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Towards Wound Closure Optimization: Final Report

Larry I. Sanders

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LaserSurge, Inc.

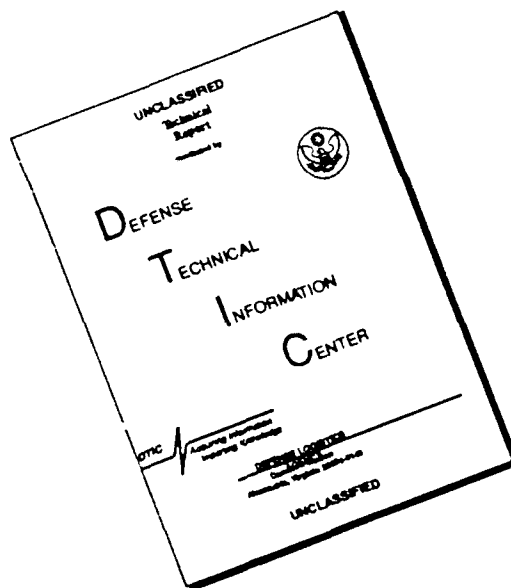
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REPORT DOCUMENTATION PAGE		1. REPORT NO. N-FIN-1990	2.	3. Recipient's Accession No.	
Title and Subtitle Towards Wound Closure Optimization: Final Report				5. Report Date 15 JAN 1991	
Author(s) Larry I. Sanders				6.	
9. Performing Organization Name and Address LaserSurge, Inc. 2144 Brighton-Henrietta Town Line Road Rochester, NY 14623				8. Performing Organization Rept. No.	
				10. Project/Task/Work Unit No.	
				11. Contract(C) or Grant(G) No. (C) N00014-89-C-0263 (G)	
12. Sponsoring Organization Name and Address Office of Naval Research Department of the Navy 800 N. Quincy Street Arlington, VA 22217				13. Type of Report & Period Covered Contractor Report (Final)	
				14.	
Supplementary Notes					
Abstract (Limit: 200 words)					
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Document Analysis a. Descriptors					
b. Identifiers/Open-Ended Terms					
c. COSATI Field/Group					
18. Availability Statement		19. Security Class (This Report)		21. No. of Pages	
		20. Security Class (This Page)		22. Price	

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Summary

Extensive experimentation with many combinations of lasers and chromophores was conducted to determine the optimal parameters for laser tissue welding. New Zealand White rabbit small bowel was used as an *in vitro* model for this study. The analysis indicates that particular chromophores can be utilized to enhance the effectiveness of certain lasers. For example, India ink is an effective chromophore for the 1.06 micron Nd:YAG laser, while blood is most effective for the 0.514 micron Ar⁺⁺ laser. The 2.1 micron Ho:YAG laser produced strong chromophore-free welds, and also produced strong welds in the presence of India ink and blood. The laser welding literature indicates that Indocyanine Green is an adjuvant to laser welding with the 0.808 micron Ga:Al:As diode laser. The diode lasers that were examined in this study did not provide sufficient energy to weld tissue and evaluate these statements. Indocyanine Green did prove to be an effective chromophore for the 0.532 micron KTP laser. The apparatus designed and developed for this study provides an unique method to determine the laser tissue welding parameters which will produce the strongest welds.

Introduction

LaserSurge, Inc, of Rochester, NY was established to develop, demonstrate, and facilitate the clinical use of automated surgical laser delivery systems. The speed, effectiveness, and reliability of using laser energy to connect or weld living tissue makes laser tissue welding one of the most promising areas of medical research today. The controlled application of laser energy thermally induces intrinsic tissue changes which lead to both immediately strong bonds between tissue and rapid restoration of tissue function. Conventional surgical techniques typically require sutures and staples to close tissue wounds or to construct anastomoses (i.e., surgical connections that provide functional communication between hollow organs such as bowel). A surgeon's bonding of tissue using laser tissue welding can be compared to a metal worker's handling of steel. Whereas the conventional suturing or stapling is like the use of screws or rivets in steel, laser tissue welding, like welding steel, uses an outside energy source to cause intrinsic material changes which alone provide for the strong bond. A fundamental requirement to weld either material is that the surfaces to be welded be in intimate contact with each other. To fully realize the enormous potential of this revolutionary wound closure modality, an enhanced theoretical understanding of laser tissue welding is essential. In an effort to better recognize and evaluate the many factors that determine a successful laser tissue weld, LaserSurge has developed a laser tissue welding equation which describes laser tissue welding as a function of its component parameters; lasing parameters, chromophores, and tissue parameters. Using this structured approach, an investigator can readily dissect and compare the effects of changes in individual or multiple variables. This study was designed to identify the most favorable laser tissue welding conditions. To accomplish this goal, an integrated laser tissue welding and tensiometry (weld strength measurement) system was designed, constructed, and tested. This system permits the user to selectively vary several parameters of interest including welding temperature, welding time, aperture size, laser type, power, and chromophores. Experimental trials using different combinations of the aforementioned parameters were performed in this study.

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Methods, Assumptions, and Procedures

Methods

Device Refinement and Evaluation

In order to examine the effects of multiple combinations of lasers and chromophores, a new device was developed to quantify the strength of laser welds. The laser welding/tensiometry apparatus permits any laser which can be transmitted through an optical fiber to be coupled to the beam alignment system. The beam alignment system configured the beam so that it slightly overfilled the aperture. The beam passed through a high-speed shutter, which opened and closed in response to the thermocouple temperature reading. The aperture size was fixed at either 0.5 x 4.0 mm or 2.0 x 4.0 mm, and the aperture was placed just above the surface of the tissue strips to be welded. The beam impinged perpendicularly upon the tissue strips at the site of apposition. A thermocouple was placed between the strips so that it was positioned 1 mm beneath the surface of the weld. The strips were then brought into contact by a piezoelectric motor under computer control. The laser welding temperature control program allowed the operator to designate the parameters of interest, including the welding control temperature. Following welding, the welded tissue was pulled apart and the load required to rupture the weld was measured as a function of the distance moved. Graphs of load versus distance were generated to determine maximum weld strength.

The tensiometry software was seamlessly integrated into the laser welding control program by Mr. William Kraft. This new program eliminated the need to reboot the computer between experimental trials. This major improvement permitted more rapid data acquisition and reduced the average time between trials to approximately five minutes.

The thermocouple placement system has also been modified to provide more reproducible and accurate temperature measurements. A single thermocouple was mounted on a specially-designed plexiglas holder. This thermocouple was placed 1 mm below the surface of the apposed tissue at the site of welding, as depicted in Figure 1 in Appendix C. The temperature recorded from the thermocouple controlled the opening and closing of the shutter mechanism, thereby maintaining the designated tissue welding temperature. The new thermocouple holder permits easier, faster, and more reliable thermocouple placement.

A new problem surfaced during the experimentation. The stages began to stall and resist free movement because of dried bowel and saline which had entered the stage. The stages were removed, cleaned, and remounted. Periodic cleaning and maintenance have rectified this problem.

Assumptions

An implicit assumption in the original design of this experimental protocol is that the freshly harvested *in vitro* bowel very closely resembles native *in vivo* bowel. The time from resection to welding was minimized by sequentially harvesting small sections of bowel from intravenously anesthetized rabbits. The resected bowel was placed in physiological saline to maintain its integrity, while the remaining intact bowel was returned to the

abdomen for later use. Tissue processing and handling were minimized to the extent possible. Tissue trauma was minimized by handling and manipulating the bowel gently. We have assumed that the *in vitro* tissue would not be significantly altered by the removal and processing steps. The veracity of this assumption is important since the intent of this study is to generate data which will be readily transferrable to clinical applications.

One set of experiments suggests that the *in vitro* bowel model may not be wholly representative of the *in vivo* state. When more than one hour elapsed between bowel resection and welding, the welds produced were clearly inferior to welds produced using freshly harvested bowel under the same conditions. This lack of success may be attributable to changes in tissue turgidity and perhaps also to other biological effects (platelet aggregation and adhesion, etc.). The bowel turgidity appears to change as a result of storage in physiological saline. It is unclear whether this change might influence the laser welding of bowel. Ischemia and oxygen deprivation may also cause changes which are responsible for the difference seen between welding *in vitro* and *in vivo*.

As a consequence of the *in vitro* alterations to bowel, the weld strengths obtained in this study were much lower than anticipated based upon our earlier *in vivo* data. In order to obtain recognizable welds, the highest laser power and temperature settings were employed. Several of the lasers, namely the diode and Argon⁺⁺, were unable to provide the high power output required to weld tissue. Thus, the results for the diode and Argon lasers are inconclusive, and few or no welds were performed using these lasers.

Experimental Procedure

The experimental protocol required the resection of small bowel from New Zealand White rabbits. As discussed in the third quarter 1990 report, weld strength appears to diminish as the length of time between bowel harvesting and welding increases. In order to more closely emulate the clinical setting, fresh bowel was sequentially resected from an intravenously anesthetized rabbit (see Figure 2 in Appendix C for a complete description of the experimental protocol). The harvested tissue was cut into strips measuring 4 mm x 20 mm. The strips were carefully positioned on the laser welding/tensiometry apparatus. The thermocouple was positioned 1 mm deep at the site to be welded and the tissue strips were brought into apposition. Next, the laser was fired and, following the laser exposure, a welded tissue seam was created where the tissue strips were in contact. Thus, the thermocouple was imbedded in the welded tissue. The laser welding temperature control software directed the opening and closing of the shutter to maintain the designated welding temperature. Immediately following laser welding, the tissue was pulled apart and the load required to break the bond (in grams) was measured as a function of the distance (in millimeters) moved. Load versus distance plots were generated to assess the strength of each weld. Maximum strength was determined for each weld.

The 0.808 micron diode lasers used in this study were not powerful enough to use for laser welding using the apparatus as designed. Both LaserSurge's Spectra Diode Laboratory 3 W laser diode array and Columbia-Presbyterian's 1.5 W IRIS Medical OcuLight SL diode were coupled to the laser welding/tensiometry apparatus. The power delivered to the weld site, as measured by a power meter, was insufficient to weld tissue, since less than 0.15 W was transmitted through the optical delivery system. No appreciable temperature rise was observed, even with the Indocyanine Green chromophore. Thus, further studies of the diode laser and its interaction with chromophores were not performed.

Another laser which was initially included in this study was the 1.32 micron Nd:YAG. Rochester General Hospital has one 1.32 micron laser, and it had not been used in more than one year. When the laser was turned on, the laser's power setting mechanism did not function. This laser was unable to be repaired prior to the conclusion of this study. Thus, the 1.32 micron Nd:YAG laser was not studied further.

The Rochester General Hospital 0.514 micron Ar⁺⁺ laser was studied. This laser, a 7.5 W Lexel Aurora Model 150 Pump Laser and a Model 600 Dye Laser, is a tremendously large research unit. The delivered power was quite low, approximately 0.7 W, and this precluded testing of some chromophore and temperature combinations.

The 100 W, CW, Sharplan 2100 1.06 micron Nd:YAG laser was examined using all chromophores and both aperture sizes. The maximum power of 5.0 W (delivered to the site of welding) was selected for use throughout since, at the lower temperatures even with this high power, weld strength was low. Thus, the lower power settings were not examined.

The Columbia-Presbyterian Medical Center in New York, NY has a Coherent Two Point One Holmium laser, with a maximum output power of 15 W operating in pulsed mode. The 2.1 micron Ho:YAG was examined at approximately 1 and 5 W with the small and large apertures.

The 20 W, CW, LaserScope 0.532 KTP laser was also examined in this study. Both aperture sizes were examined at the highest obtainable delivered power of 4 W.

The power delivered to the weld site through the optical system was occasionally not sufficient to attain some of the higher temperatures. These results are indicated in the data section that follows.

Results and Discussion

Results

The data collected and included in the subsequent analysis are limited in number. Most of the early data collected using the ASYSTANT data acquisition program has been excluded due to problems with the tensiometry apparatus, as will be explained in the Discussion (see Appendix B for these force versus distance plots). A great deal of time was devoted to software development and testing, and therefore, the results reported herein generally come from one or two samples. A thorough statistical analysis was not performed; rather, averages were obtained for each laser and chromophore combination. These averages were assessed to determine the most promising combinations. The averages are presented in Table 1.

TABLE 1- MAXIMUM WELD STRENGTH (g)

0.514 Micron Argon (Small Aperture, 0.7-0.8W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>
UNWELDED	0.9	0.6	0.2
50° C	1.2	0.7	1.1
60° C	1.4	1.0	0.9
70° C	-	0.7	1.3
80° C	3.8	-	-
100° C	-	-	-

0.532 Micron KTP (Small Aperture, 4.0 W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>
UNWELDED	0.7	0.1	0.5
50° C	1.7	1.0	0.4
60° C	1.1	2.2	0.5
70° C	1.7	2.7	0.9
80° C	1.3	1.3	1.0
100° C	2.1	3.4	0.6

0.532 Micron KTP (Large Aperture, 4.0 W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>
UNWELDED	-	0.1	-
50° C	-	0.7	-
60° C	-	0.8	-
70° C	-	1.0	-
80° C	-	1.0	-
100° C	-	3.7	-

1.06 Micron Nd:YAG (Small Aperture, 5.0 W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>
UNWELDED	0.2	0.1	0.5
50° C	0.9	0.9	1.0
60° C	1.5	1.1	0.7
70° C	1.6	1.2	2.8
80° C	1.9	1.0	2.0
100° C	1.8	1.1	18.6

1.06 Micron Nd:YAG (Large Aperture, 5.0 W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>
UNWELDED	-	-	1.0
50° C	-	-	1.0
60° C	-	-	1.0
70° C	-	-	1.0
80° C	-	-	1.25
100° C	-	-	2.0

2.1 Micron Ho:YAG (Small Aperture, 5.0 W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>	<u>NO CHROMO</u>
UNWELDED	0.6	1.7	0.6	0.7
50°	1.8	3.4	5.6	4.0
60°	3.7	2.9	9.4	5.8
70°	4.8	9.6	7.0	7.9
80°	13.6	5.9	21.0	8.9
100°	29.4	10.9	21.0	20.8

2.1 Micron Ho:YAG (Large Aperture, 5.0 W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>	<u>NO CHROMO</u>
UNWELDED	0.6	0.9	1.0	0.8
50° C	0.6	4.0	5.4	13.9
60° C	1.5	11.4	2.4	1.1
70° C	2.8	2.8	15.3	2.8
80° C	31.3	45.0	14.2	34.0
100° C	36.5	50.8	2.1	39.0

2.1 Micron Ho:YAG (Small Aperture, 1.0 W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>	<u>NO CHROMO</u>
UNWELDED	1.3	0.8	1.6	1.2
50° C	2.1	2.1	1.7	1.7
60° C	2.8	0.4	2.4	1.4
70° C	2.4	4.8	3.4	1.5
80° C	1.5	3.6	7.0	2.1
100° C	9.5	5.9	17.9	2.9

2.1 Micron Ho:YAG (Large Aperture, 1.0 W delivered)

<u>TEMP</u>	<u>BLOOD</u>	<u>ICG</u>	<u>INDIA INK</u>	<u>NO CHROMO</u>
UNWELDED	1.0	0.3	0.2	0.2
50° C	6.7	2.7	1.3	1.5
60° C	6.1	6.8	0.9	-
70° C	5.5	24.5	2.0	4.4
80° C	4.9	4.1	0.8	1.4
100° C	11.3	5.3	3.1	4.1

NOTES:

BLOOD=fresh whole blood collected in a Vacutainer blood collection tube with heparin.

ICG=prepared as a 2X solution (25 mg Indocyanine Green per 10 ml aqueous solvent).

- =unable to perform.

Discussion

Thermocouple Placement

The earlier observation that thermocouple placement is crucial continued to be supported by experimentation. If the thermocouple is placed above the weld site, the recorded temperature is an artefact which corresponds to the heating of the thermocouple and not to the heating of the tissue at the weld site. If the thermocouple is placed too deeply, it again fails to accurately represent the temperature increase at the site of welding since the recorded temperatures are lower than those at the weld. Since the laser welding temperature control program controls the temperature at the weld site based upon the thermocouple measurements, proper thermocouple placement is imperative. The final thermocouple holder design provides adequate reproducibility. When thermocouple placement was incorrect, as evidenced by either an abnormally short or a protracted time to attain the stipulated control temperature, the trial was repeated with fresh tissue strips.

Prior to the design and construction of the new thermocouple holder, there were major problems with thermocouple placement. The thermocouple was difficult to position reproducibly, and thus, much of the early data is erroneous. Since the temperature control program utilizes feedback from the thermocouple, and since the thermocouple was incorrectly positioned, the time of laser exposure as well as the actual temperature at the weld site were incorrect as well.

Chromophore Delivery and Placement

Precise chromophore placement was another important factor in this study. Each of the chromophores tested was a liquid. Attempts were made to deposit the chromophore at the weld site using a micropipettor. This allowed a fixed amount of chromophore to be deposited, but the application was not evenly distributed along the weld seam. A cotton-tipped applicator was used to apply a barely visible coat of chromophore to both tissue strips prior to bringing the strips into apposition. The strips were then brought into contact by the computer-controlled piezoelectric motor. When the requisite apposition was obtained, the top surface of the weld site was gently wiped with a clean cotton-tipped applicator to remove any chromophore which oozed upwards when the tissue was compressed. When too much chromophore was placed at the top of the weld site, excessive energy was absorbed at the surface, rather than in the deeper areas of the weld site, and smoking, charring, and diminished weld strength were noted. Chromophore placement in the deeper half of the weld site resulted in stronger, more homogeneous welds.

Maintenance of equipment, software package, and its effect on data.

Maintenance of the laser welding/tensiometry apparatus was crucial. The stages upon which the tissue is clamped are highly susceptible to stalling if they become contaminated with dried bowel and saline. Stalling of the motor due to a contaminated stage was readily apparent on the first control run of the day, as the tensiometry plots of force versus distance indicated the resistance of the stage to movement. Periodic removal of the stages for cleaning and maintenance was a necessity. The outside surfaces of the laser welding/tensiometry apparatus were carefully cleaned after each use. These steps prevented corrosion of the apparatus.

Initially, however, the problem of stalling was not so readily apparent. Using the original ASYSTANT data acquisition software package, we were unable to obtain plots of the data in either real time or immediately after the completion of the trial. To plot data in ASYSTANT required a lengthy process of file conversion and computer rebooting. Thus, data was not analyzed until after the animal had been sacrificed. This software problem resulted in the generation of tremendous amounts of erroneous data (see Appendix B), since it was impossible to interpret the effect of stage resistance on the measured weld strengths.

Since there were substantial problems with the software, several different software programs were utilized during this study. ASYSTANT was utilized for the earliest data acquisition, but it was cumbersome and inefficient. The time between welding and tensiometry was often more than five minutes. The final version of the temperature control and tensiometry program is written in BASIC and can switch from the welding temperature control program to tensiometry in a matter of seconds. The data acquired using the BASIC programs was imported into either Lotus 1-2-3 version 2.1 or Lotus Symphony release 2.0 for subsequent analysis and graphing.

All data were collected at the laboratory and were stored on 3.5 inch high density floppy disks to permit data analysis at the office. Additional backup copies of the data have been made for the LaserSurge software archives in case of loss or damage to the working disks. These disks are stored off site.

Overall results- difference in aperture size and its effect, power delivered and its effect, chromophores and their effect, time of welding and its effect

Aperture size was one parameter examined in this study. Two aperture sizes were utilized, 0.5 x 4.0 mm and 2.0 x 4.0 mm. The small aperture, with its attendant higher power density, generally produced stronger welds. This was true for all lasers examined, except for the Ho:YAG. For the 5.0 W Ho:YAG trials, the large aperture produced better welds with either Indocyanine Green or in the absence of chromophore. For the 1.5 W trials, the large aperture again produced stronger welds with Indocyanine Green, blood, and without a chromophore.

Power densities can also be calculated for the two aperture sizes used. The power densities, in W/cm^2 , were:

- Small Aperture, 1 W- 50
- Small Aperture, 5 W- 250
- Large Aperture, 1 W- 12.5
- Large Aperture, 5 W- 62.5.

Since the large aperture appeared to weld better than the small aperture for the Ho:YAG laser, perhaps the increased surface area of welding was responsible for the strong welds seen.

High and low power settings were also examined. The higher power of 5 W produced welds of superior strength when compared to the lower power welds. This is true for equal welding temperatures, and seems surprising since the lower power setting often required a longer total laser exposure to reach the desired welding temperature.

The effect of the length of exposure to laser energy on weld strength was not assessed in this study. Most of the temperature settings used required between 15 and 30 seconds to reach the designated control temperature. When the control temperature was attained, feedback from the thermocouple to the shutter control maintained the desired temperature for 10 s. Since there was significant variation in the amount of time required to reach the predetermined welding temperature, the differences due to the variation of controlled exposure would be very difficult to interpret. Thus, a single, fixed 10 s exposure was consistently used throughout the study.

The relationship between maximum temperature and weld strength is also unclear. The highest temperature examined, 100 degrees C, usually elicited smoking as well as tissue blanching and desiccation. Occasional charring was noted in some samples. As mentioned above, the time required to reach the desired temperature varied from sample to sample. Thus, the conclusion that weld strength appears to increase with increasing temperature must be tempered with caution. This is particularly true because the 100 degree welds were often slightly weaker than the 80 degree welds. We speculate that this might be due to increased thermal injury at the higher temperature. Many samples that were welded at 100 degrees became charred or carbonized, and the tissue was dry and brittle. This type of extreme thermal injury may compromise the strength of the weld, and may explain why the 100 degree welds were weaker than the 80 degree welds. Many of the 100 degree welds that were mildly desiccated and blanched seemed to be strongly welded. The overall pattern seemed to indicate that weld strength did increase with increasing temperature.

Conclusions

Laser tissue welding is successful when the correct combinations of laser wavelength, chromophore, and aperture size are utilized. Based upon the *in vitro* results obtained in this study, the following laser/chromophore combinations appear to show promise for laser tissue welding:

- 0.514 micron Ar⁺⁺- blood or ICG chromophore
- 0.532 micron KTP- blood or ICG chromophore
- 1.06 micron Nd:YAG- India ink chromophore
- 2.1 micron Ho:YAG- blood, India ink, or no chromophore.

In comparing the weld strength produced by each of these lasers, the Ho:YAG laser clearly produced the strongest welds. Many of the Ho:YAG welds appeared to be full thickness welds. The optimal welding temperature for any of the tested laser and chromophore combinations appeared to be between 80 and 100 degrees C. The higher power levels seemed to produce stronger welds, at least in the range of 1 to 5 W. A certain minimum power is required to increase the tissue temperature to the desired range (80 to 100 degrees C). Whether additional power above this threshold actually improves the strength of the welds cannot be asserted from the data collected.

Recommendations

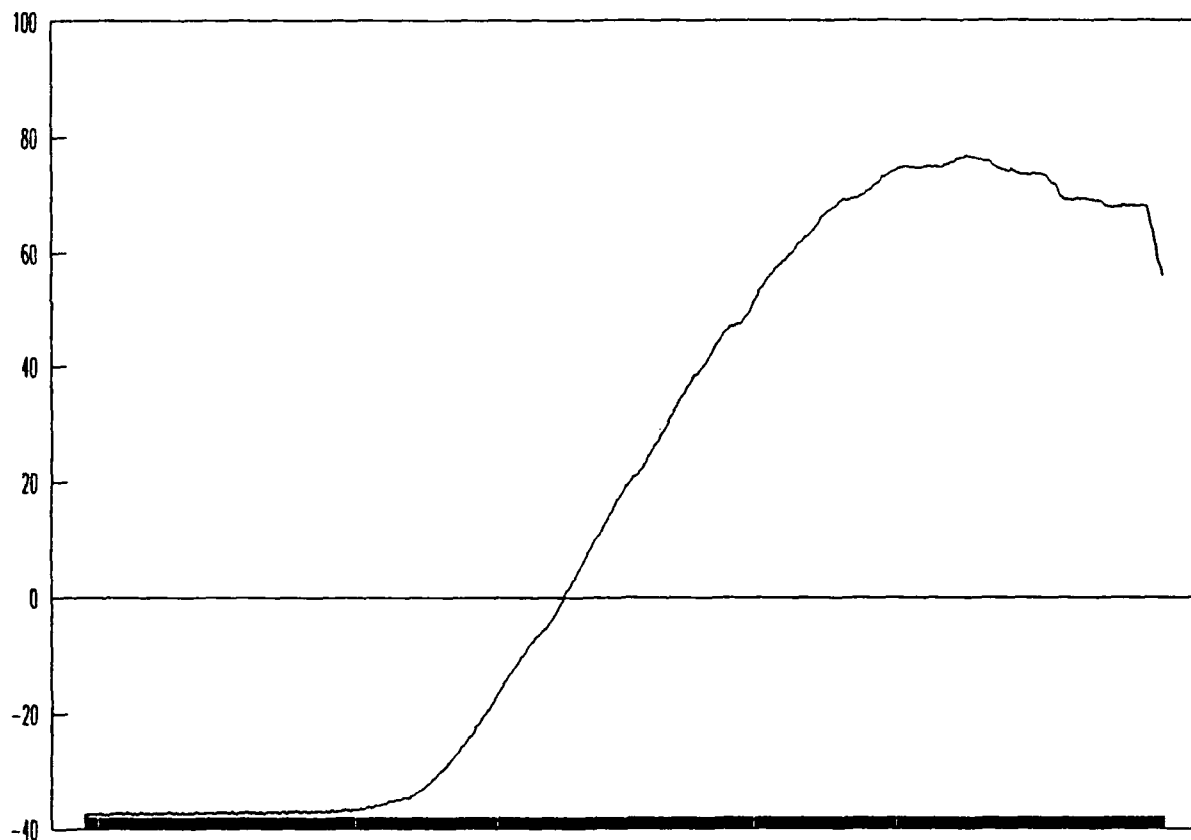
The laser welding/tensiometry apparatus developed for this study provides an unique and ideal method to analyze the effects of various parameters on weld strength. The in vitro model has some limitations, and an in vivo corroboration of these results is needed. An in vivo model would permit an assessment of the effects of thermal injury and healing, two clinically relevant issues.

Laser tissue welding continues to show great promise for clinical application, and the data generated in this study provide a solid foundation for future pre-clinical and clinical investigations of this new modality.

Appendix A- Included Data

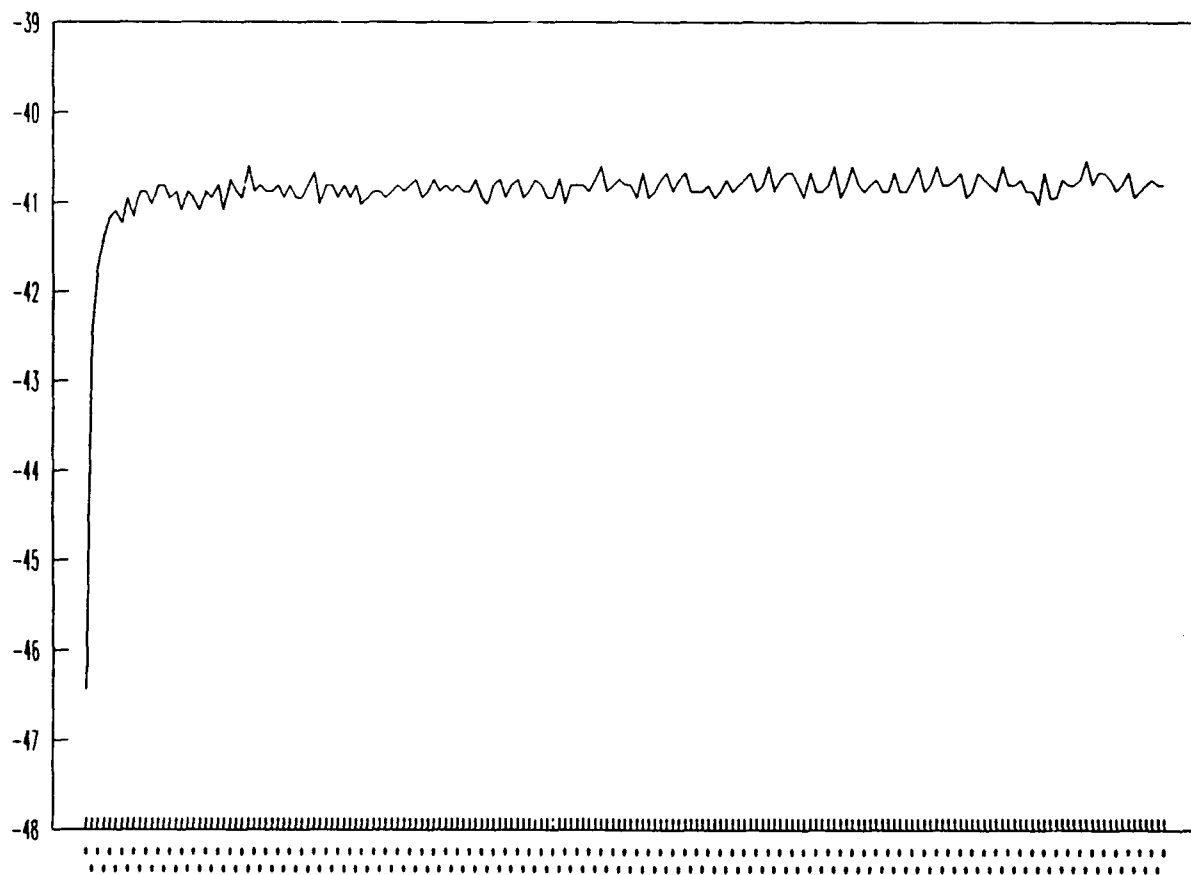
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Small aperture

ONE STRIP UNWELDED CONTROL SEP27A



~~1.06 um 14.146"~~ TWO STRIP UNWELDED CONTROL
Small aperture

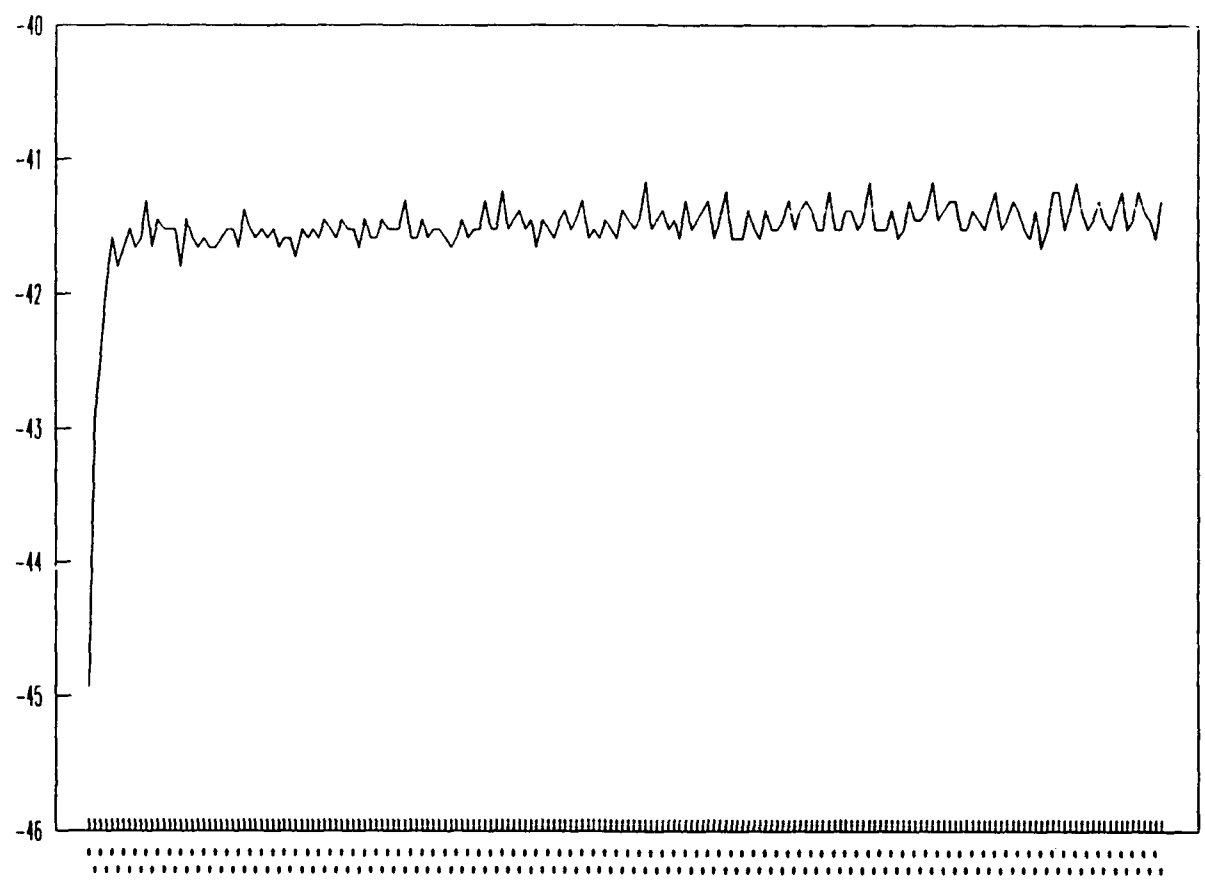
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~~000000~~ KLF
small aperture

