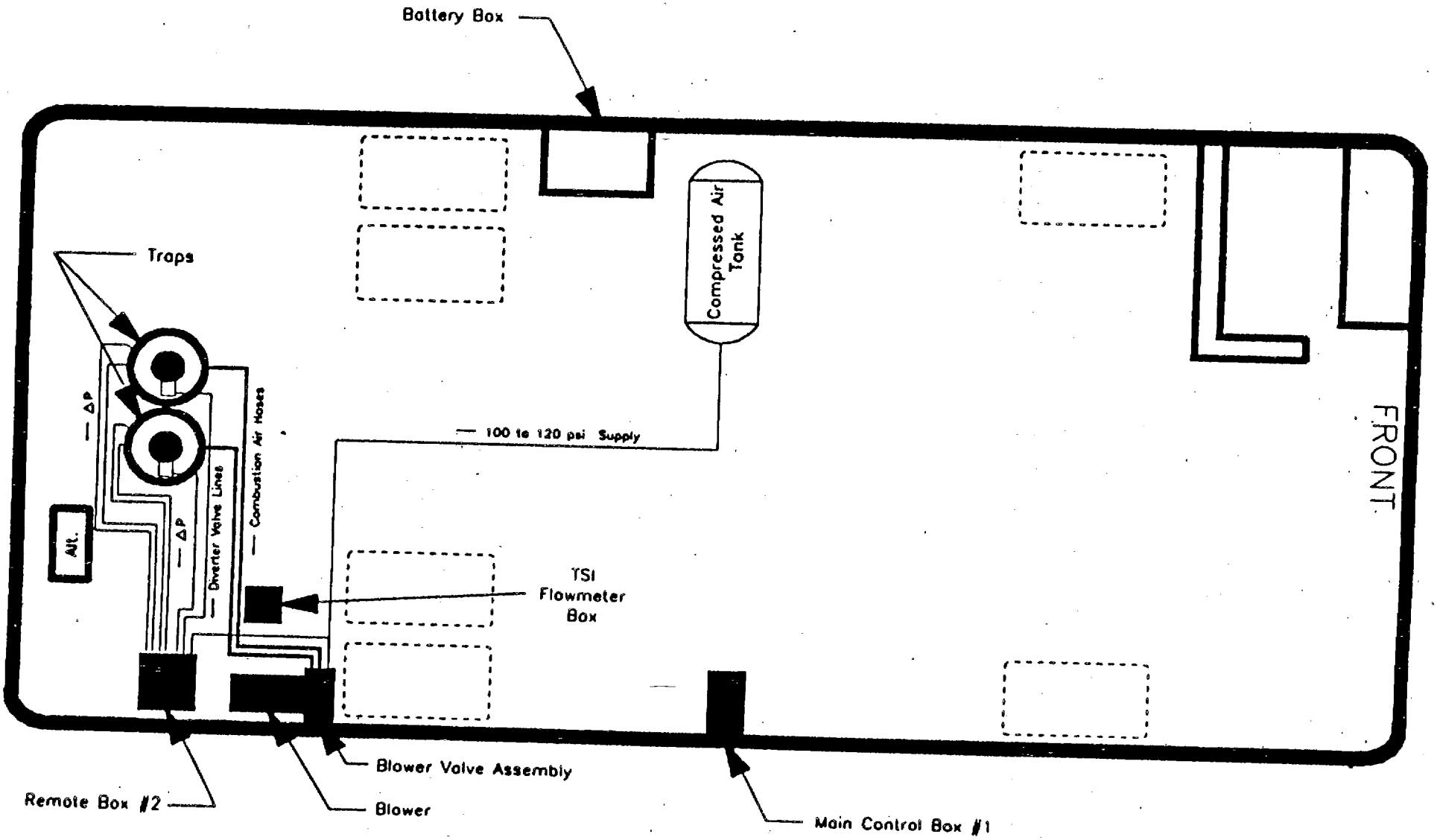
Qty	Item
2	5215B232 Trap Muffler Assembly o Perfed baffle inlet o 5215B223 heater o .12 dia TC on core face o 5215B catalyzed foam face cores o Scarfed, perfed tube outlet
1	Bracket Assembly
1	Inlet Manifold - 2-pieces, 5215B261
1	#1 Tailpipe
1	#2 Tailpipe
1	Tailpipe Mounting Bracket
2	5 inch diverter valve - WABCO, nickel plated, 1-pc shaft, bushings
1	5215B176 Blower with 2 mounting clamps
2	062E1 3-way Humphrey solenoids
2	PVC shut-off valve with .4375 orifice
1	Box of assorted fittings for blower connections
1	P21-2201 bp relief valve
1	MFM04-5237 relief valve muffler
-	2.0 inch flex pipe and mounting clamp
1	6 inch OD 16 ga alzd intake duct with TSI fitting
1	Main Control Box #108
1	Remote Control Box 2 Transducers 2 Prestolite Relays 1 Circuit Breaker 2 Humphrey Solenoids for Diverter Valves
1	TSI Probe #84245
1	Modified coolant line 5215B262
1	Remote mount oil filter kit
2	Condensate traps

Accessories

1.0 ID Neoprene tubing
5.0 Sealclamps
Teflon tubing .25 OD x .12 ID
SS Swagelok fittings
Legris fittings
.25 OD SS tubing

