



State Pathologist
Professor J Crane
MB BCh MRCPATH DMJ (Clin et Path)

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JC/MDEC

20th December, 1995.

Dr. E. Sumner,
Hospital for Children,
NHS Trust,
Great Ormond Street,
LONDON WC1N 3JH

Dear Dr. Sumner,

Following our recent telephone conversation I should be grateful if you would provide an expert opinion on my case - Adam Strain, for H. M. Coroner for Greater Belfast, Mr. J. L. Leckey, LL.M.

Please find enclosed:

1. The original hospital notes. (TAB 2)
2. Two reports from the consultant anaesthetist involved.
3. A report from the consultant paediatric nephrologist.
4. Equipment check report. (TAB 7)

To summarise:

This 4-year old child with a history of polyuric renal failure due to posterior urethral valves was admitted for a renal transplant. He had had a number of operations in the past including five funduplications and more recently an orchidoplexy. All were uneventful. He ate nothing by mouth and as such was fed via a gastrostomy button which would include a night feed of 1,500 mls.

The operation itself produced a little more bleeding than expected and technically it was apparently a little more difficult than usual because this child was well nourished. When the operation was completed this child did not wake up. An urgent CT scan one hour later showed gross cerebral oedema. He was ventilated for about another 24 hours before the ventilator was turned off.

Findings at autopsy:

1. Gross cerebral oedema (brain still fixing along with spinal cord) with the brain bulging through the dura.
2. No substantial pulmonary oedema or oedema of any other organ.

I should be grateful if you could provide us with an opinion in this case.

Yours sincerely,



**Alison Armour
Senior Registrar**

Encls:

c.c. Mr. J. L. Leckey, H. M. Coroner for Greater Belfast.

Adam Strawn

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1 MW NP II

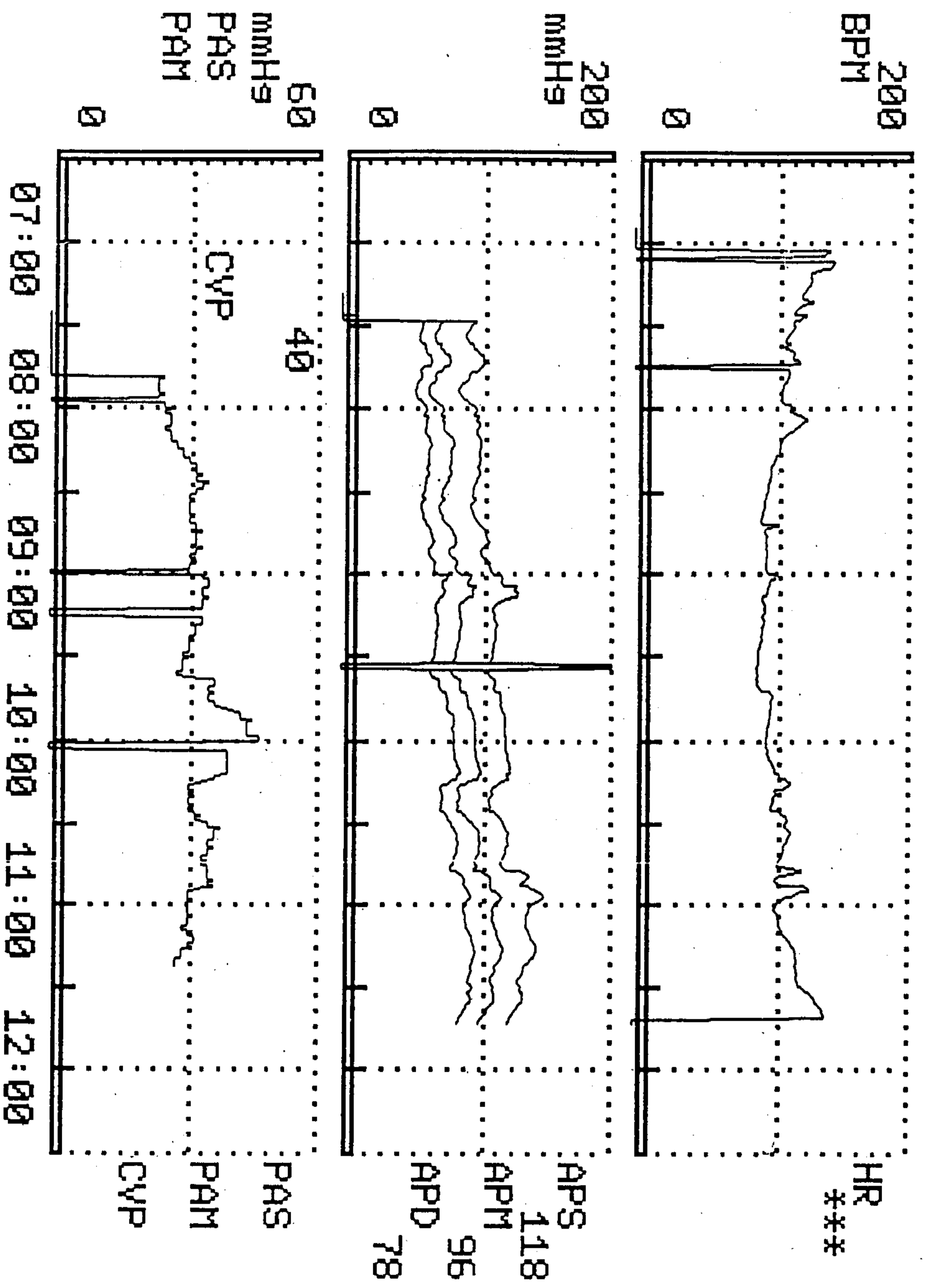
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HR * L * 200 50

Adult +

RR

NOTES	ALARMS	TIME
		11:43



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EVENT NOTES/ALARMS

PAGE 1

HOURS 6

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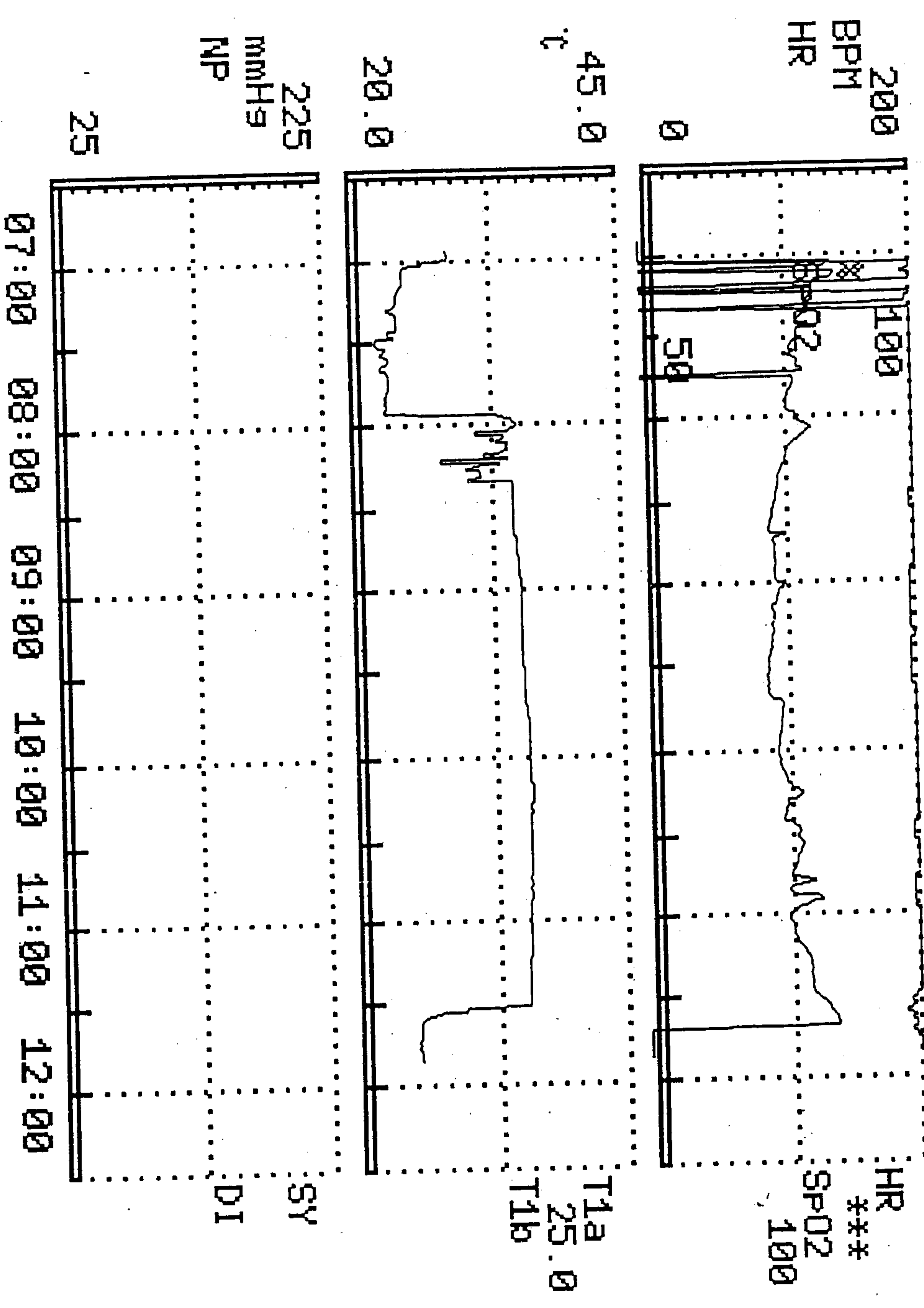
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Adam Simon