TWO STRIP INDIA INIT UNWELDED
CONTROL

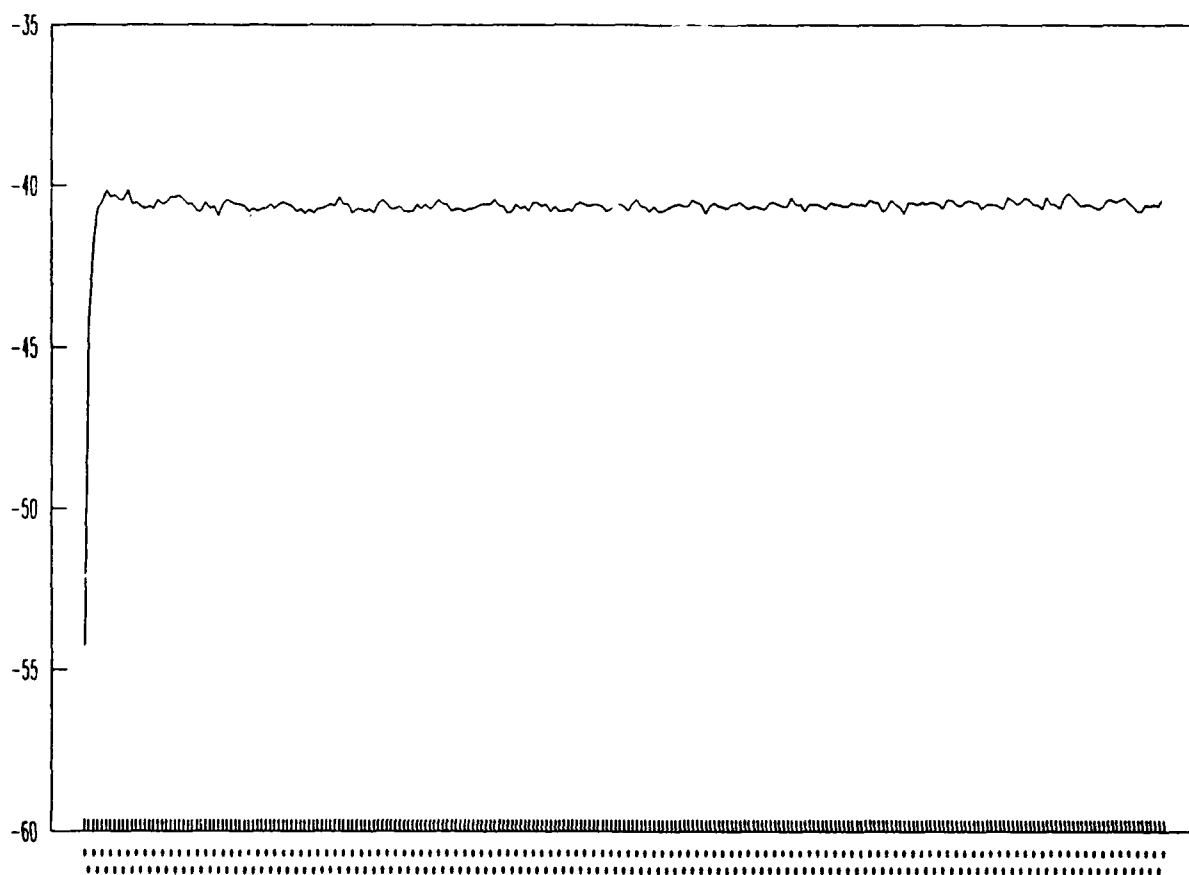
SEP 27C



~~1.06 um Nd:YAG~~ KTP
small aperture

INDIA INK - CONTROLLED AT 50°C

SEP 27 D

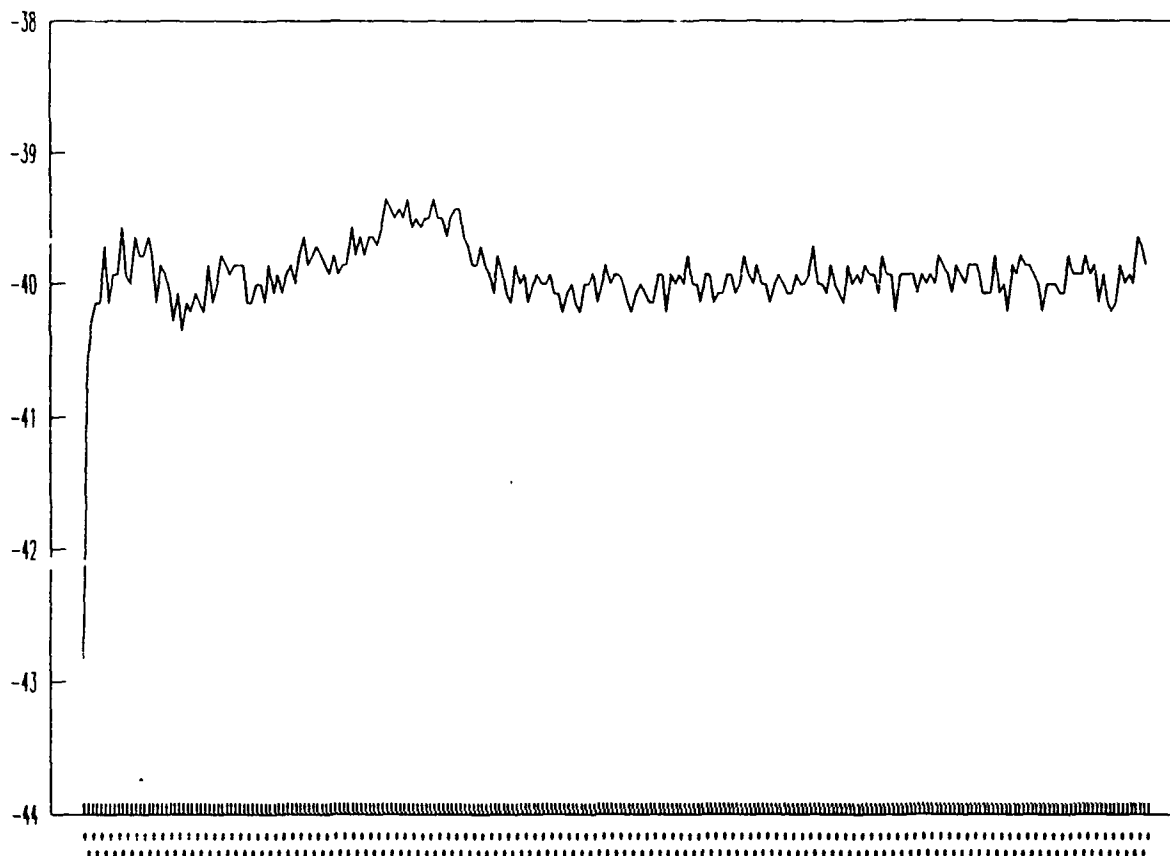


106um NO-YAG KTP

SEP 27 F

Small aperture

INDIA INK - CONTROLLED AT 70°C

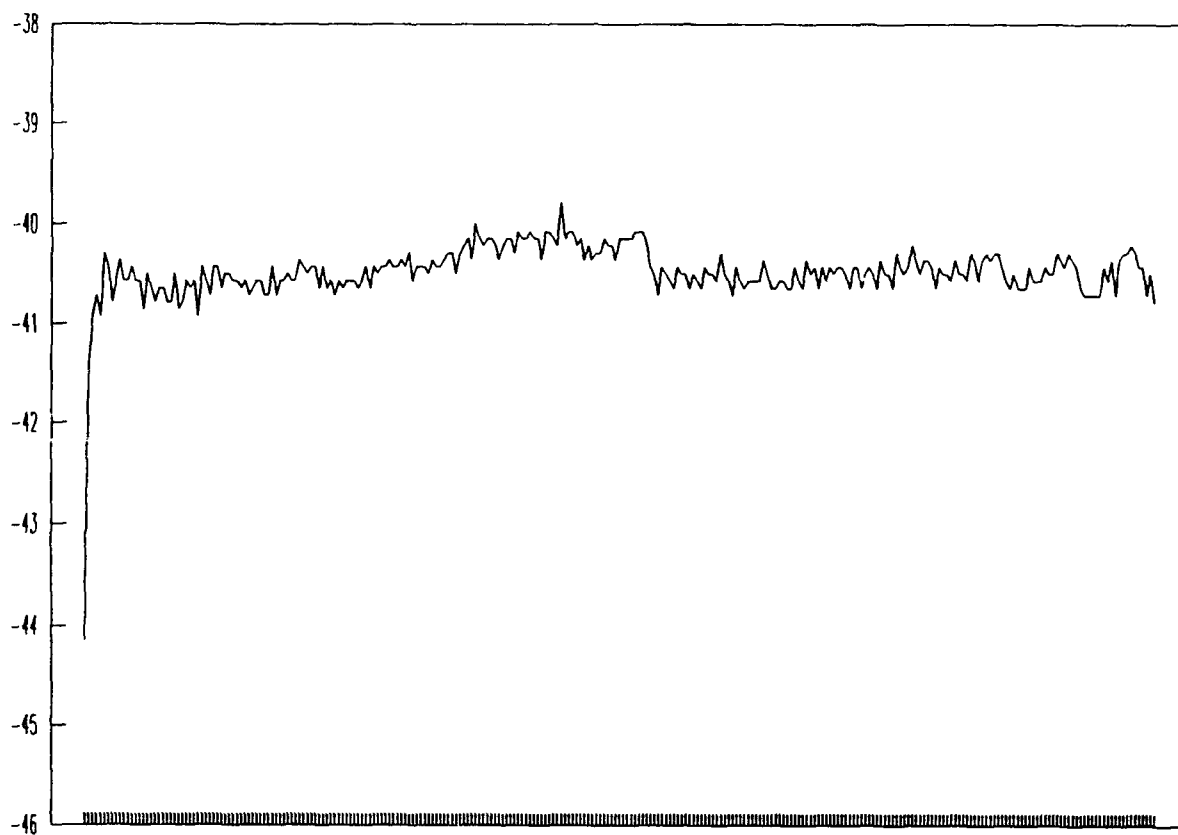


~~56µm Nd:YAG K₁D~~

SEP 27 G

Small aperture

INDIA INK CONTROLLED AT 80°C

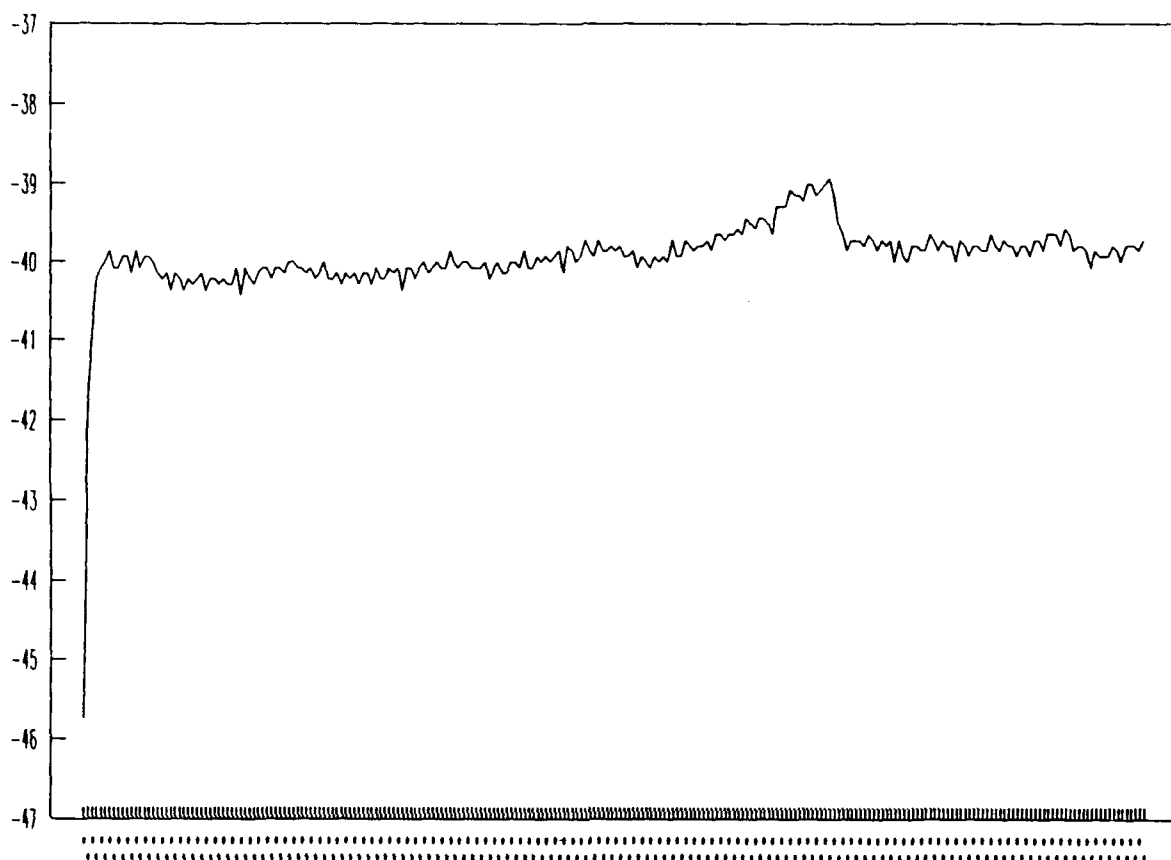


~~Object No: YAG~~ KTP

SEP 27 H

Small aperture

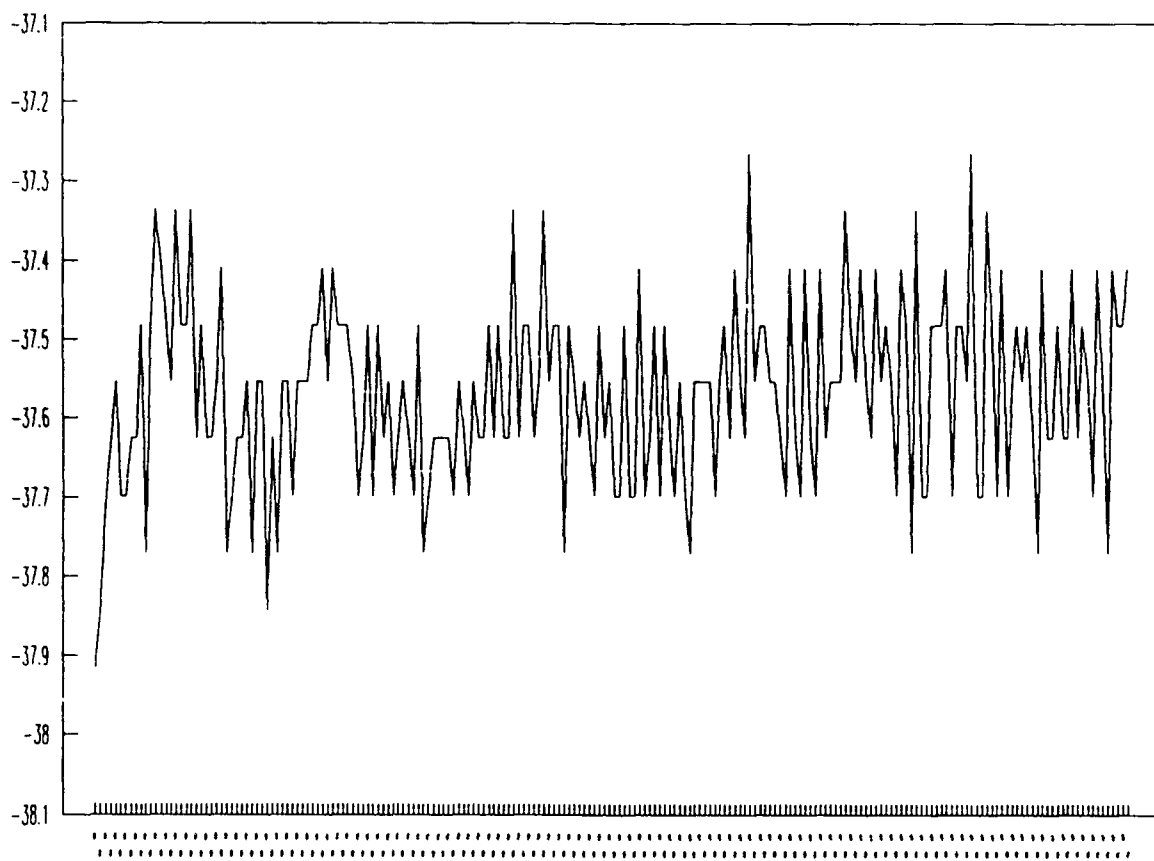
INDIA INK CONTROLLED AT 100°C



~~06 Jan~~ Nd:YAG RIP
Small aperture

SEP 27 0

BLOOD UNWELDED CONTROL

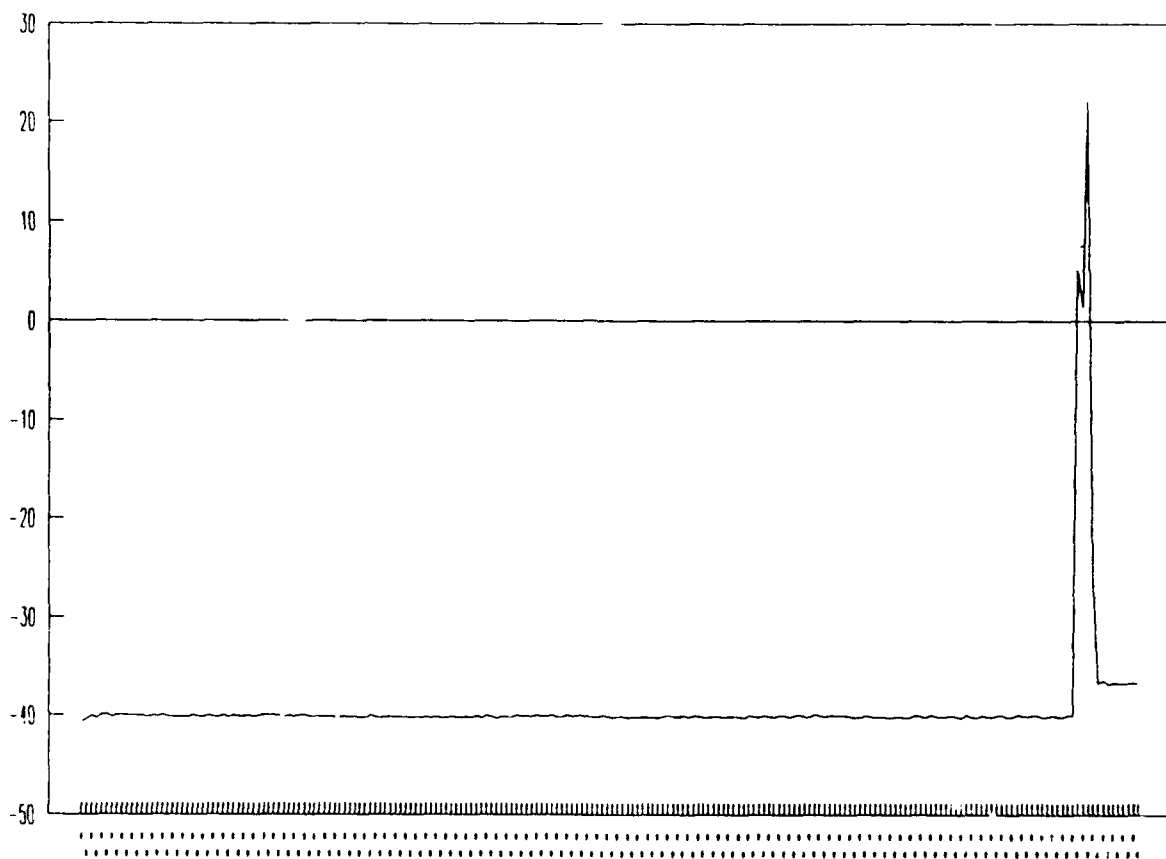


1.56 μ m Nd:YAG KIP

SEP 27P

small aperture

BLOOD CONTROLLED AT 50°
(touched table at end of run)