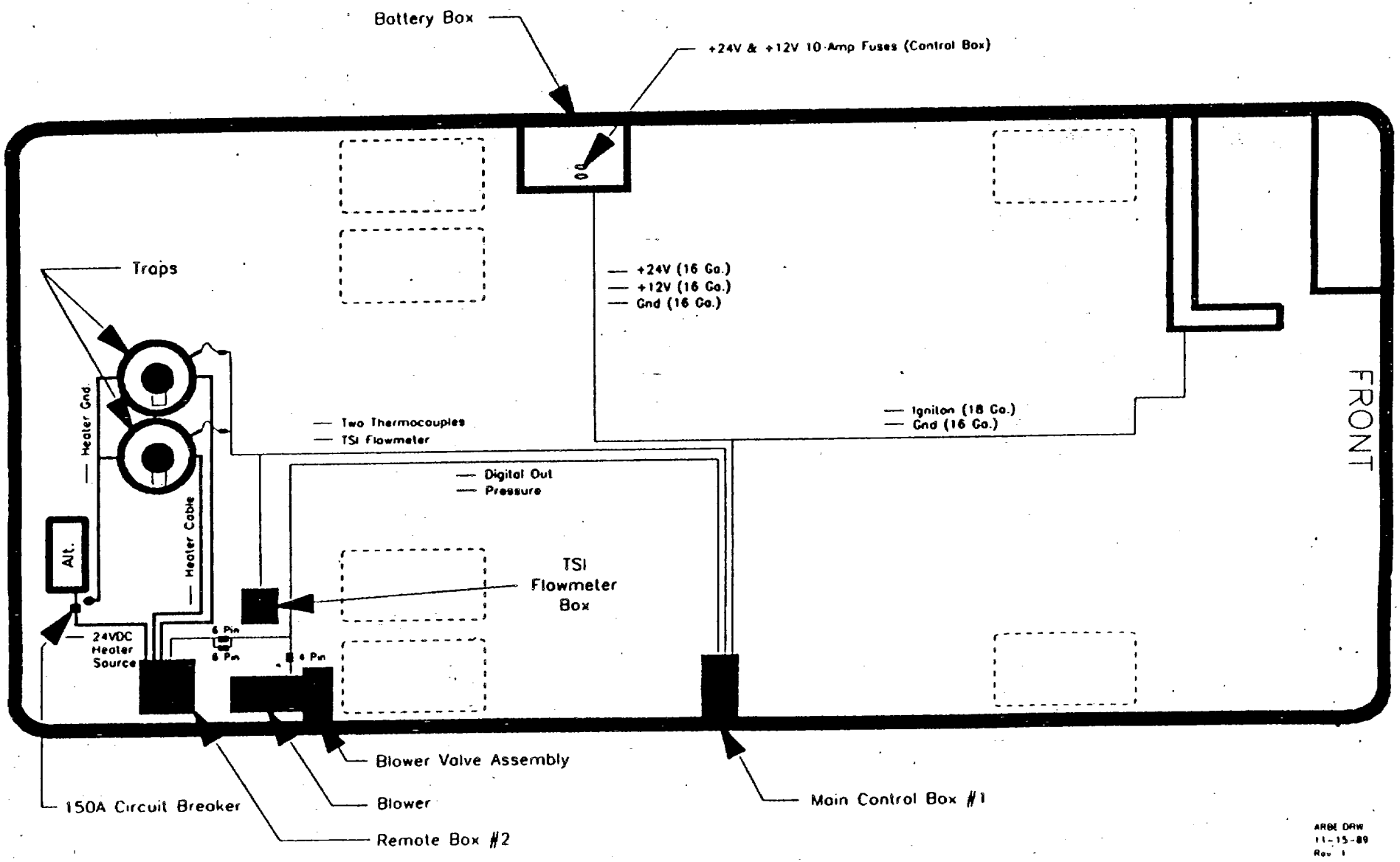
ARB BUS

PNEUMATIC LINES



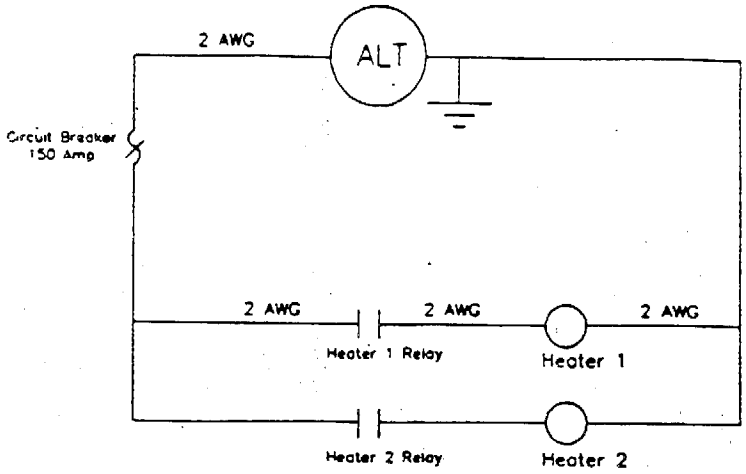
ARBN DRW
11-01-89

ARB BUS
WIRE LOOMS

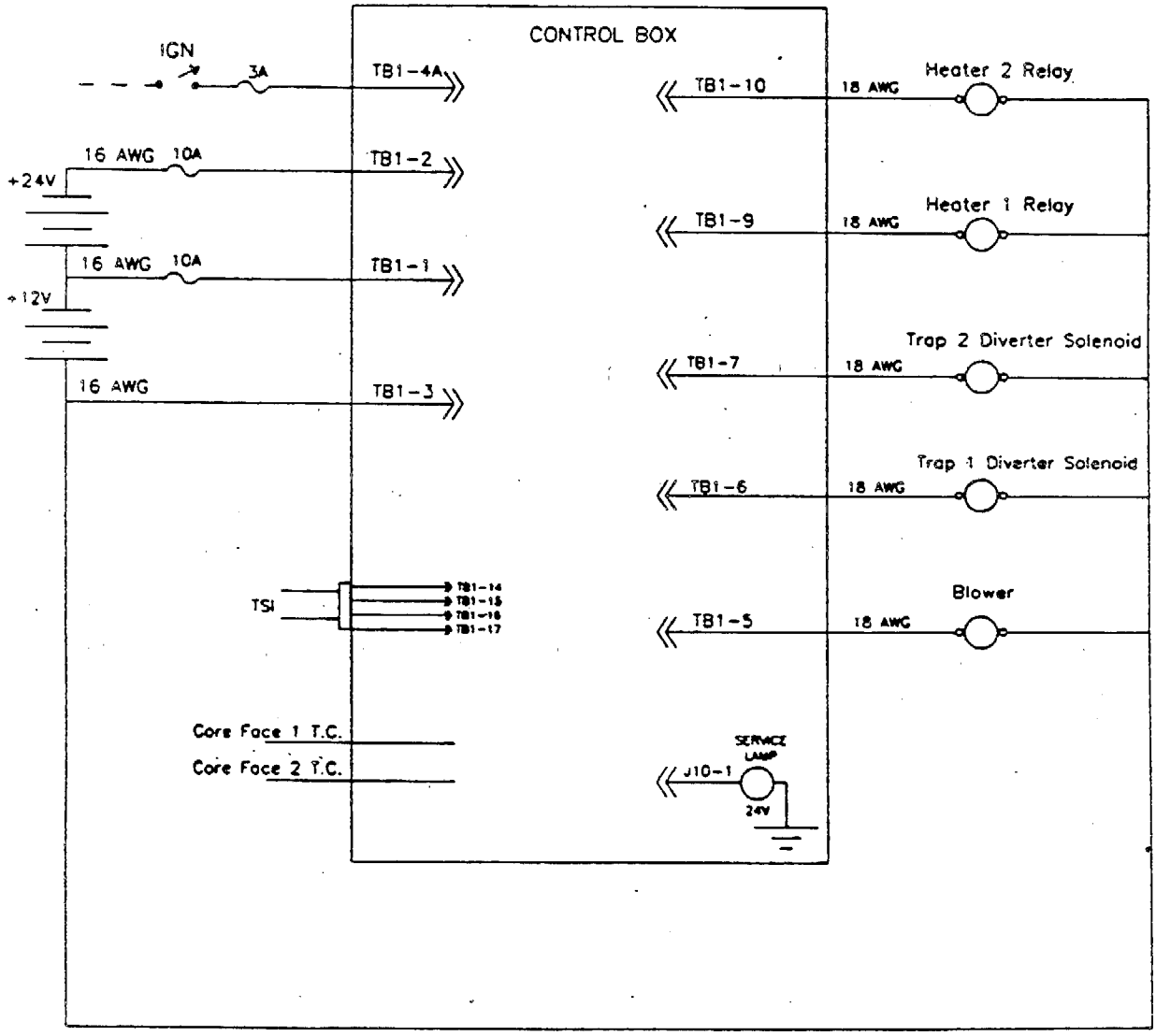


ARBE DRW
11-15-89
Rev 1

ARB 108 BUS Control Box Wiring



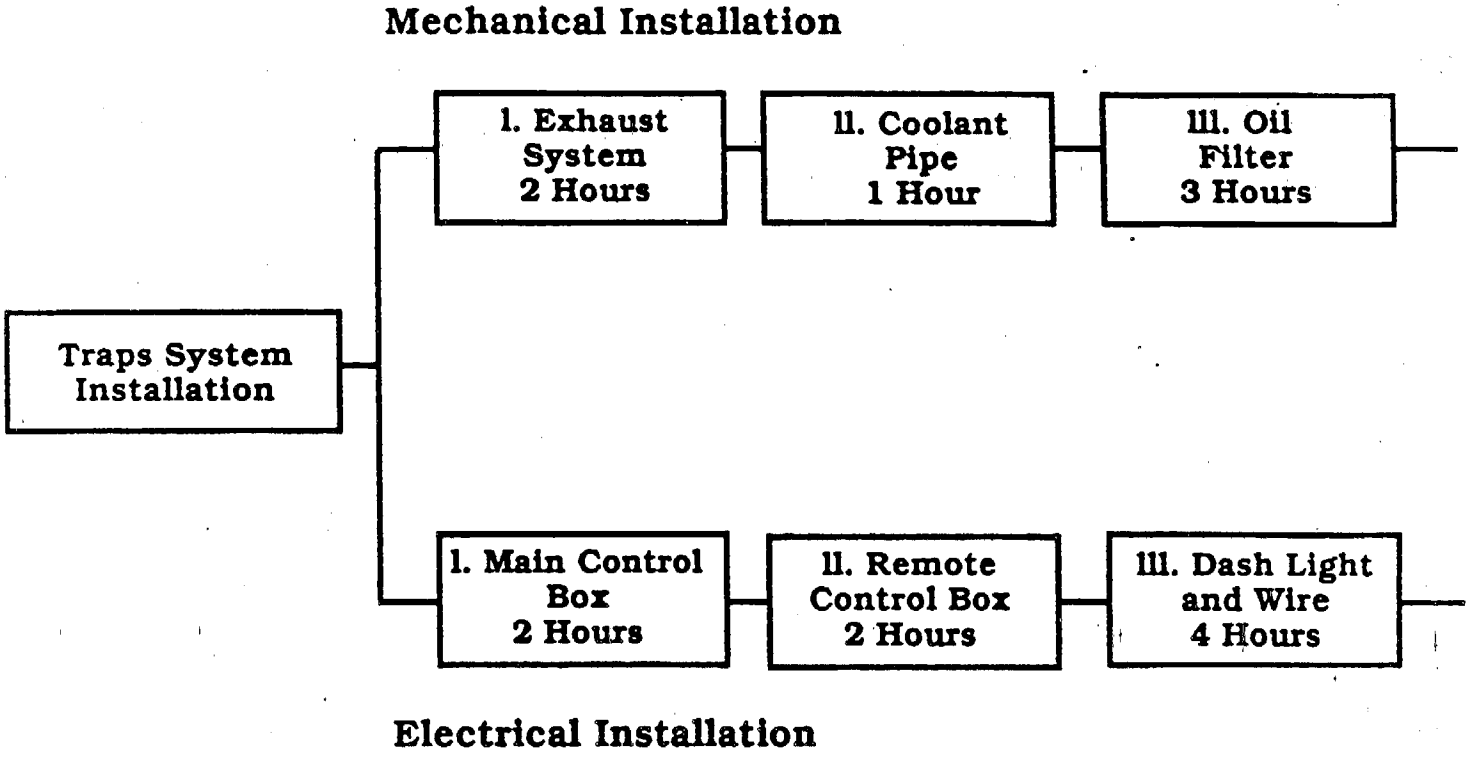
Heater Current Draw
28V
140 Amps
for 6-10 minutes
every 40 minutes



U108WRG.DRW
11-15-89
Rev. 1

ARB Bus Installation
Schedule Chart

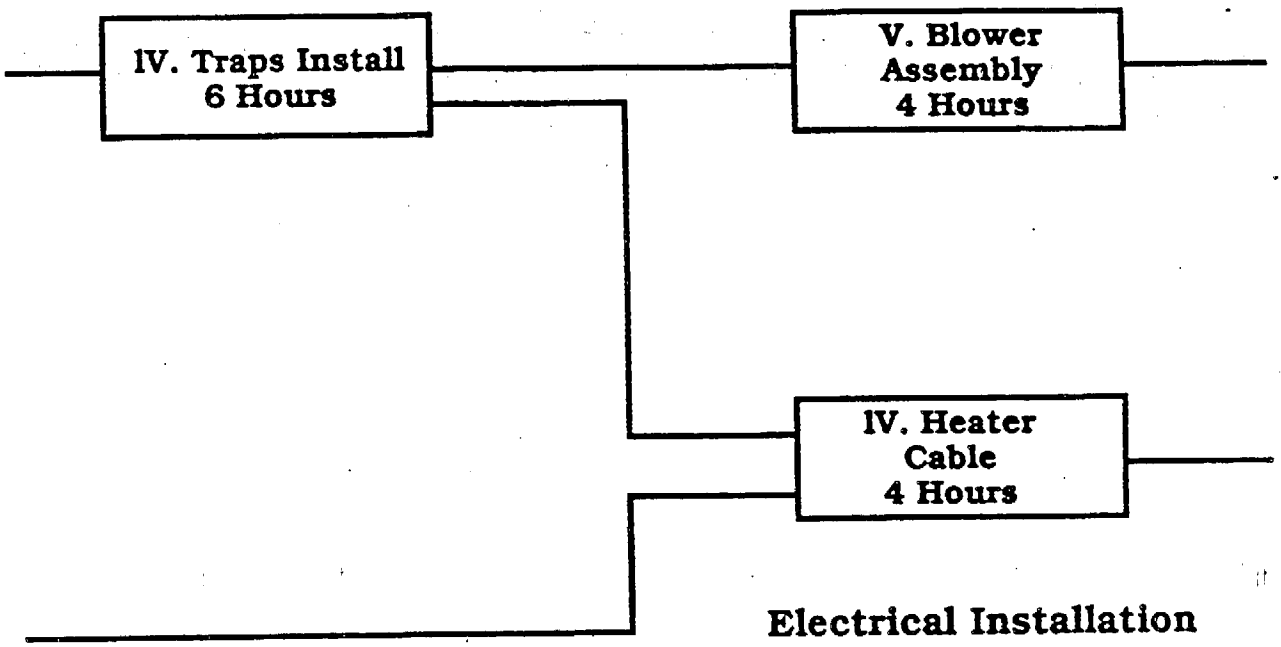
Day 1



ARB Bus Installation
Schedule Chart

Day 2

Mechanical Installation



Electrical Installation

ARB Bus Installation
Schedule Chart

Day 3

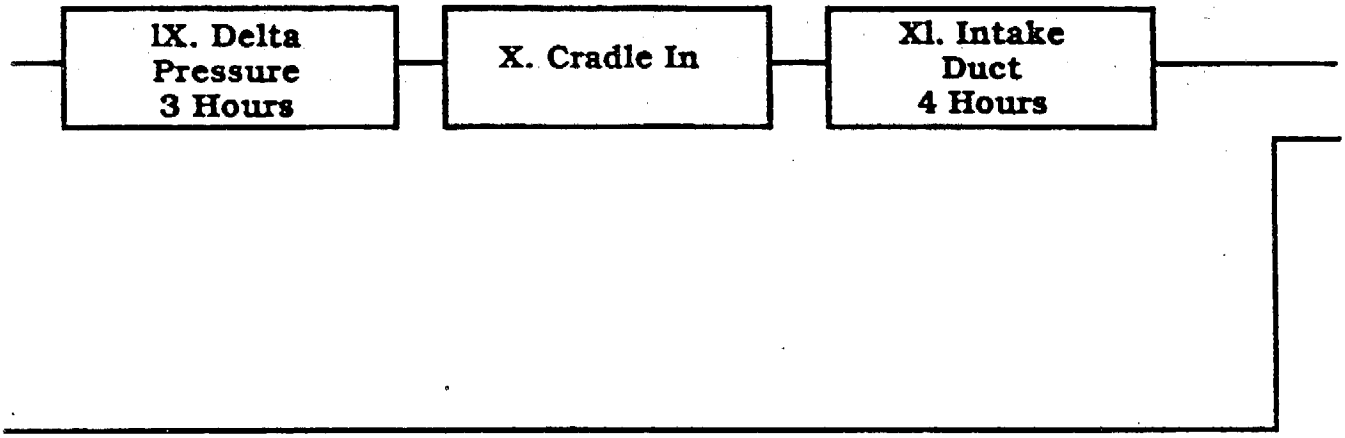
Mechanical Installation

Electrical Installation

ARB Bus Installation
Schedule Chart

Day 4

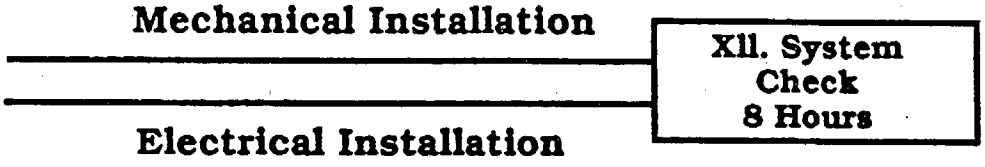
Mechanical Installation



Electrical Installation

ARB Bus Installation
Schedule Chart

Day 5



ARB TRAP SYSTEM DEMONSTRATION

GENERAL DISCUSSION

- NEW YORK BUS PROGRAM
  1) 2 MORE BUSES WITH DDEC I
  2) PHASE II

- TMC MANUFACTURING TEAM

- 1991 BUS EMISSION STANDARD

- WINDSOR WORKSHOP

Project
Project NYC Trap Systems Demonstration

Phrase I :

3 Buses with ORTECH Burner Systems

12 Months In-Service Evaluation

2 New Calif DDEC II Engines

Phrase II :

1 Bus with DCI Electric System

1 Bus with DCI Burner System

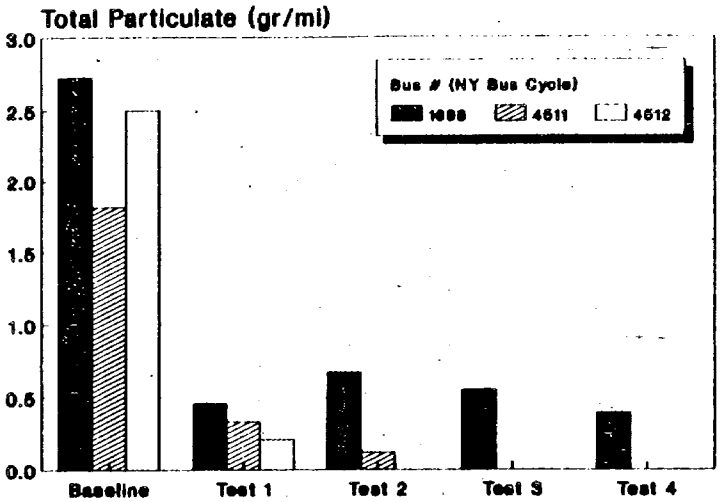
24 Months In-Service Evaluation

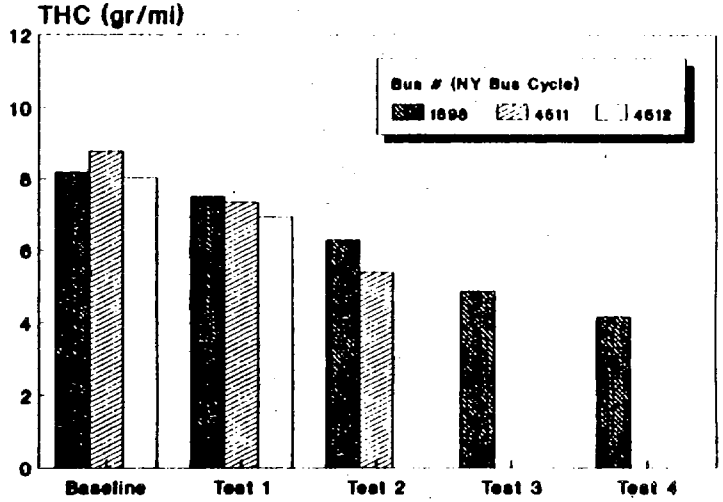
Scheduled for Janurary 90

% Emission Reduction Using Trap System

Chassis Dyno (NYC DEP) NYC Bus Cycle										
Emission	Test 1 %	Test 2 %	Test 3 %	Test 4 %	Test 5 %	Test 6 %	Test 7 %	Test 8 %	Test 9 %	Test 10 %
Bus #1698 Mechanical Governor-240 hp										
Particulate	83	76	80	86						
CO	69	48	64	63						
THC	8	23	40	49						
NOX	12	16	20	22						
Bus #4511 DDEC II-277 hp										
Particulate	82	96								
CO	33	68								
THC	16	38								
NOX	0	5								
Bus #4512 DDEC II-277 hp										
Particulate	91									
CO	57									
THC	14									
NOX	0									