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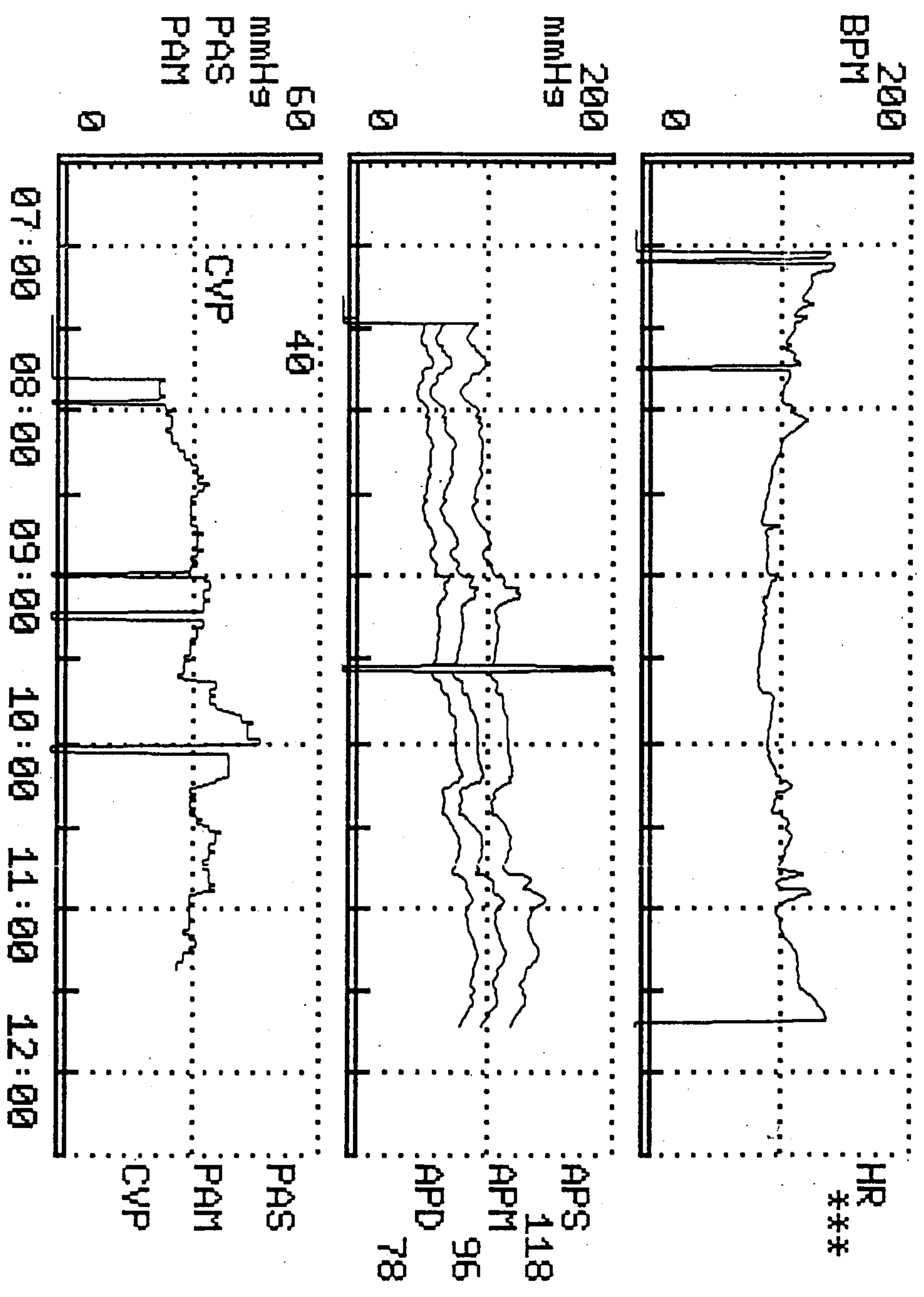
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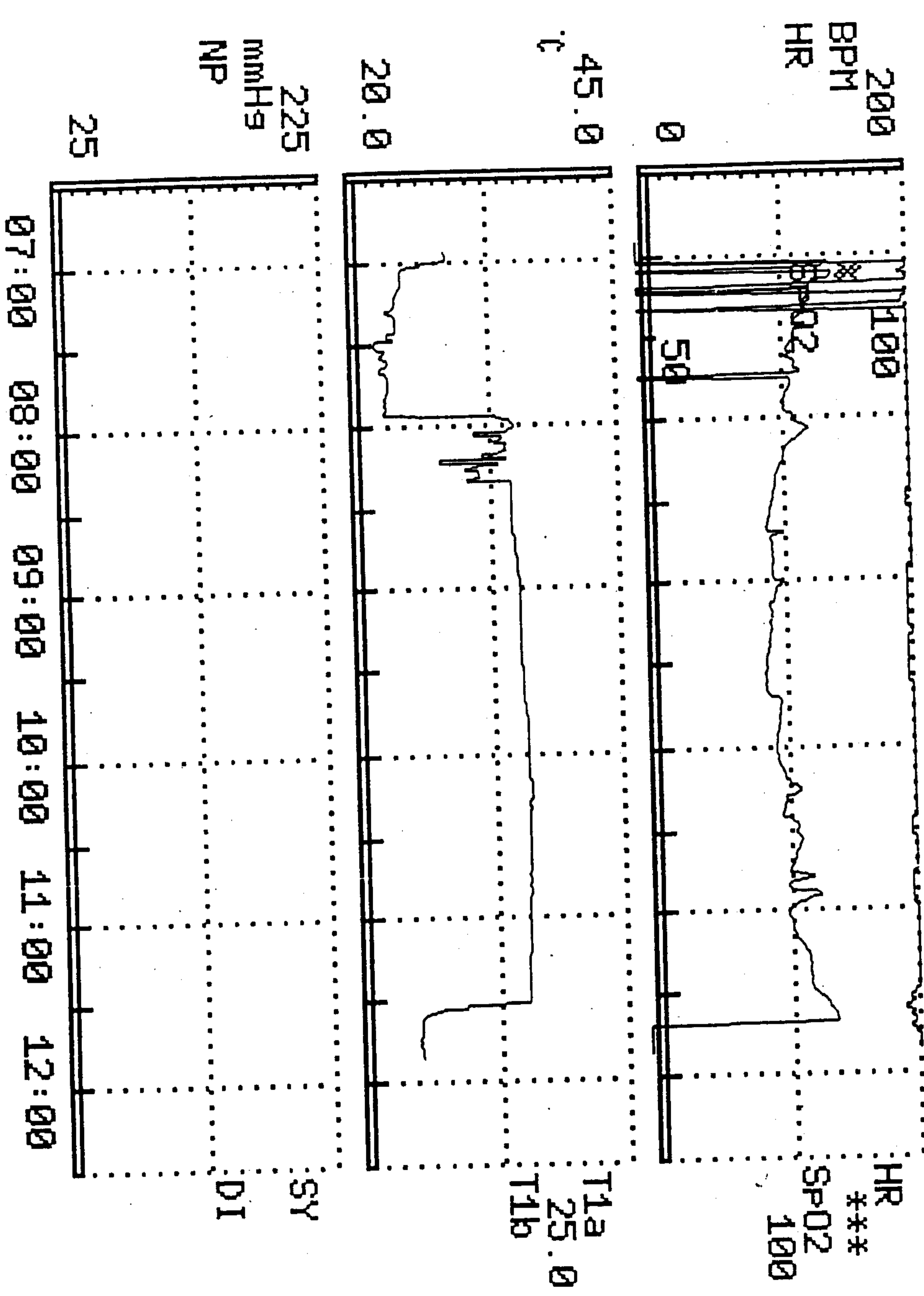
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