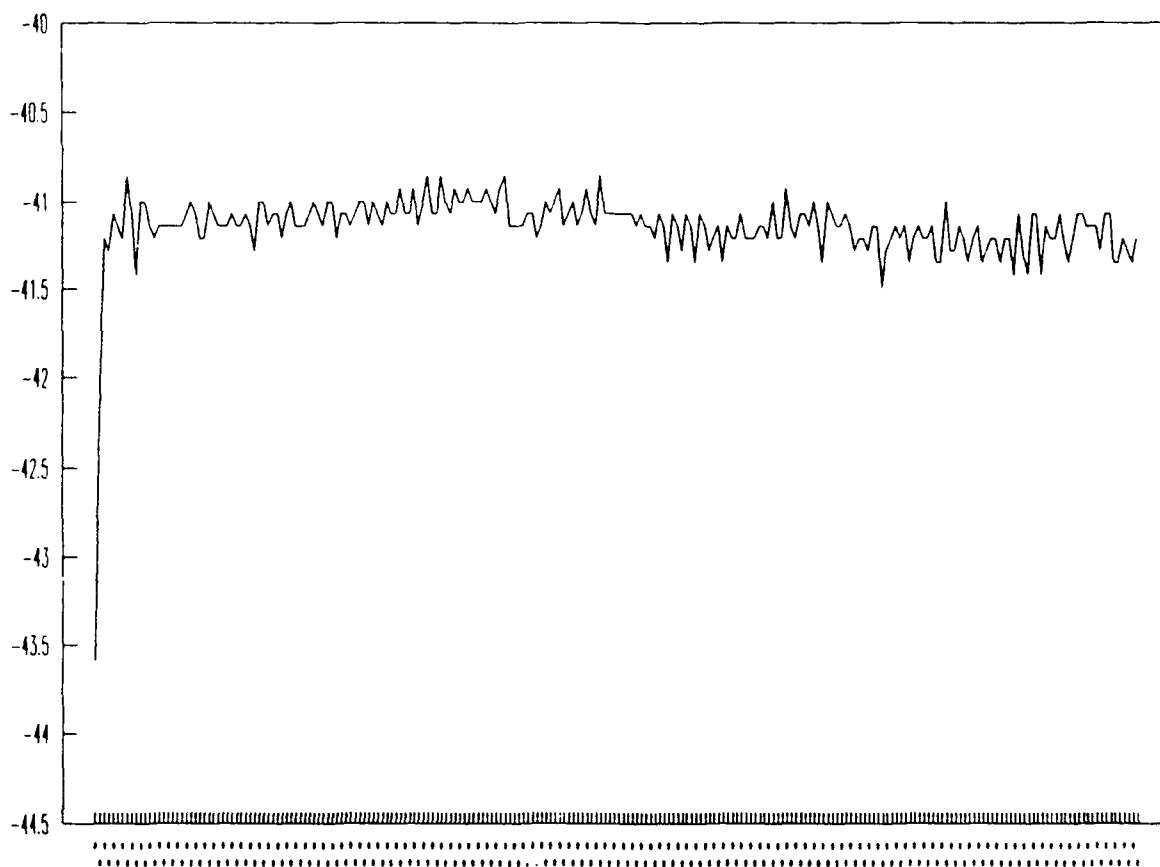


1006um ND: VAG KTP

SEP 29Q

Small aperture

BLOOD CONTROLLED AT 60°C

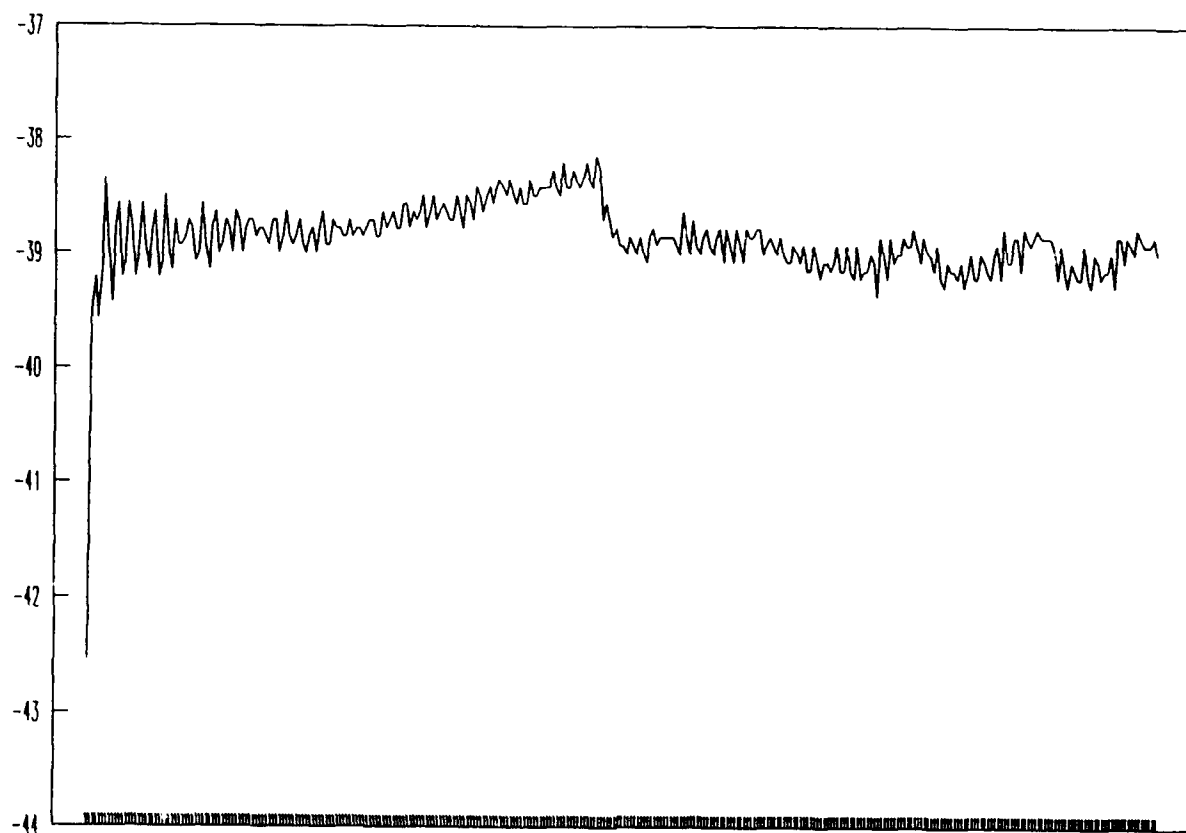


06/um Nd:YAG KTP

SEP 27 8 R

Small aperture

BLOOD CONTROLLED AT 70°C

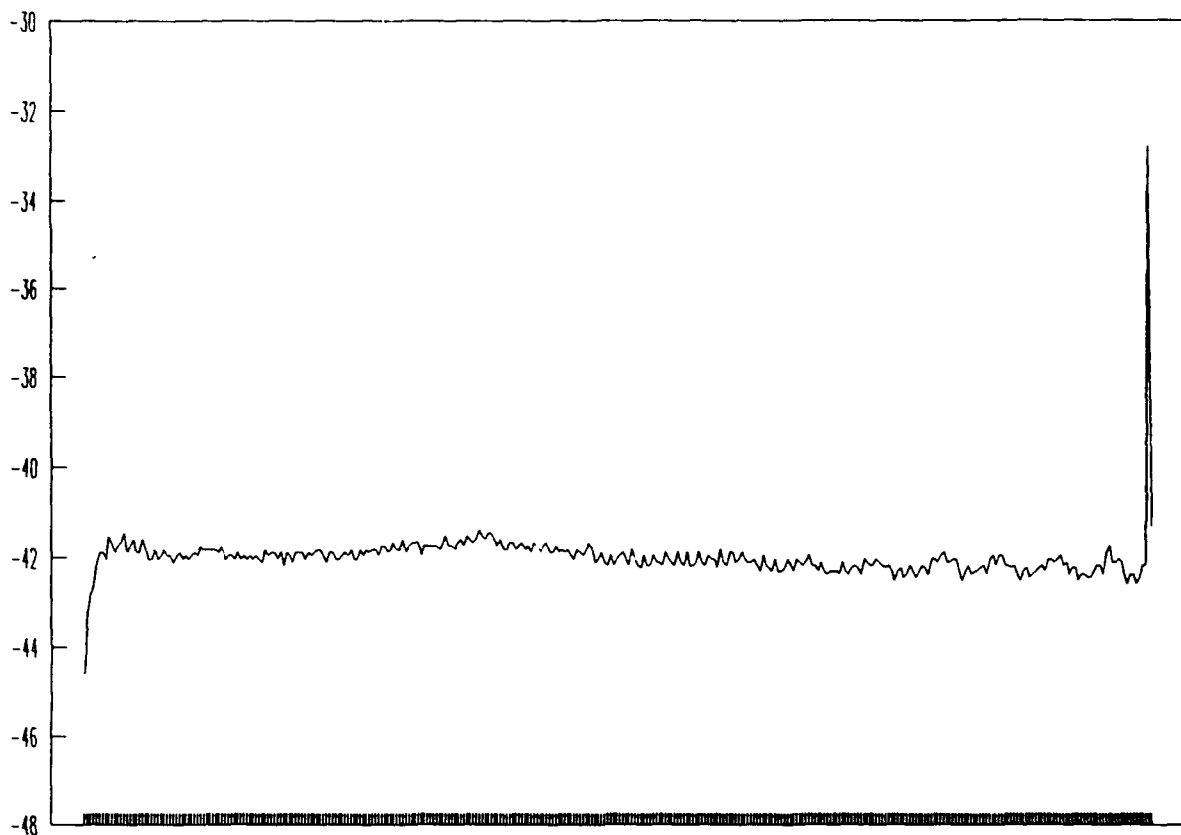


~~100um Nd:YAG~~ KTP

SEP 27 S

small aperture

BLOOD CONTROLLED AT 80°

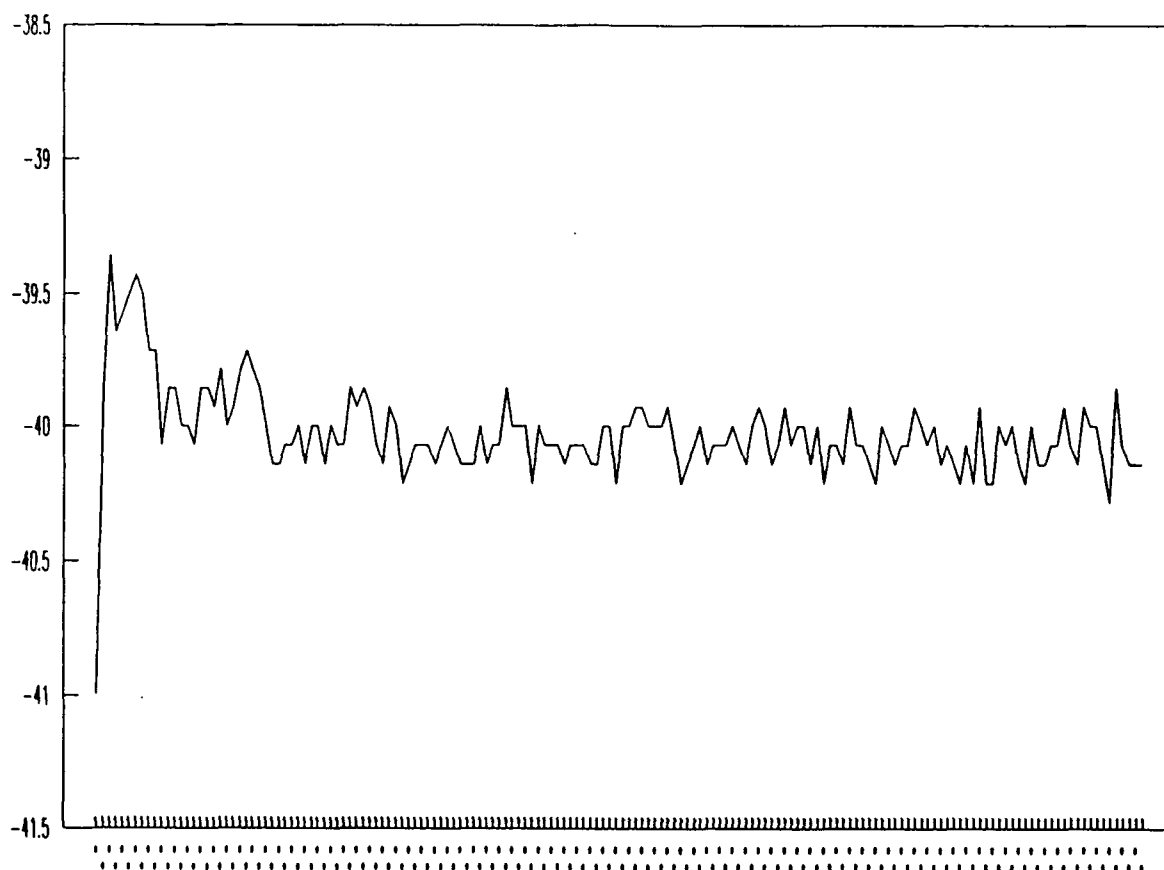


~~06km Nd:YAG~~ KTP

SEP 27T

small aperture

BLOOD CONTROLLED AT 100°C

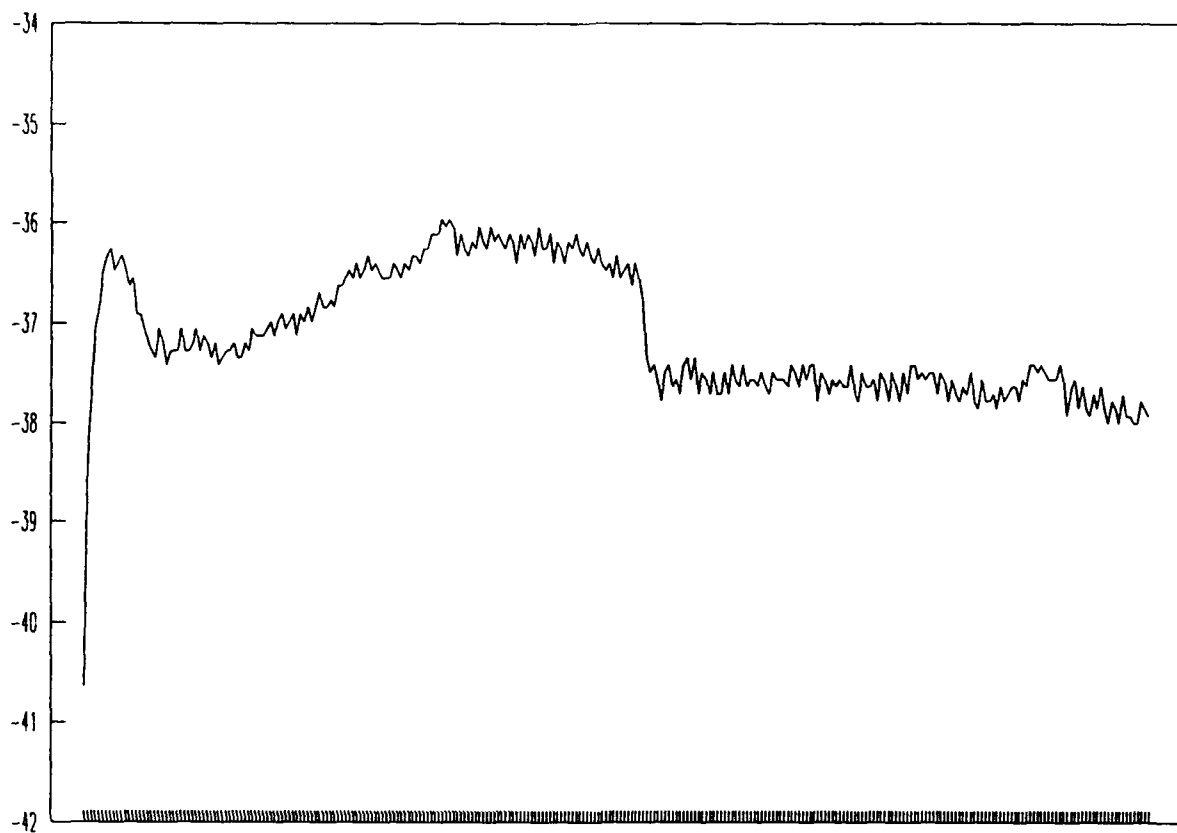


1.06 μ m Nd:YAG KTP

SEP 27U

Small aperture

BLOOD CONTROLLED AT 100°C

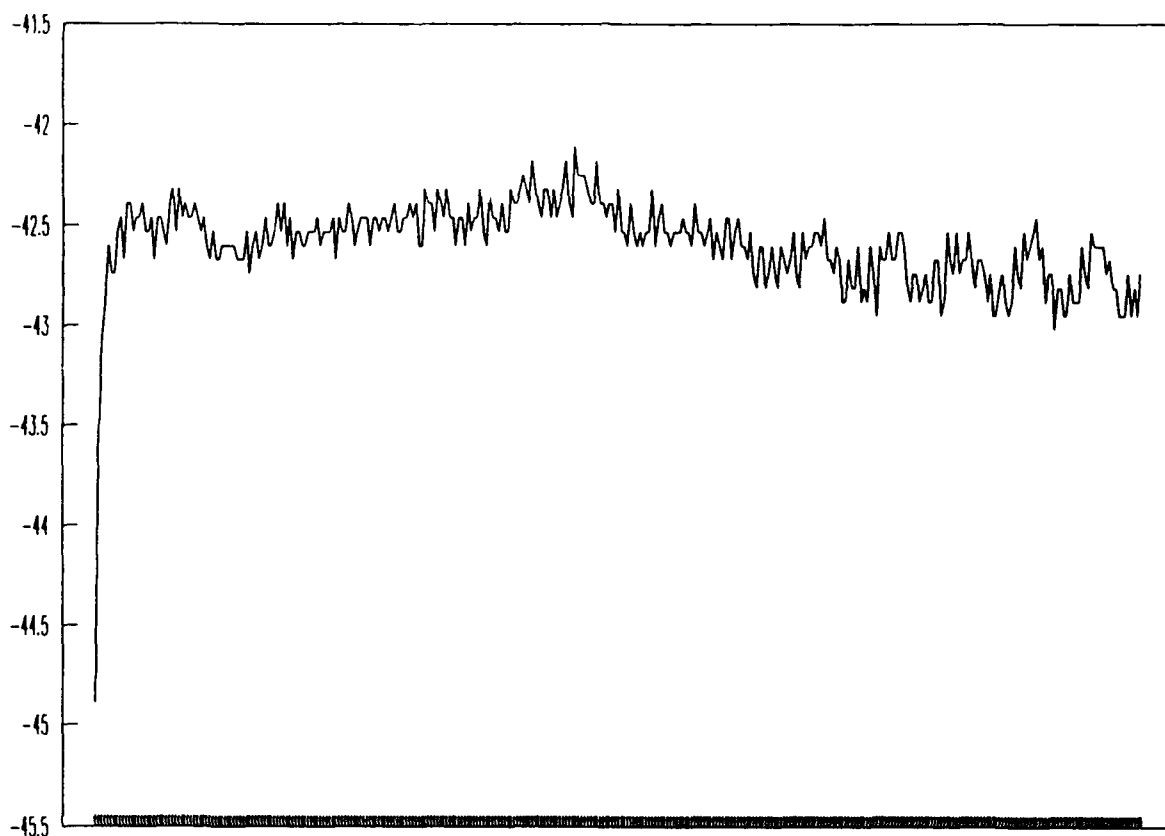


~~Hydram~~ ~~NO: YAG~~ KTP

SEP 27 V

Small aperture

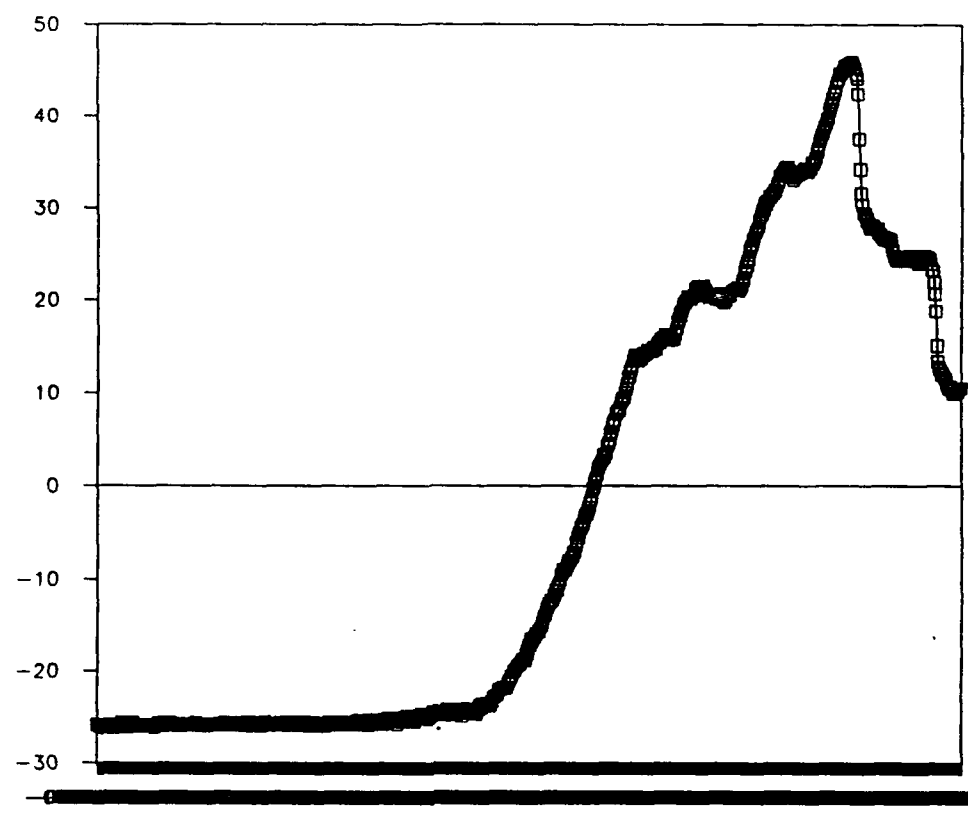
BLOOD CONTROLLED AT 100°C



0.06 μ m Nd:VAG
small aperture

ONE STRIP
~~HE~~ UNWELDED CONTROL

SEP 28 I



06 μ m Nd:YAG
small aperture

ONE STRIP

~~LEG~~ UNWELDED CONTROL

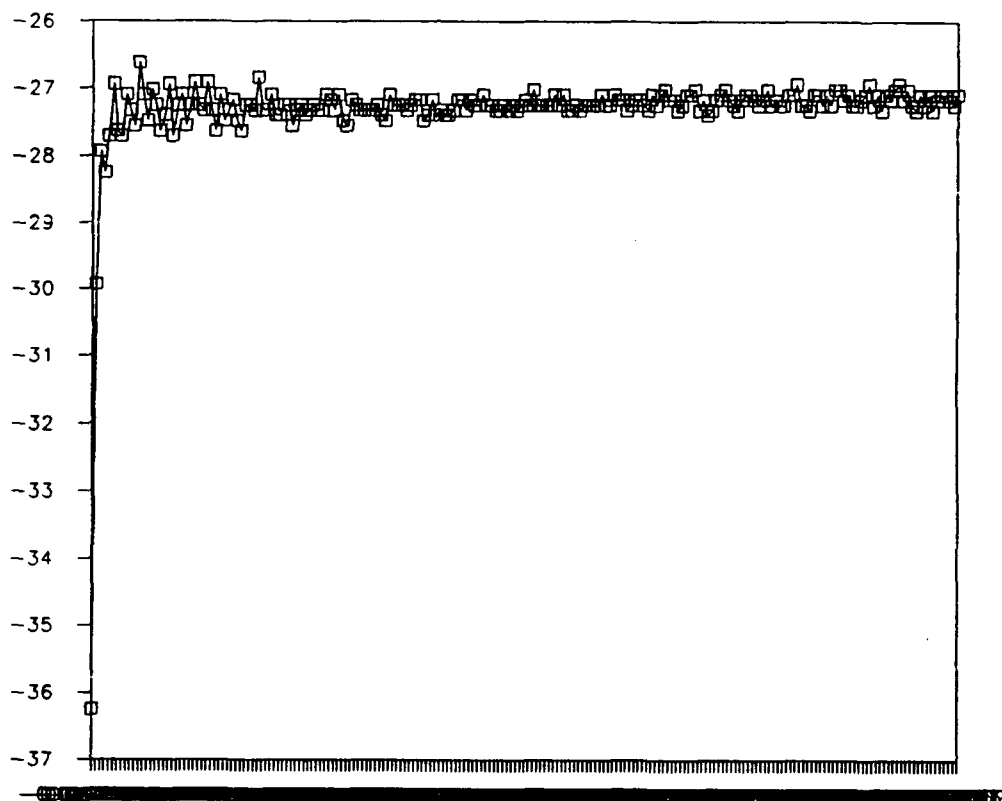
SEP 28 J



06 μ m Nd:YAG
Small aperture

SEP 28 K

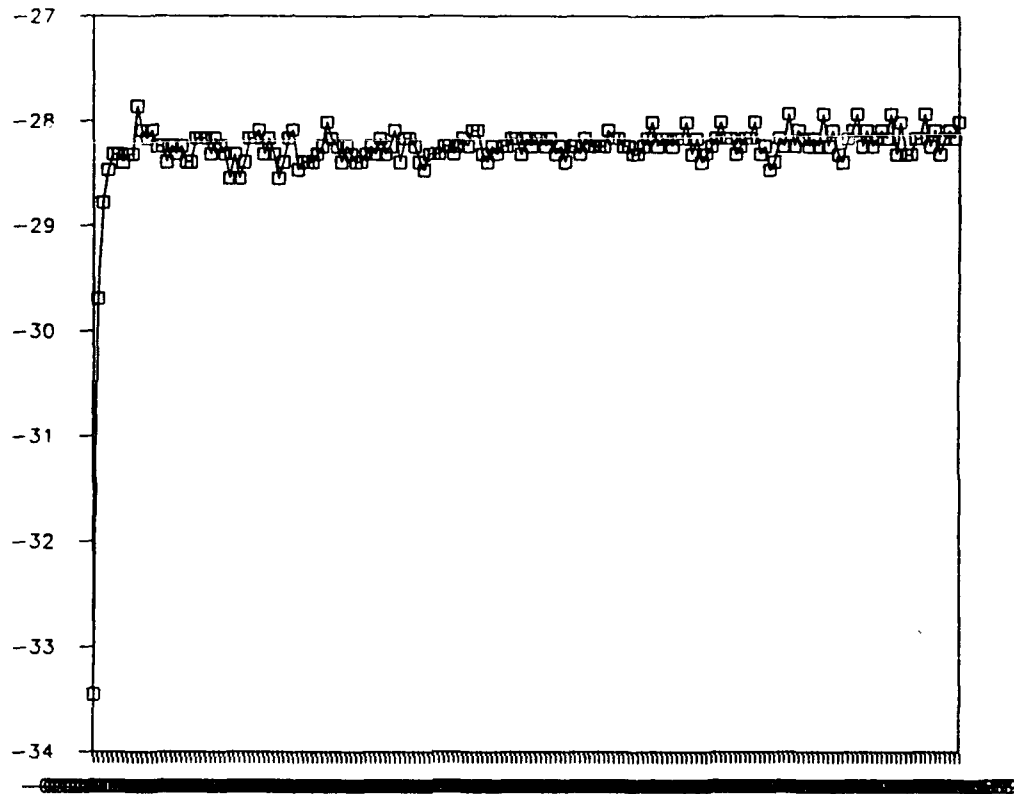
TWO STRIP UNWELDED CONTROL



0.06 μ m Nd:YAG
small aperture

TWO STRIPS ICG UNWELDED CONTROL

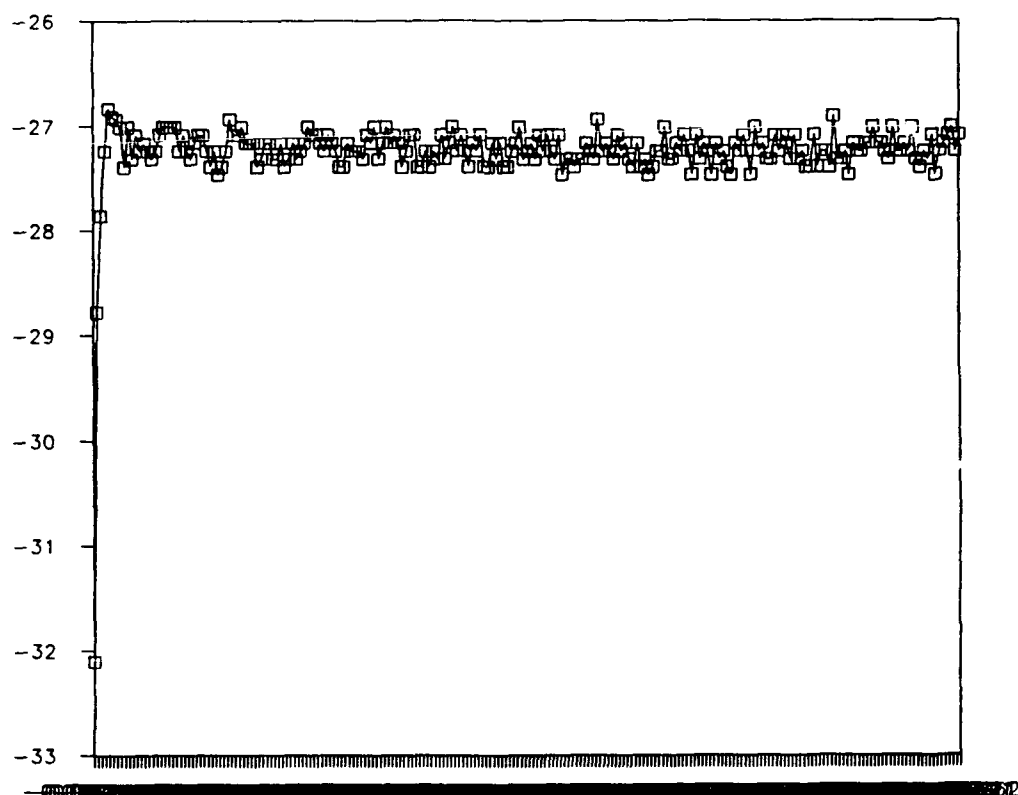
SEP 28L



.06 μ m Nd:YAG
small aperture

SEP 28M

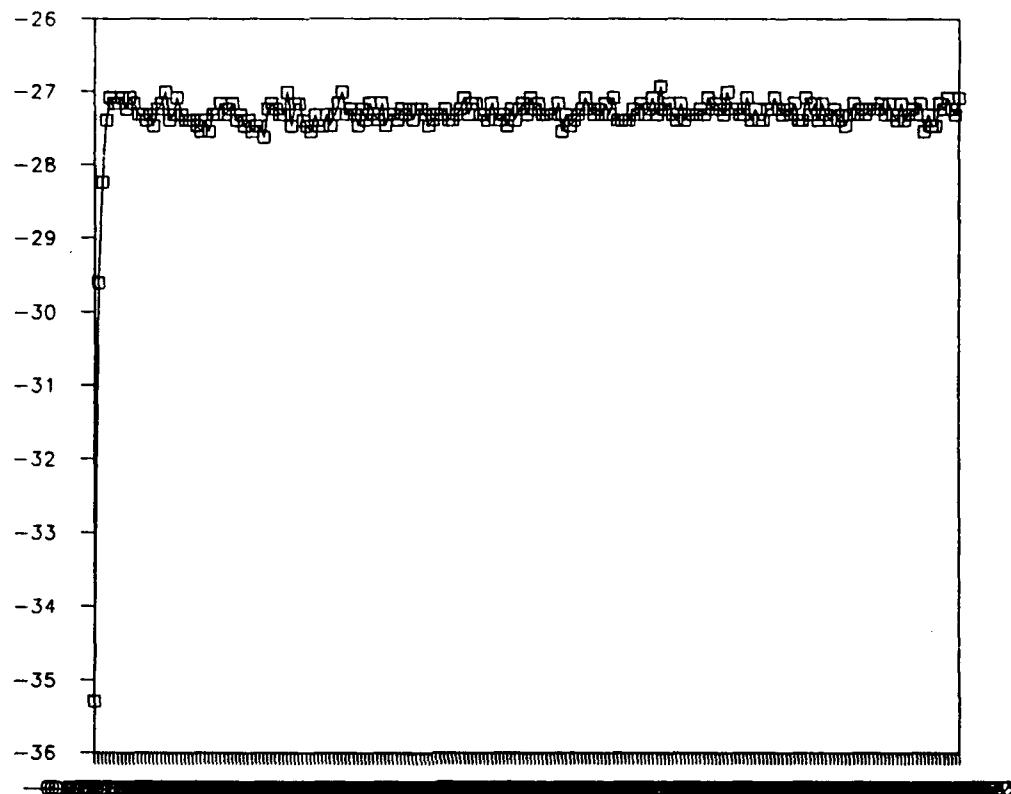
ICG CONTROLLED AT 50°C



106 μm Nd:YAG
small aperture

SEP 28 N

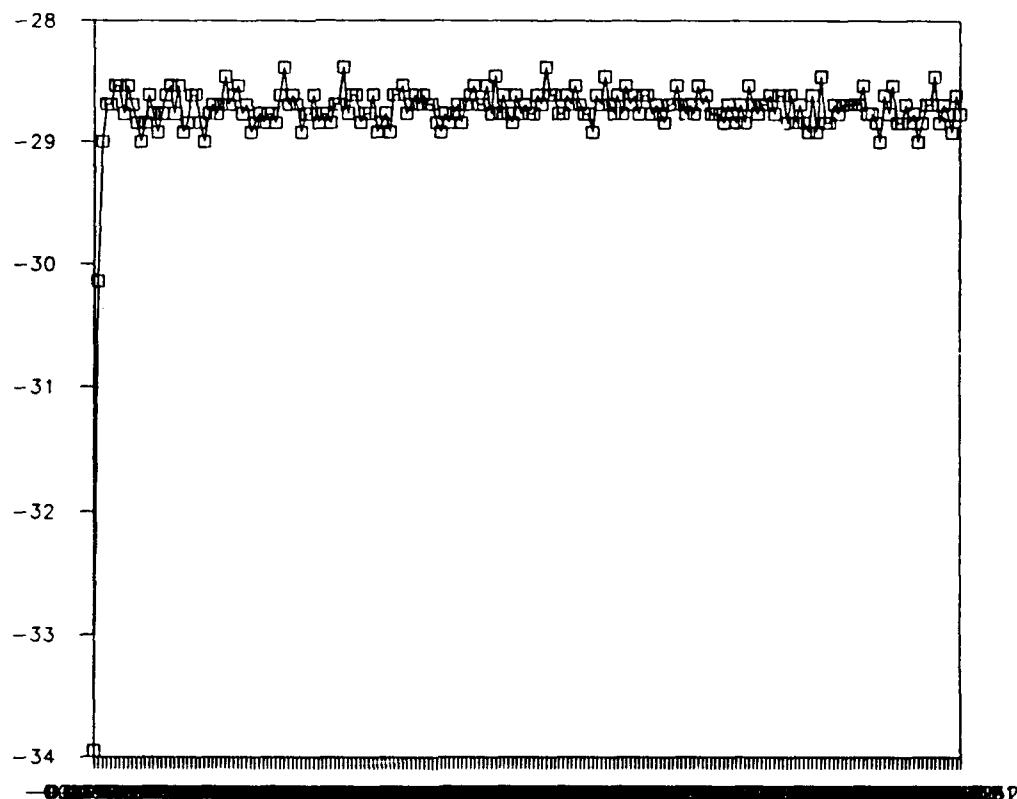
ICG CONTROLLED AT ~~50°C~~ 60°C



06 μ m Nd: YAG
Small aperture

ICG CONTROLLED AT 70°C

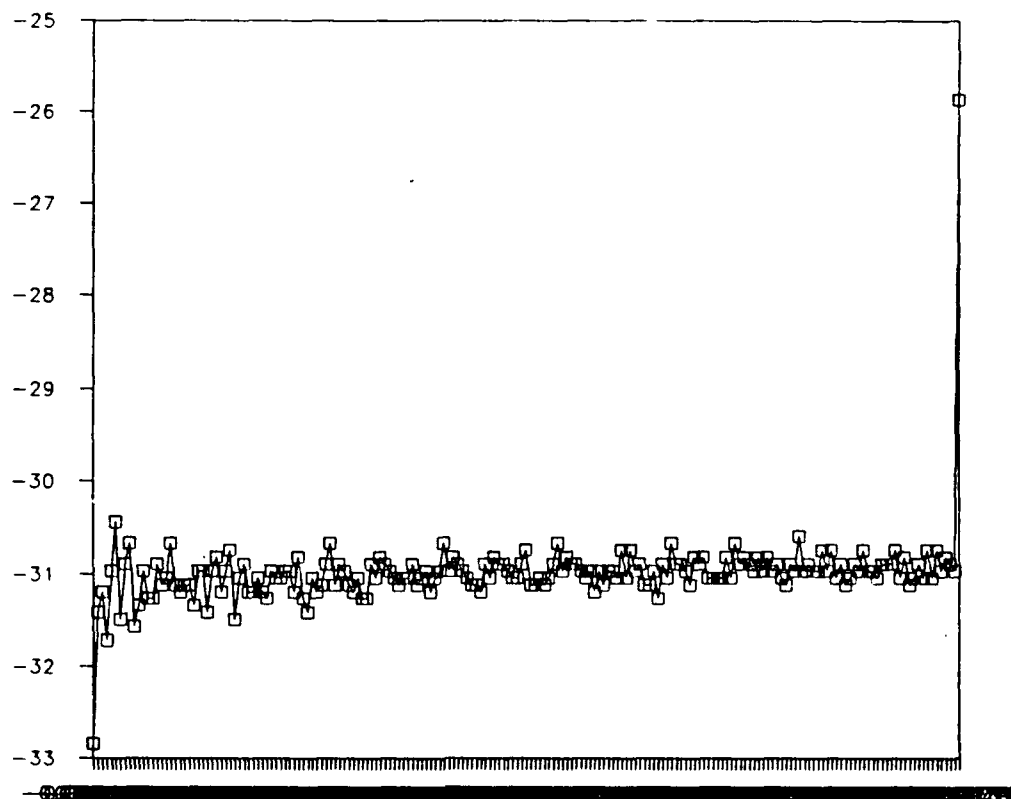
SEP 28 0



06 μ m Nd:YAG
small aperture

SEP 28 P

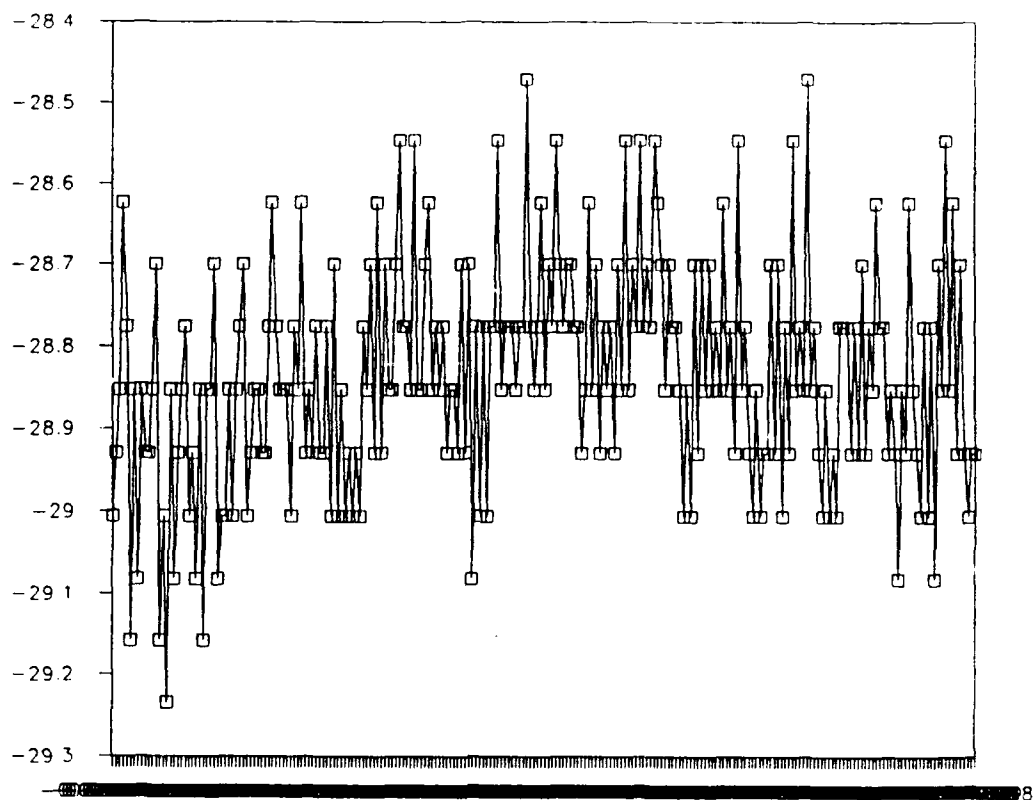
ICG CONTROLLED AT 80°C



06 μ m Nd:YAG
small aperture

ICG CONTROLLED AT 1000C

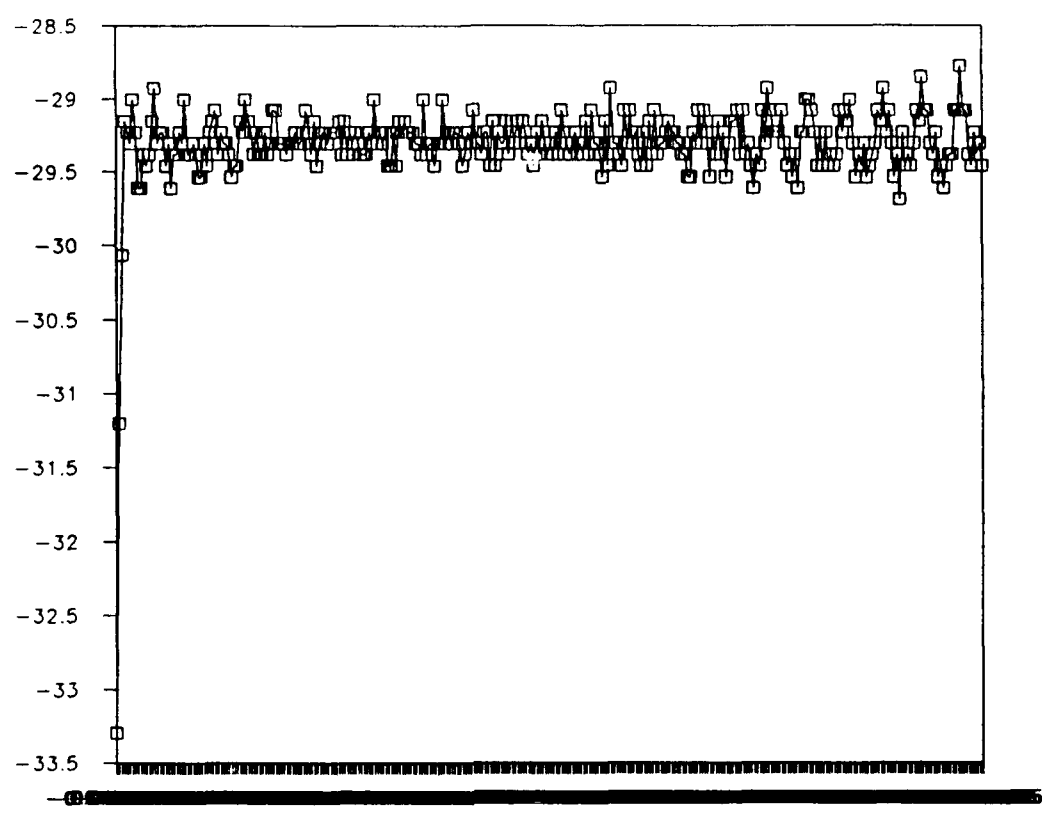
SEP 28 Q1



106 μ m Nd:YAG-
small aperture

ICG CONTROLLED AT 100°C

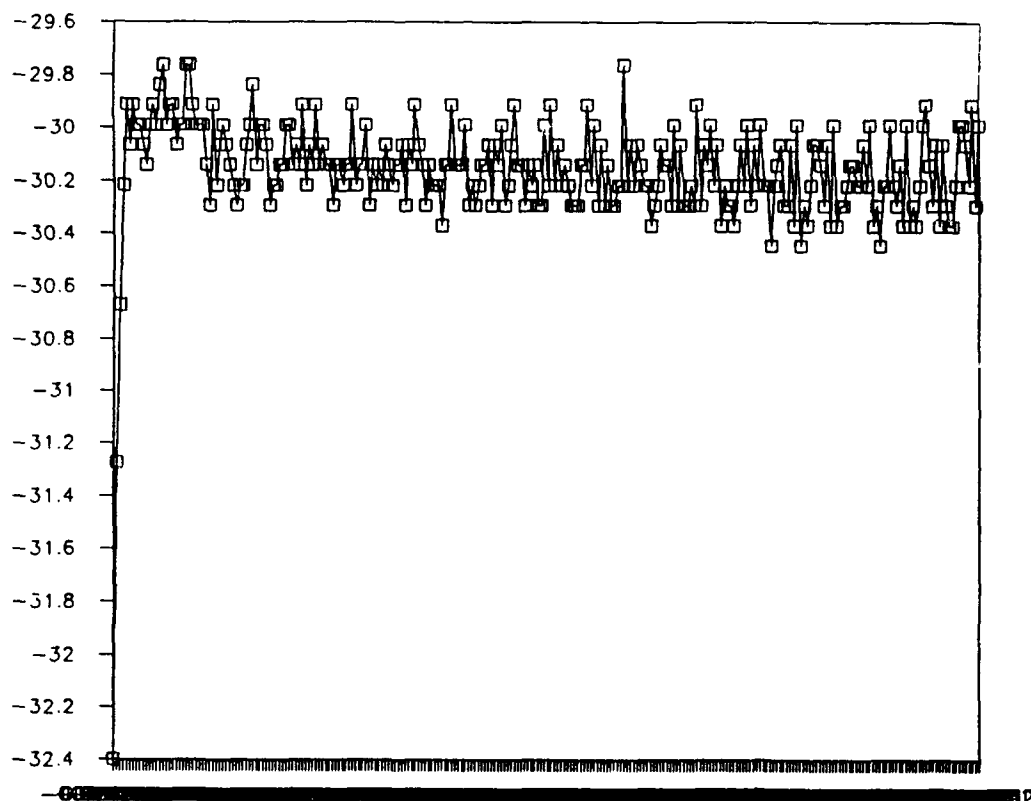
SEP 28 R



06 μ m Nd:YAG
small aperture

INDIA INK CONTROLLED AT 80°C

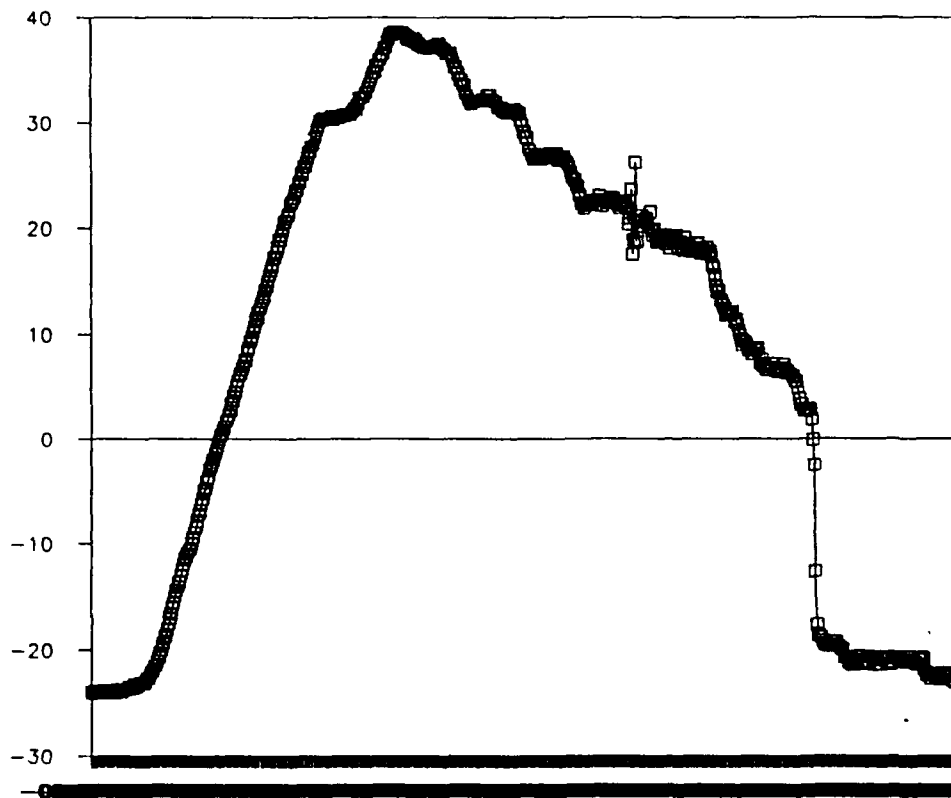
SEP 28 S



06 μ m Nd:YAG
small aperture

SEP 28 1985

ONE STRIP CONTROL



OCT 9, 1990

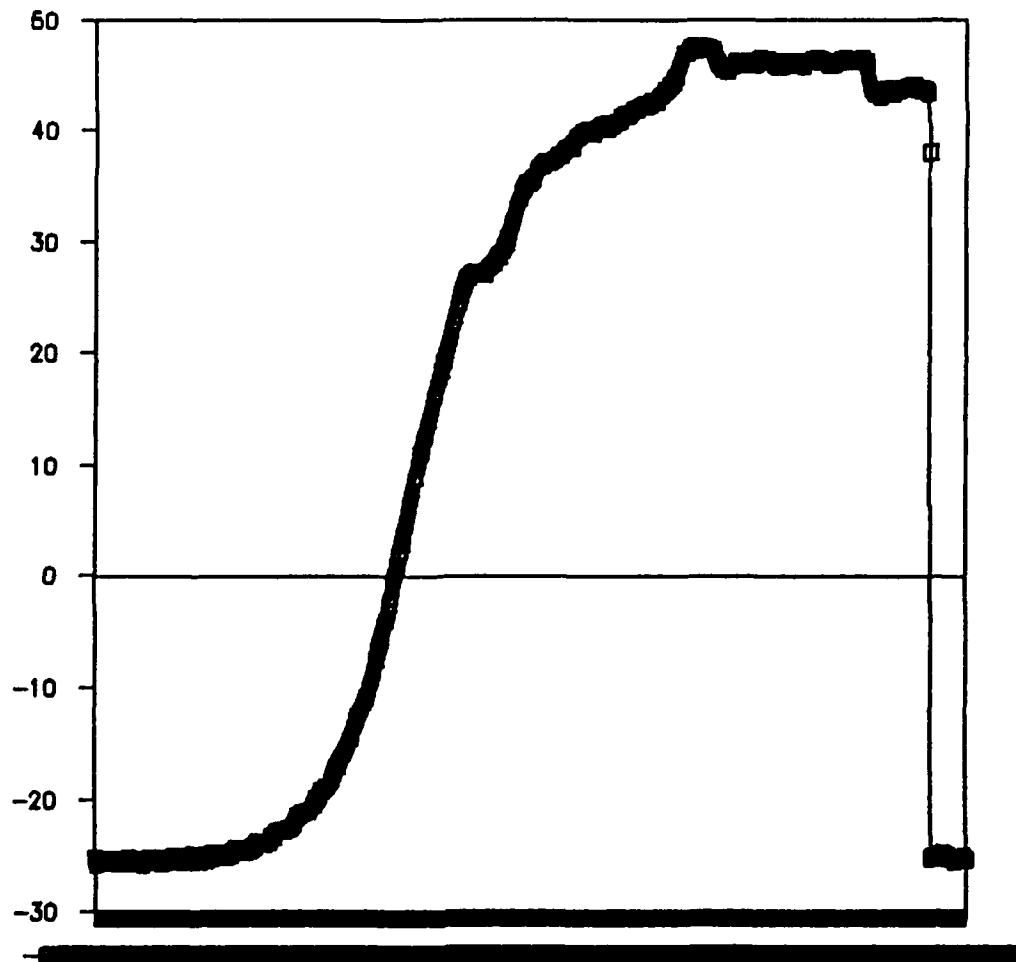
KTP laser $\rightarrow$ 20W out of laser $\rightarrow$ 4.0W delivered