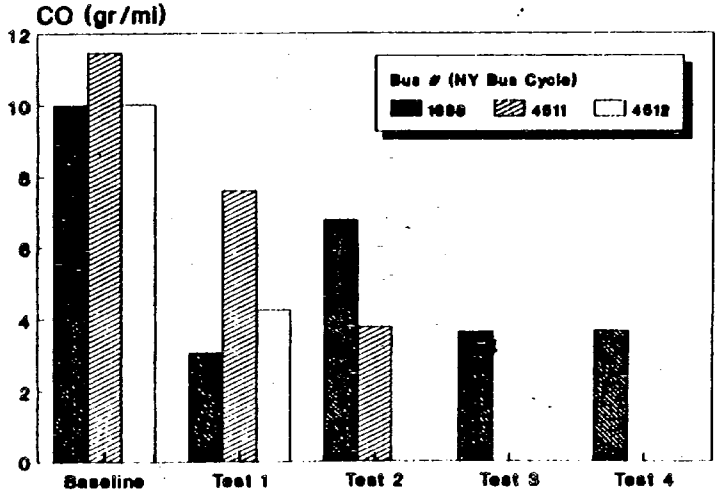
14-Nov-89 File : \NYBUS\%RED

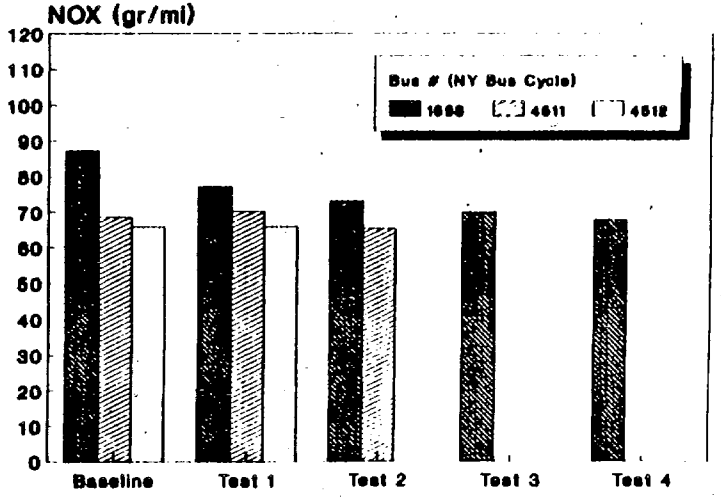




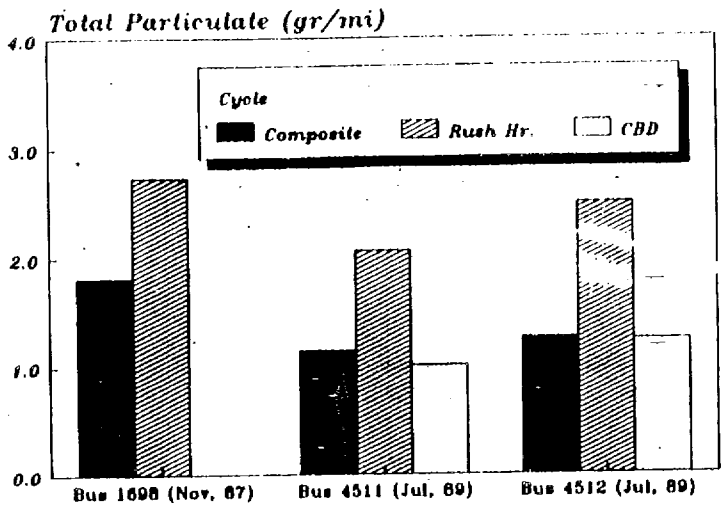
NYC Trap System Chassis Dyno Emission Results

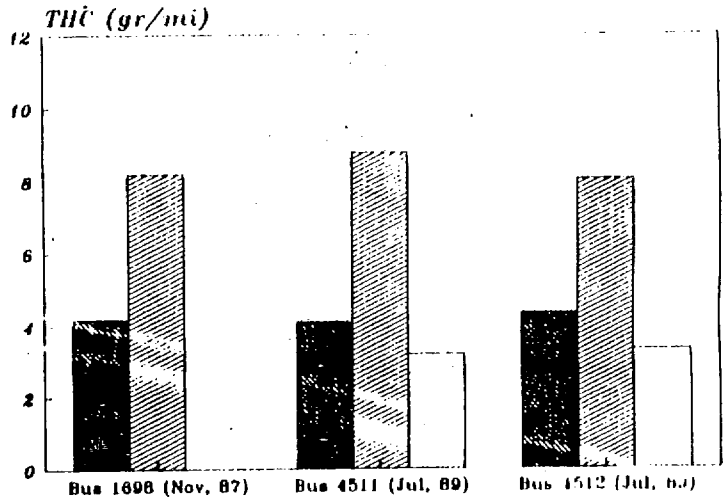
Emission Reduction Including Regeneration Emission