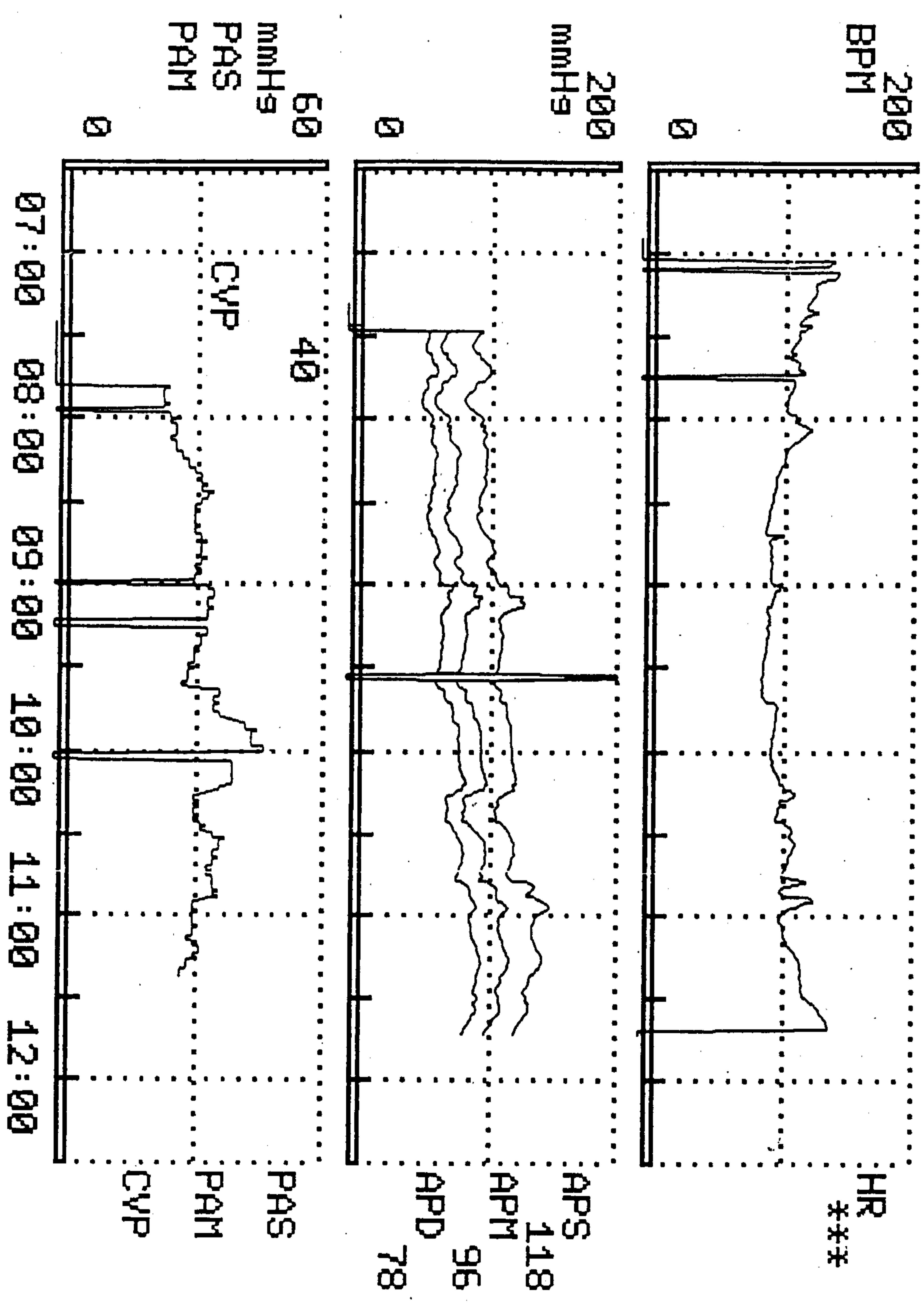
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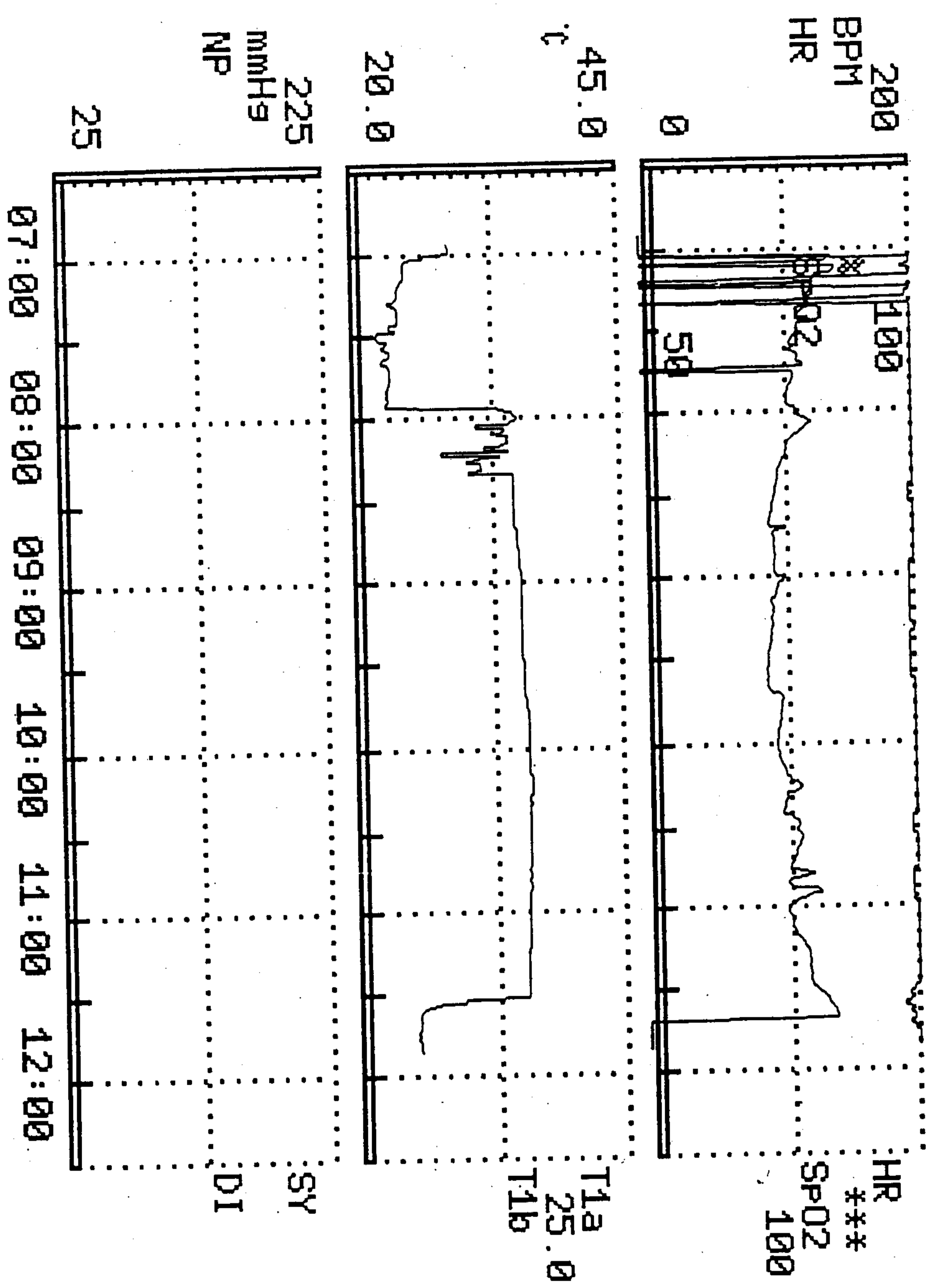
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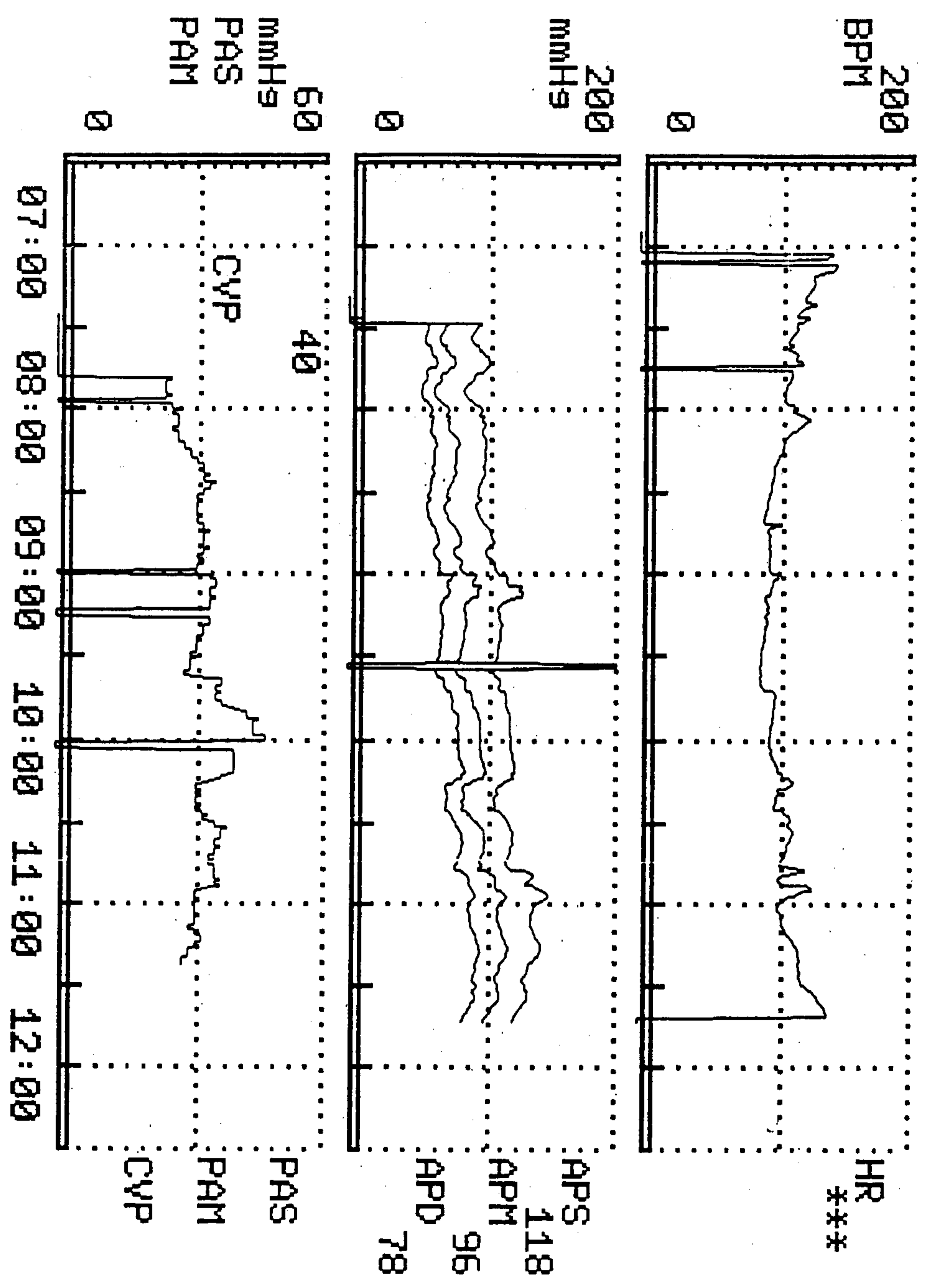
Adam Strawn