Small Aperture

Ferronyl - $\frac{1g \text{ Ferronyl}}{3ml \text{ 0.9\% Saline}}$

Ferronyl + Blood - $\frac{1g \text{ Ferronyl}}{3ml \text{ whole blood in EDTA}}$

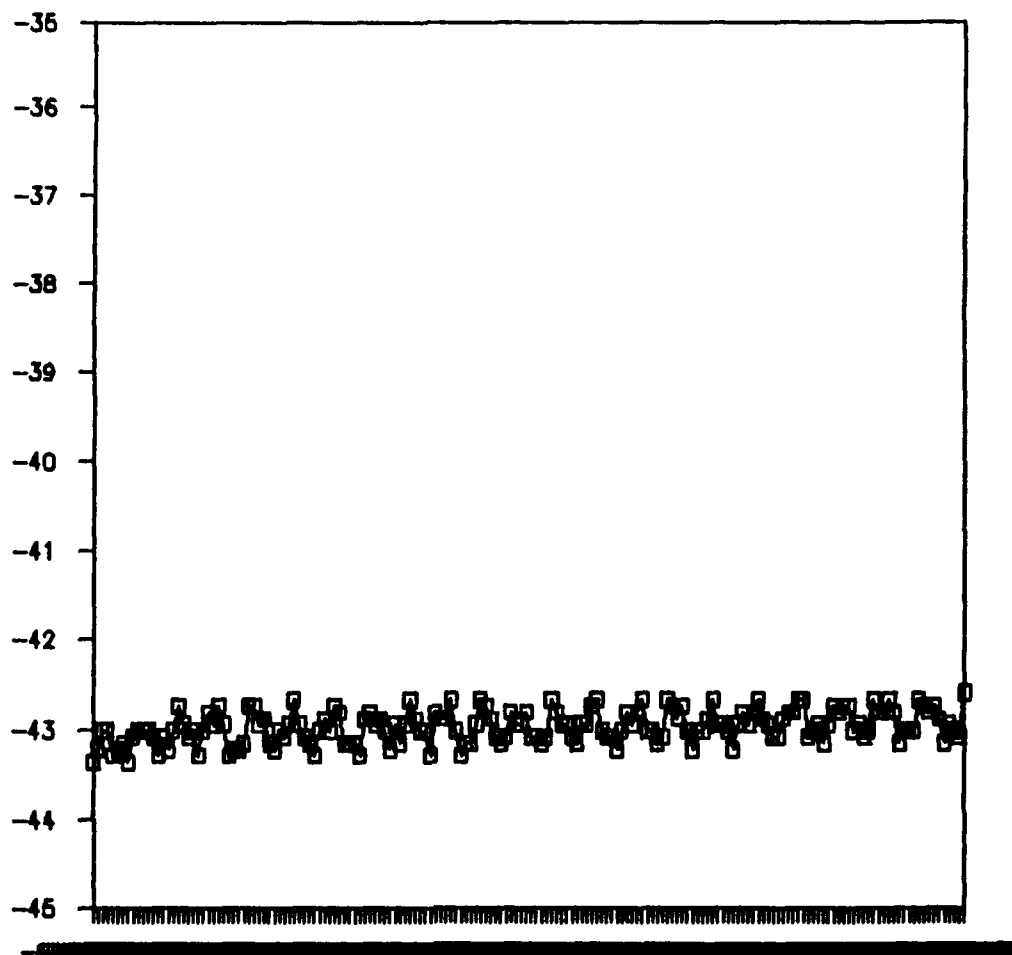
OCT9A



KTP - one step unwelded
control

small aperture

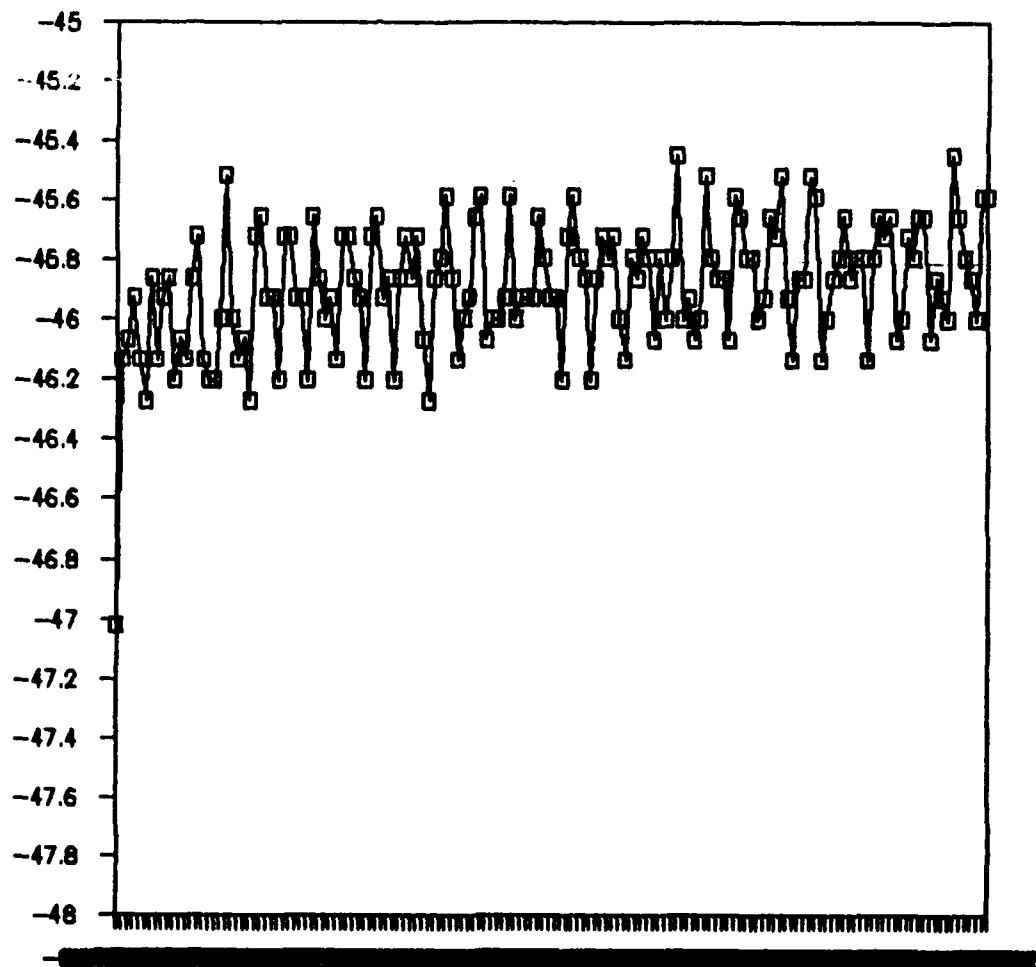
OCT9B



KTP - two strip unwelded
control

small aperture

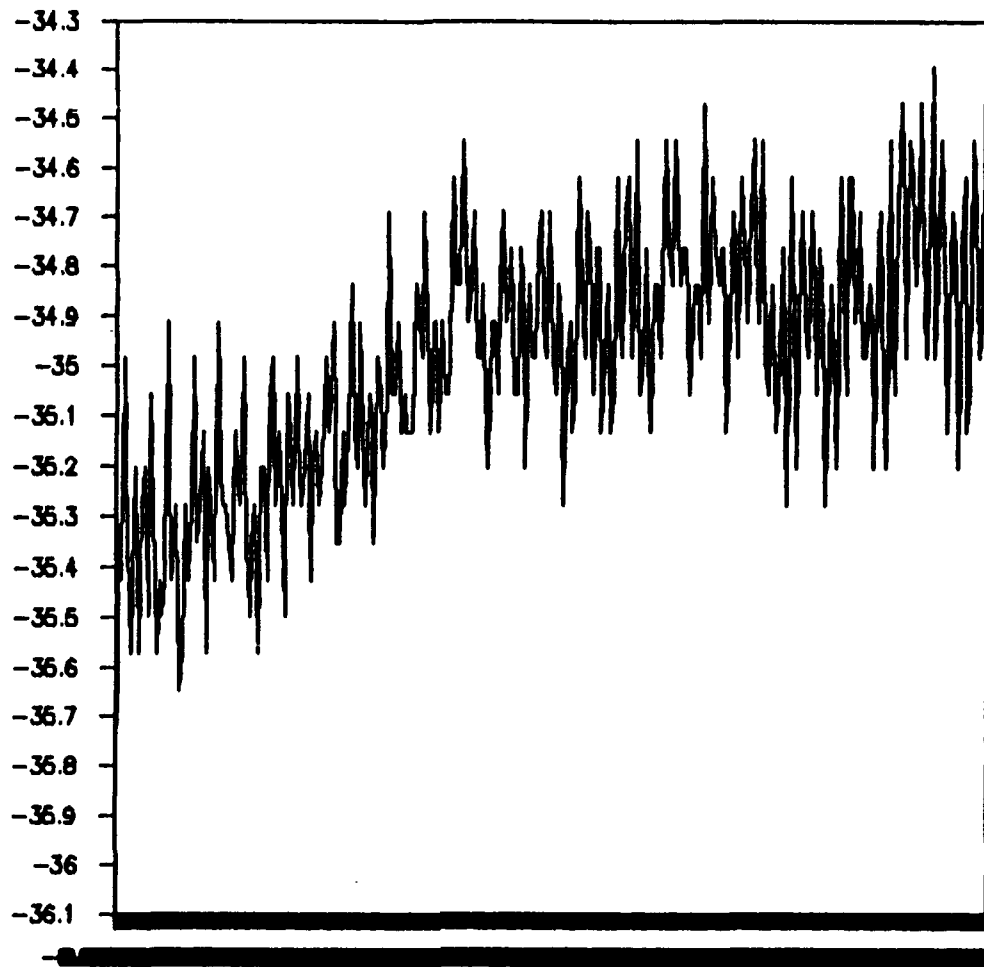
OCT9C



KTP - two strip India ink
unwelded control
small aperture

OCT9D

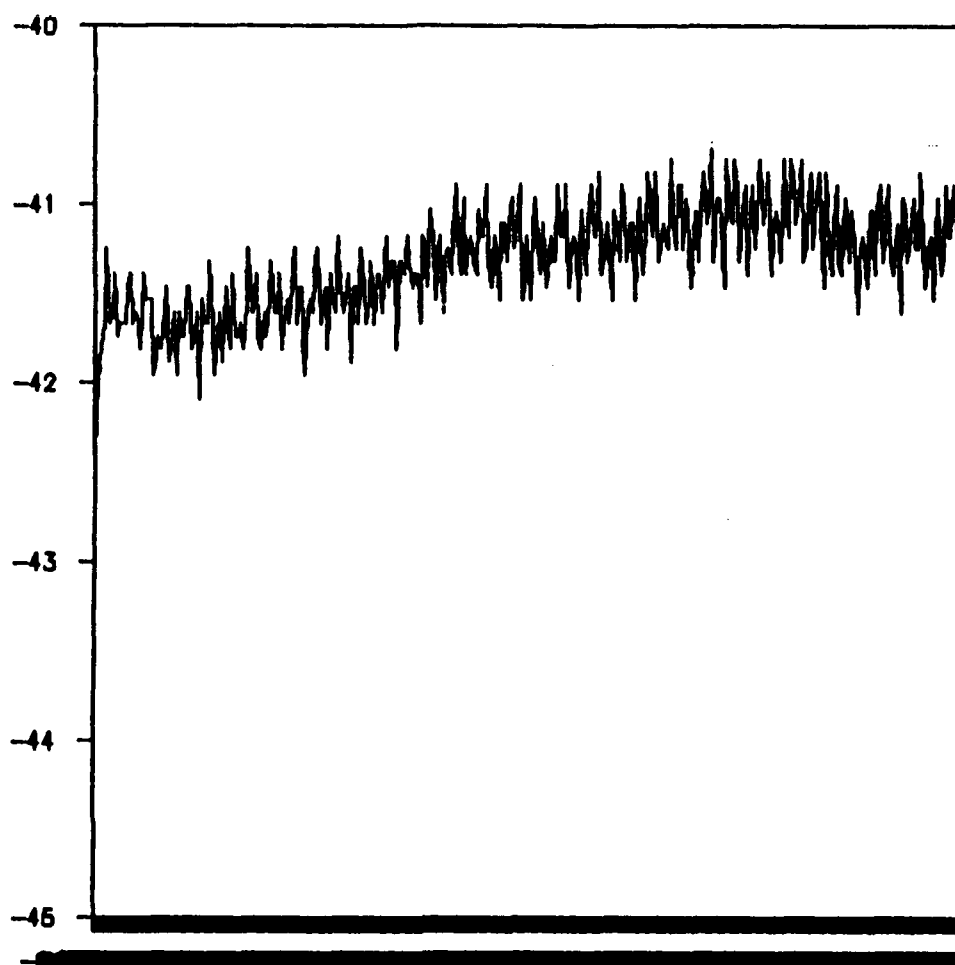
065



KTP - India int - 50°C

small aperture

OCT9E



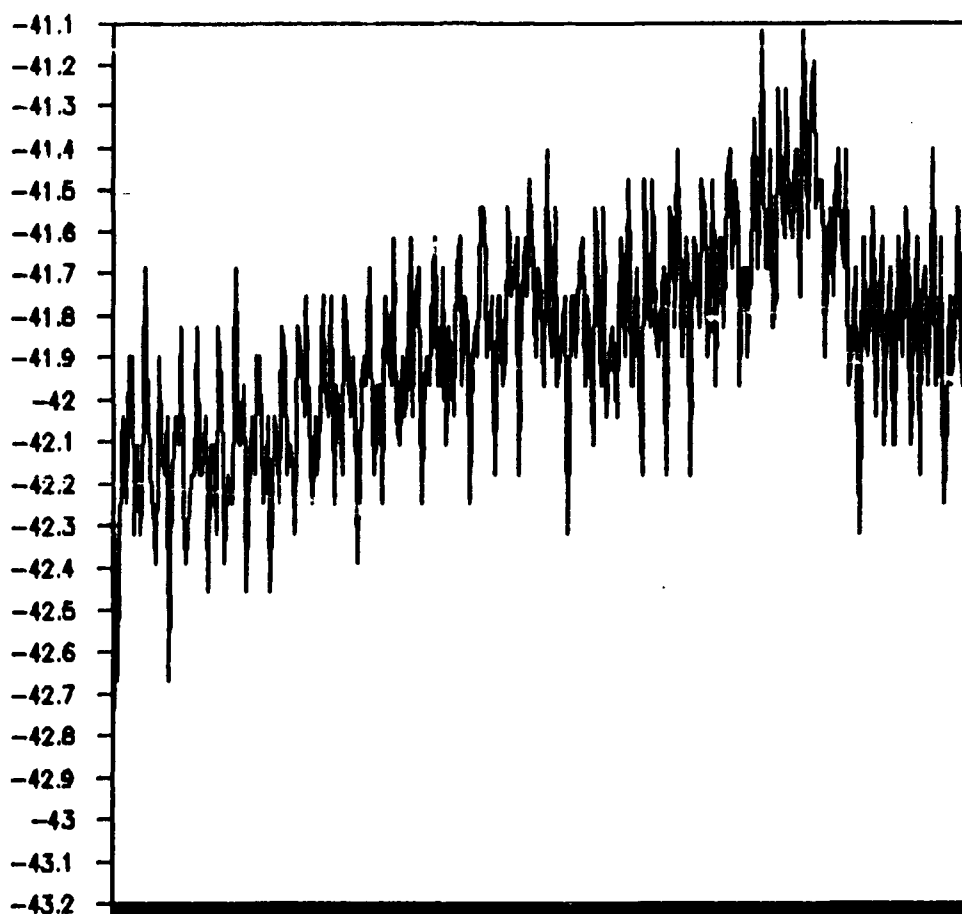
028

KTP- India ink - 60°C

small aperture

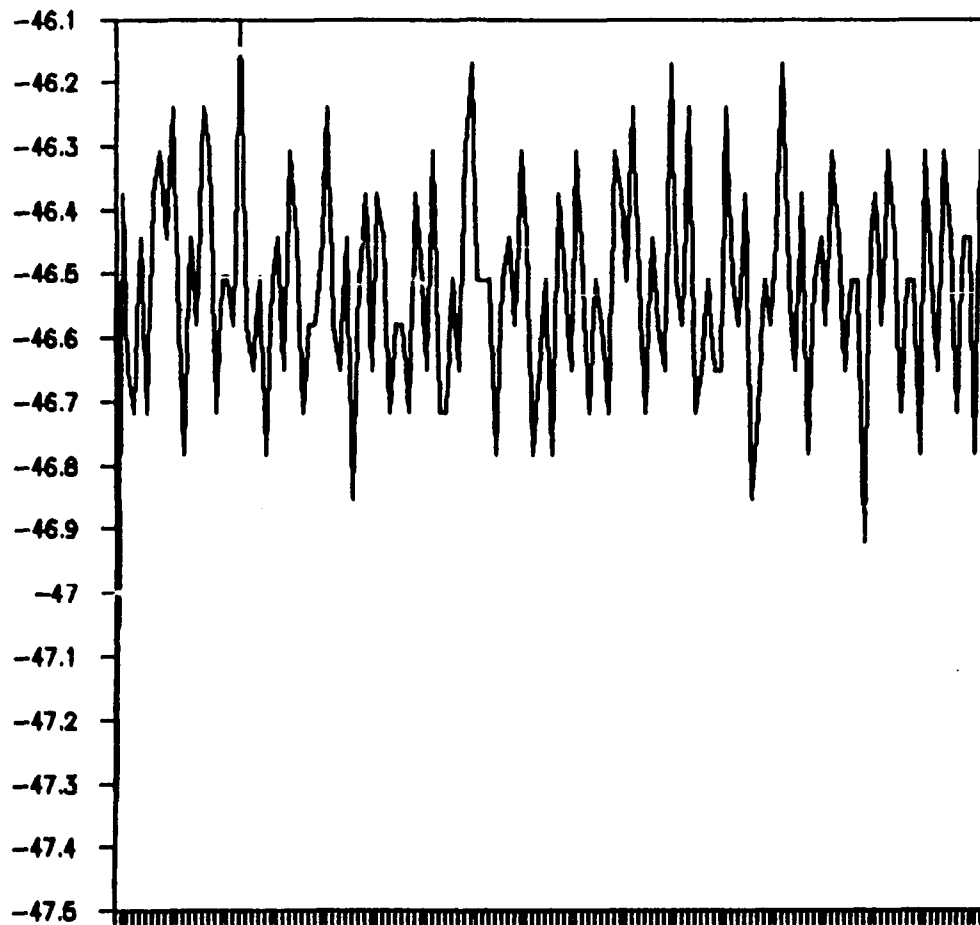
OCT9F

0.8g



KTP- India ink - 70°C
small aperture

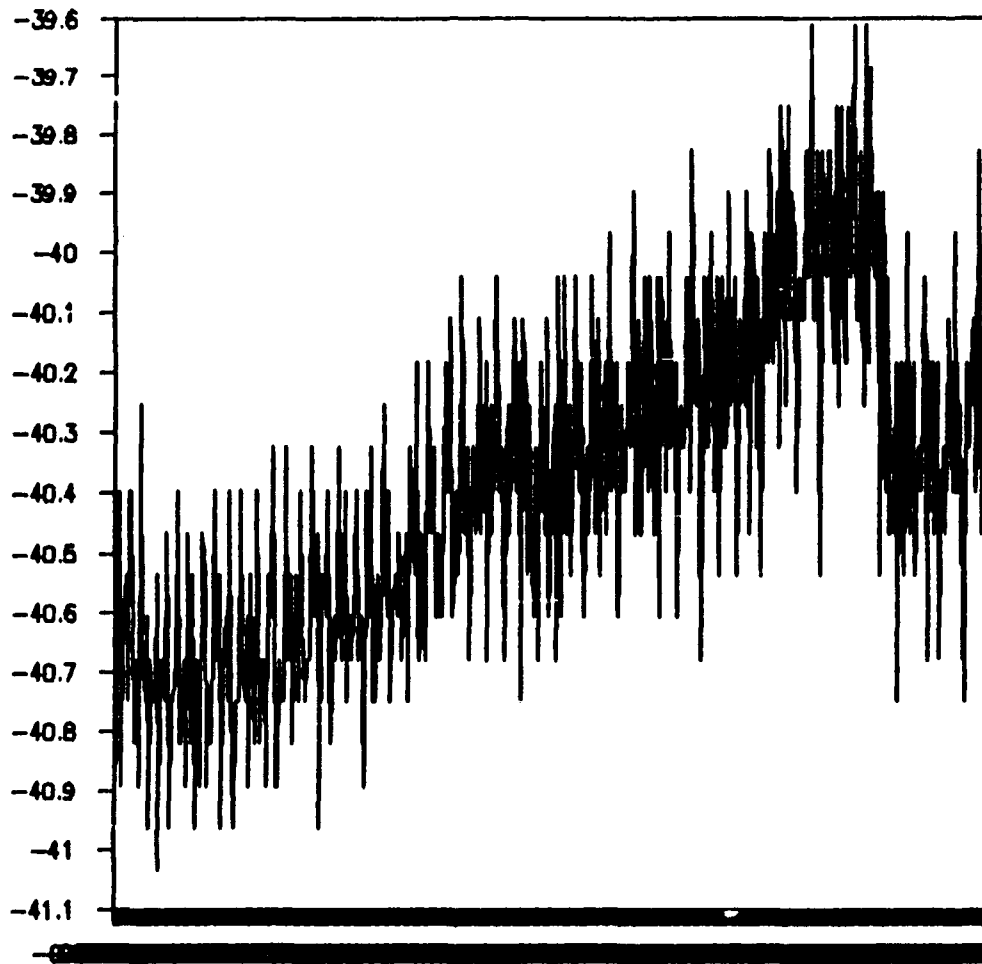
OCT9G



KTP- India sub - 80°C
T_c too superficial ?
small aperture

.OCT9H

078

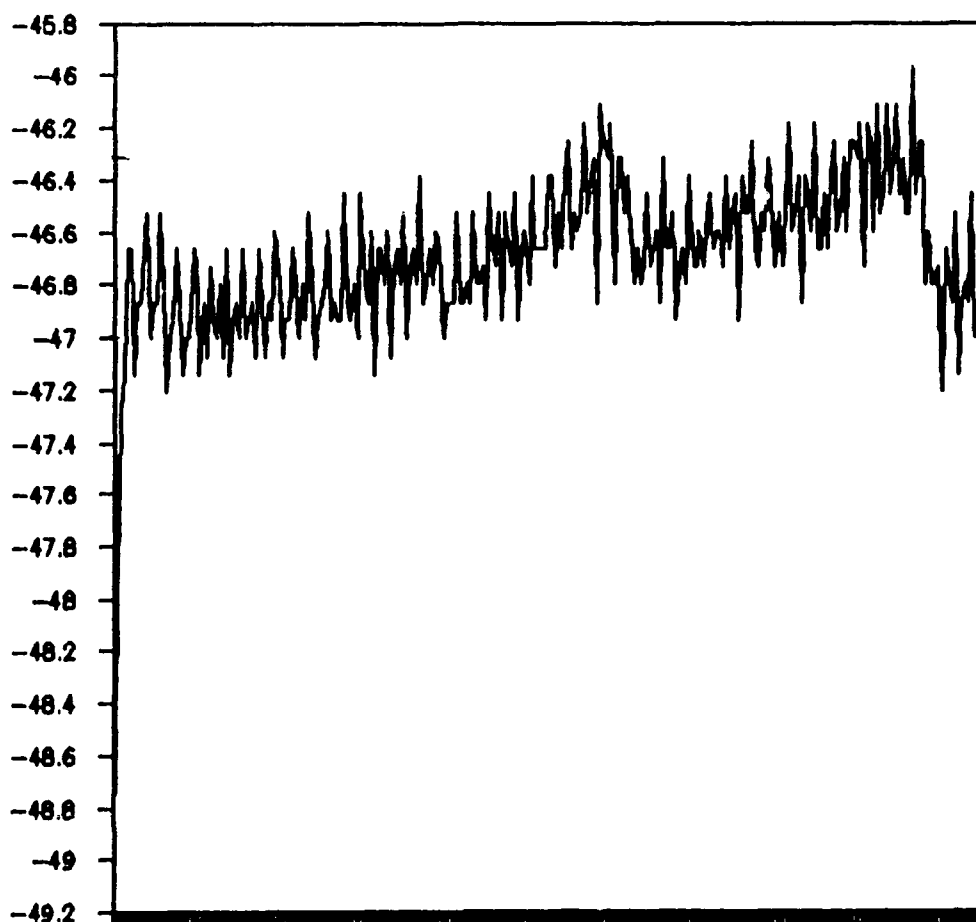


KTP- India ink - 80°C

small aperture

OCT91

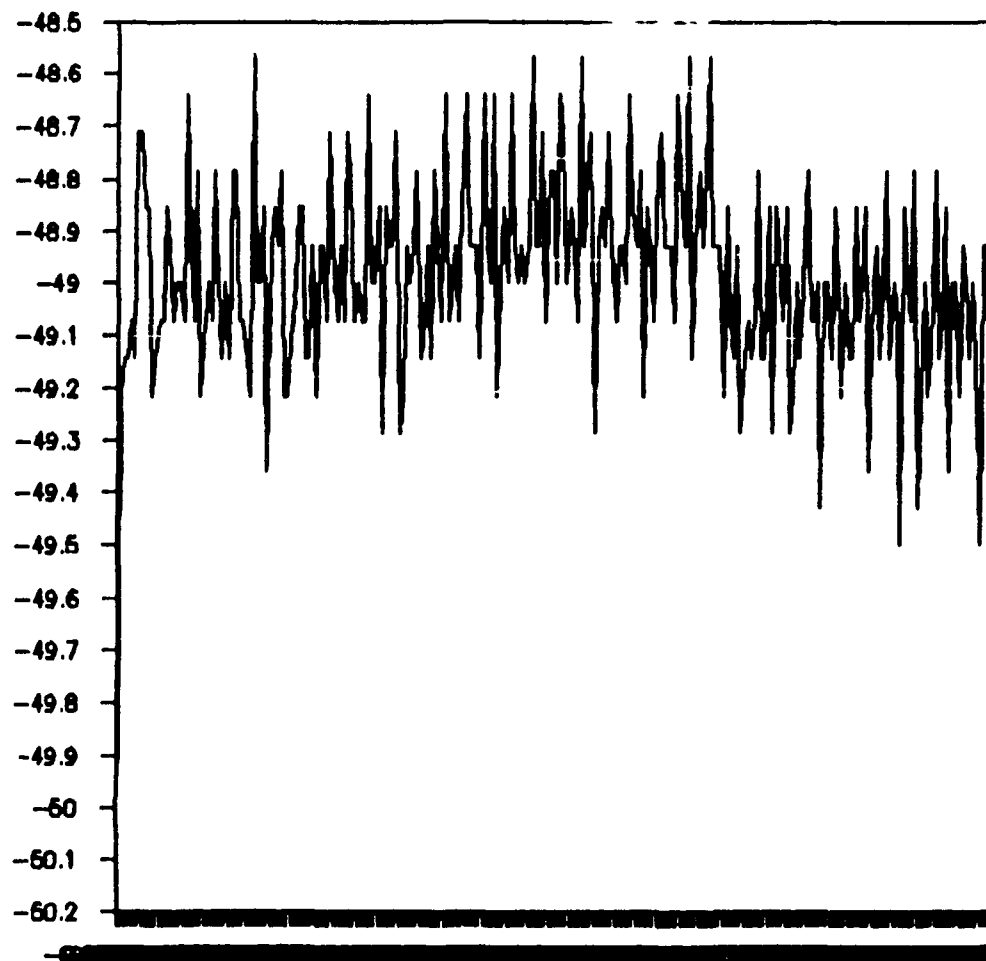