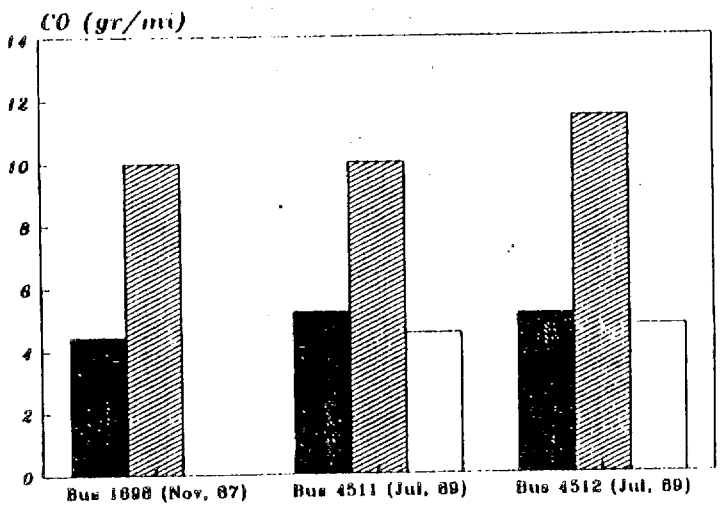
AET-ORTECH International

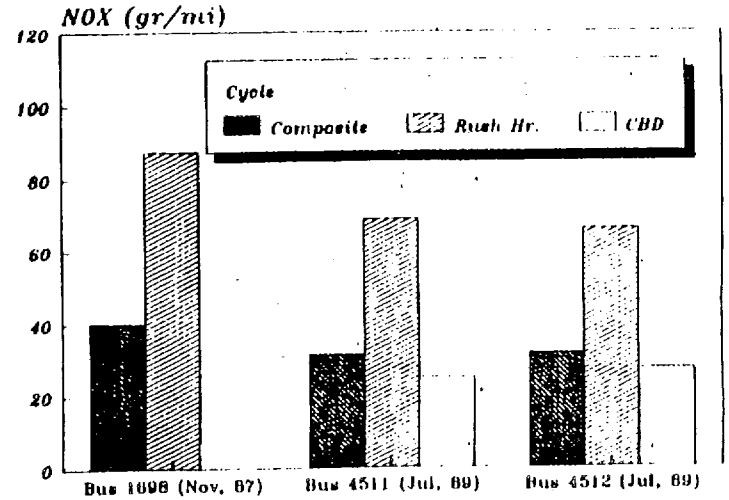




NYC Trap System Chassis Dyno Emission Results

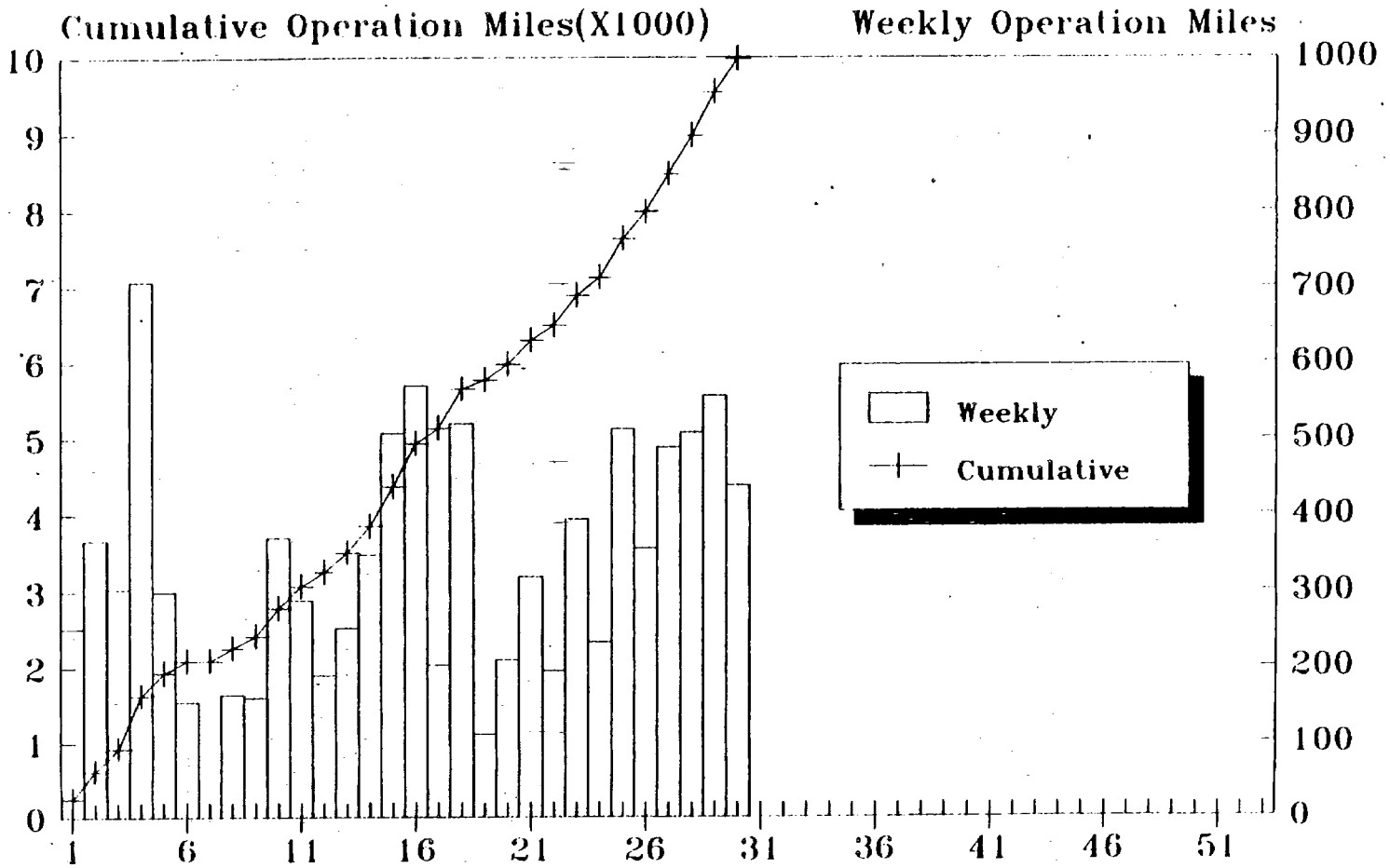
Baseline Emission Comparsion





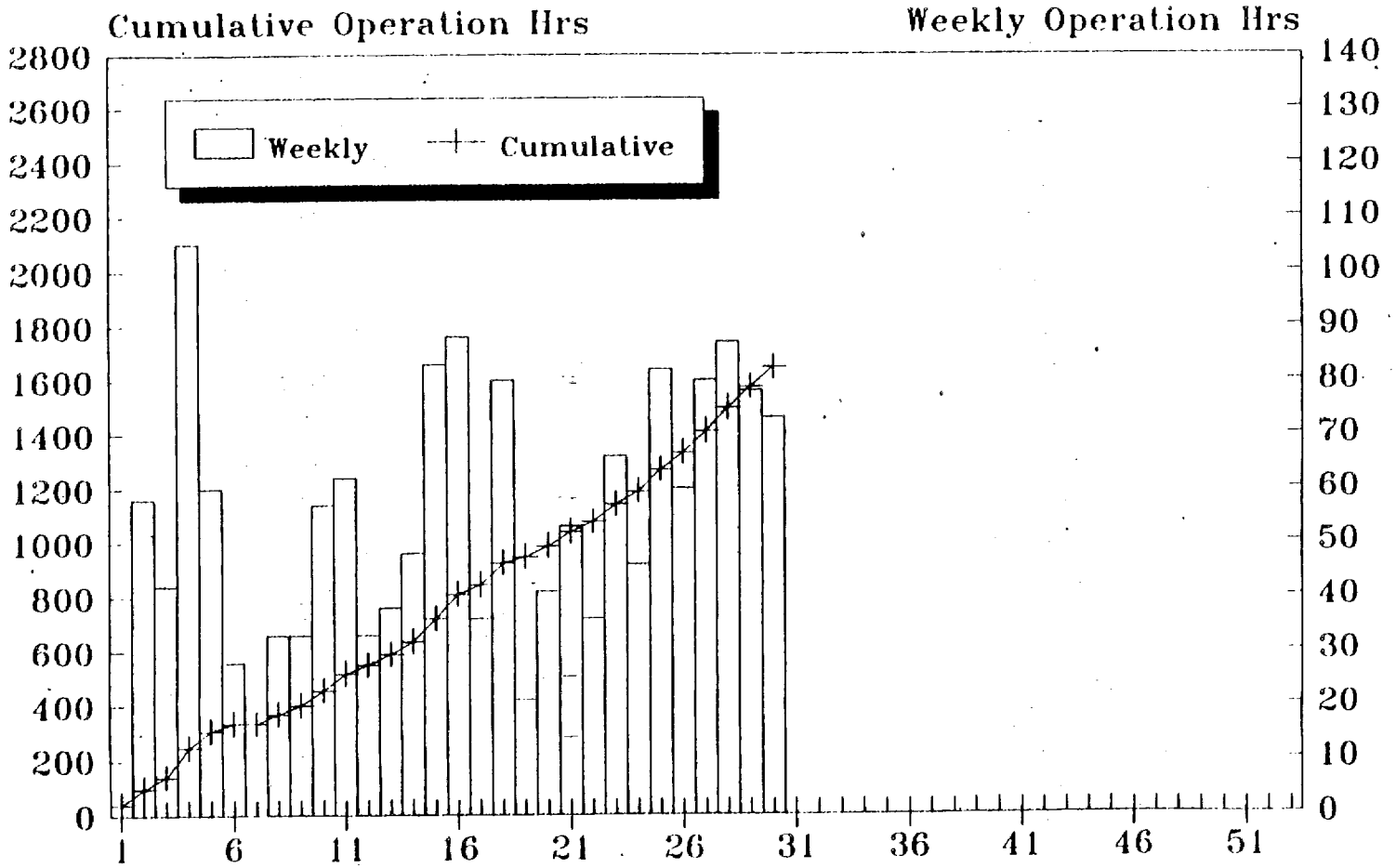
AET-ORTECH International

NYC Trap System Demonstration
Bus 1698

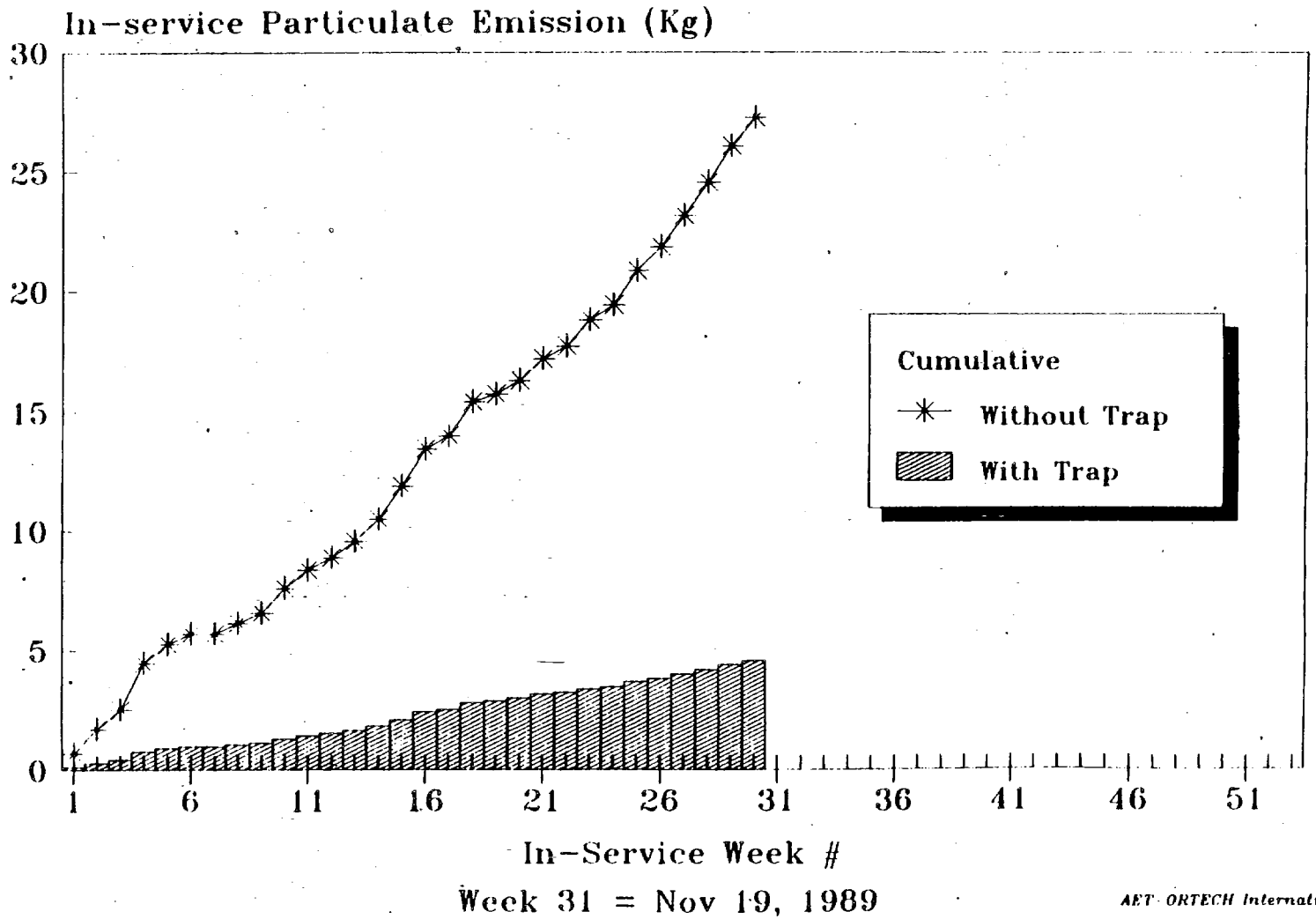


AET ORTECH International

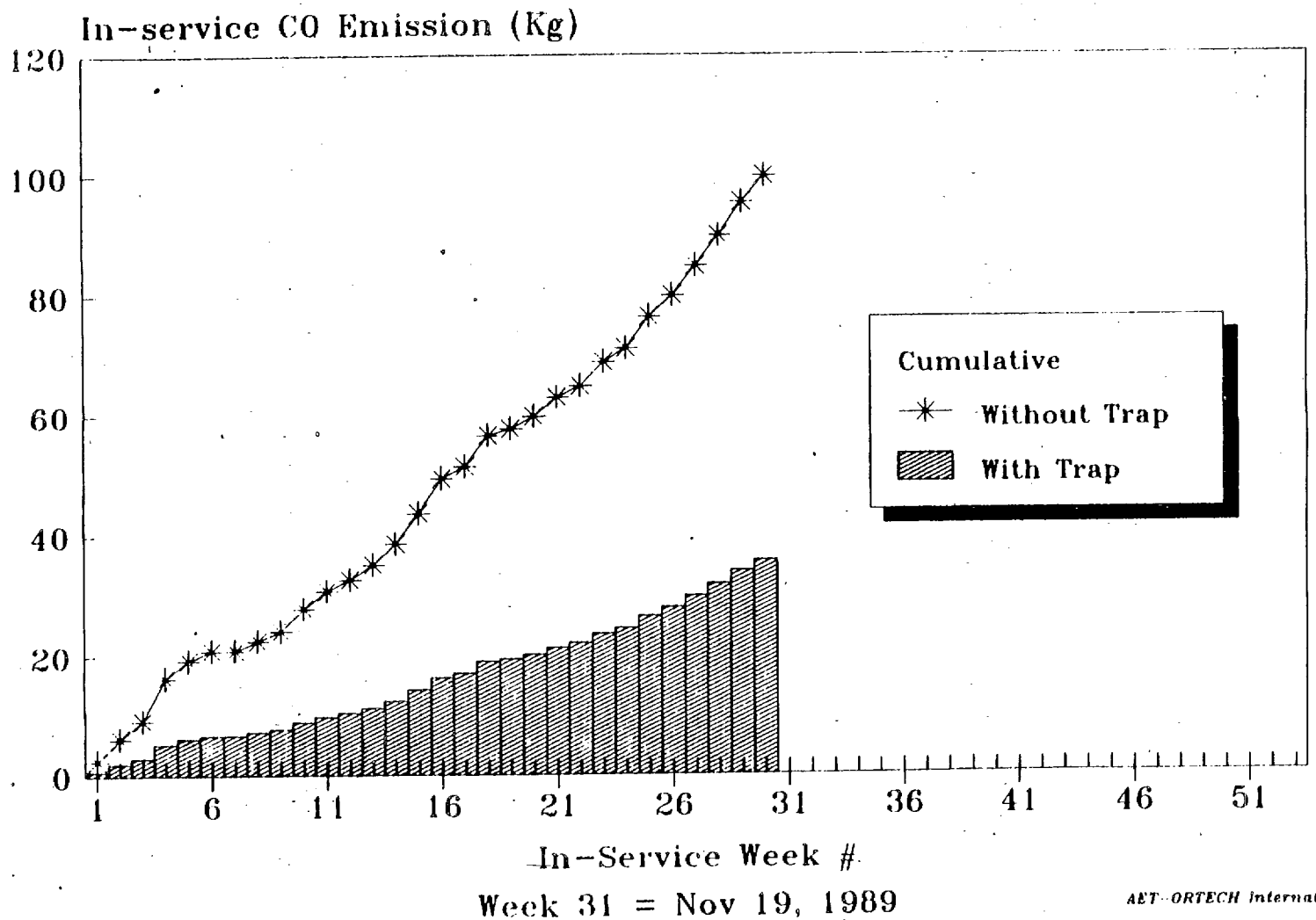
NYC Trap System Demonstration
Bus 1698



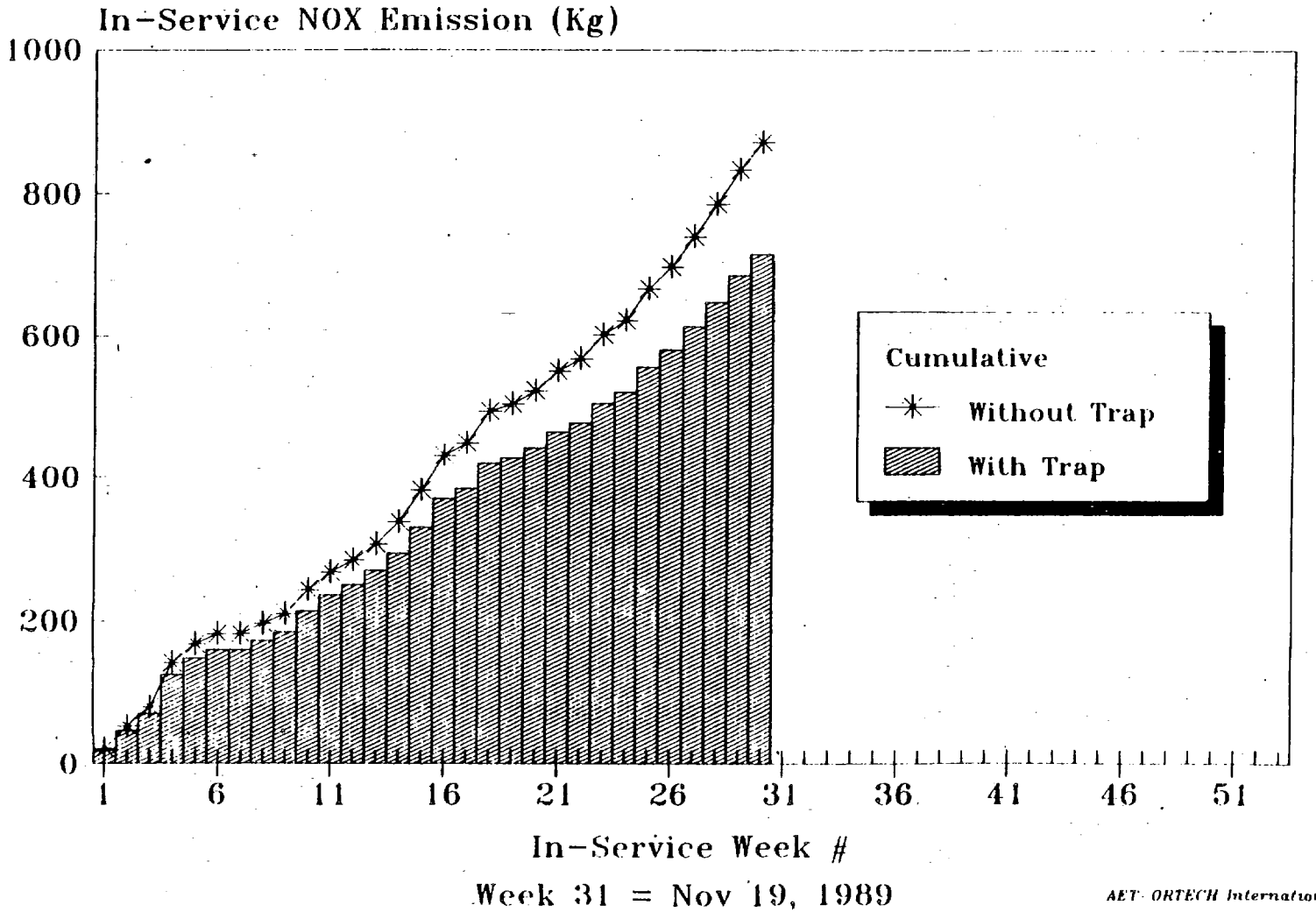