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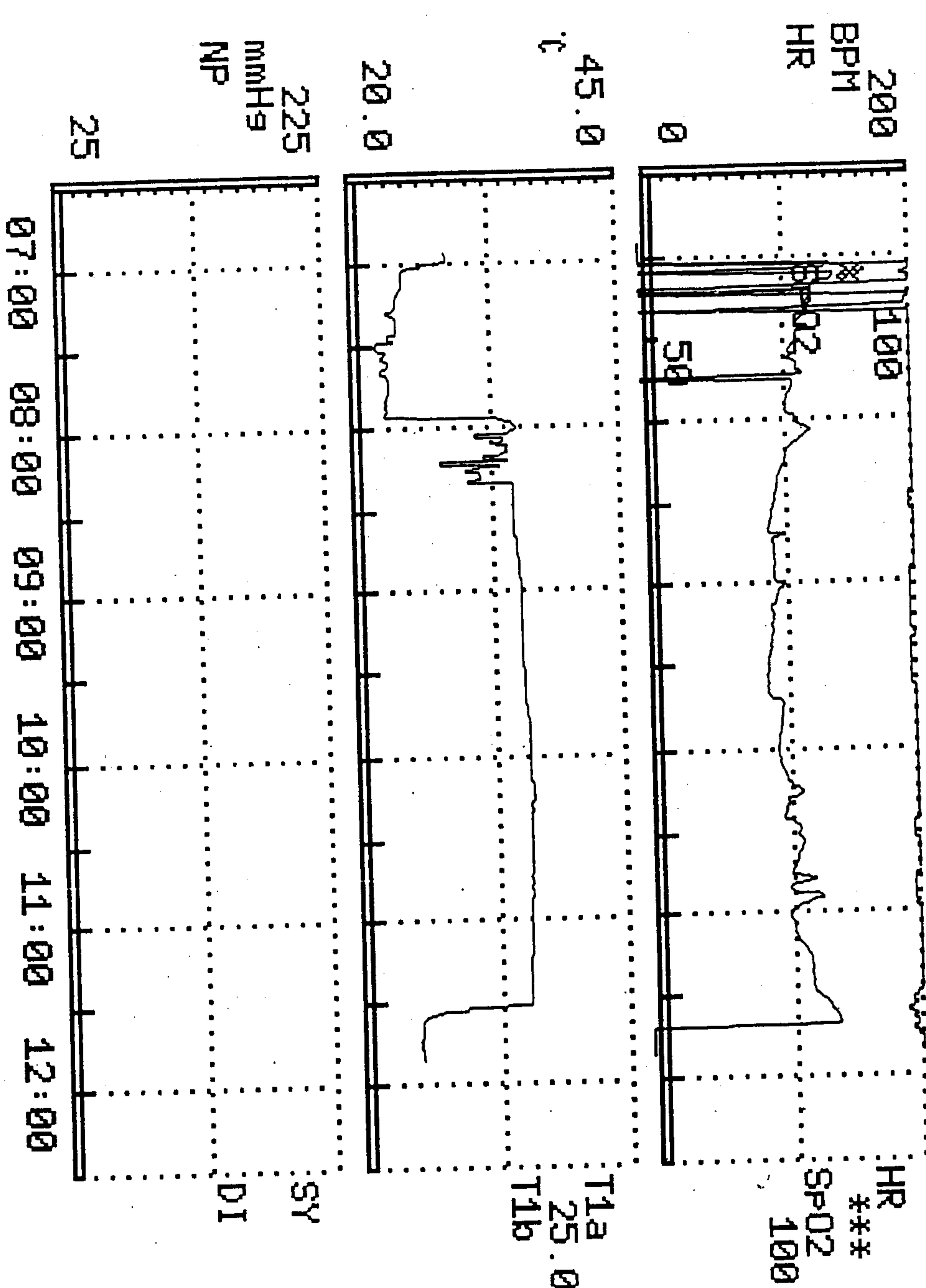
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Adam Struss