0.78



KTP- India ink - 100°C

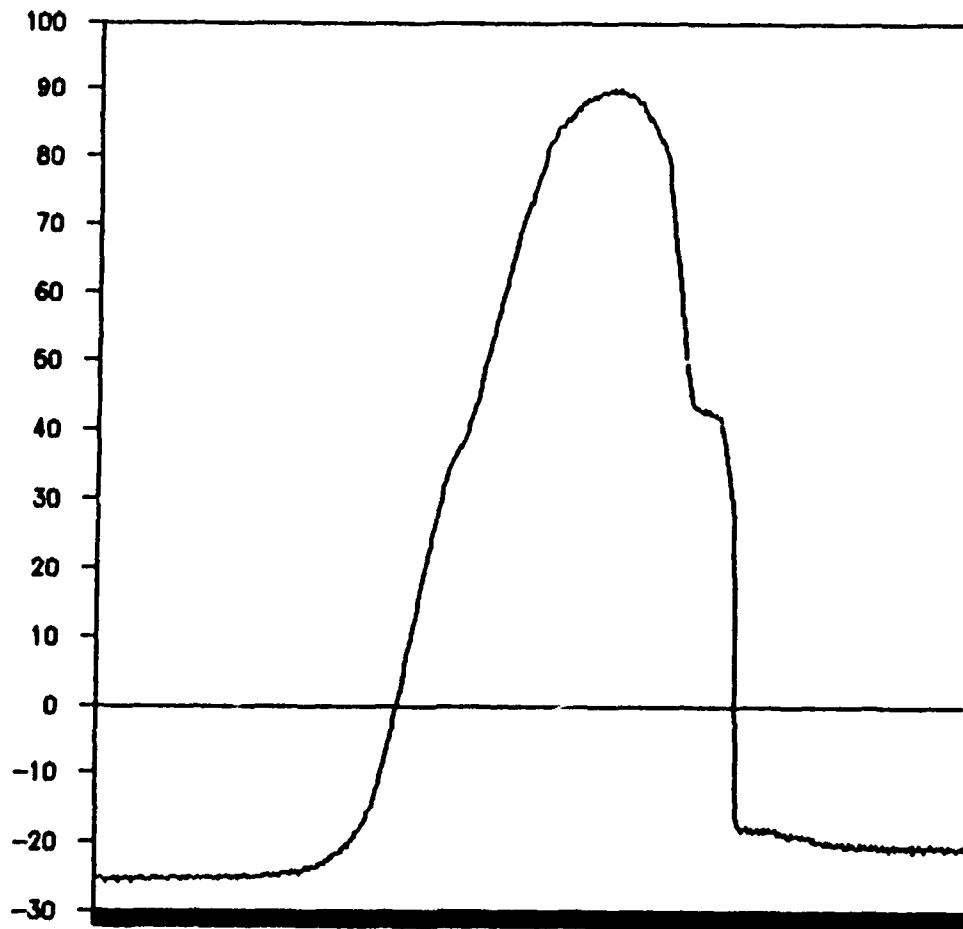
small aperture

OCT9J



KTP - India mm - 100°C
small aperture

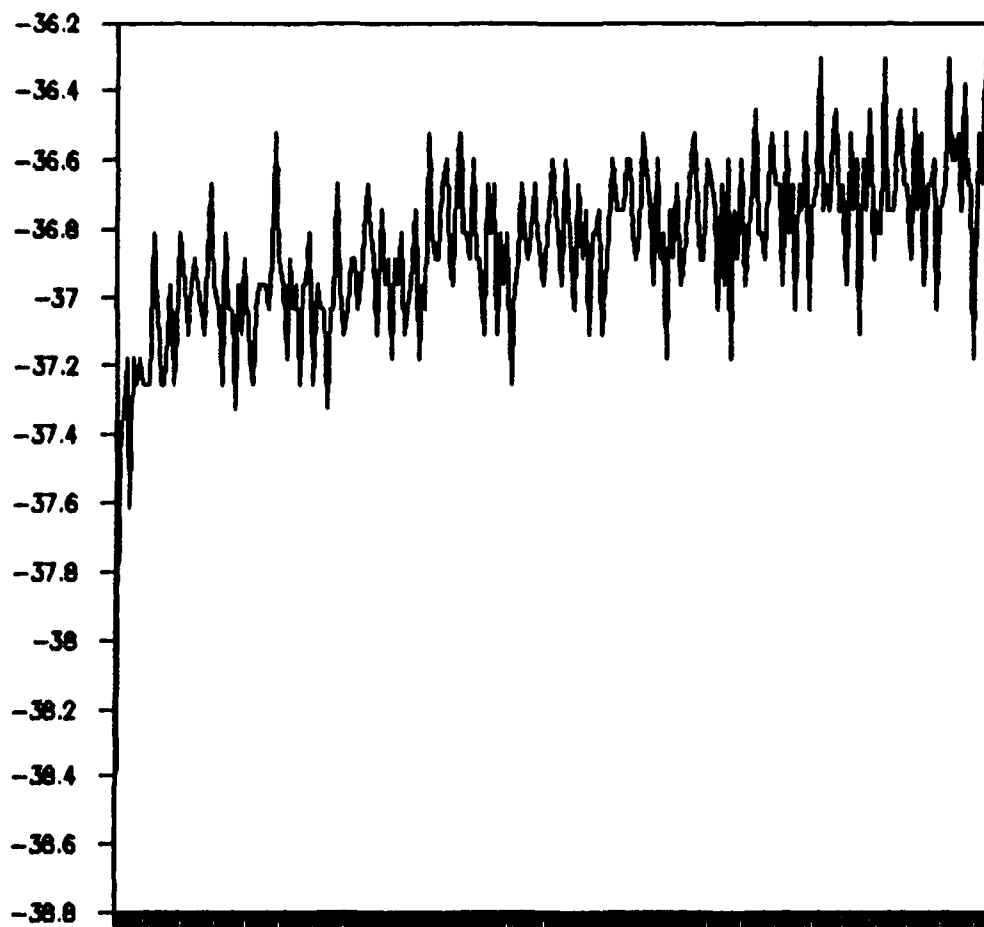
OCT9R



KTP - one stop control

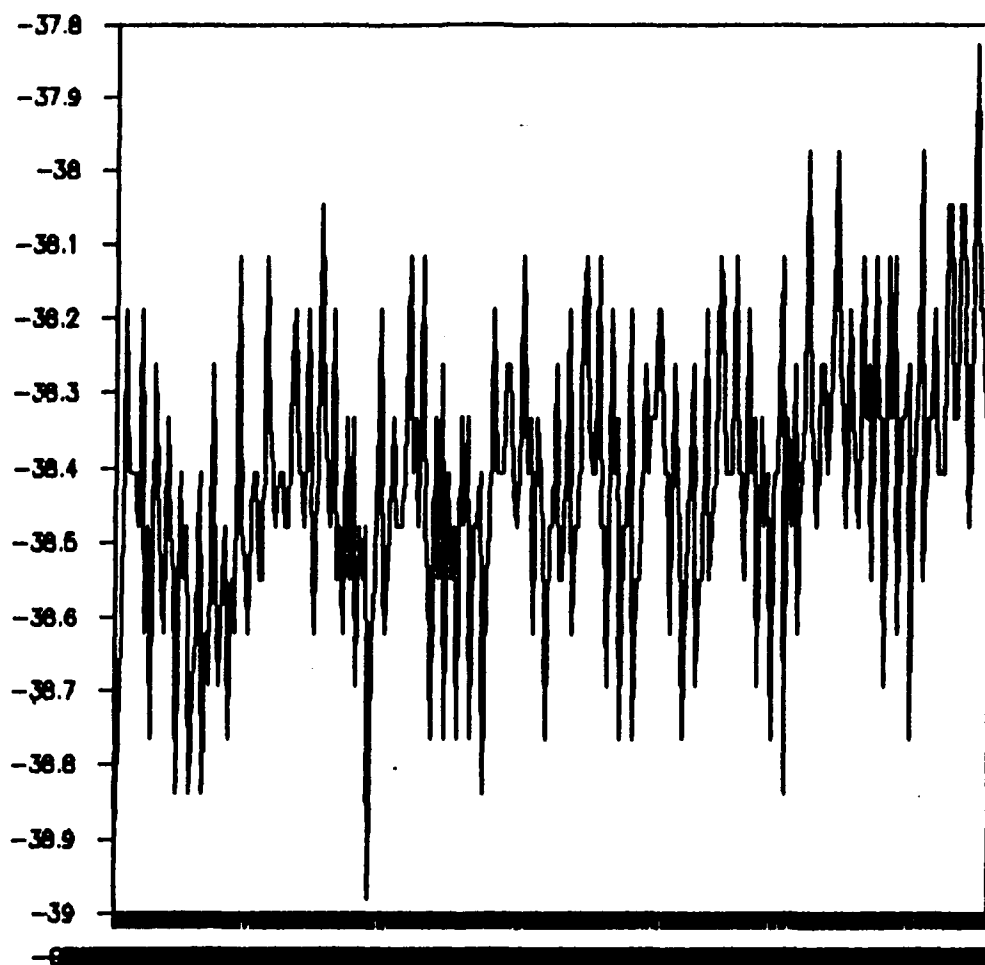
small aperture

OCT9S



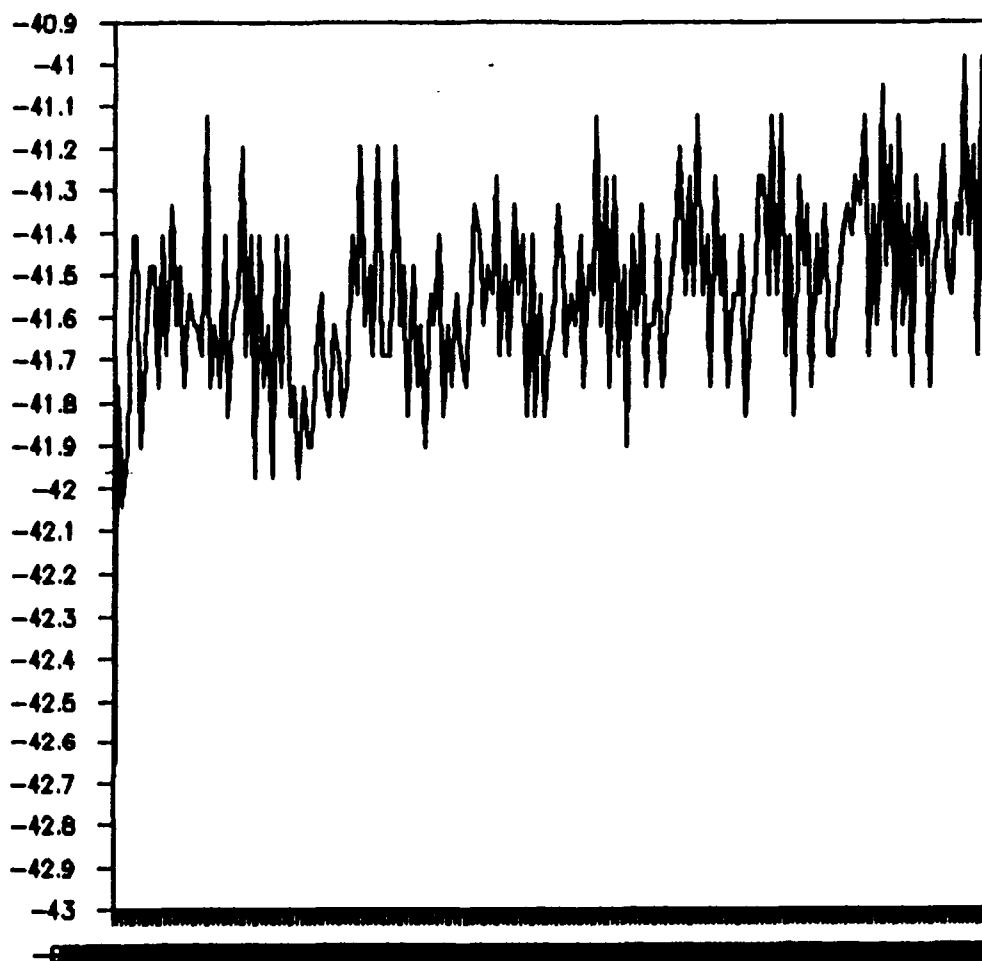
KTP - two strip control
small aperture

OCT9T



KTP - two strip unwelded blood
control
small aperture

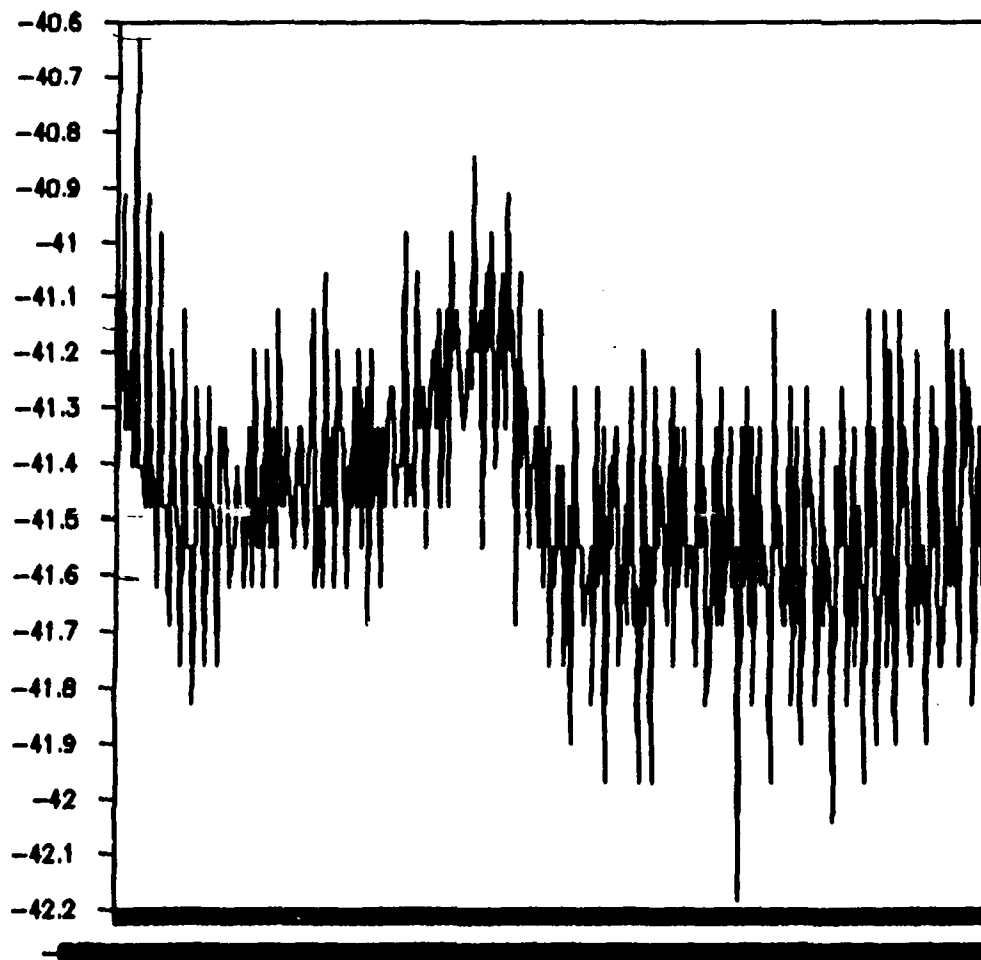
OCT9U



KTP - Blood - 30°C

small aperture

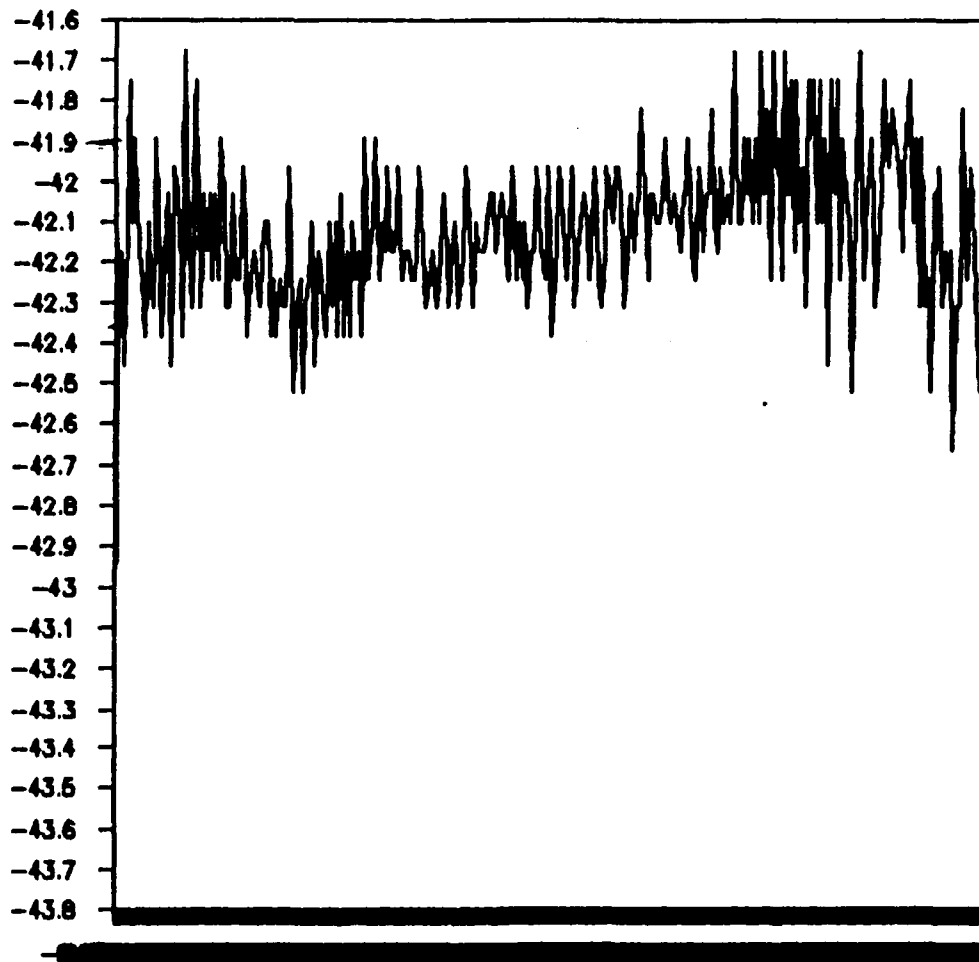
OCT9V1



KTP - Blood -60°C

small aperture

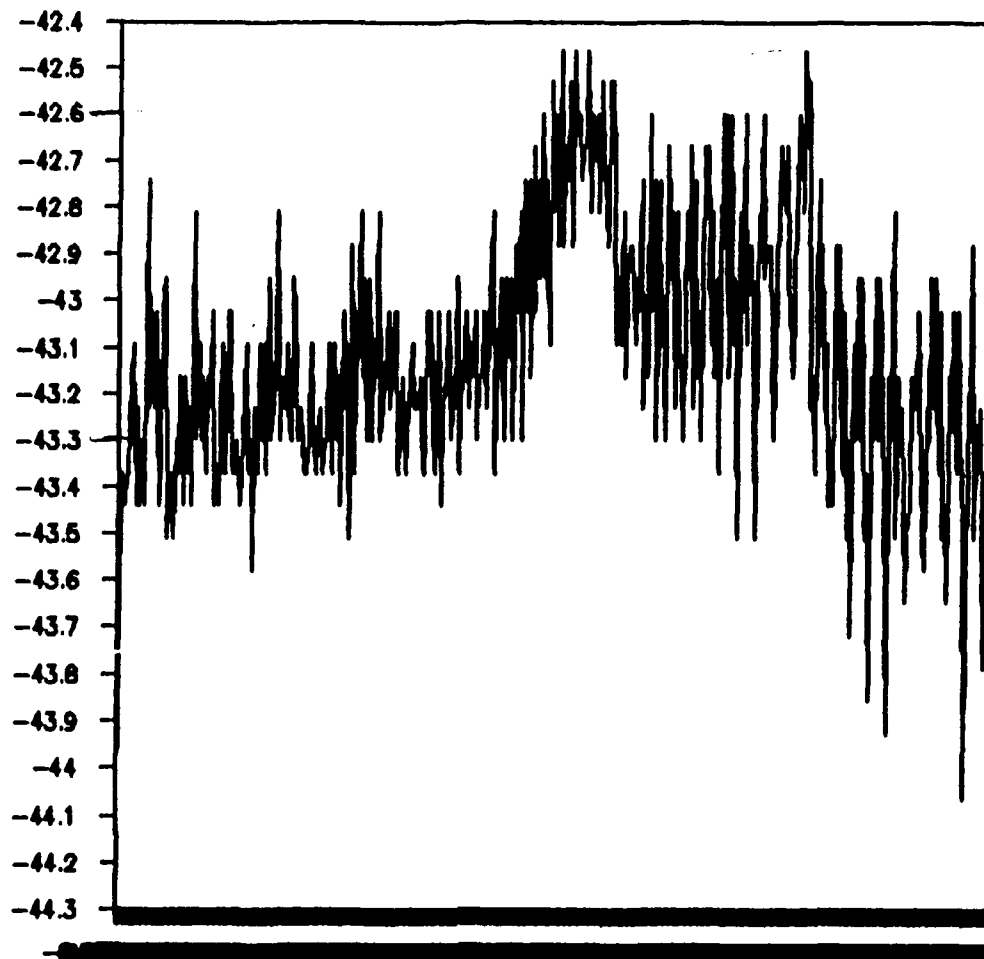
OCT9W



KTP - Blood - 70°C

small aperture

OCT 9X



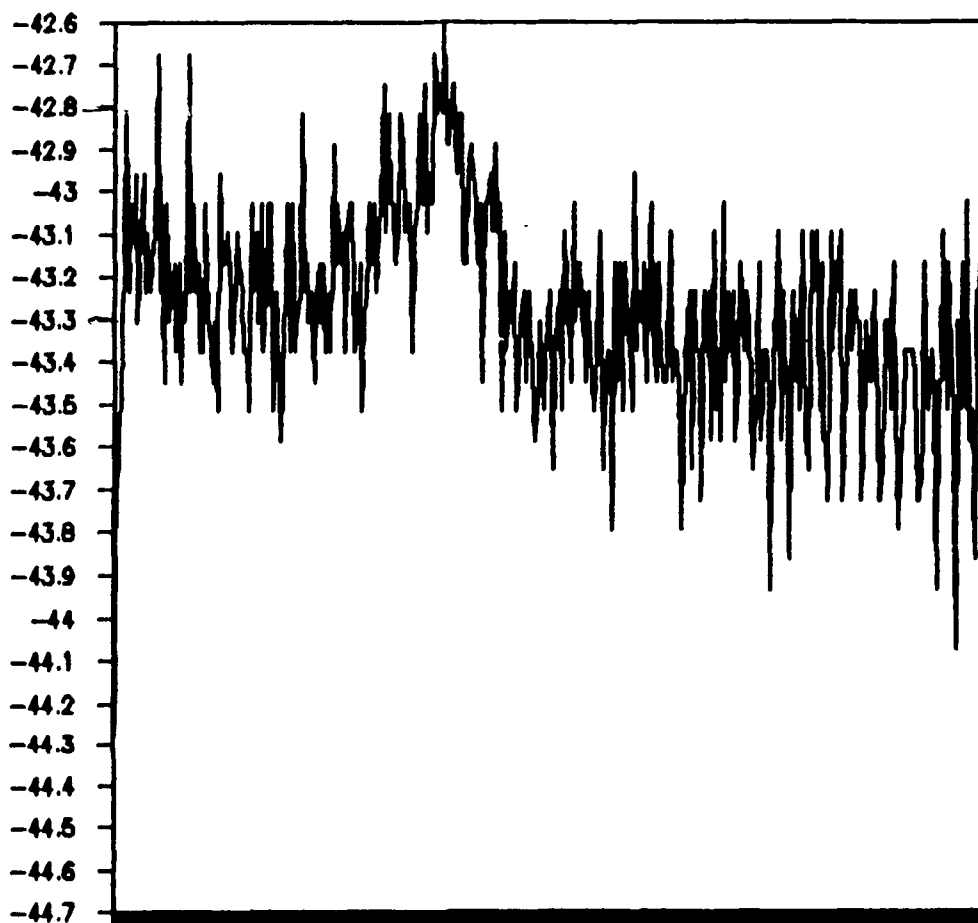
079

KTP - Blood - 80°C

small aperture

OCT9Y

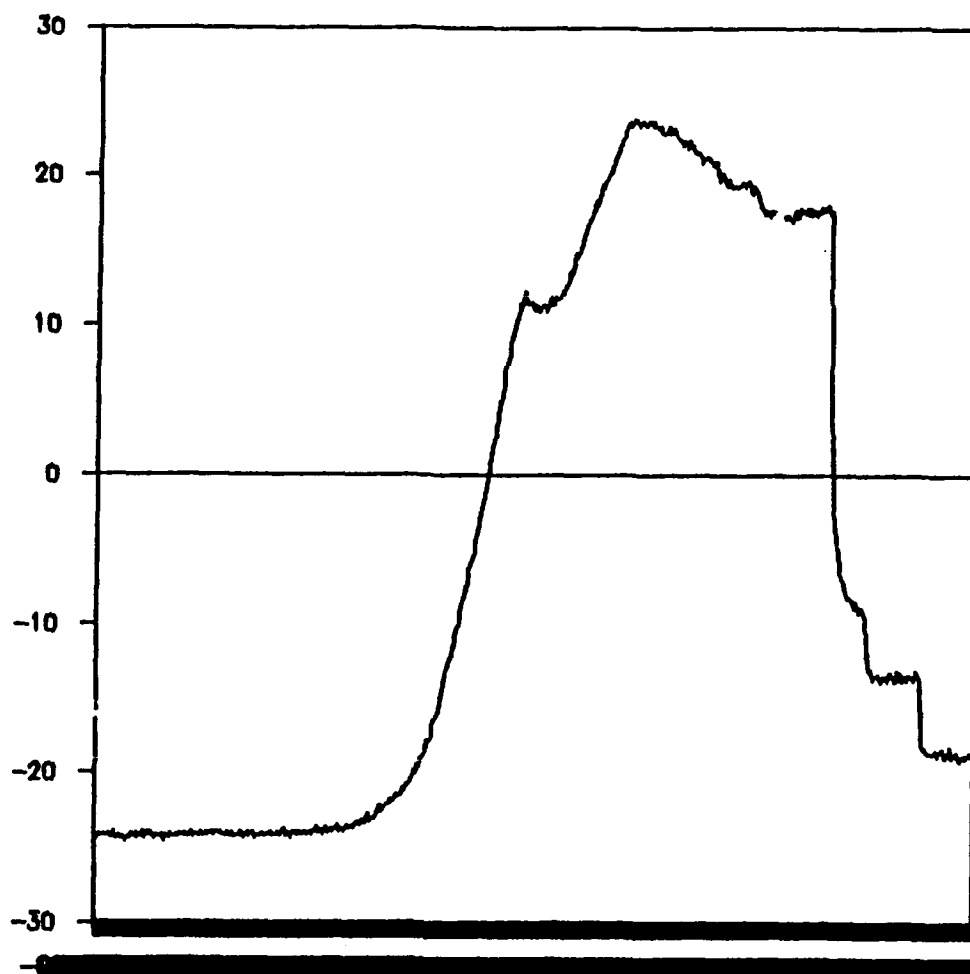
0.58



KTP - ~~GEF~~ Blood - 100°C

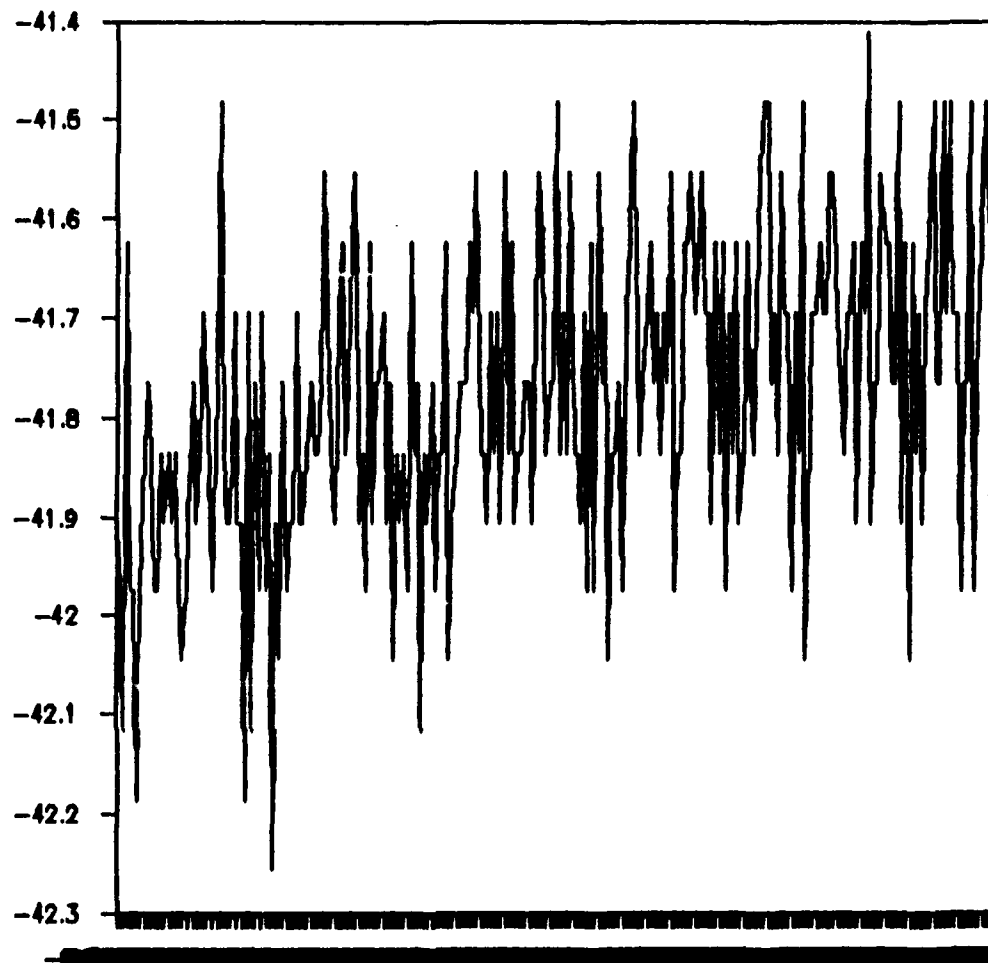
small aperture

OCT10A



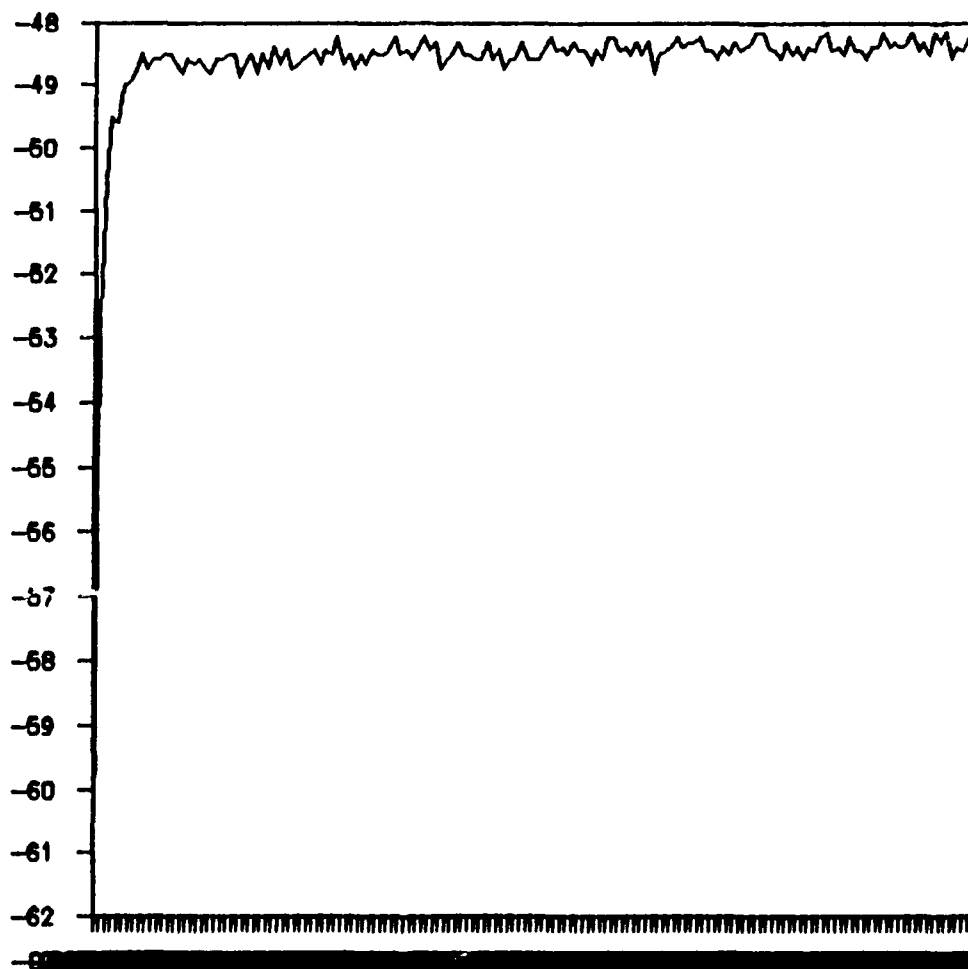
KTP - one strip unwelded control
small aperture