NYC Trap System Demonstration
Bus 1698



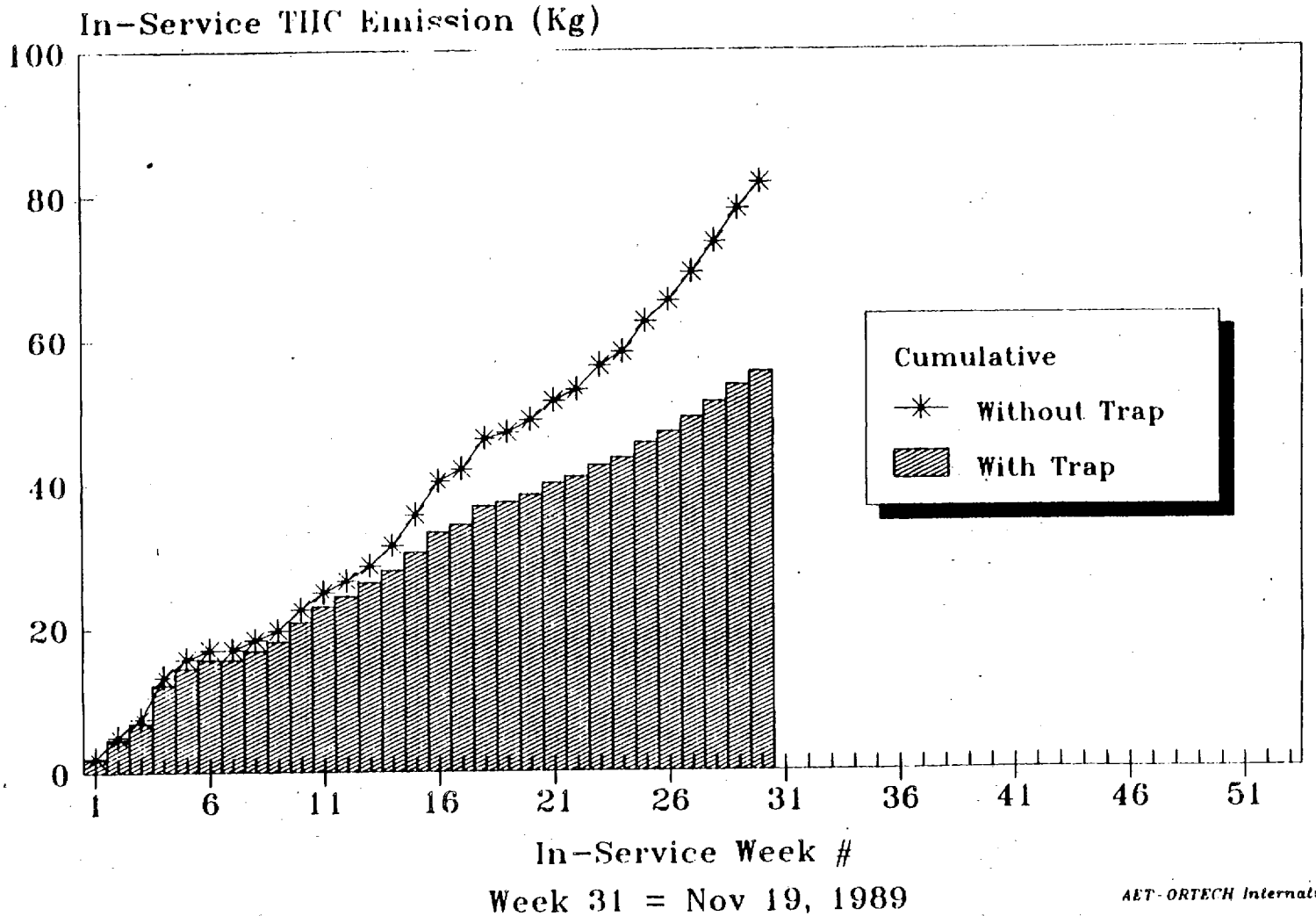
NYC Trap System Demonstration
Bus 1698



NYC Trap System Demonstration
Bus 1698



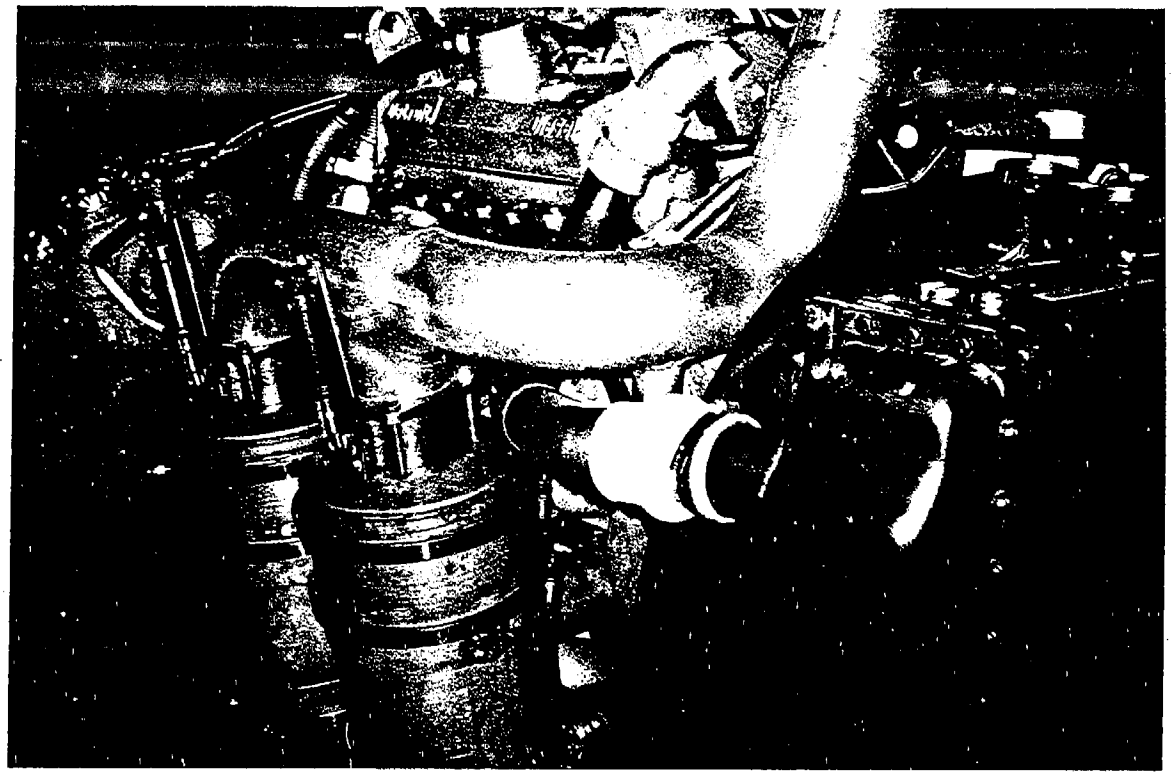
NYC Trap System Demonstration
Bus 1698



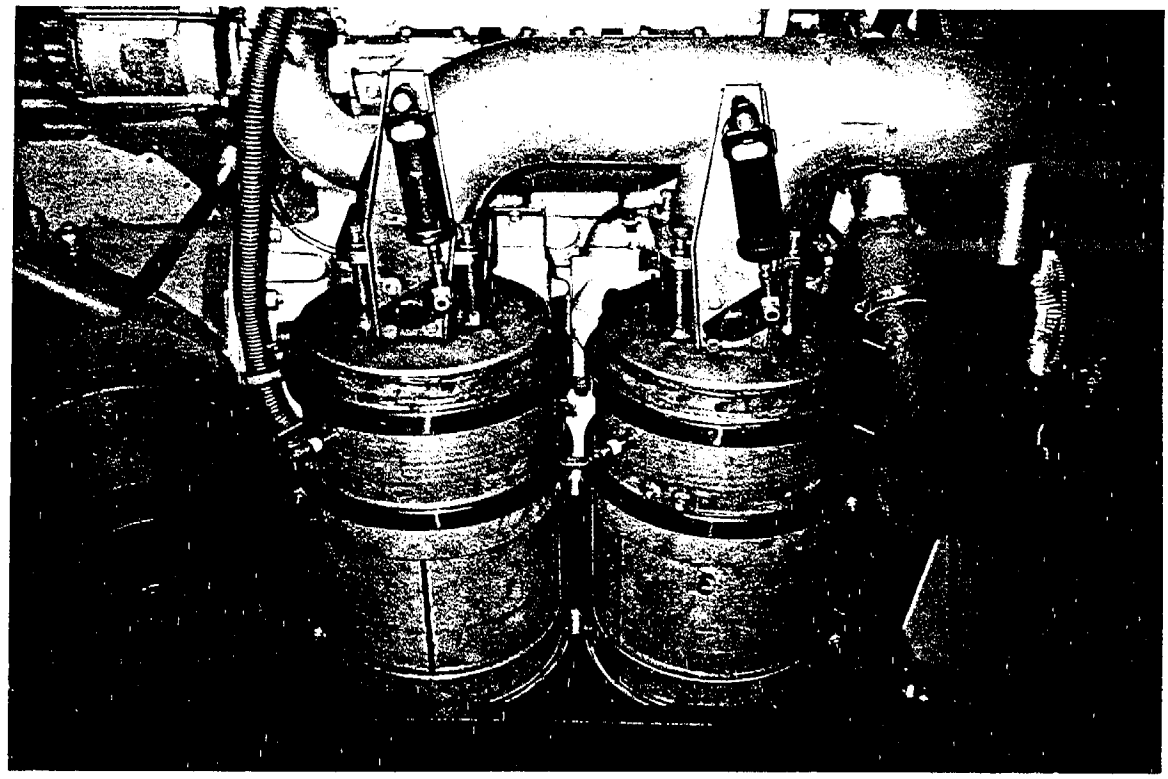
APPENDIX I

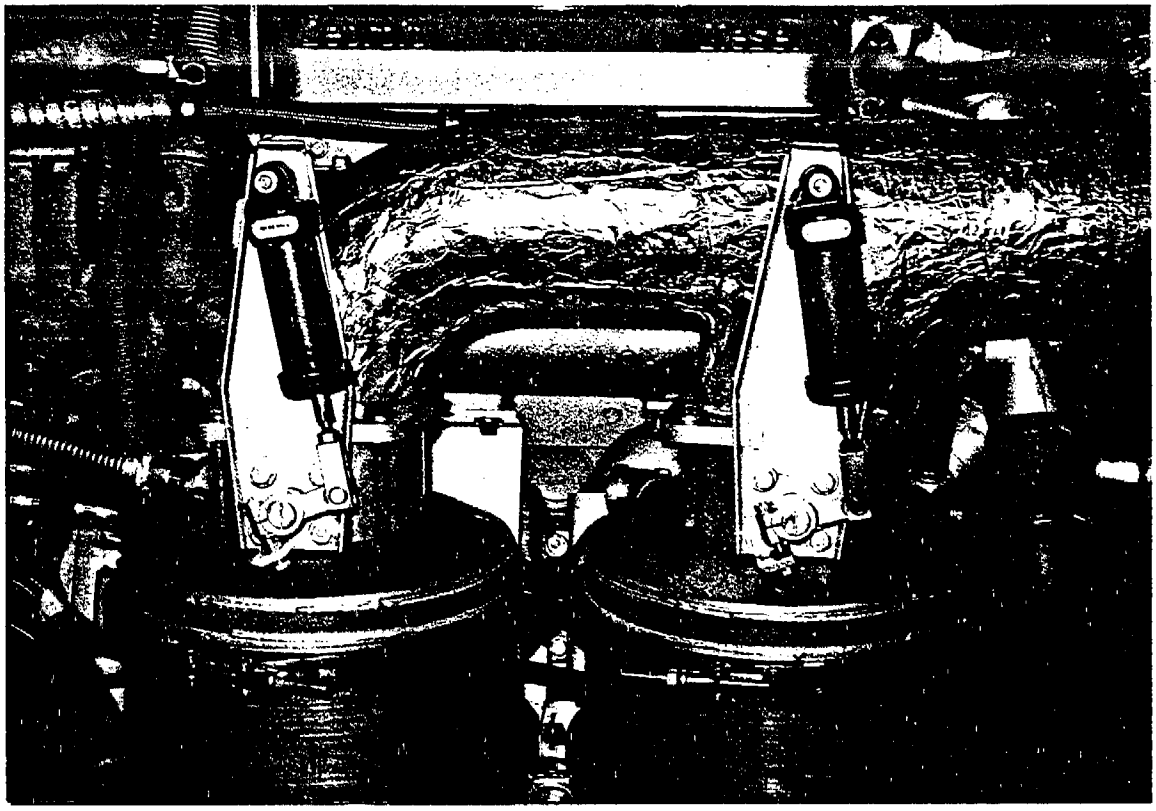
Trap Installation on Bus #8924

The photoghraphs above and below show the RTD Bus #8924. The bus was fitted with the Donaldson Dual Electric Trap System.