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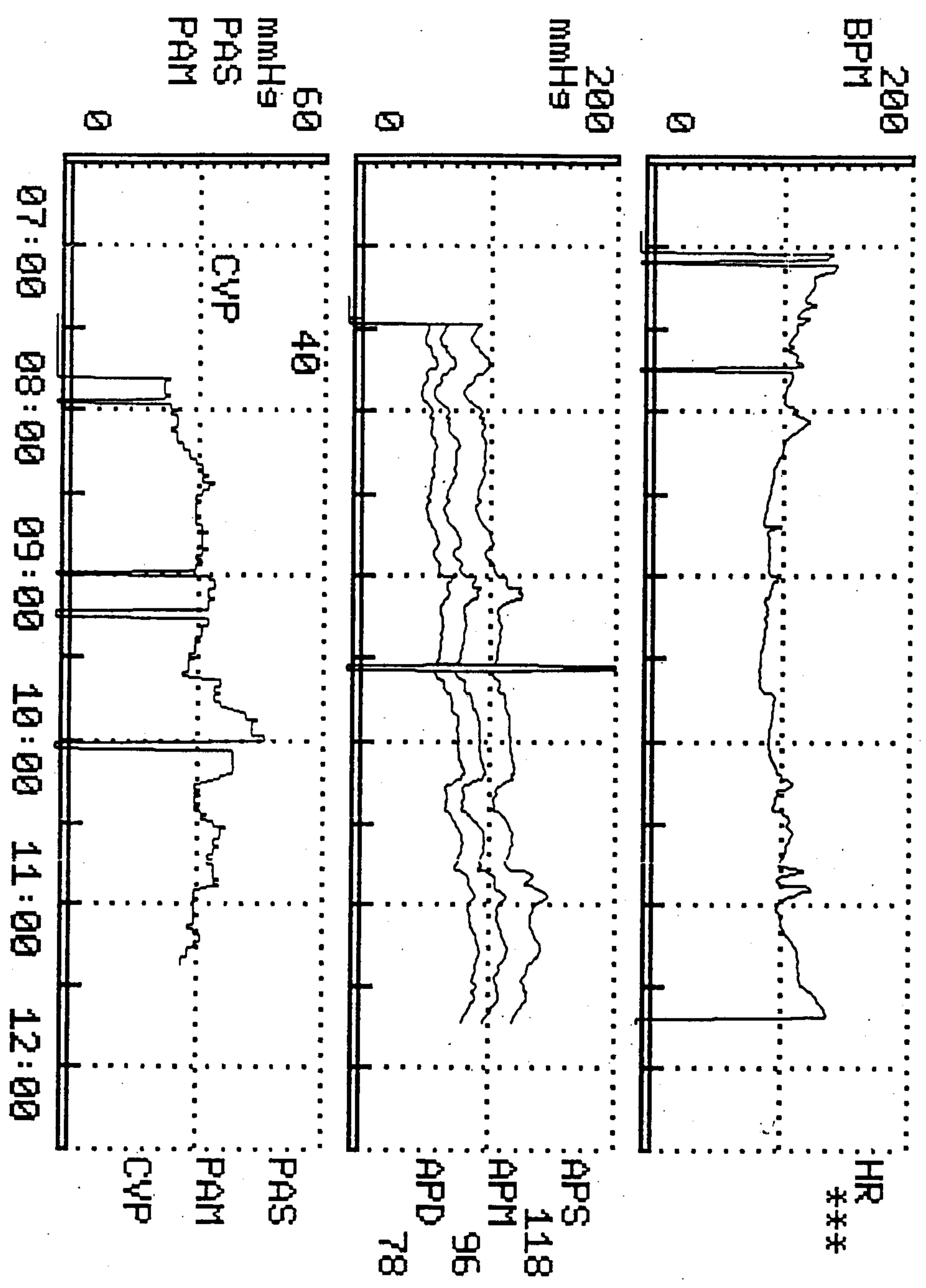
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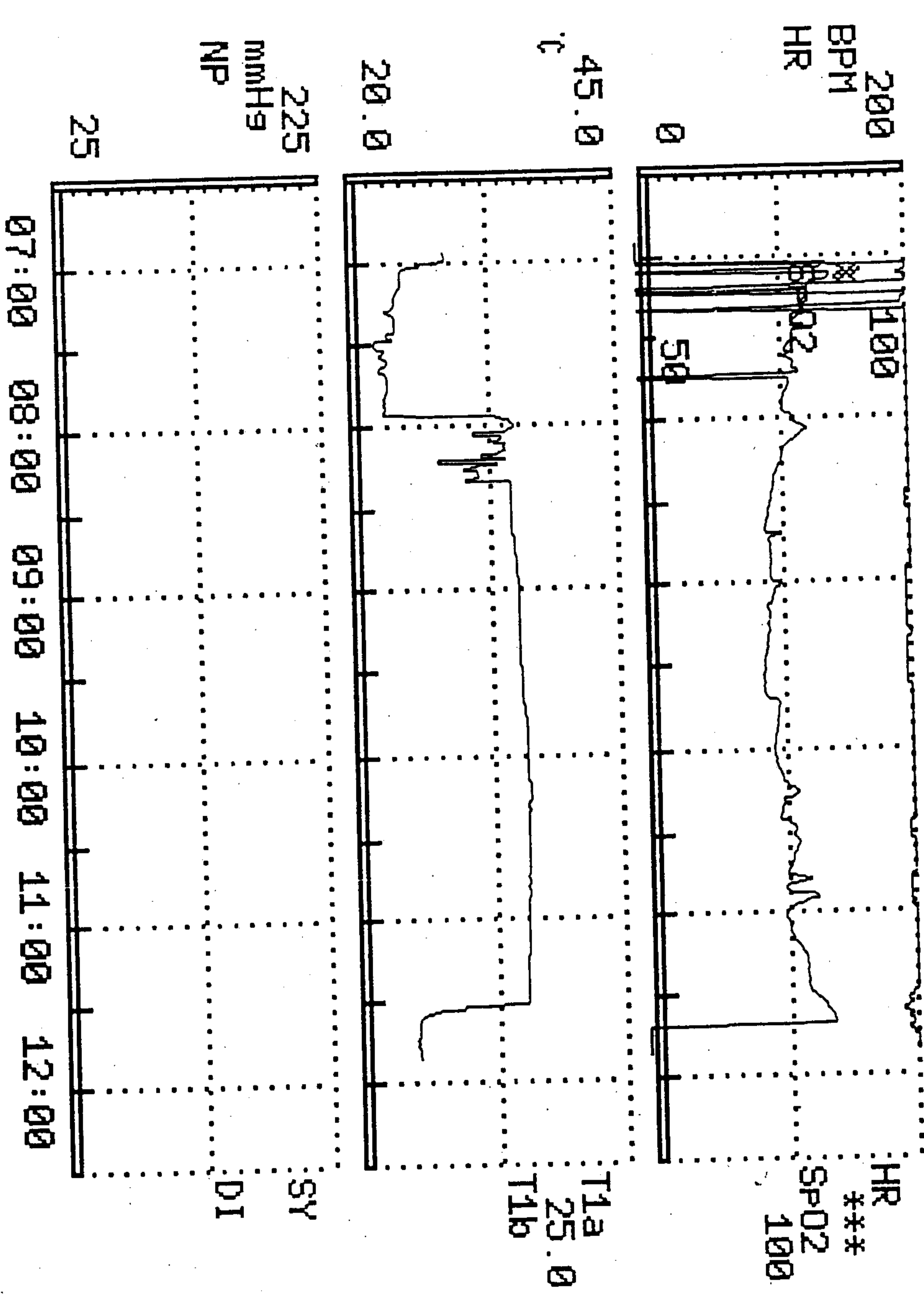
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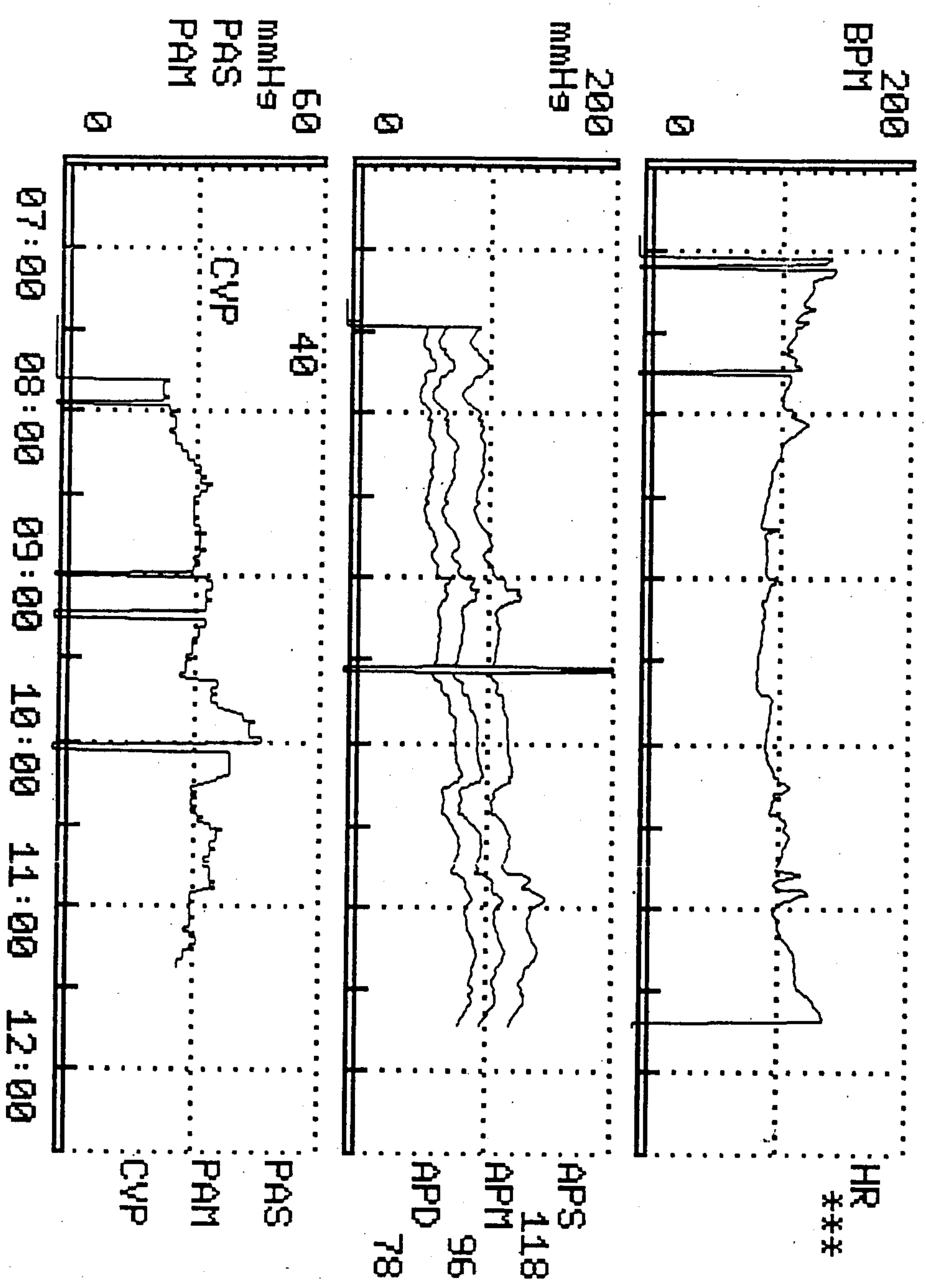