OCT10B



KTP - two strip unwelded control
small aperture

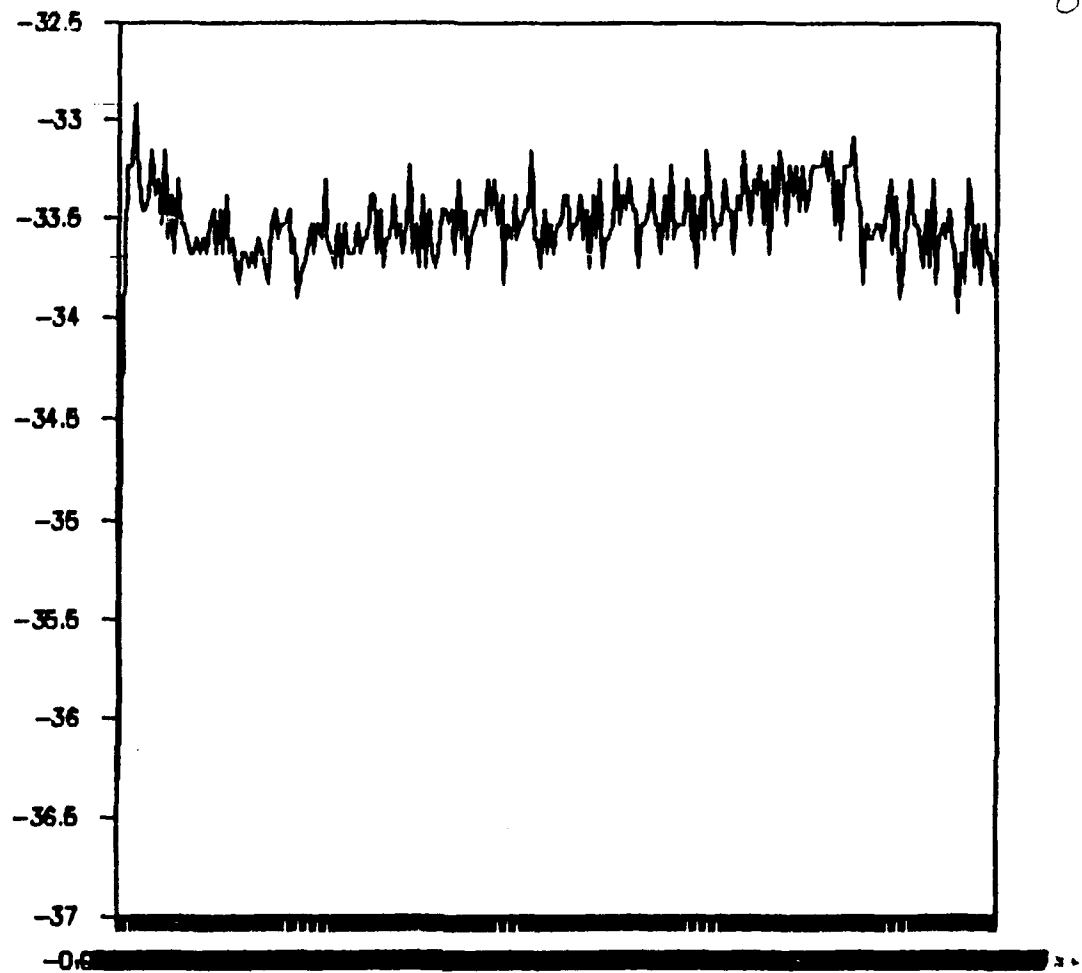
OCT10C



KTP - 2 V ICG unwelded control
small aperture

OCT10D

0.5g

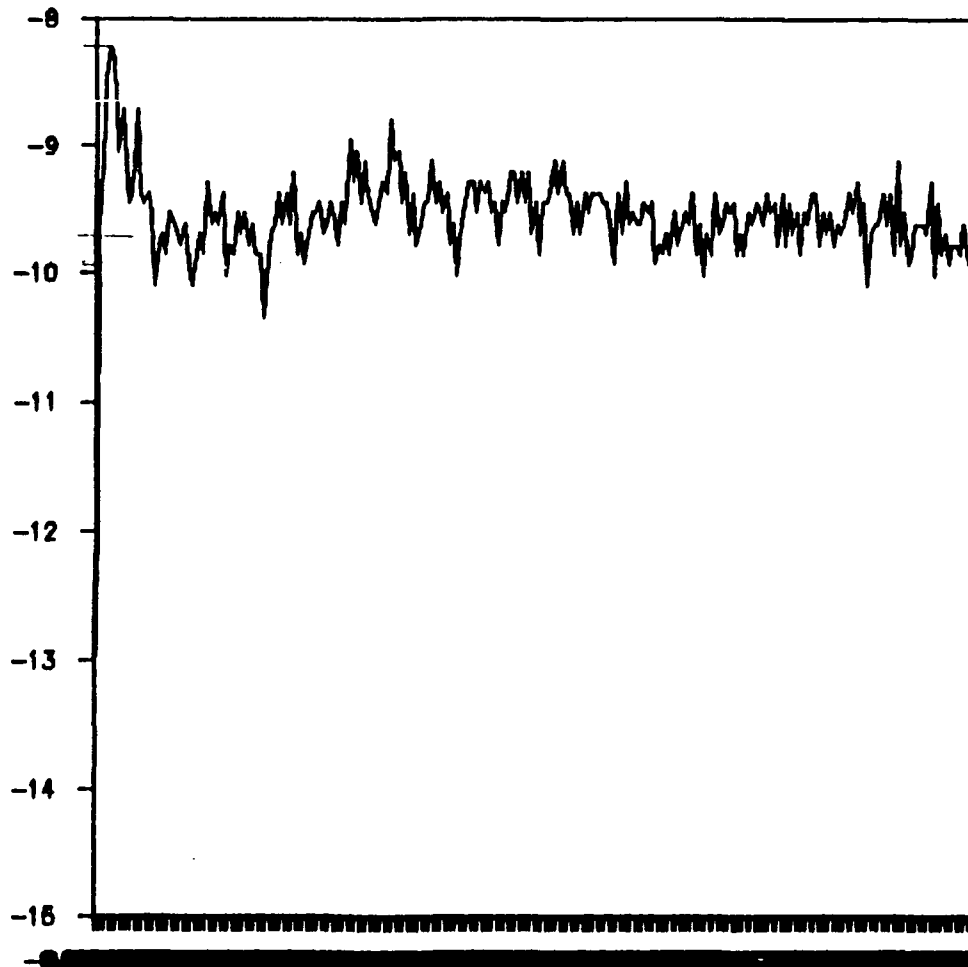


KTP - 2x ICG - 50°C

small aperture

OCT10E

6.22

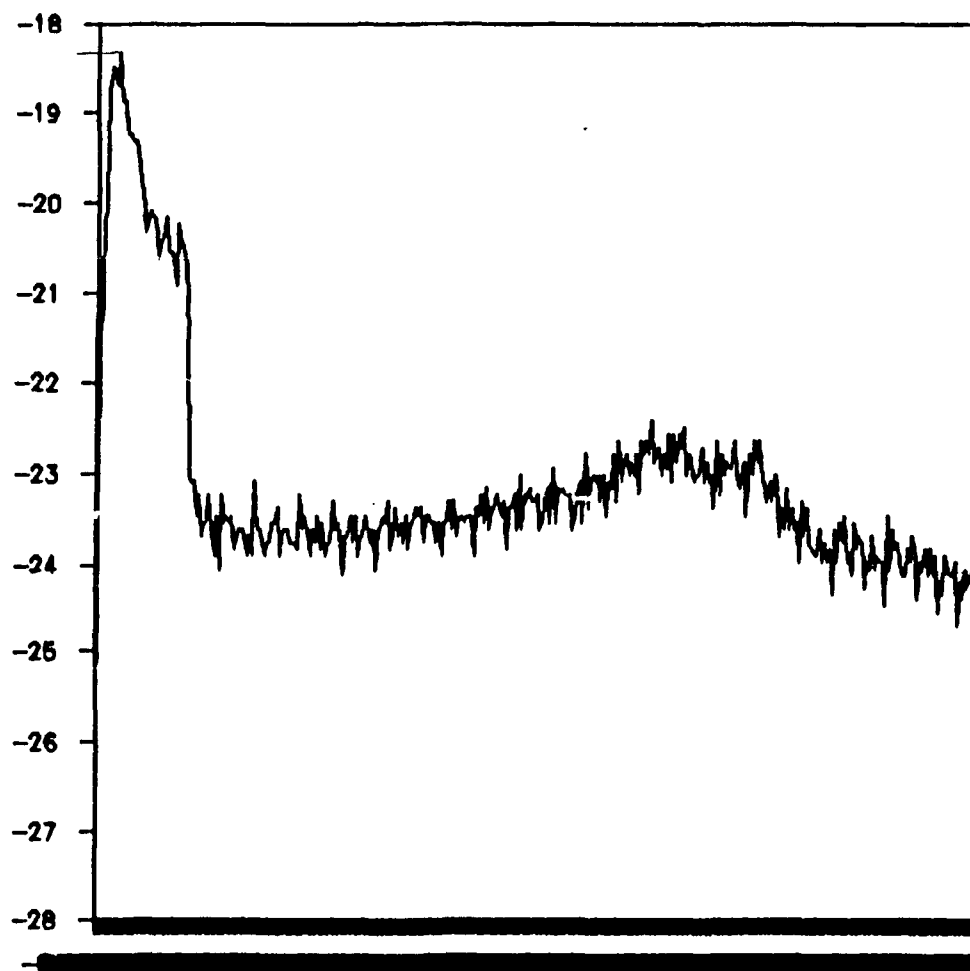


KTP - 2X ICG - 60°C

Small aperture

OCT10F1

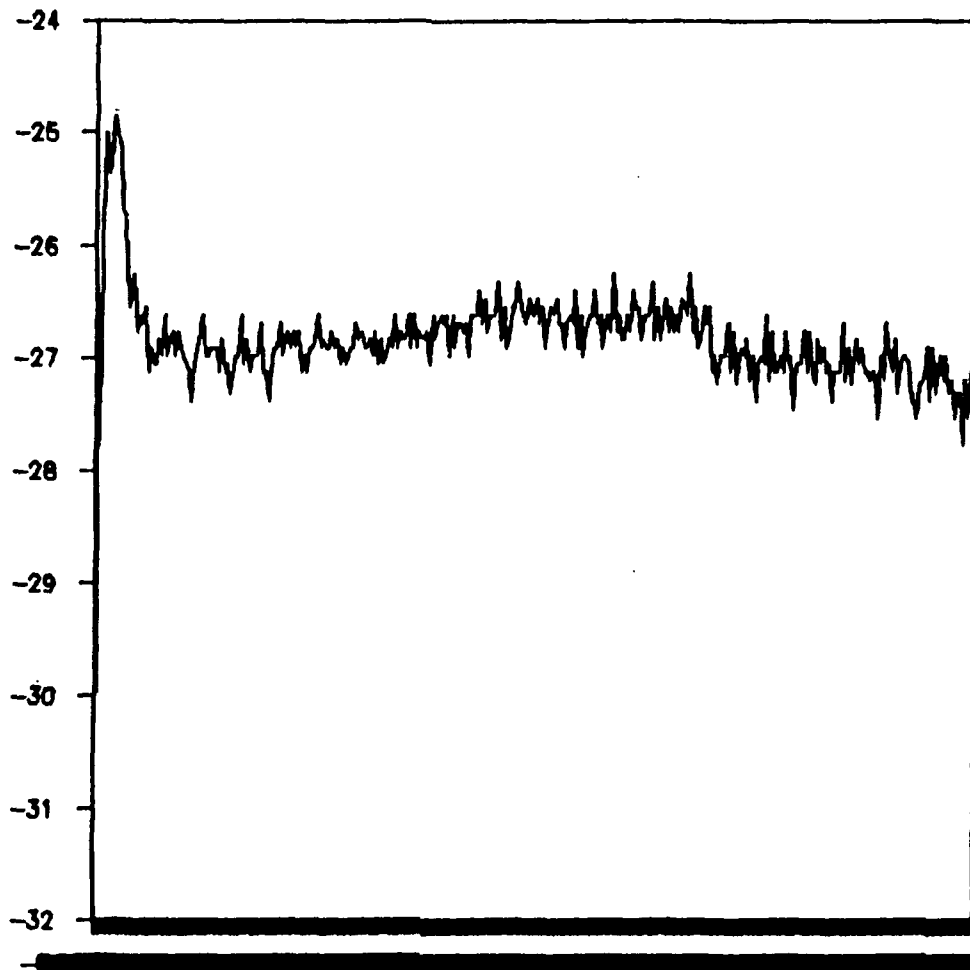
19



KTP - 2x 106-70°C

small aperture

OCT10G



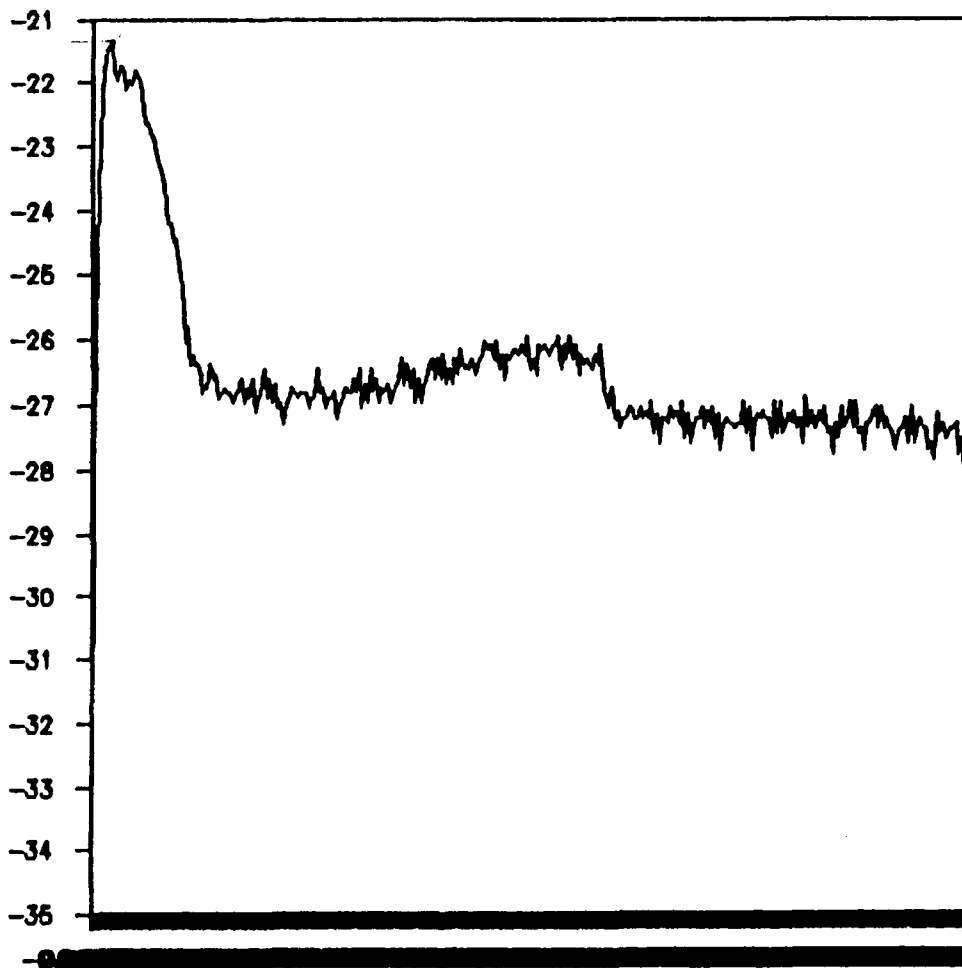
0.59

KTP - 2X ICG - 80°C

small aperture

OCT10H

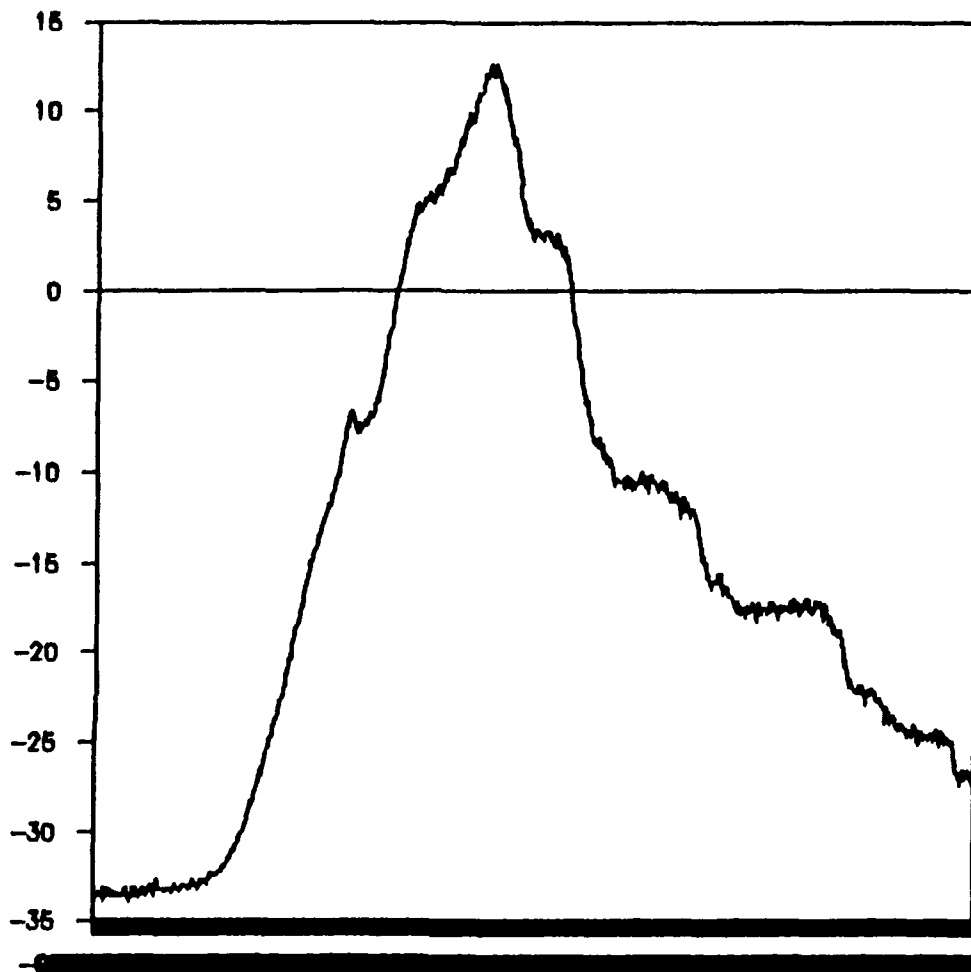
075g



KTP-2X ICG-100°C

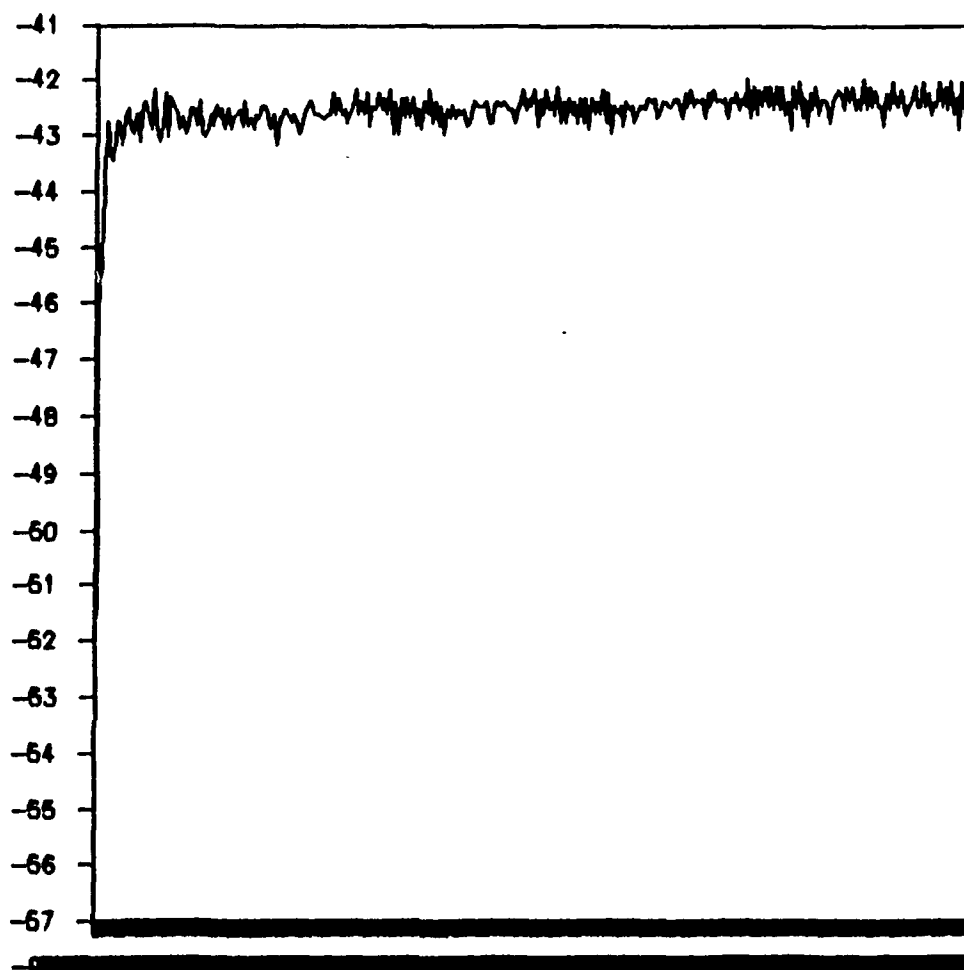
small aperture

OCT101



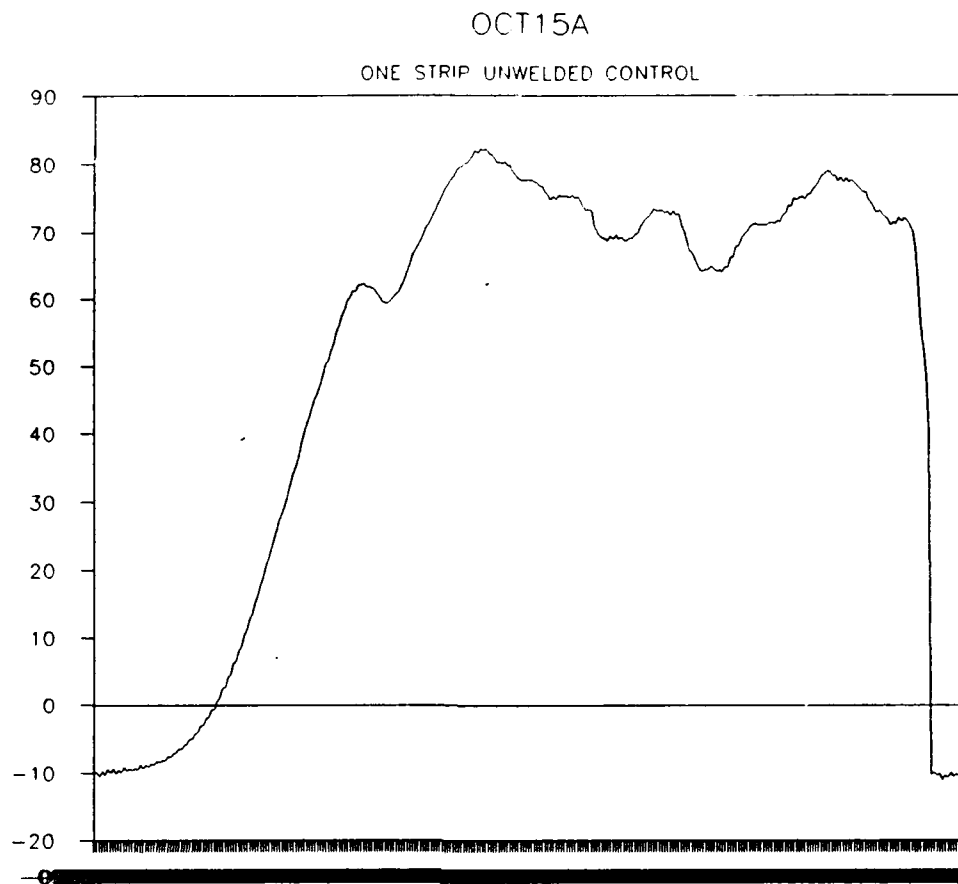
KTP - one strip unwelded control
small aperture

OCT10J



KIP - two step unwelded control

small aperture



All trials for OCT 15, 1990

Ar⁺⁺ Laser

Settings: Current Control

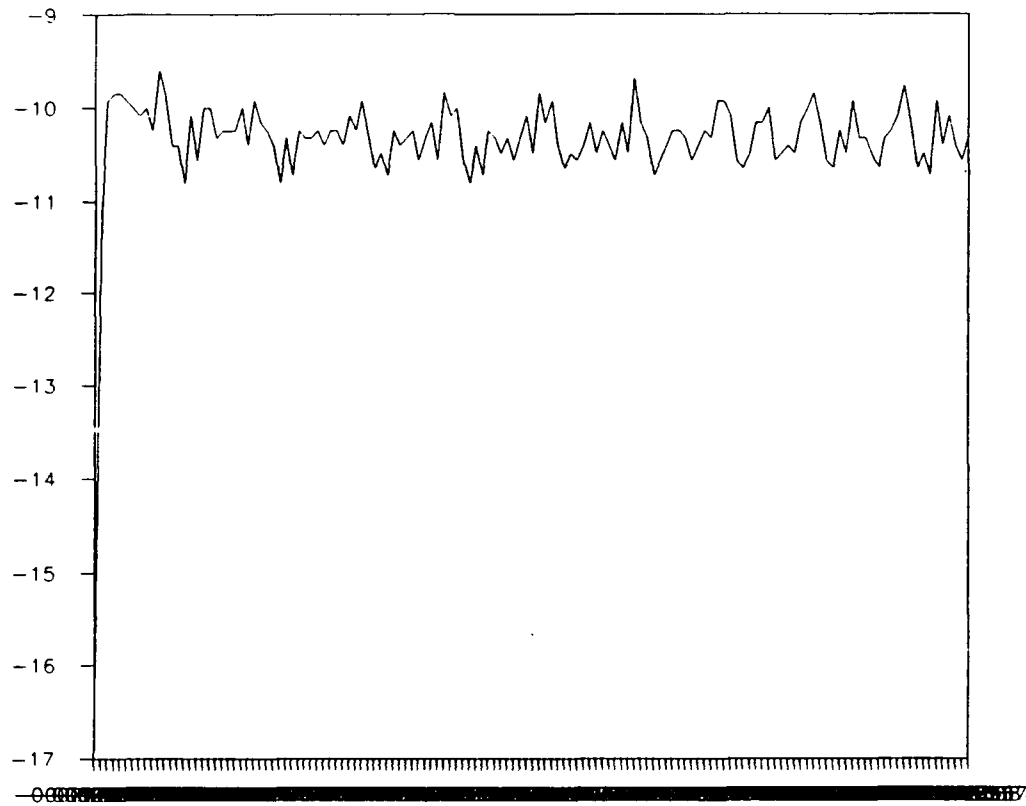
38A, 5.8W

0.7W delivered

Small Aperture

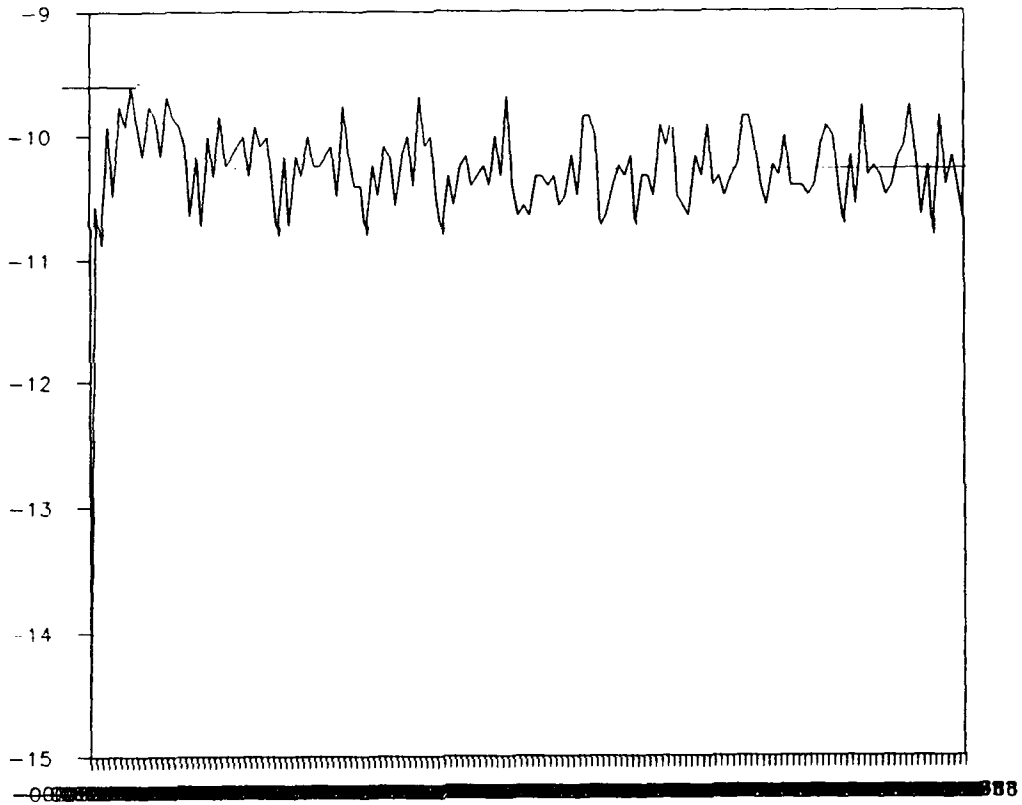
OCT15B

TWO STRIP UNWELDED CONTROL



OCT15C

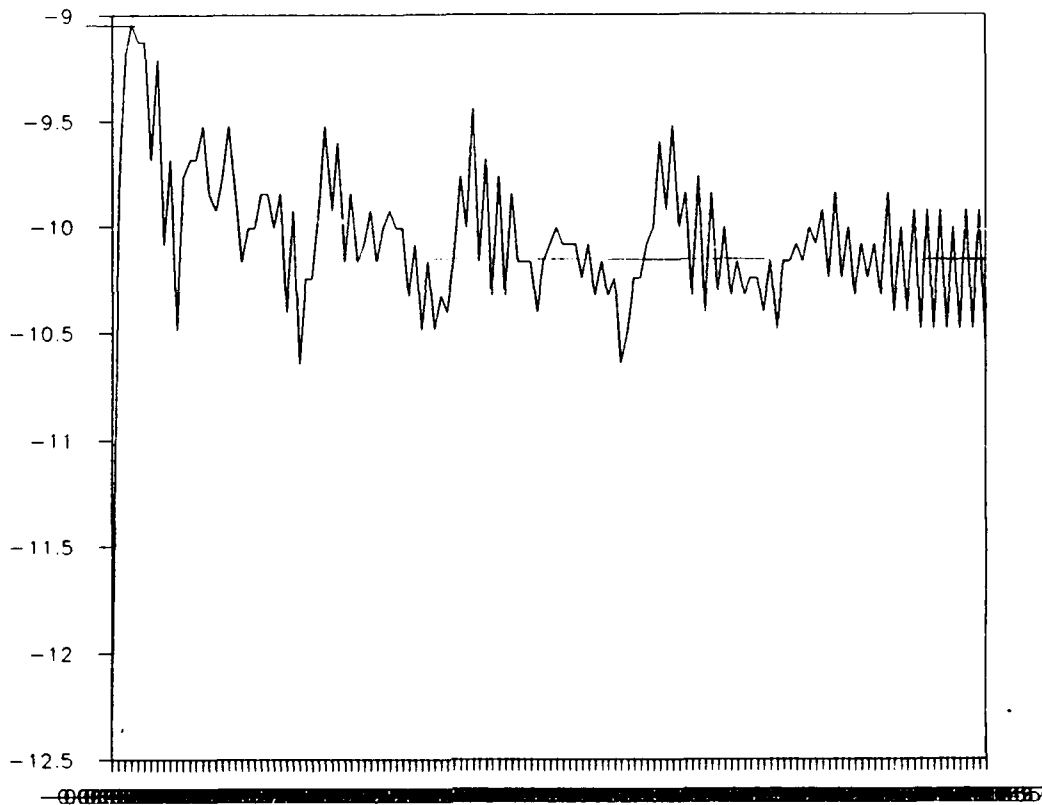
TWO STRIP INDIA INK UNWELDED



7. 0. 0.

OCT15E

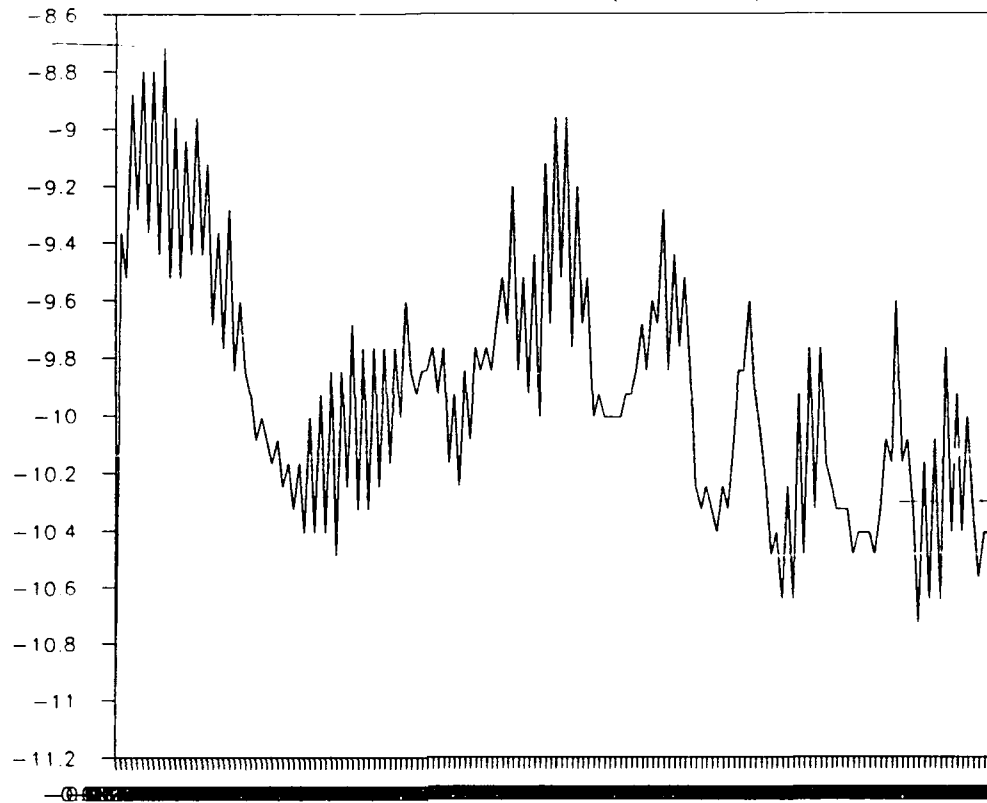
INDIA INK - 60 DEGREES



OCT15F1

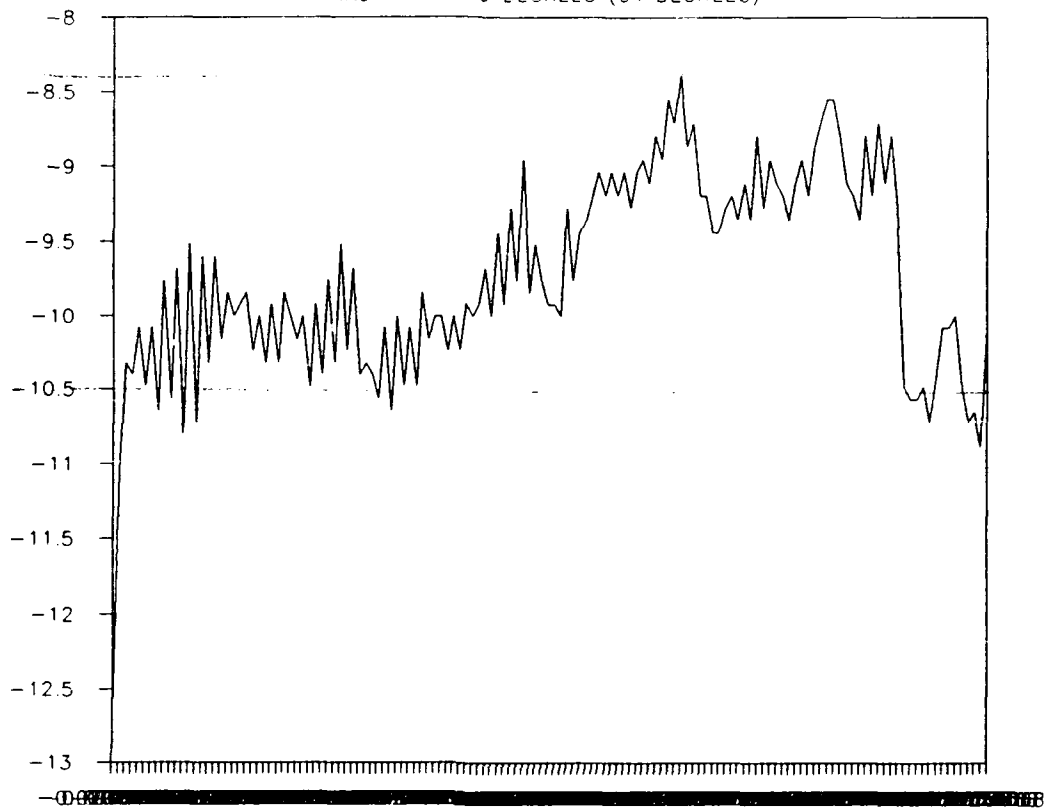
19

INDIA INK - 70 DEGREES (47 DEGREES)



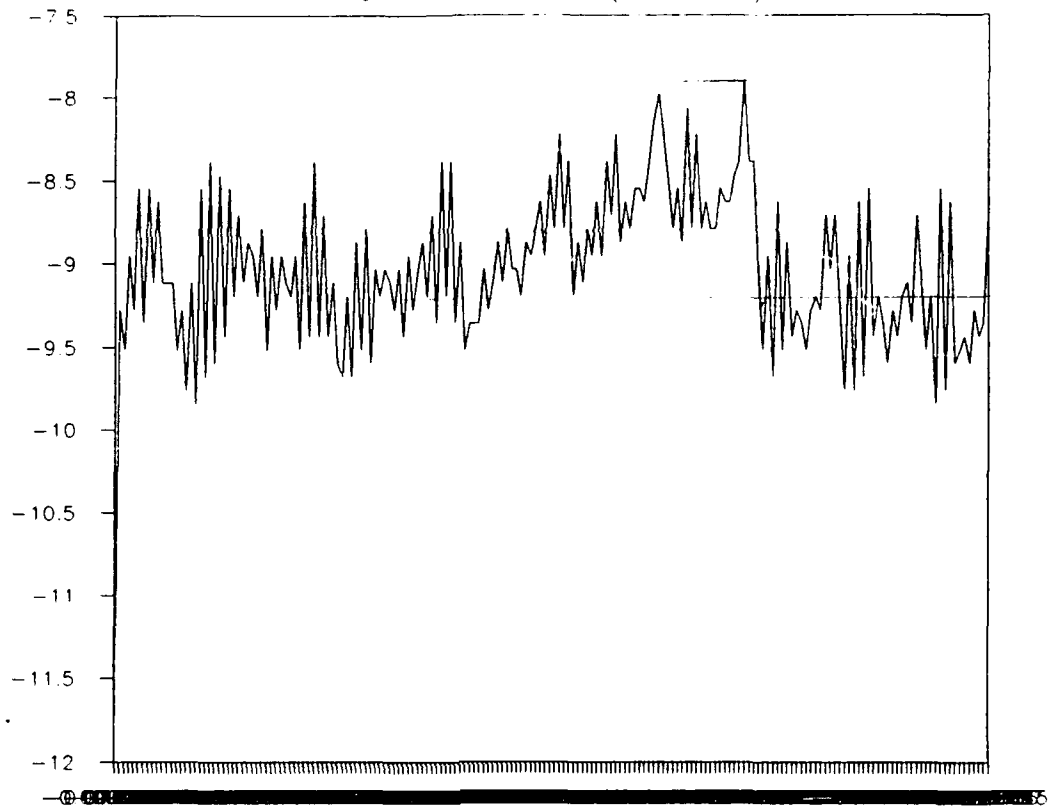
OCT15G1

INDIA INK - 70 DEGREES (64 DEGREES)



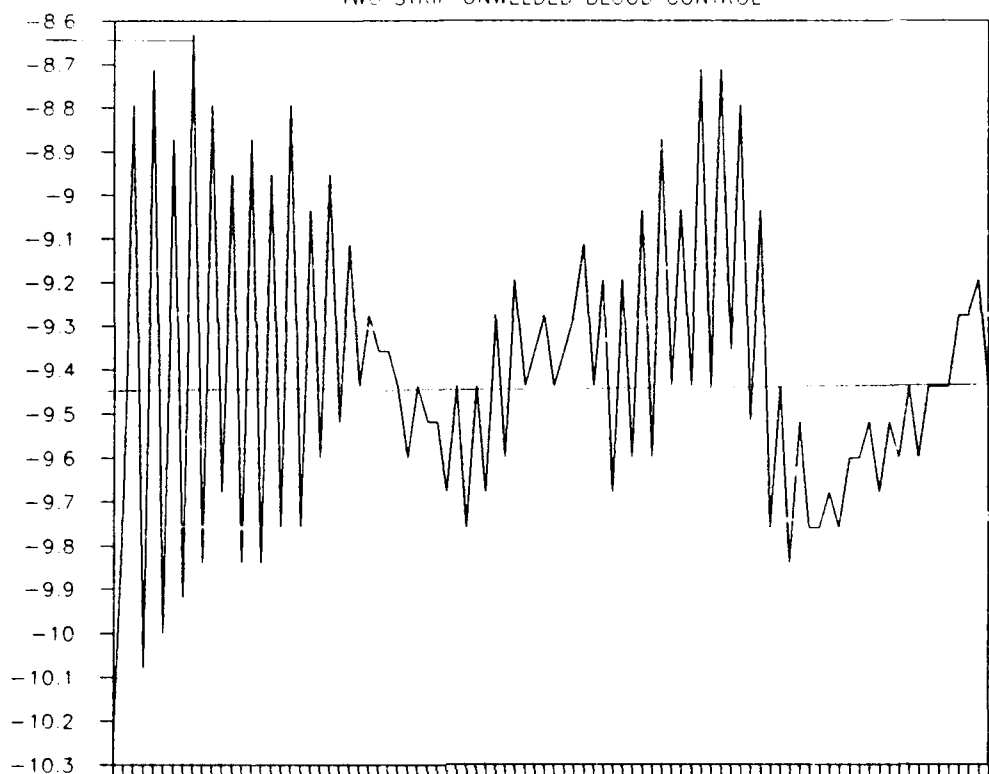
OCT15H1

INDIA INK - 80 DEGREES (66 DEGREES)