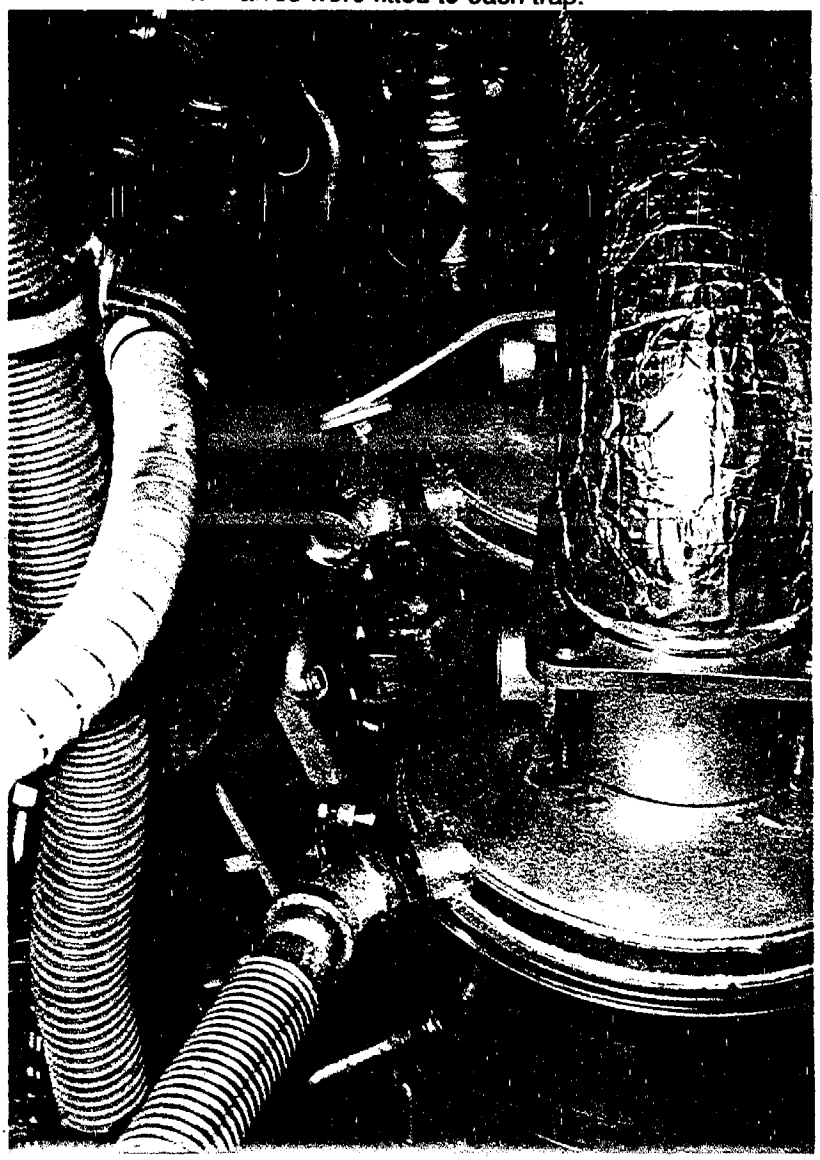


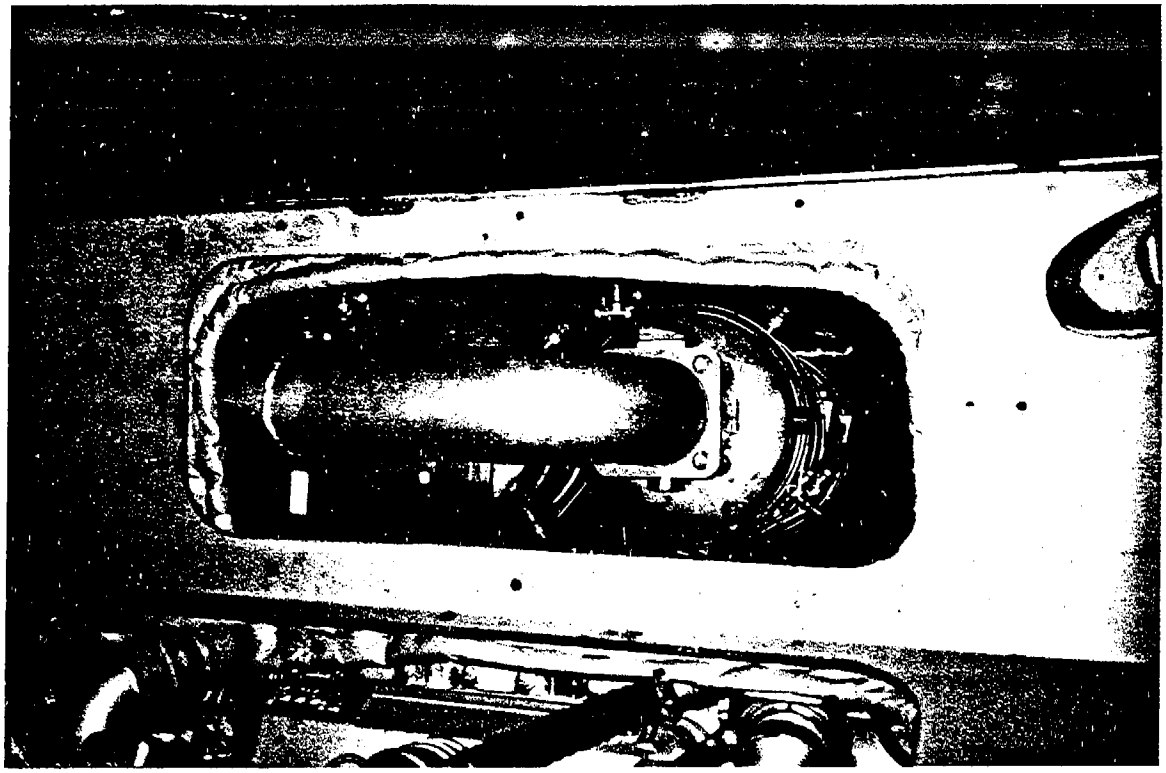
The photographs above and below show the
Donaldson Trap System fitted to DDC 6V-92TA Engine



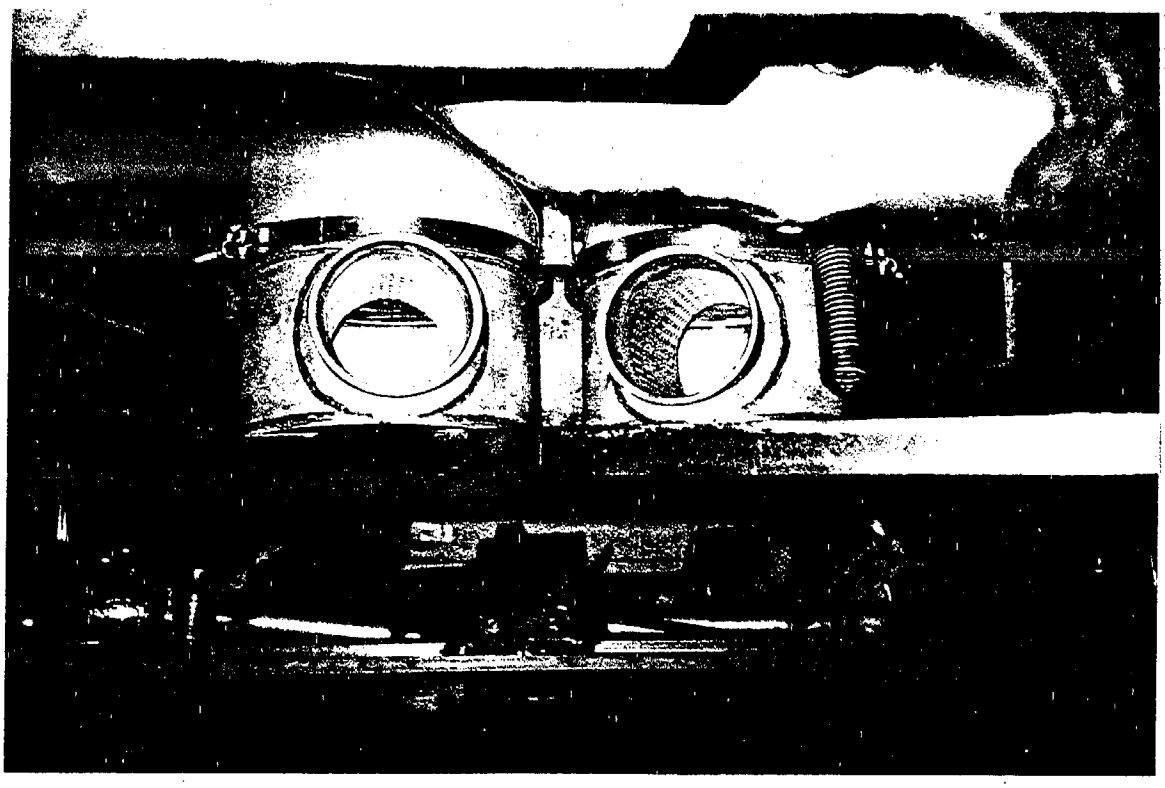


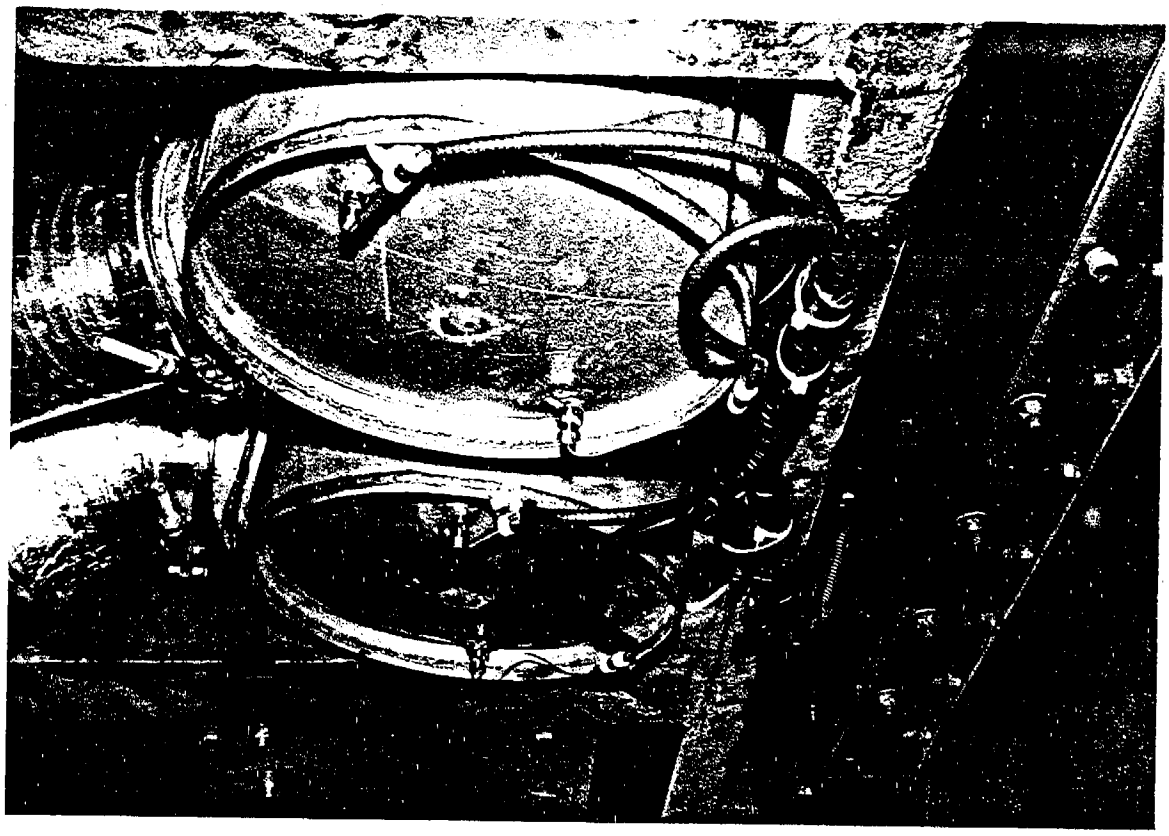
The photographs above and below show the Donaldson Trap System. The diverter valves were fitted to each trap.



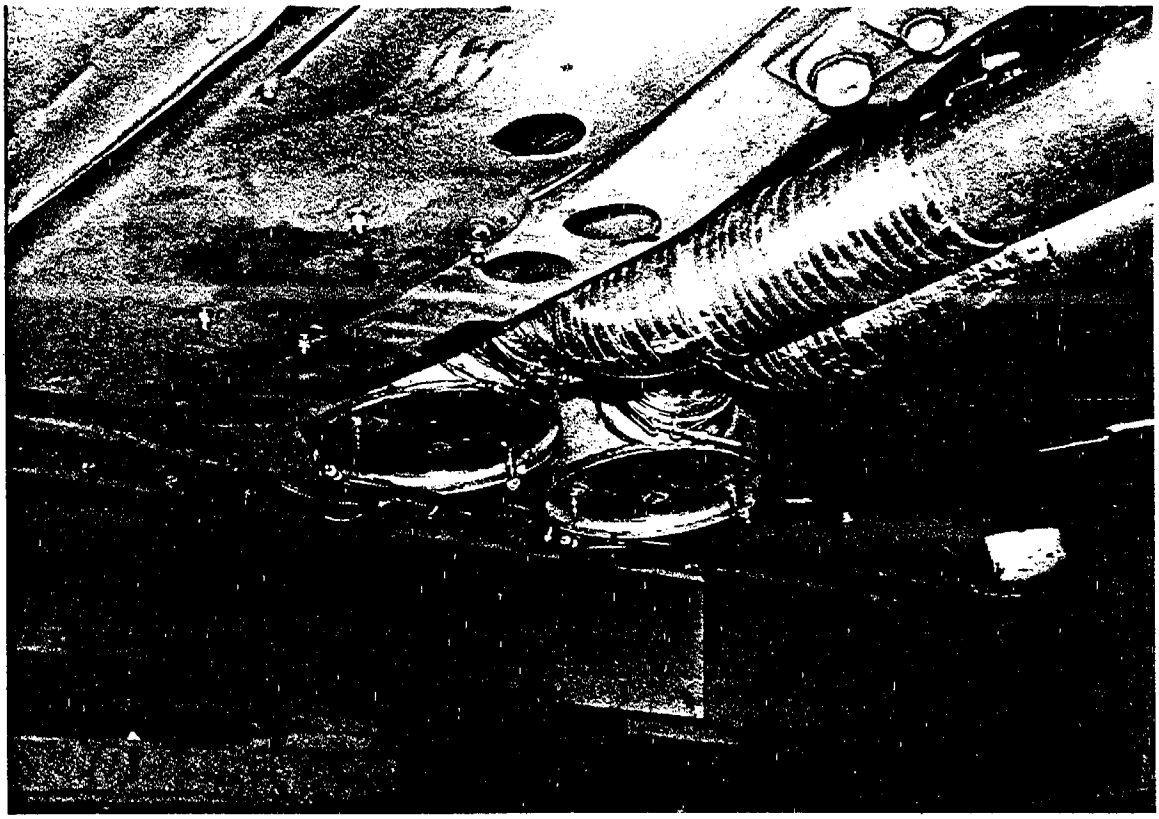


The photographs above and below show different views of the trap system.