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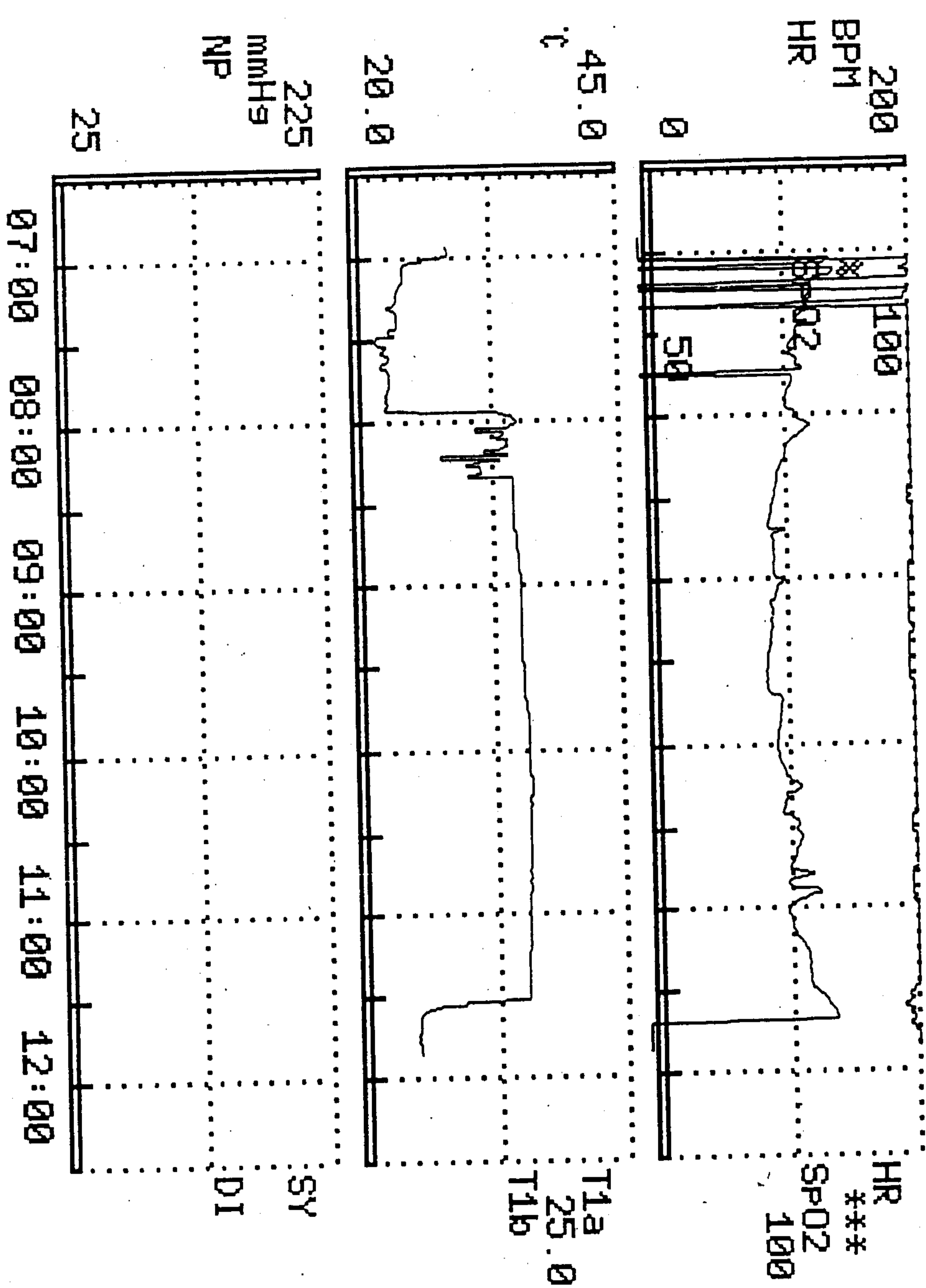
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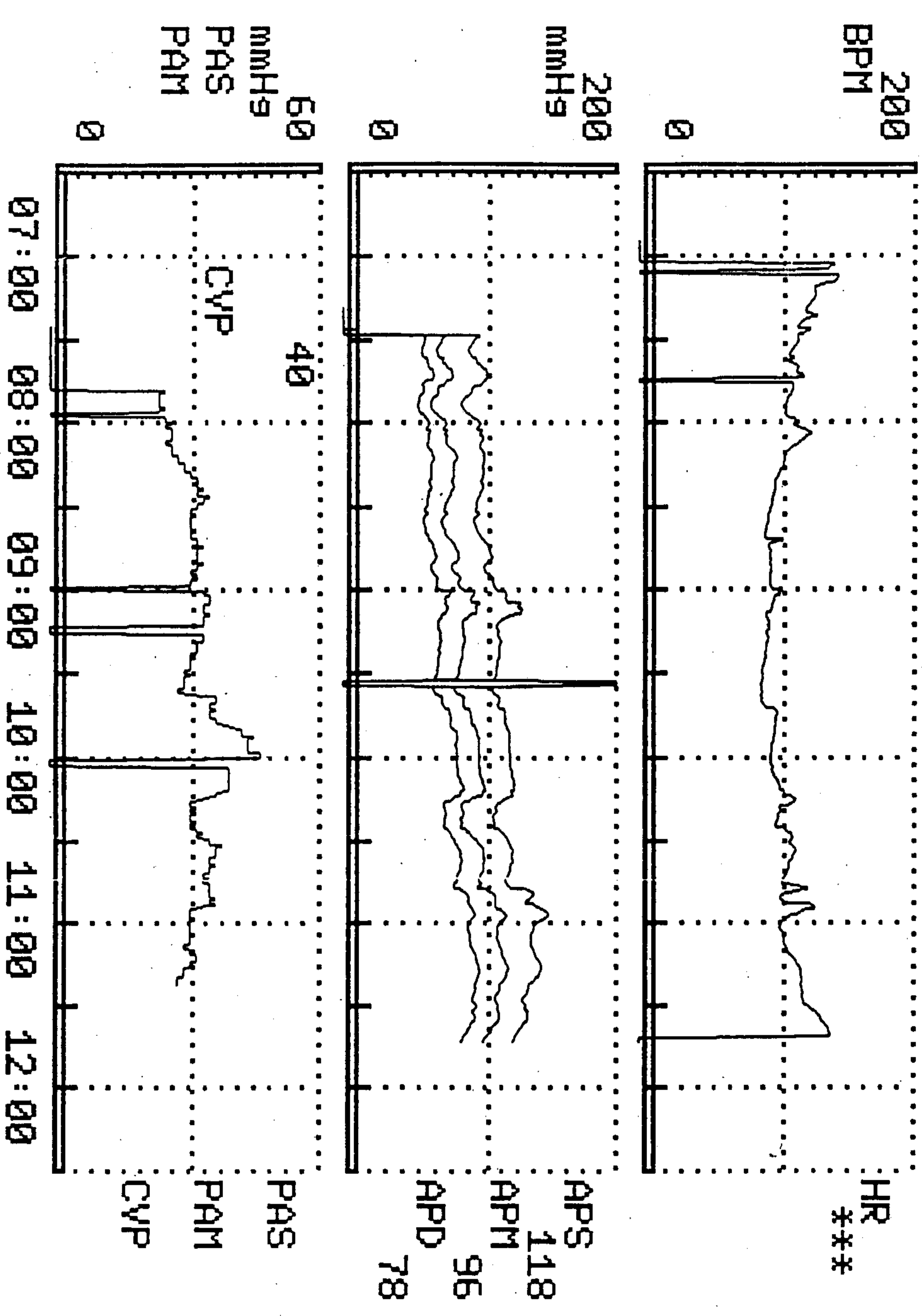
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Adam Sivan