OCT 151

TWO STRIP UNWELDED BLOOD CONTROL

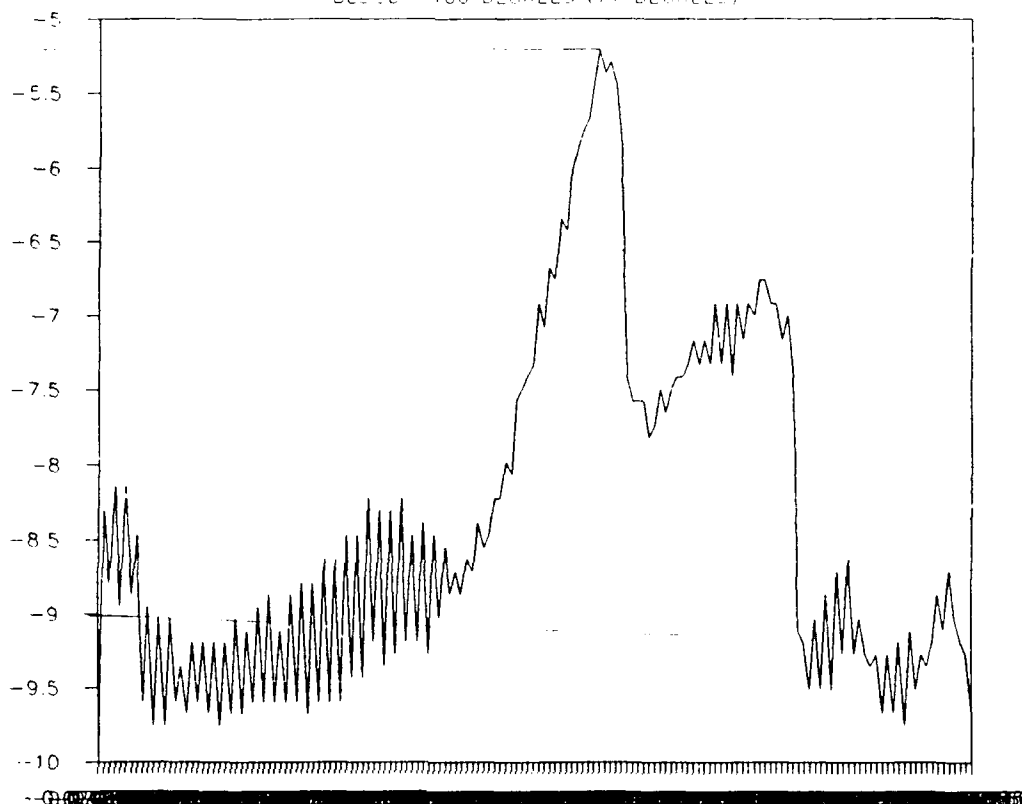


~~CONFIDENTIAL~~

409

OCT15J1

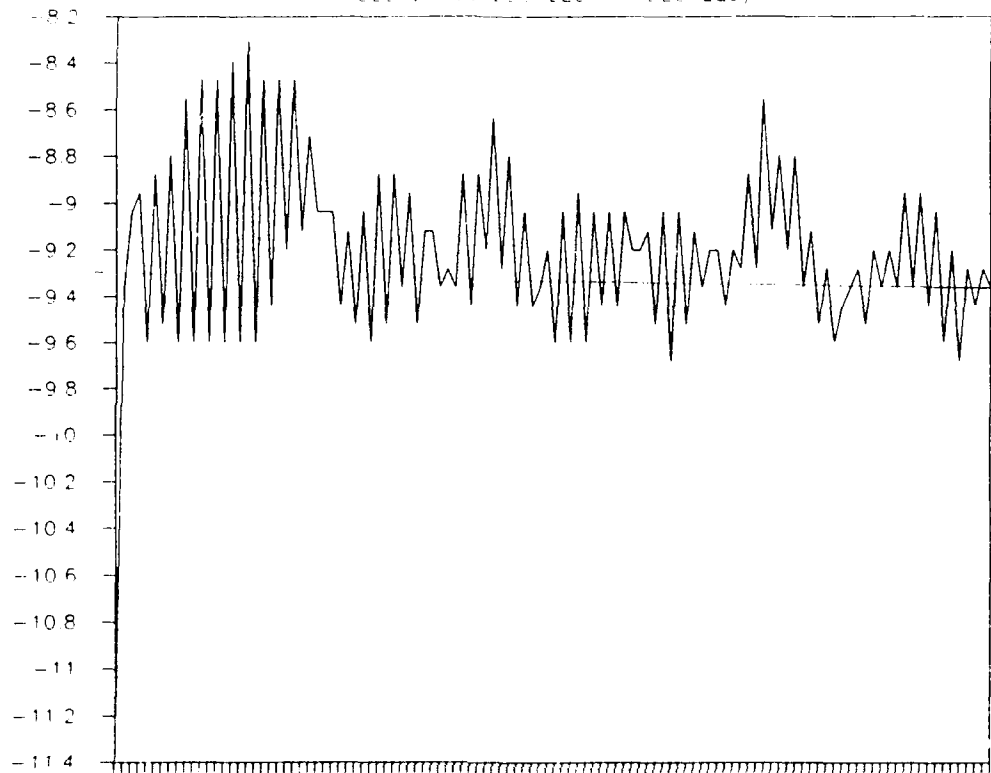
BLOOD- 100 DEGREES (77 DEGREES)



OCT 15 1

5.25

BLOOD 50 DEGREES (44 DEGREES)

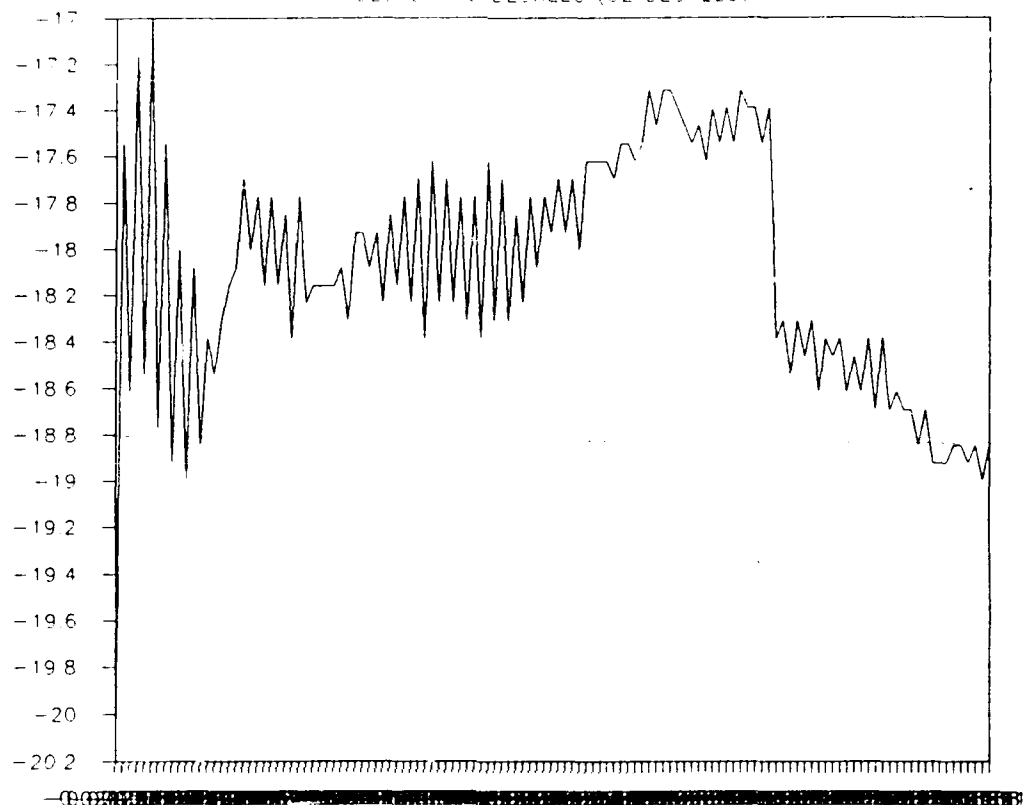


000000 000000

OCT15M1

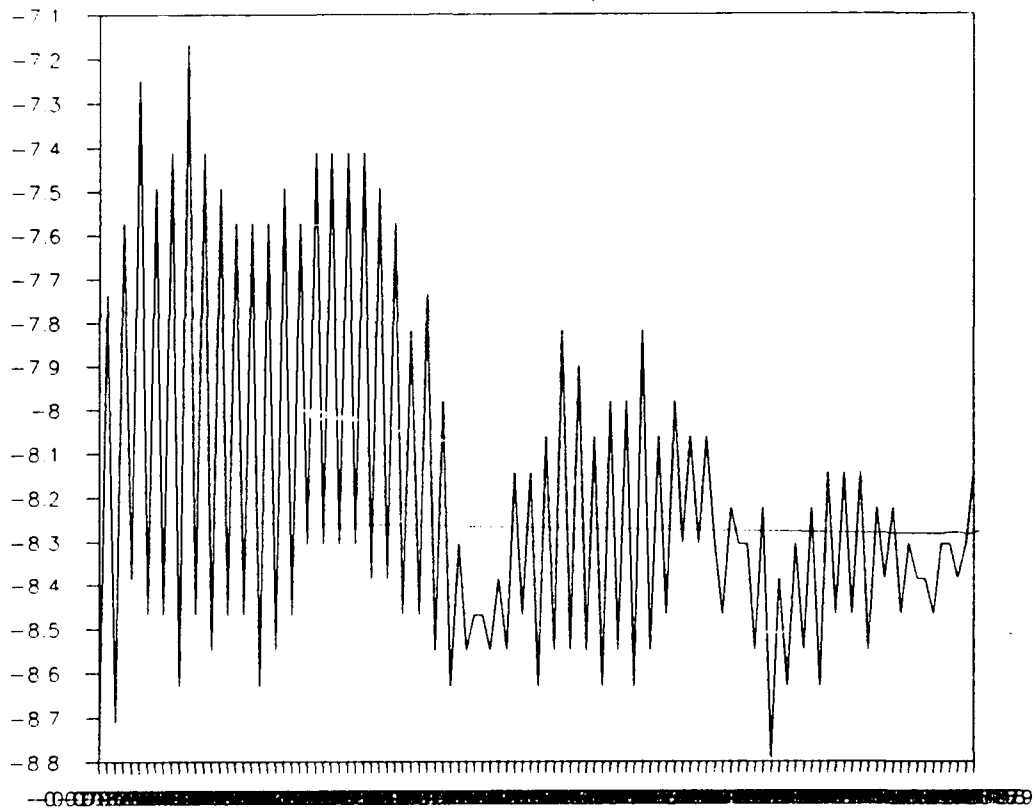
109

RL000- 70 DEGREES (62 DEGREES)



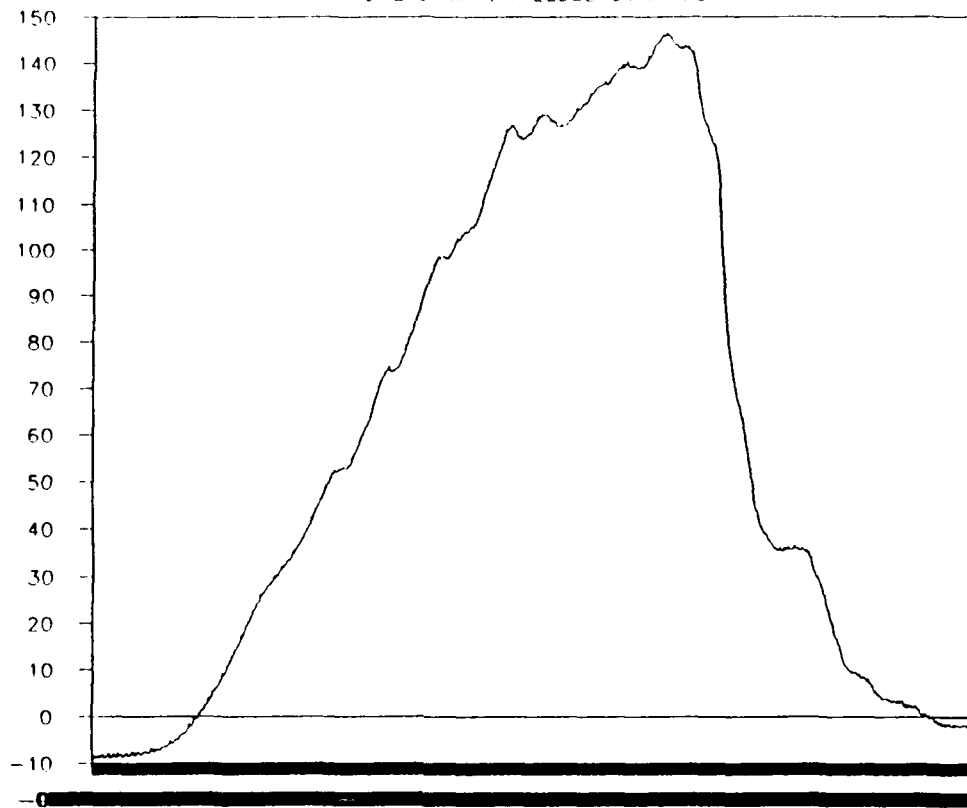
OCT15P1

BLOOD- 100 DEGREES (56 DEGREES)



OCT16A

ONE STRIP UNWELDED CONTROL



All trials for OCT 16, 1990

Ar⁺⁺ Laser

Settings: Current Control

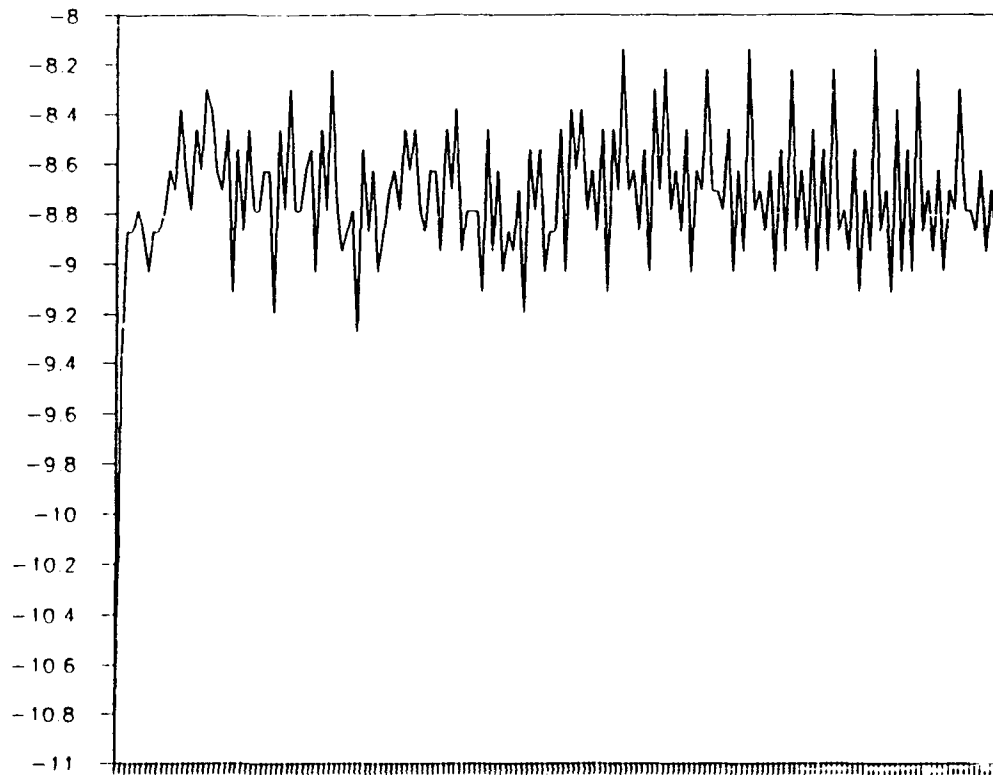
38A, 58W

0.8W delivered

Small Aperture

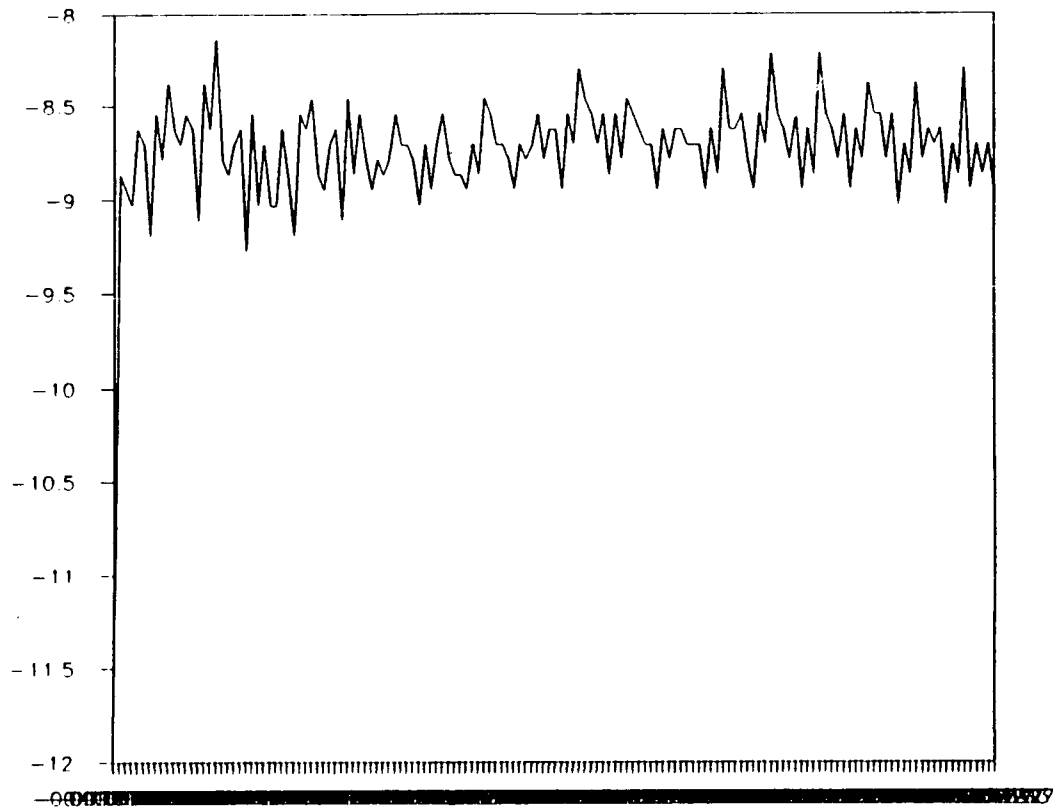
OCT16B

TWO STRIP UNWELDED CONTROL



OCT16C

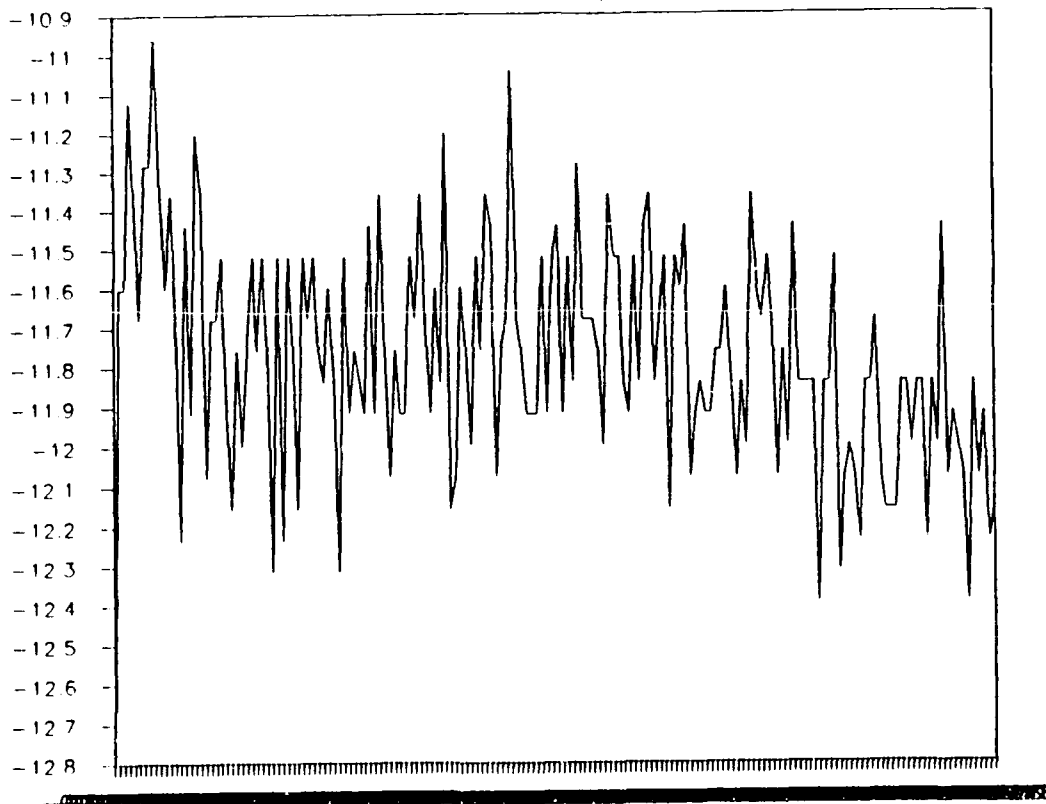
TWO STRIP 2X ICG UNWELDED CONTROL



0.30

OCT16D1

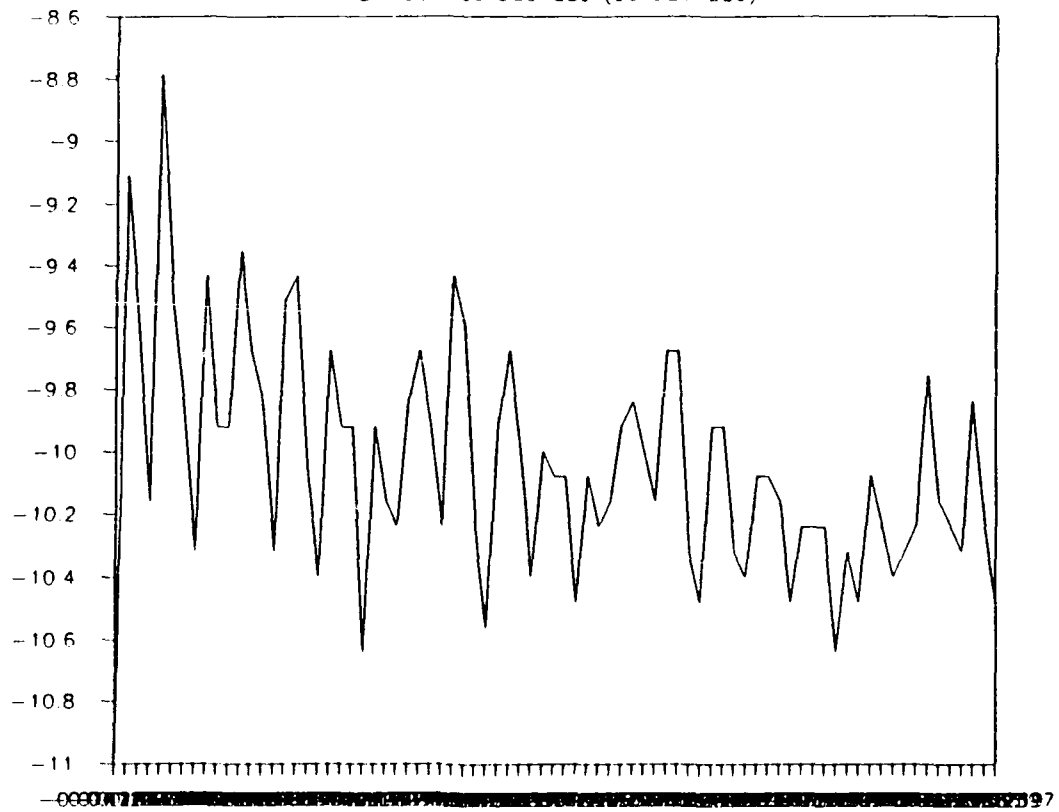
2X ICG- 50 DEGREES (44 DEGREES)



OCT16F

089

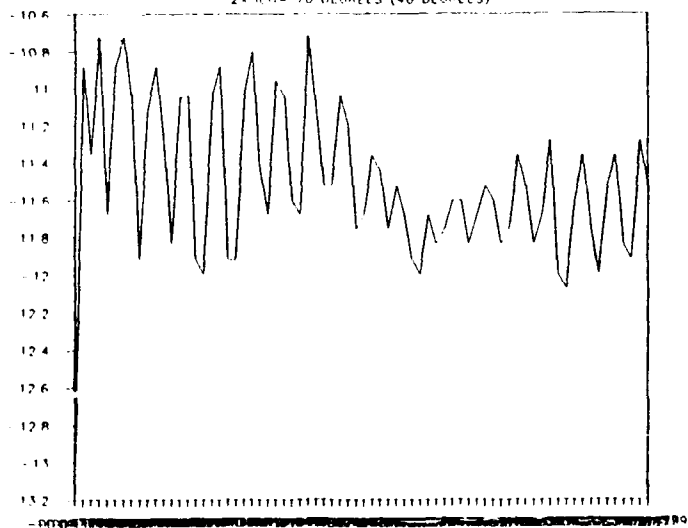
2X ICG - 60 DEGREES (53 DEGREES)

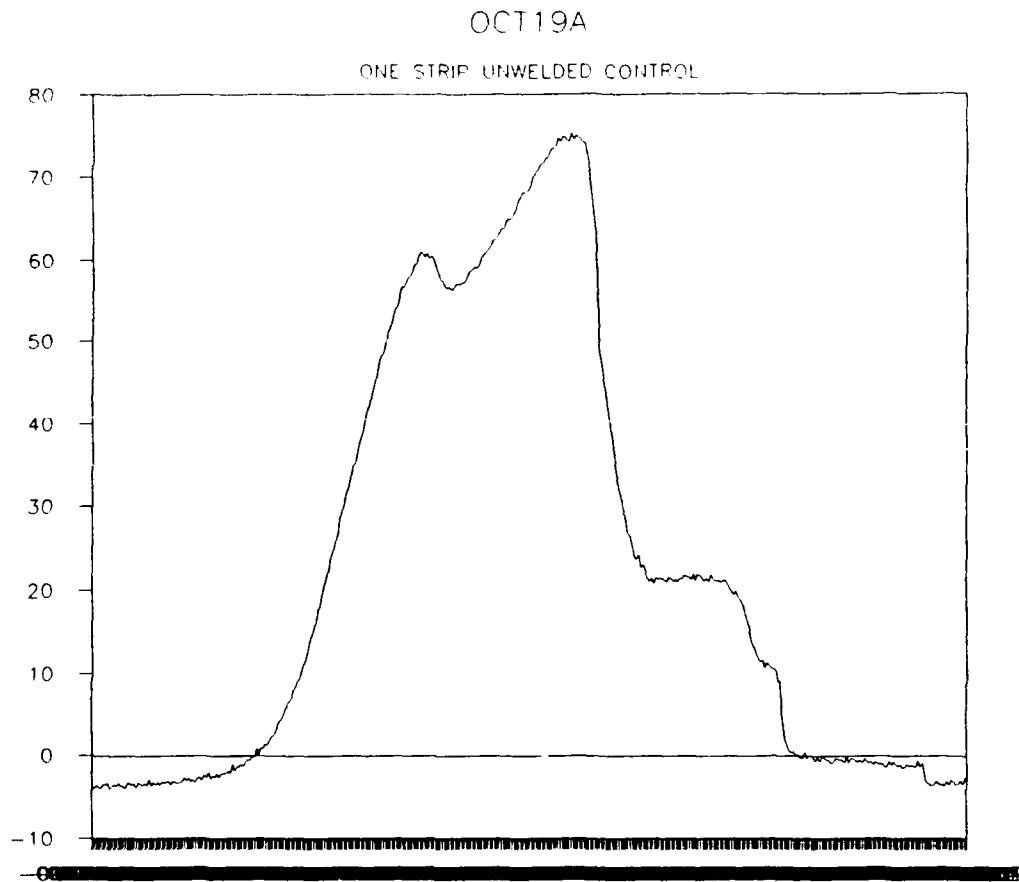


OCT 16H

2X 100- 70 DEGREES (46 DEGREES)