The photographs above and below show the underside of the trap.



APPENDIX J

Trap System Installation Manual for Bus #8924

Project
ARB Particulate Trap System Demonstration

Trap System Installation Manual For SCRTD Transit Bus

K. Ha
I. Carmichael
DCI Staff

AET-ORTECH International

DCI Diesel Particulate Trap System Installation Manual

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Appendices

Appendix A: Installation Schedule Chart
Appendix B: Bus Main Control Box Wiring
Appendix C: Bus Pneumatic Lines
Appendix D: Bus Wire Looms
Appendix E: Parts List

DCI ELECTRICAL DIESEL PARTICULATE TRAP SYSTEM INSTALLATION MANUAL

GENERAL INFORMATION

The purpose of this manual is to aid in the retrofitting of a Donaldson Company (DCI) Electrical Diesel Particulate Trap System (EDPT) on a RTS II coach.

The system consists of three main components. The first group is the trap assemblies. The assemblies (2) are comprised of the diesel particulate filter (DPF), 24 VDC electrical heater and the exhaust inlet and outlet cones. The second group in EDPT system is the control boxes. There are two boxes; the Main Control Box which is mounted under the bus houses all the electronic hardware and control logic for the system, and the Remote Control box, contains the pressure transducers, heater control relays and air control solenoid valves. The third component group is comprised of all the auxiliary equipment required to connect the system together. This includes the wiring harness, air blower assemblies and air flow sensor.

DCI ELECTRICAL DIESEL PARTICULATE TRAP SYSTEM INSTALLATION MANUAL

BUS PREPARATION

Before the DCI EDPT system can be installed, the engine and transmission cradle must be removed. This will make the installation much easier.

It is also recommended that the existing batteries (4) be replaced with new ones rated @ 900 CCA.

Trap system components will be placed in various unoccupied spaces around the engine bay area.

Since available options and equipment may vary on RTS II bus depending on TA's requirements, it is best to check these major component spaces to make sure they are available and not obstruced.

1) bulkhead infront of air conditioning compressor.

2) V-shaped compartment above engine bay on curb side.

3) compartment under the bus where air tanks are mounted for brakes and suspension.

4) battery compartment for extra batteries (if required).

DATA ACQUISITION (Optional)

If the bus is to be equipped with a data acquisition unit (DAU), it will likely be installed in the battery box. A space of 14" x 18" x 7" will be required. The DAU can sit in any position. A 12 VDC power source will be required that will remain **LIVE** even when the bus is shutdown. The DAU will have wires run to the engine compartment but will require no additional space.

DCI ELECTRICAL DIESEL PARTICULATE TRAP SYSTEM INSTALLATION MANUAL

EDPT SYSTEM UNPACKING

It is very important that this part be read and understood before the EDPT is removed from its crate. The following points must be understood before unpacking:

1) do not lift the trap assembly by the electrode ends of the heater.

2) do not lift the trap system by the thermocouple wires.

3) lift the trap assemblies by putting hands around the assembly or in the inlet and outlet cones.

4) If the control boxes contain electronic equipment, do not drop them.

5) the TSI airflow measurement device is very fragile on its sensing end "**be very careful not to damage it in any away**".

DCI ELECTRICAL DIESEL PARTICULATE TRAP SYSTEM INSTALLATION MANUAL

ELECTRICAL INSTALLATION

This section describes the installation of the trap system control box.

(I) Control Box Mounting

1. The main control box will be mounted on the inside front wall of the first compartment under the bus, ahead of the front wheels. This will be the compartment with air tanks for brakes and suspension.

2. Use rubber vibration isolation pads between the bulkhead and the control box.

3. Be sure that the amphenol (electrical) connector is at the bottom.

(II) Remote Box Mounting

1. Mount box on the bulkhead in front of the air conditioning compressor.

2. Be sure that hose connections and electrical connections are mounted on the down side of the box.

(III) Heater Cable

1. Cut 2 AWG cable to length (from the remote box to the leads on trap assemblies).

2. Solder crimp ends on the cables.

3. Cut looms to length and push cables through the looms.

4. String the cables from the Prestolite relays in the remote box to the trap assemblies. Be sure that the correct Prestolite relay in the remote box is hooked to the correct trap assembly. The relays will be labelled 1 and 2. Prestolite relay #1 must go to Trap #1 and Relay #2 must go to Trap #2. See Appendix D.

5. When connecting cable ends to the trap assembly and Prestolite relay connection pins, it is very critical that the pins do not turn.

6. Be sure cables are suspended away from any direct heat source (i.e. exhaust manifold or trap assemblies).

7. Run a length of 2 AWG cable from 24 VDC alternator post to the remote control box. This wire must be in a loom as well. See Appendix D

(IV) Signal Wire

1. Mount TS1 flowmeter control box to top of the engine compartment near the air filter.
2. Run shield wire from the remote control box to main control box. See Appendix D.
3. Be sure to suspend wire so as not to come in contact with any high heat source (exhaust manifolds).
4. These wires described here must be a loom.

(V) Control Wire

1. Run the control wiring harness from the remote control box to the main control box. See Appendix D.

2. Run wires to blower assembly from the remote box (be sure to use looms for all wires while in the engine compartment).

MECHANICAL INSTALLATION

This section describes the installation of the trap filter assembly.

(I) Cradle Removal

See GMC Coaches Maintenance Manual RTS Models under Section 6A, pages 10 through 13.

(II) Muffler Removal

1. Remove the tailpipe from the muffler and frame.

2. Remove exhaust manifold pipe between the turbocharger and the muffler.

3. Loosen off the straps that hold the muffler in place (note: the muffler must be supported at this time), remove the muffler.

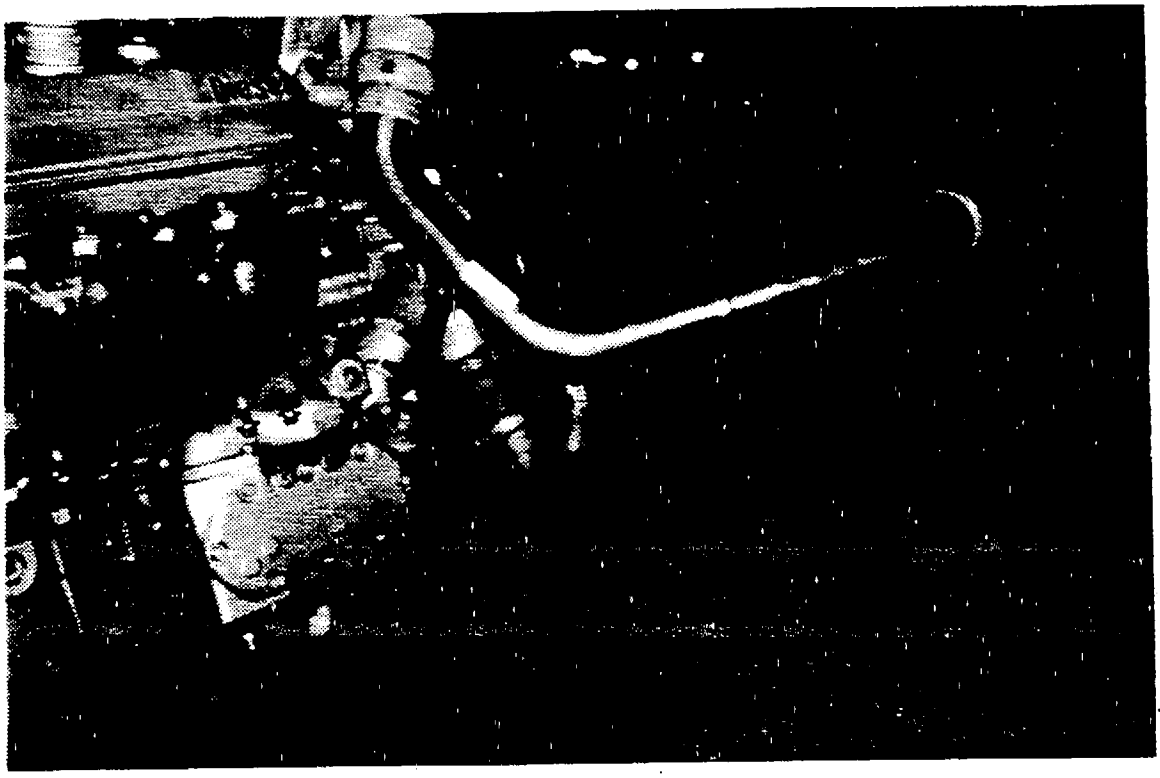
4. Remove the muffler mounting brackets.

(III) Coolant Modifications

1. Drain engine coolant.
2. Remove the radiator inlet pipe.
3. Install supplied parts to replace the original pipe (be sure clamps are tight). See Figure 1.
4. Refill coolant system.

FIGURE 1

Coolant Pipe Replacement

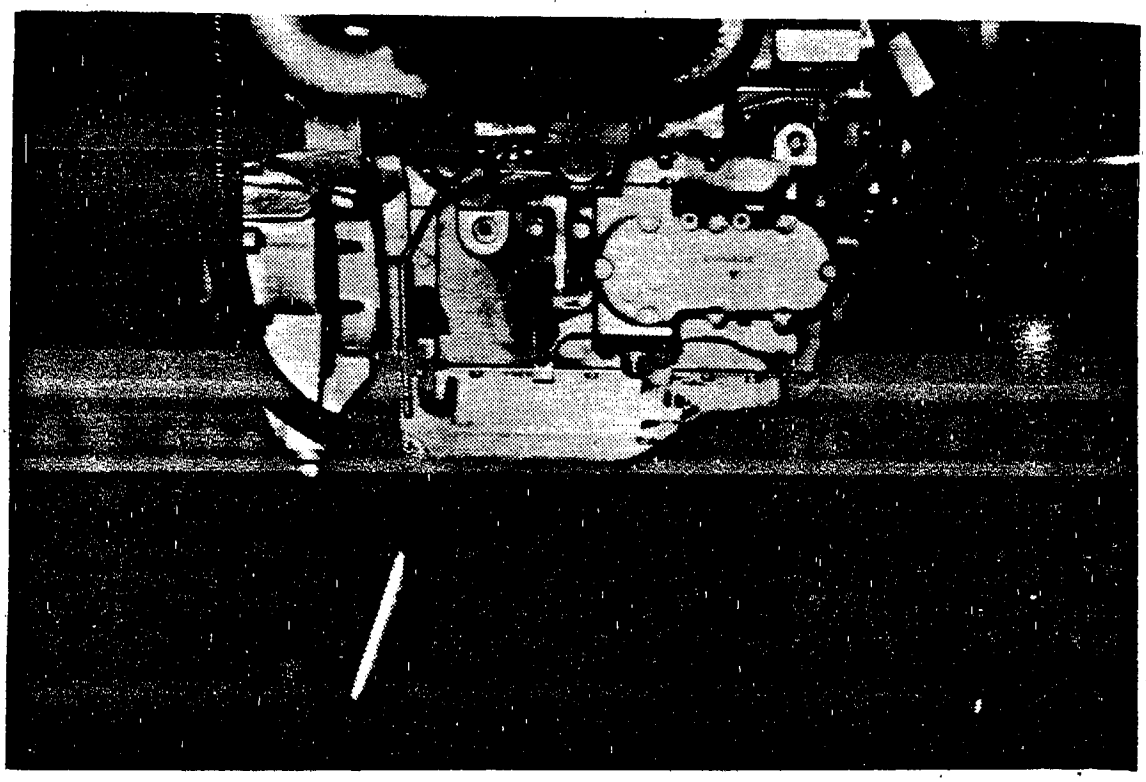


(IV) Oil Filter Relocation

1. Remove oil filter.
2. Remove oil filter mounting housing.
3. Install oil filter remote mouting adapter. See Figure 2.
4. Install remote filter housing bracket on top of transmission.
5. Install hoses between remote filter housing and the adapter.
6. Be sure to suspend oil hoses.

FIGURE 2

Remote Oil Filter Mounting Housing



(V) Filter Traps Installation

1. Position trap mounting saddles to the engine by bolting to existing bosses on exhaust manifold, do not tighten the bolts at this time.

2. Install the traps into the saddles. Be sure that bottom of traps is hooked in supports.

3. Wrap saddle straps around traps, then position the heater connectors towards the firewall. Tighten the straps to 20 ft. lbs. See Figure 3.

4. Install exhaust pipe to the turbocharger then position bypass valves to the trap inlets and tighten the exhaust manifold to the trap inlets. See Figure 4.