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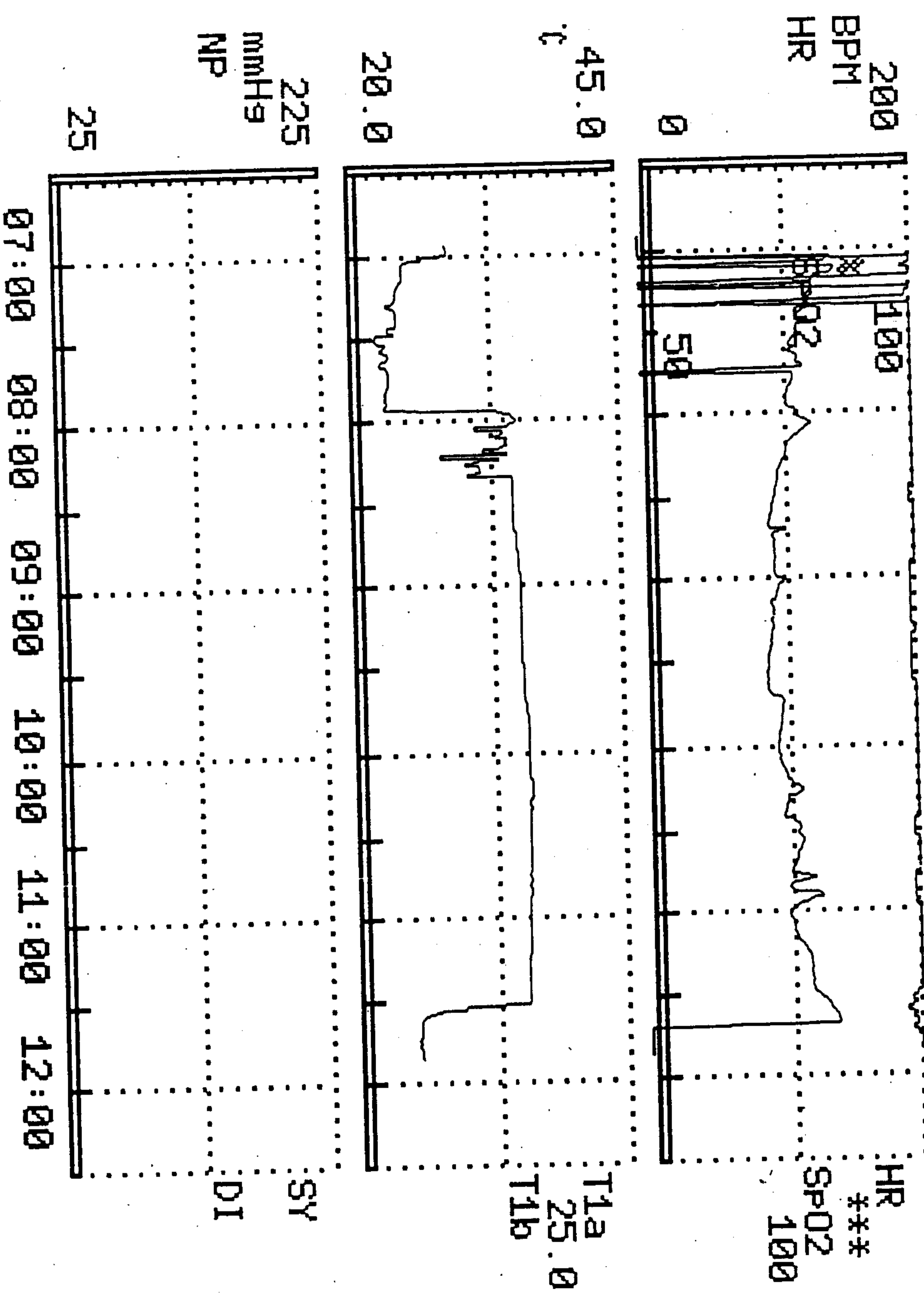
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The