5. Install the exhaust tailpipes to the trap outlets. See Figure 5.

6. Tighten bolts on saddle mounts to 40 ft.lbs.

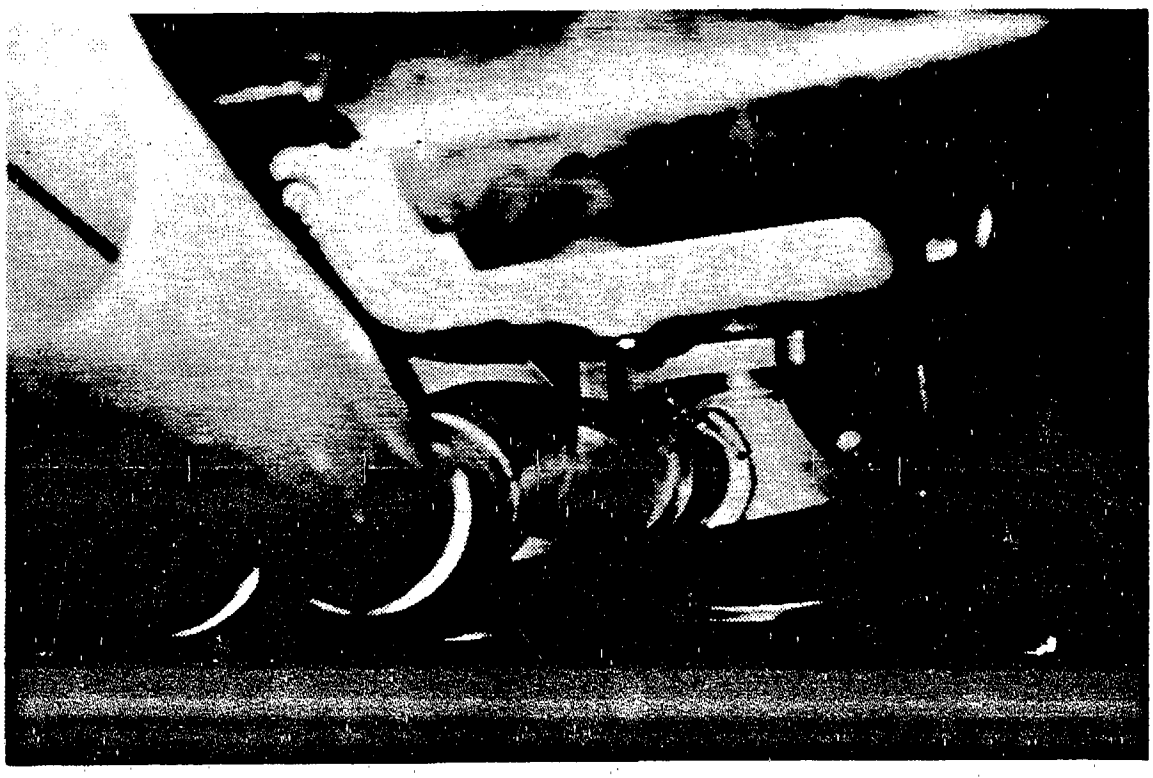
FIGURE 3

Saddle Straps

(V) Filter Traps Installation

FIGURE 5

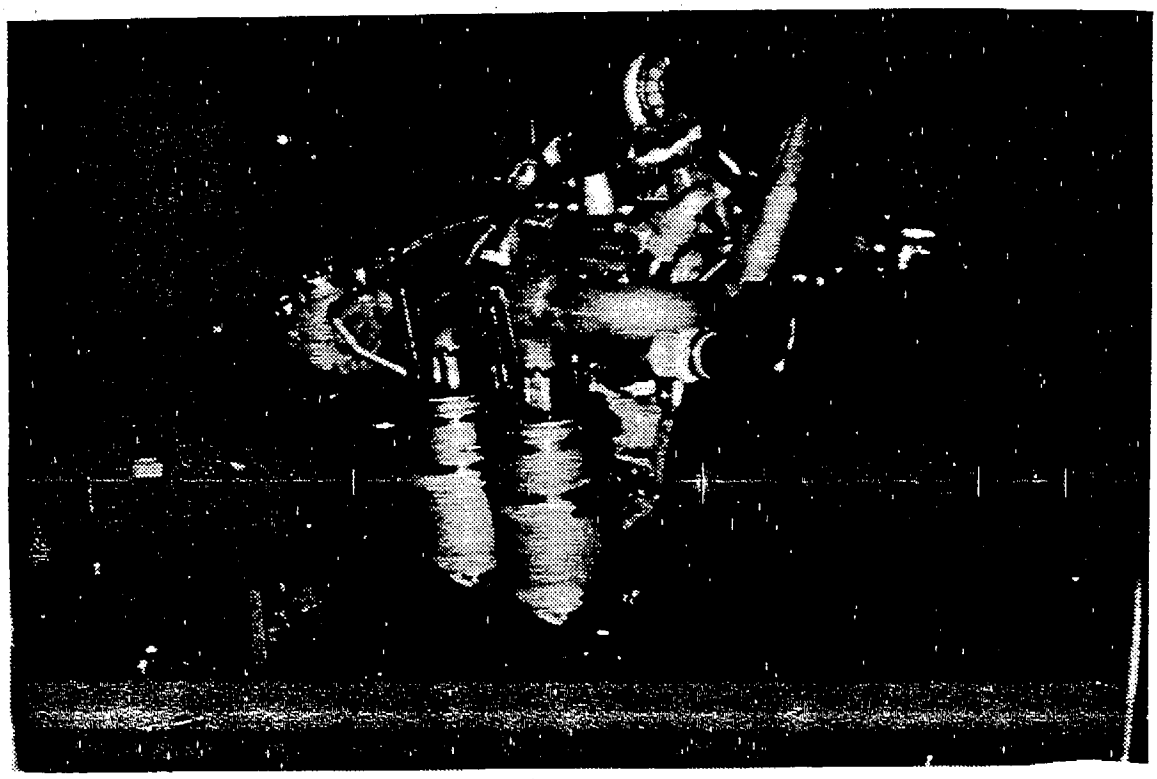
Exhaust Tail Pipe from Traps



(V) Filter Traps Installation

FIGURE 4

Exhaust Pipe from Turbocharger

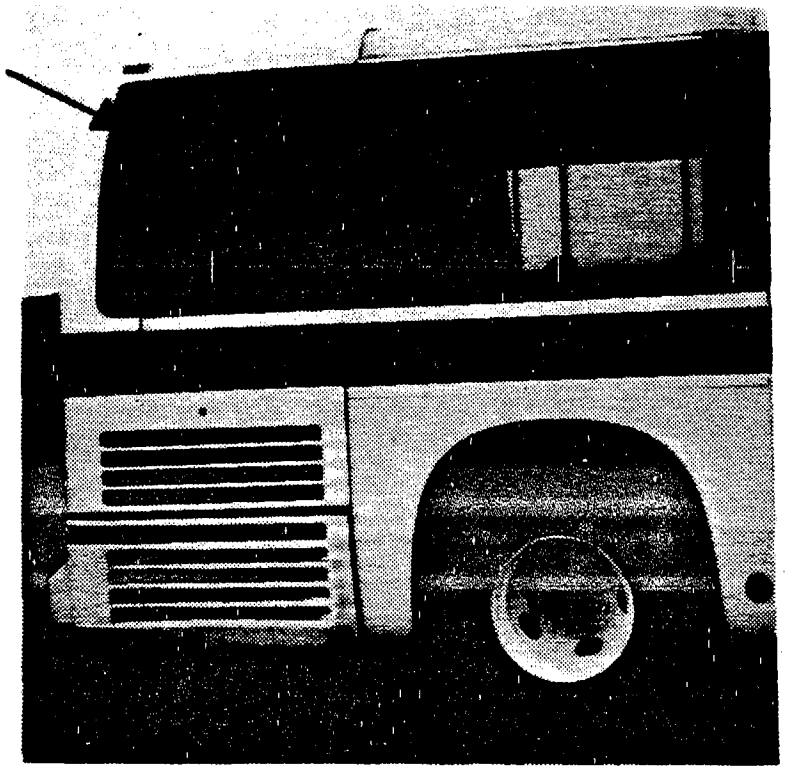


(VI) Blower Assembly

- The blower and blower manifold are to be mounted in the compartment above the engine on the curb side. See Figure 6.
- Remove 10 1/4"-20 bolts and set panel cover aside.
- Mount the blower to back panel (can be either drilled and bolted or welded on).
- Mount two Humphrey 12 VDC air solenoid valves in same compartment as the blower assembly.

FIGURE 6

Side Compartment for Blower Mounting



(VII) Pneumatic

1. Run a 1/4" Teflon tube from each Humphrey solenoid valve in the remote control box to each bypass valve in the exhaust pipe (at top of trap assemblies). Be sure to match solenoid valve 1 to bypass valve 1 and 2 to 2. See Appendix C.

2. Run both of these 1/4" teflon tubes in a loom.

3. Run 1/4" teflon tube from the two solenoid valves mounted with the blower assembly to the actuators on the blower manifold. Be sure to match valve 1 to actuator 1 and 2 to 2.

4. Run a 1/4" teflon tube from an air supply to the remote box air manifold.

(VIII) Combustion Air Hoses Hook Up

1. Run the 1" hose from the blower manifold connections to the trap assemblies.

2. Match up trap one combustion air connection to the blower manifold connection marked #1 and trap 2 to #2.

3. It will be necessary to drill or cut two 1-1/4" holes in the bulkhead between the engine compartment and the compartment housing the blower assembly.

4. Put a rubber grommet around these holes to stop chaffing on the combustion air hoses.

(IX) Pressure Sensing Lines

1. Install the 1/4" stainless steel lines to the trap assembly fitting located at the top and bottom of the trap assemblies (4 pc.).

2. Connect 1/4" Teflon tube to the ends of the 1/4" stainless steel tubes. Run these Teflon tubes back to the remote control box. In the remote control box there are 2 Shavety pressure transducers. On each transducer there is a Hi and Lo port. The Hi port must be hooked to the line which goes to the top of the trap assembly and the Low to the line on the bottom of the trap assembly. It is important not to mix these up. The Hi and Lo lines must be matched up, transducer #1 to trap #1 and #2 to #2.

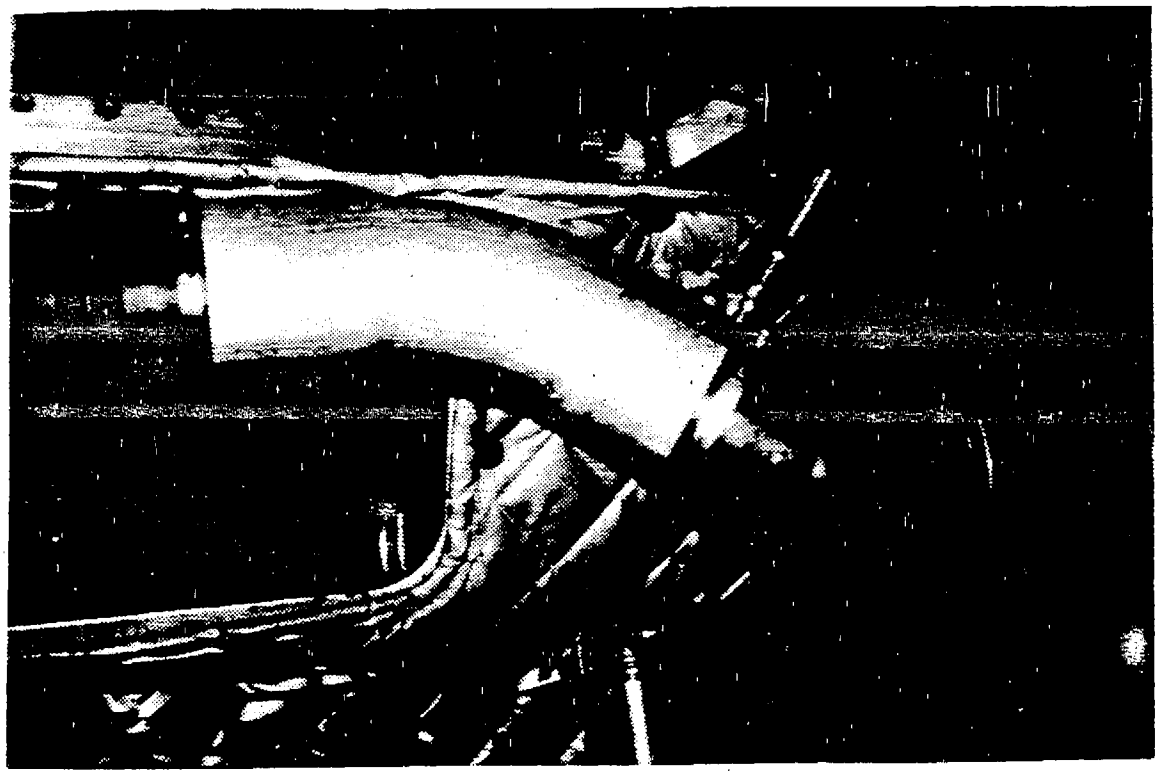
(X) Engine Cradle Reinstall

See GMC Coaches Maintenance Manual RTS Models under SEction 6A, pages 14 and 15.

(XI) Intake Air Duct

1. Remove the existing intake duct piece and replace it with one supplied. See Figure 7.
2. Insert the TSI velocity probe between the turbocharger inlet and the air cleaner outlet into the port on the duct.
3. The velocity port is fragile, use extreme care while handling.
4. Slide the probe into the port so that the probe end will be in the middle of the intake duct.
5. Run the probe wire to the TSI junction box and make the appropriate connections in the junction box.

The system is now ready for start up.

FIGURE 7

Intake Air Duct