ROYAL HOSPITALS

Dr. GA Murnaghan
Director of Medical Administration
1st Floor, East Wing



PATRON: HRH The Duchess of Kent

The Royal Victoria Hospital
The Royal Maternity Hospital
The Royal Belfast Hospital for Sick Children

THE ROYAL GROUP OF HOSPITALS AND DENTAL HOSPITAL
HEALTH AND SOCIAL SERVICES TRUST

Grosvenor Road, Belfast BT12 6BA Northern Ireland
Telephone: [REDACTED]

REPORT ON EQUIPMENT USED DURING UNTOWARD INCIDENTS
IN THE OPERATING THEATRES, RBHSC

Mr B. McLaughlin, Medical Technical Officer 4 and Mr J. Wilson, Medical Technical Officer 5 examined the anaesthetic, temperature control and monitoring equipment used in the theatre under investigation.

The investigation was carried out between 0900 hours to 1130 hours on Saturday 2 December 1995.

The equipment examined consisted of the following,
Lamtec Anaesthetic Machine, Model 990-905, Serial No. 8704905089
Penlon Nuffield Ventilator, Serial No. 0387-06 fitted with
either the NV200 valve, Serial No 33694 or the Paediatric valve,
Serial No 432004.

Siemens Patient Monitor, Model 1281, Serial No.

(This monitor is currently out for repair - a new display screen is being fitted and a loan monitor is in use.)

Datex Ultima, Model ULT V-21-01, Serial No 31523.

Hudson Oxygen Analyser.

The Siemens Monitor measures vital signs including ECG, Blood Pressure, Temperature, Heart Rate and Respiration.

The Datex measures End Tidal Carbon Dioxide (ETCO₂) and oxygen concentrations (FIO₂) in the breathing circuit.

To assist in maintaining the patient's temperature an Aqua-K-Thermia Unit is used. A water blanket is placed below the patient and the circulating water kept at a suitable temperature to maintain body temperature. The patient's temperature is monitored on the Siemens monitor using a reusable general temperature probe.

All service reports pertaining to the equipment were examined and no indication of malfunction found in the documentation. The parts replaced are standard under preventative maintenance and functional checks. The service reports for the period under investigation are Ulster Anaesthetics Job No. DD833 and DD834 (Nuffield) and Anaesthetic Services 7524, 7232, and 6992 (Lamtec).

A copy of the service report for the Siemens monitor is expected this week but verbal indications are that nothing untoward was discovered during its overhaul.

The Datex monitor is not on service contract but the calibration was checked and found to be satisfactory.

The Aqua-K-Thermia Unit is not on contract and as it is over 10 tens old does require regular maintenance and must be considered for replacement. It was difficult to assess its performance over a short period, but at the time of the investigation it appeared to work satisfactorily.

All monitor alarms worked and gave no cause for concern.

The Lamtec and Nuffield were set-up and connected to the test lung fitted with a Wright's Respirator and a Hudson Oxygen Analyser. Once a steady state was achieved the patient circuit was disconnected and the low pressure alarm became active within 20 seconds (as specification).

The steady state was again achieved and the oxygen pipeline supply disconnected causing the Alarm Whistle to be activated (as specification).

The standby oxygen cylinder fitted to the Lamtec was opened and the oxygen supply restored (as specification).

All cylinders were removed from the Lamtec, one nitrous oxide (N₂O), two medical air, one Carbon Dioxide (CO₂), one oxygen (O₂). The Pin Index System was checked for security. Five pins were discovered to be loose and could be removed. One on N₂O, both on the CO₂ and both on the O₂. This effectively removes an essential safety feature from the machine and allowed the investigators to fit the CO₂ cylinder in the O₂ yoke and supply CO₂ via the O₂ flowmeter.

At this stage the O₂ supply was still from the hospital pipeline system, that the valve system on the Lamtec should maintain. Instead the supply from the cylinder replaced the pipeline O₂ supply and the percentage oxygen in the breathing circuit fell from 50% to 11%. All anaesthetic machine and ventilator alarms were bypassed. The Datex monitor did function correctly and the high CO₂ and low O₂ alarms were activated.

It must be clearly stated that this could only be achieved by gross misconduct and failure to use the monitoring equipment.

The pins were re-inserted and the Lamtec put back to a safe working condition and again checked by a second person to ensure

correctness of gas delivery. The purity of oxygen was checked and also found to be satisfactory.

Examination of theatre practice would indicate that the cylinders are checked daily by the medical technical officer (MTO) on duty and the cylinders are only changed by the MTO. The Lamtec log book was examined and found to be signed daily prior to the commencement of the days list by the MTO after all safety and function checks were carried out satisfactorily. The Anaesthetist using the machine is also expected to sign the log before commencing the list but this does not happen on most occasions. A reason for this omission should be requested.

The anaesthetic machine is approximately 10 years old and has been regularly serviced by Anaesthetic Services. The last visit was on 12 September 1995. It is difficult to believe that 5 pins have come loose in 3 yokes in such a short time. This must be considered as a major omission on the part of the service company and requires investigation.

It is also essential that all cylinder yokes are replaced or repaired as a matter of urgency. A check of all pin index equipment within the Trust should be carried out forthwith to ensure the safety of such systems. This will include oxygen cylinders in use at ward level.

Finally it must be emphasised that the protocols and monitoring procedures set up within the RBHSC's Theatres, for more than 2 years, would have discovered if a reversal of cylinders had occurred. If these procedures had been ignored the following actions had to occur;

1. MTO did not check the anaesthetic machine
2. Anaesthetist did not check the anaesthetic machine.
3. The fresh gas supply was not checked.
4. The Datex monitor was not used.
5. Poor tissue oxygenation was ignored by the Surgeon.
6. The pulse oximeter was not used.

The procedure for constructing arterial lines was examined and found to be satisfactory and in accordance with other areas within the Trust.

In conclusion the equipment was found to be in satisfactory condition. The current practices covering anaesthetic and monitoring equipment are safe and satisfactory.

J. J. W. L.