0565





For all trials on OCT 19, 1990

Ar⁺⁺ Laser

Settings: Current Control

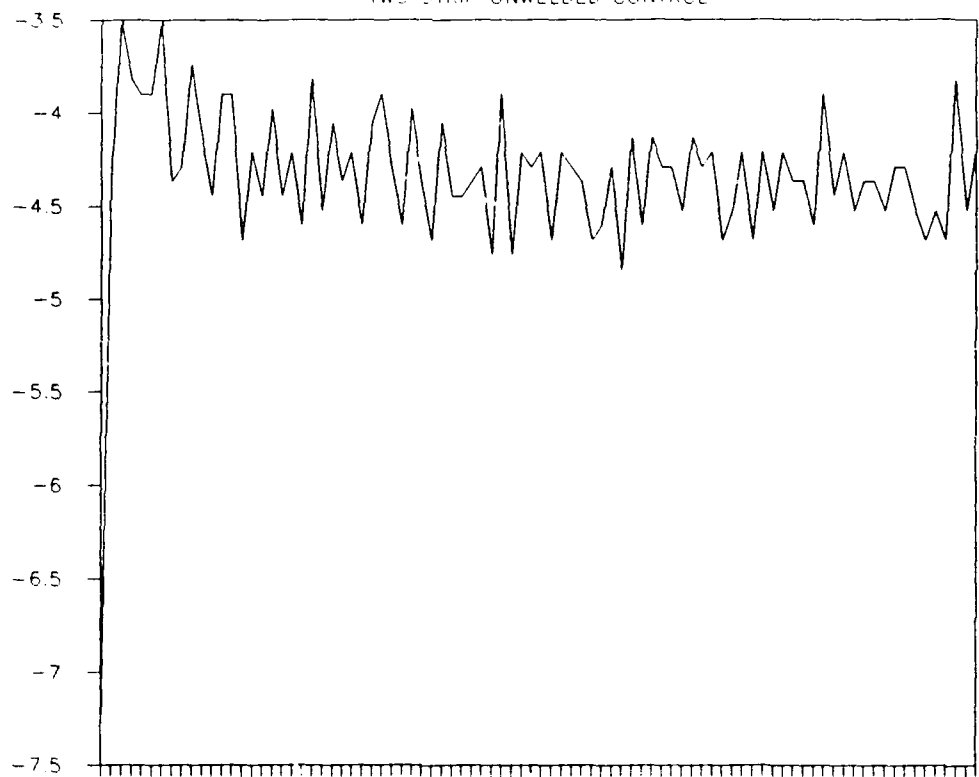
32 A, 6.0 W

0.8 W delivered

Small Aperture

OCT 19 8

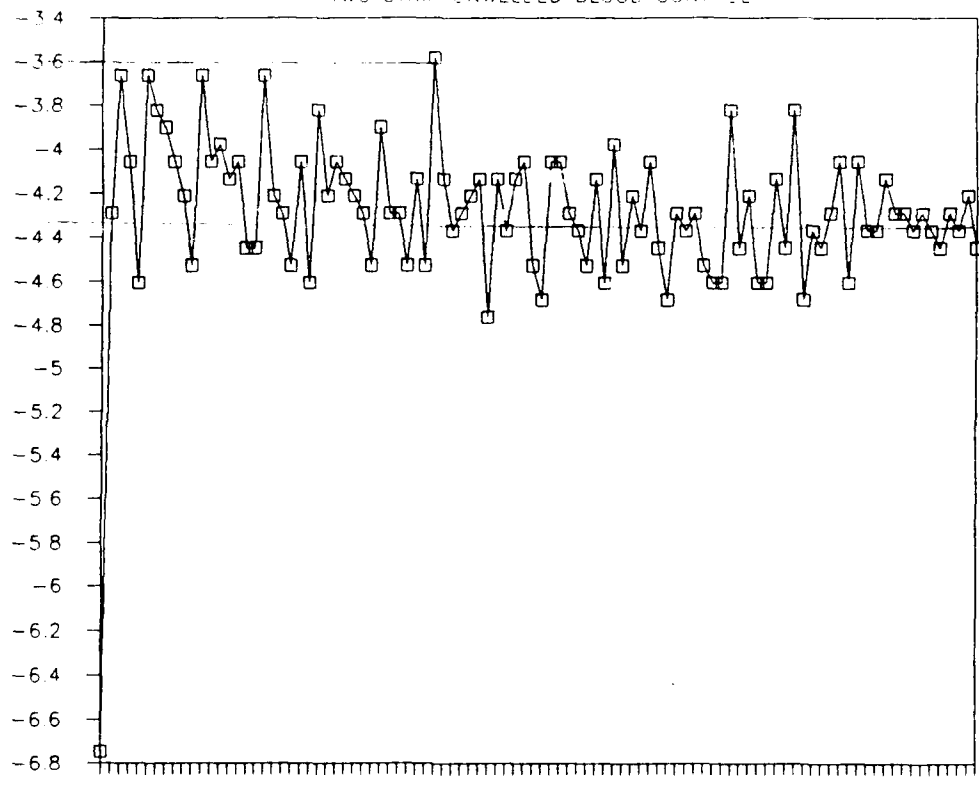
TWO STRIP UNWELDED CONTROL



~~CONFIDENTIAL~~

OCT19C

TWO STRIP UNWELDED BLOOD CONTROL

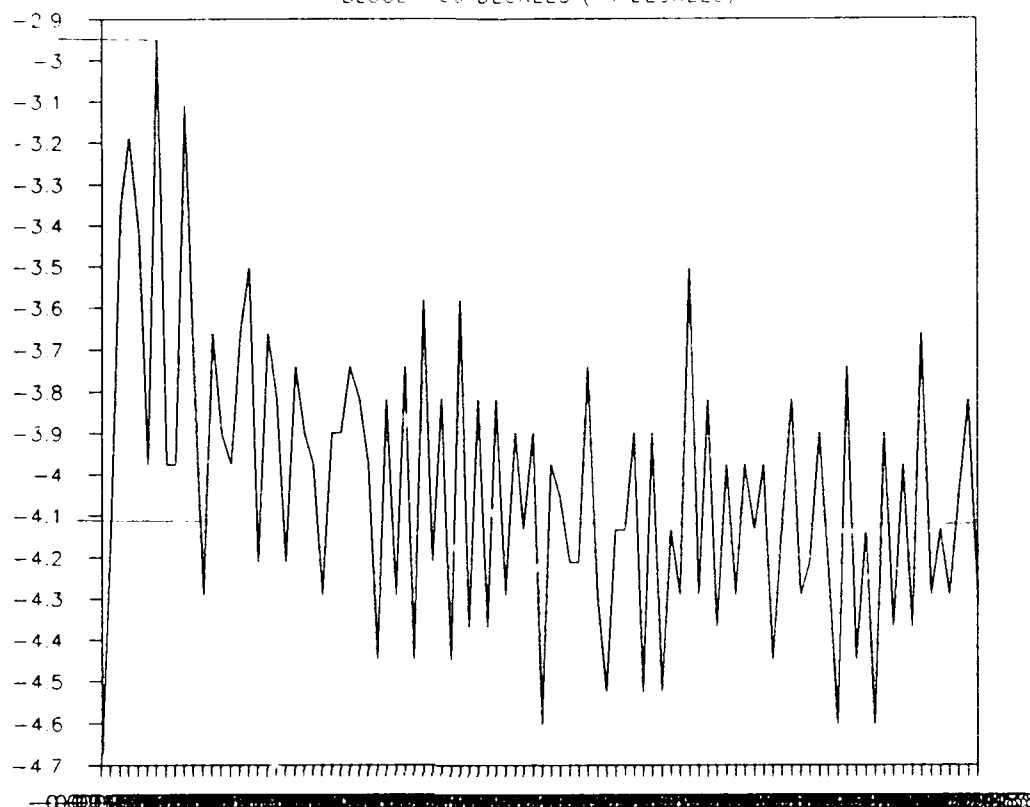


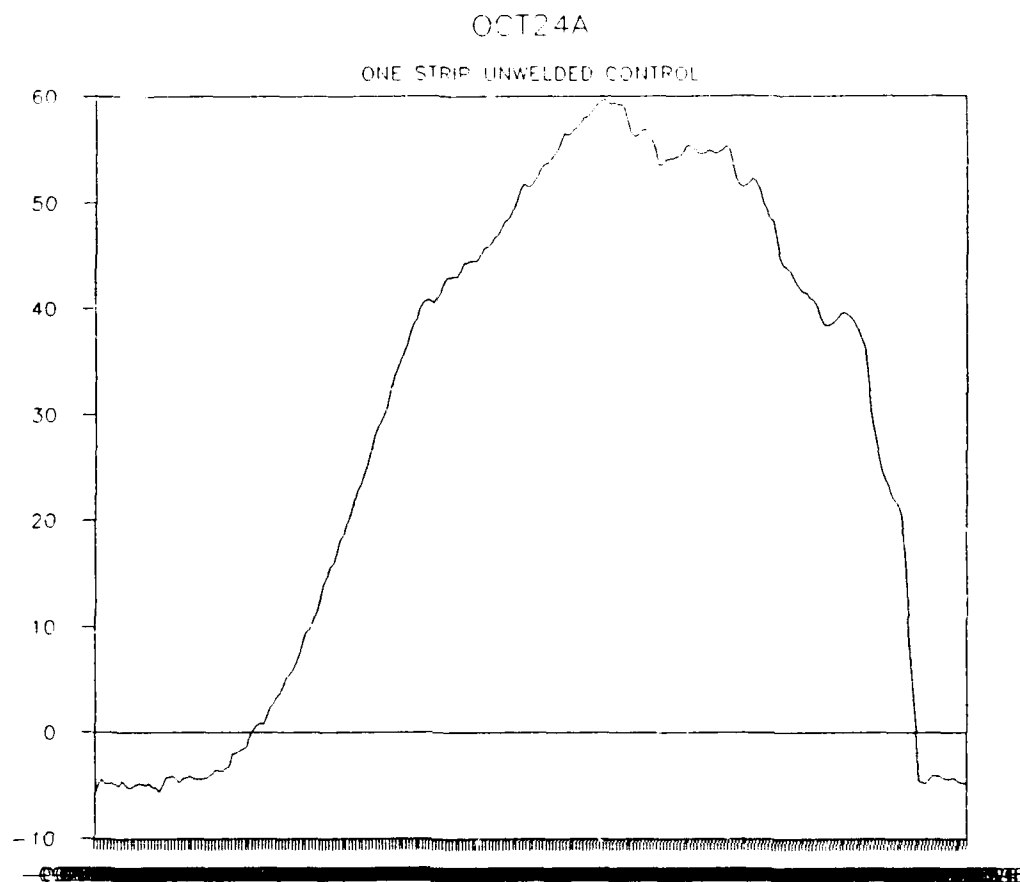
090010 100000 110000 120000 130000 140000 150000 160000 170000 180000 190000 200000 210000 220000 230000 240000 250000 260000 270000 280000 290000 300000 310000 320000 330000 340000 350000 360000 370000 380000 390000 400000 410000 420000 430000 440000 450000 460000 470000 480000 490000 500000 510000 520000 530000 540000 550000 560000 570000 580000 590000 600000 610000 620000 630000 640000 650000 660000 670000 680000 690000 700000 710000 720000 730000 740000 750000 760000 770000 780000 790000 800000 810000 820000 830000 840000 850000 860000 870000 880000 890000 900000 910000 920000 930000 940000 950000 960000 970000 980000 990000 1000000

C.3a

OCT19D1

BLOOD- 50 DEGREES (44 DEGREES)





For all trials on OCT 24, 1996

Ar⁺⁺ Laser

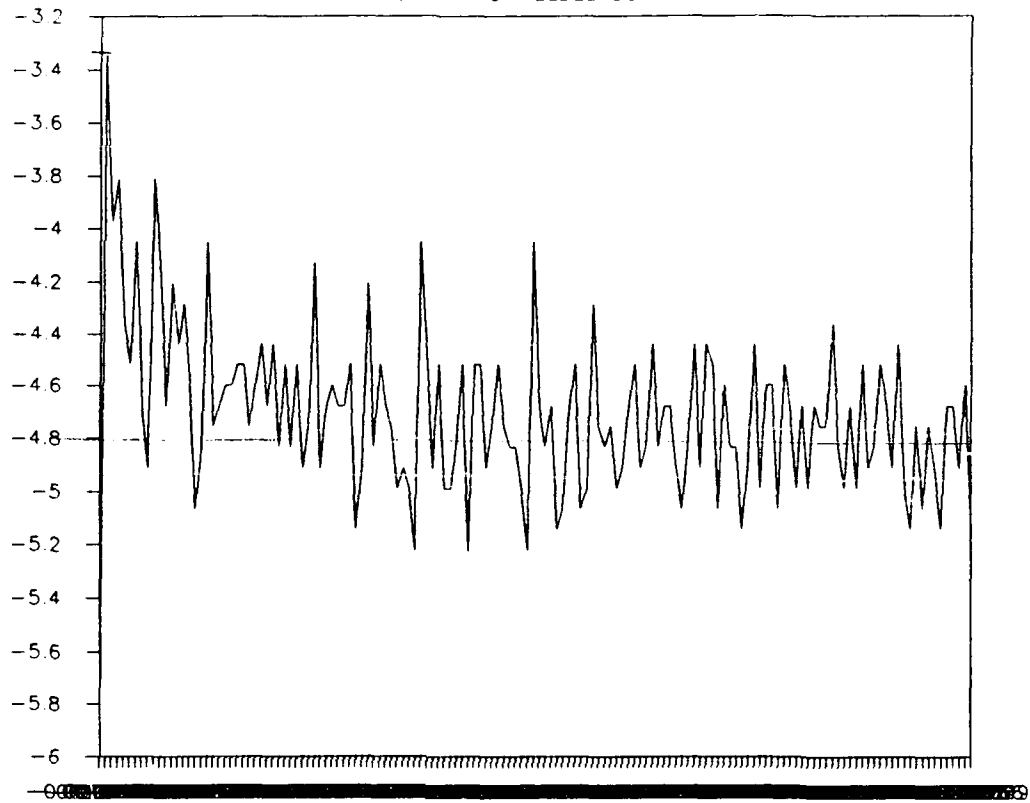
Settings: Current Control

38A, 5.6W

0.7 W delivered
Small Aperture

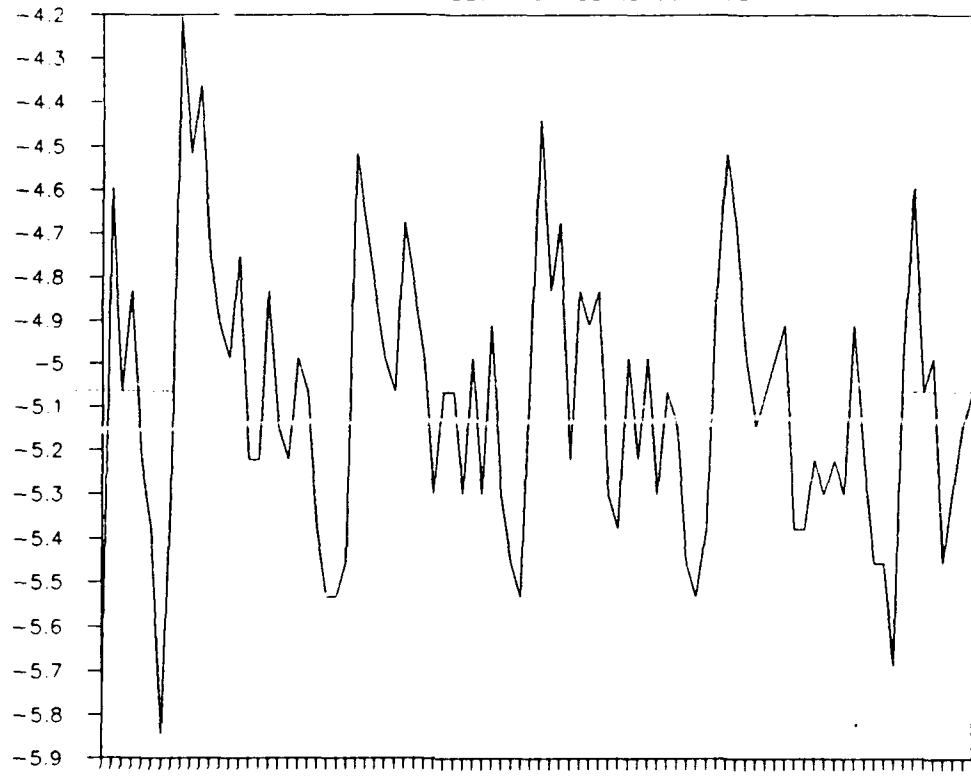
OCT24B

TWO STRIP UNWELDED CONTROL



OCT24C

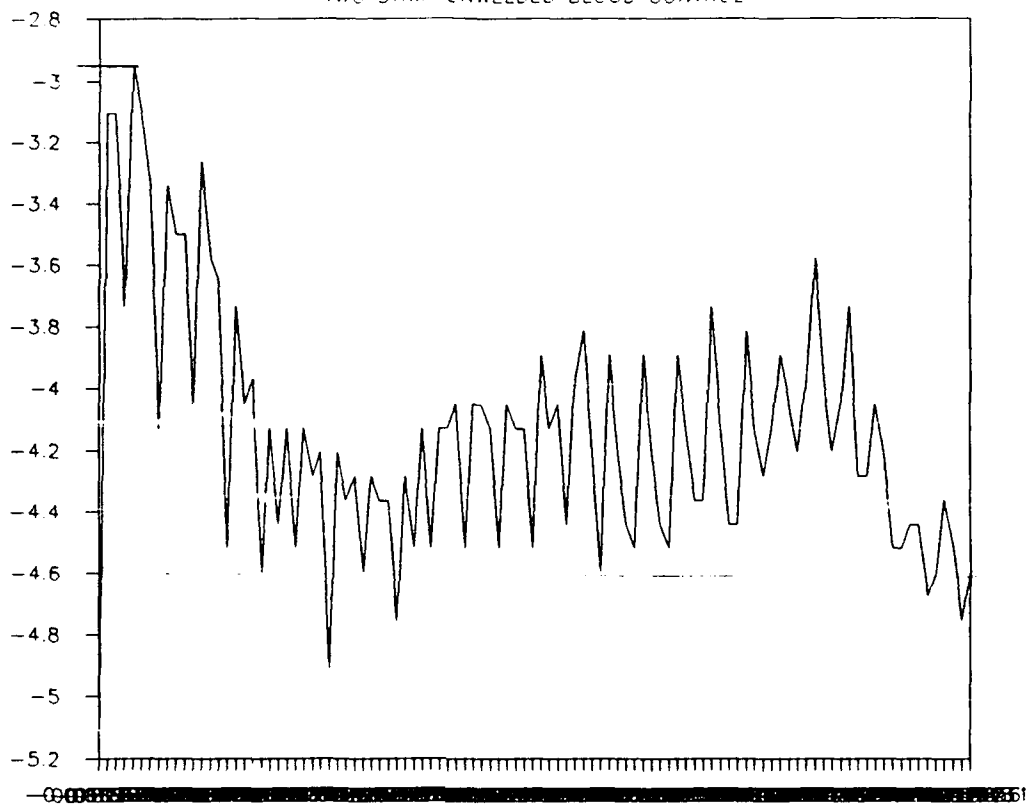
TWO STRIP BLOOD UNWELDED CONTROL



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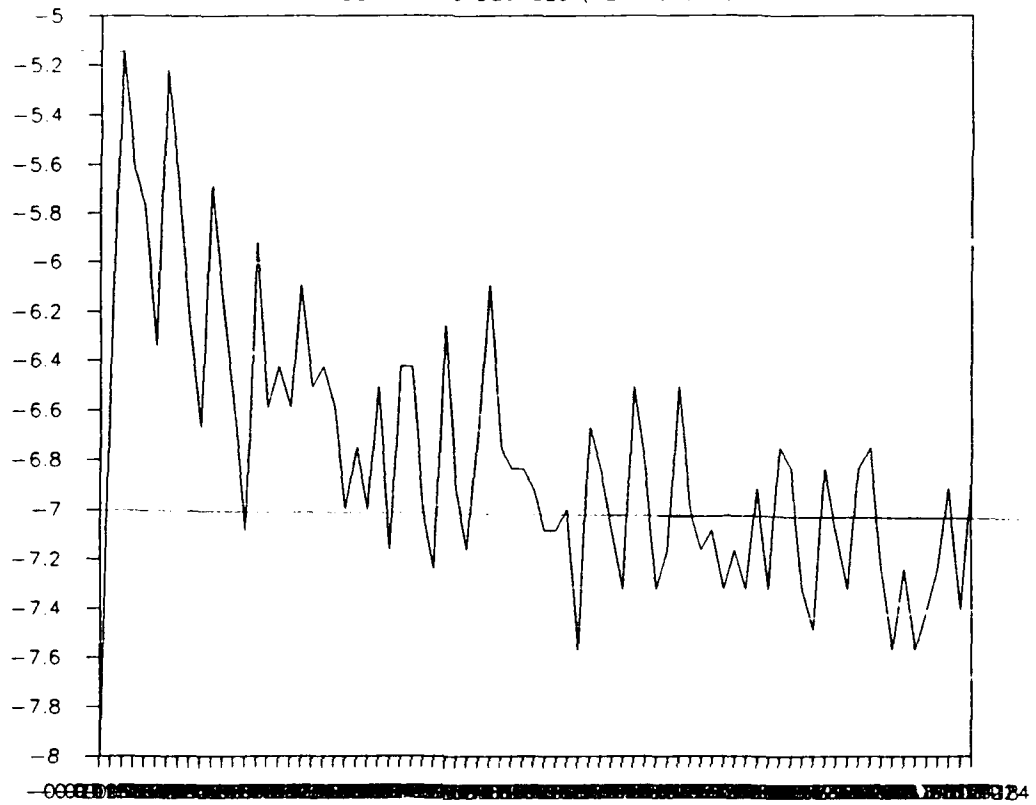
OCT24D

TWO STRIP UNWELDED BLOOD CONTROL



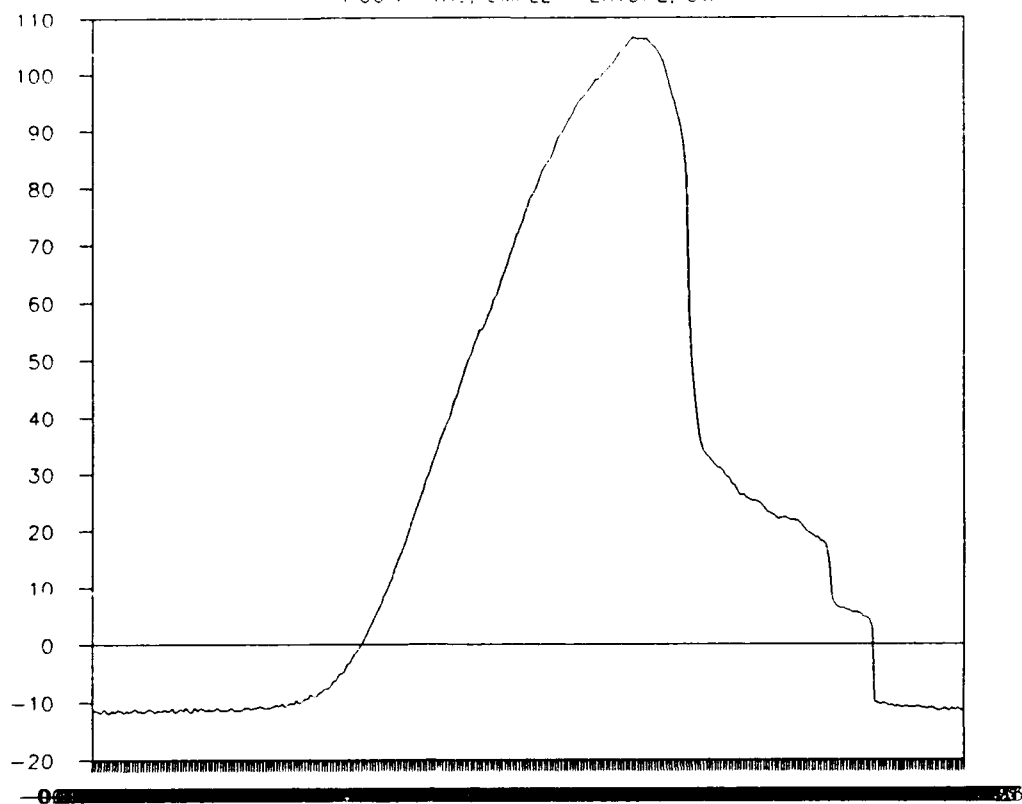
OCT24E1

BLOOD- 50 DEGREES (42 DEGREES)



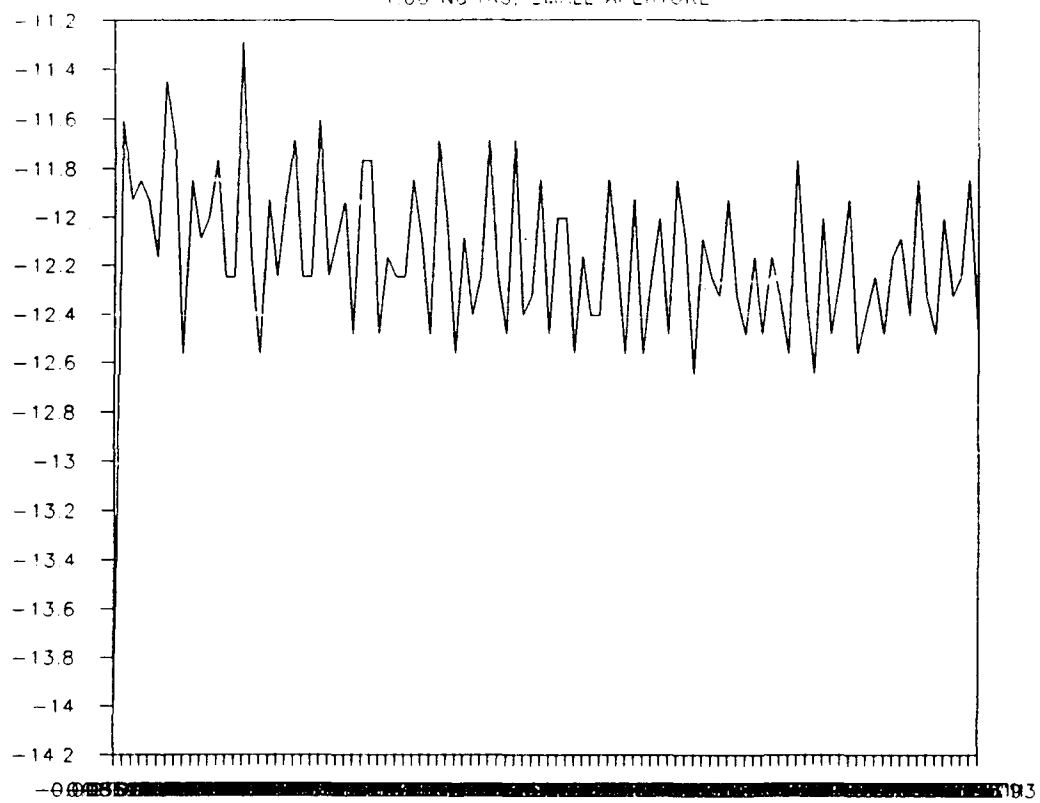
NOV8A- ONE STRIP CONTROL

1.06 M4YAG, SMALL APERTURE, 5W



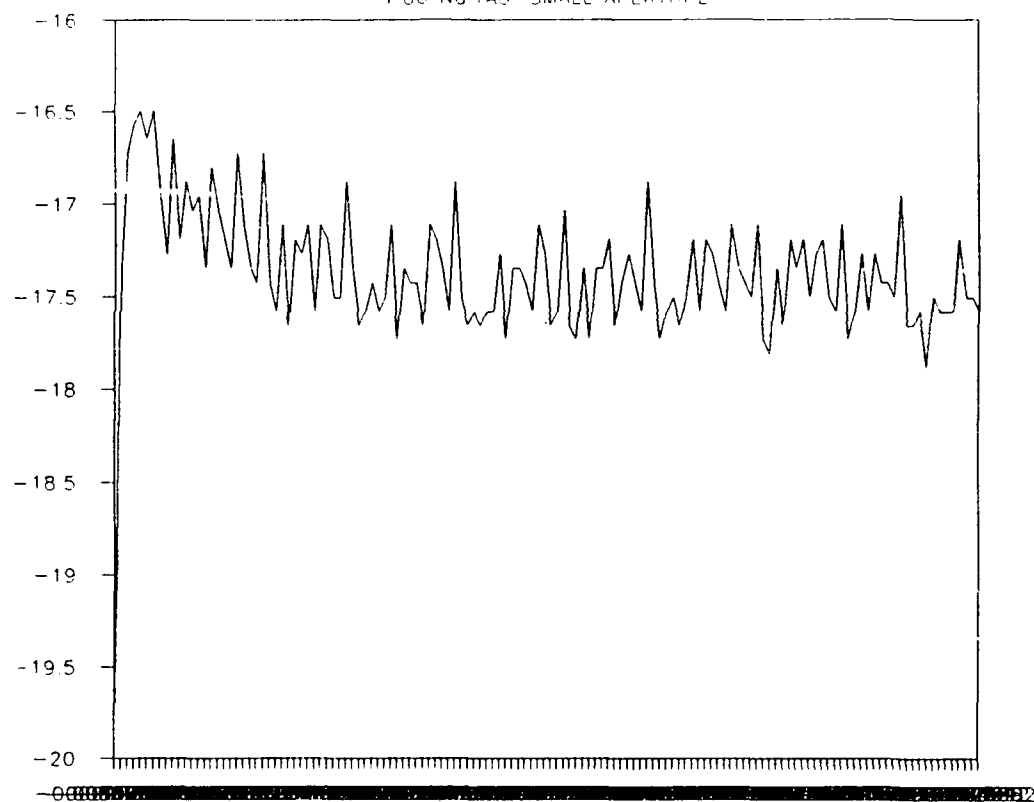
NOV80- INDIA INK UNWELDED CONTROL

1.05 ND TAG, SMALL APERTURE



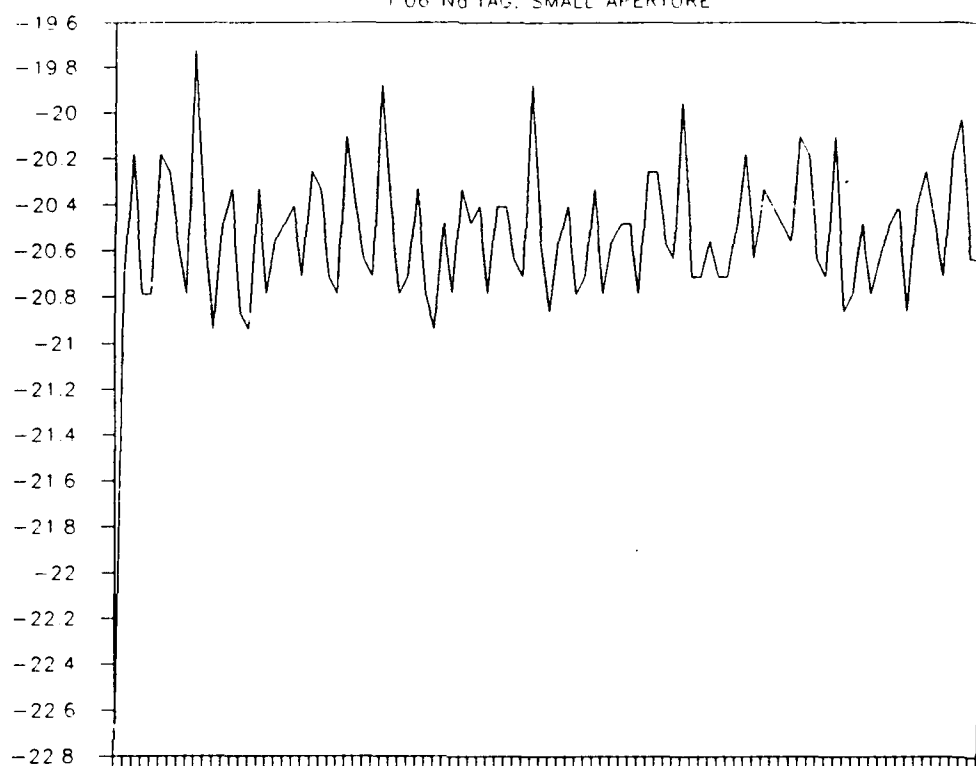
NOV8D- INDIA INK CONTROLLED AT 50

1.06 Nd:YAG SMALL APERTURE



NOVBE- INDIA INK CONTROLLED AT 60

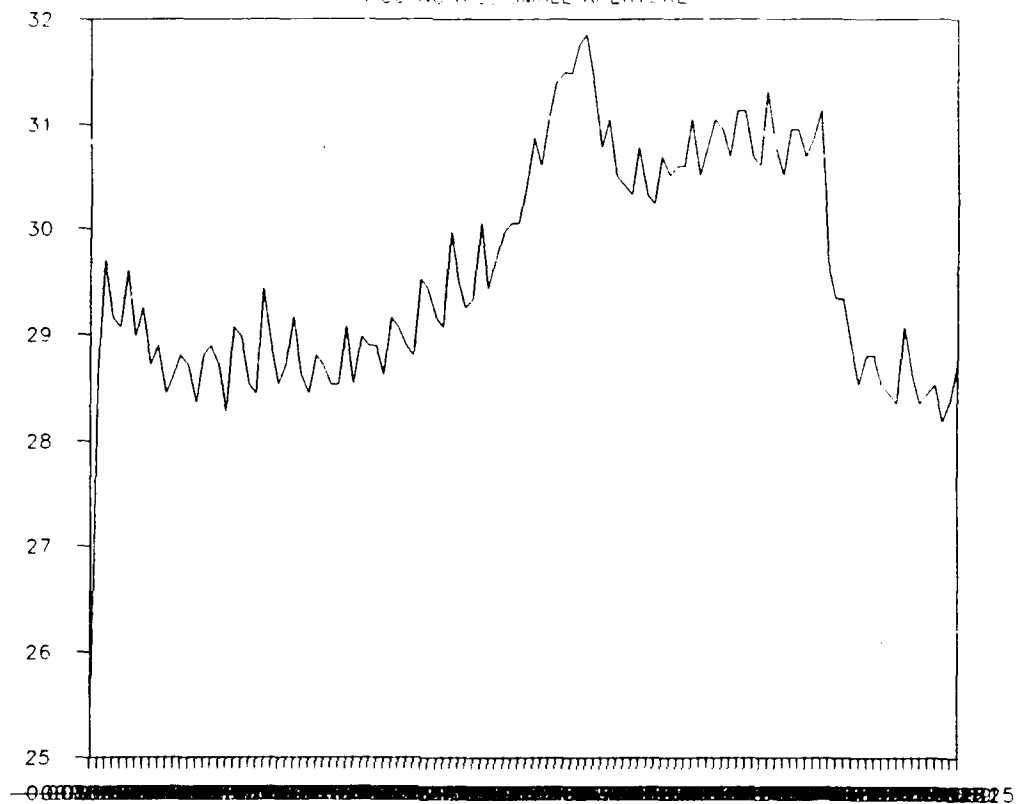
1.06 Nd TAG. SMALL APERTURE



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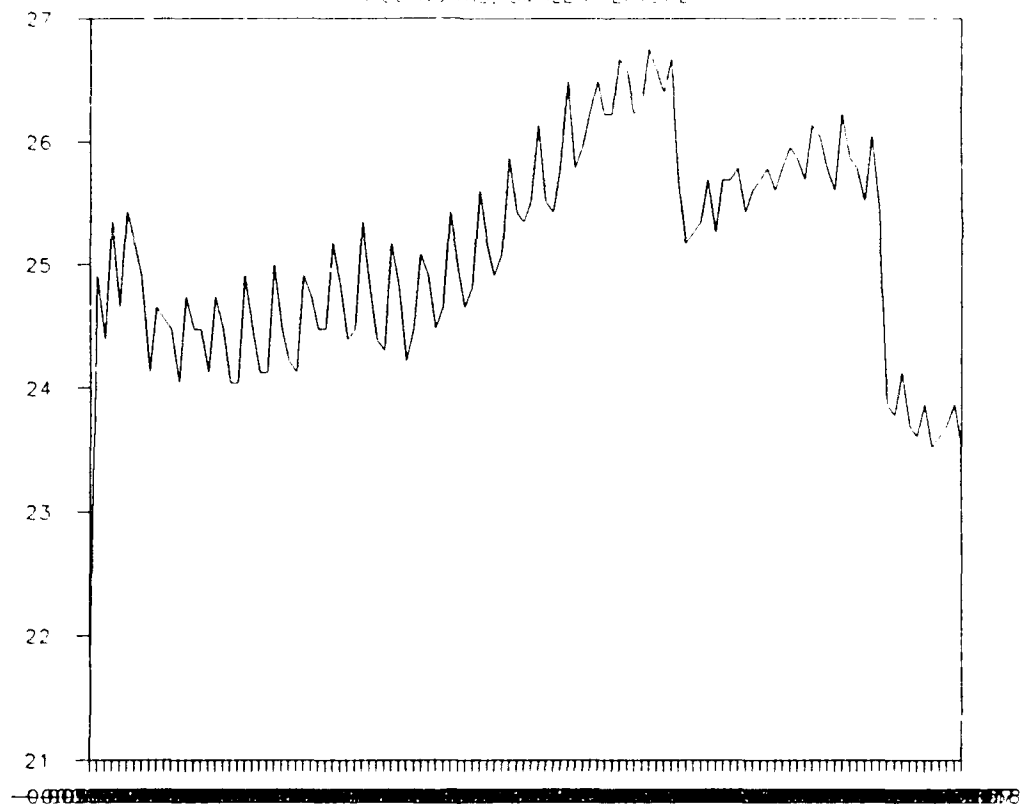
NOV8F-INDIA INK CONTROLLED AT 70

1.06 IN. (40. SMALL APERTURE



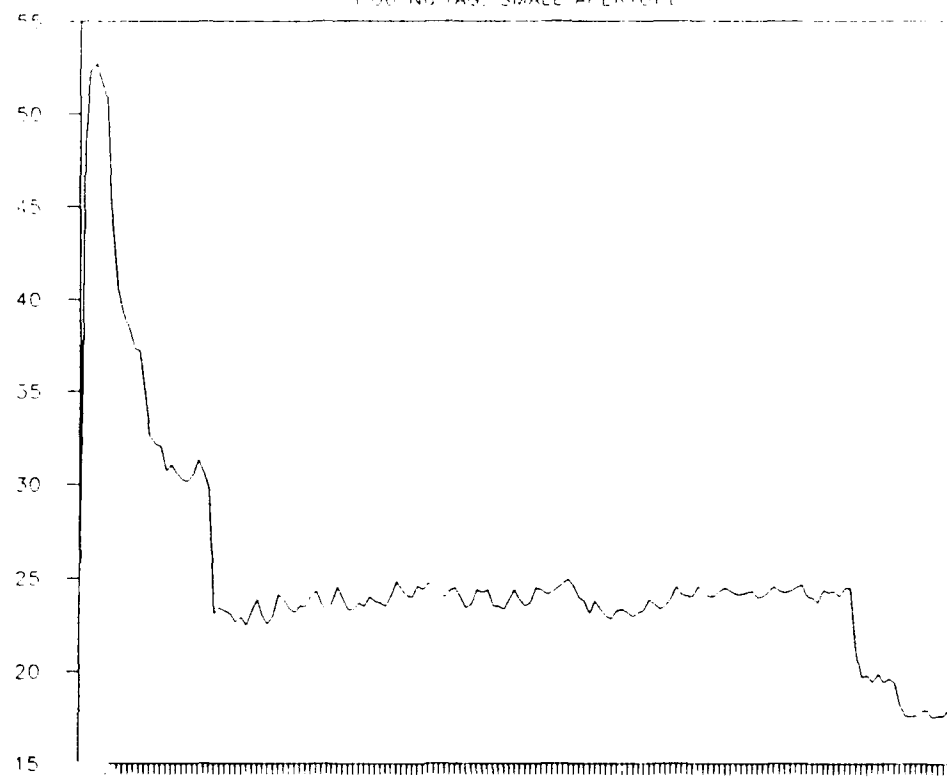
NOV8G-INDIA INK CONTROLLED AT 80

1.06 IN TAG. SMALL APERTURE



NOV8H-INDIA INK CONTROLLED AT 100

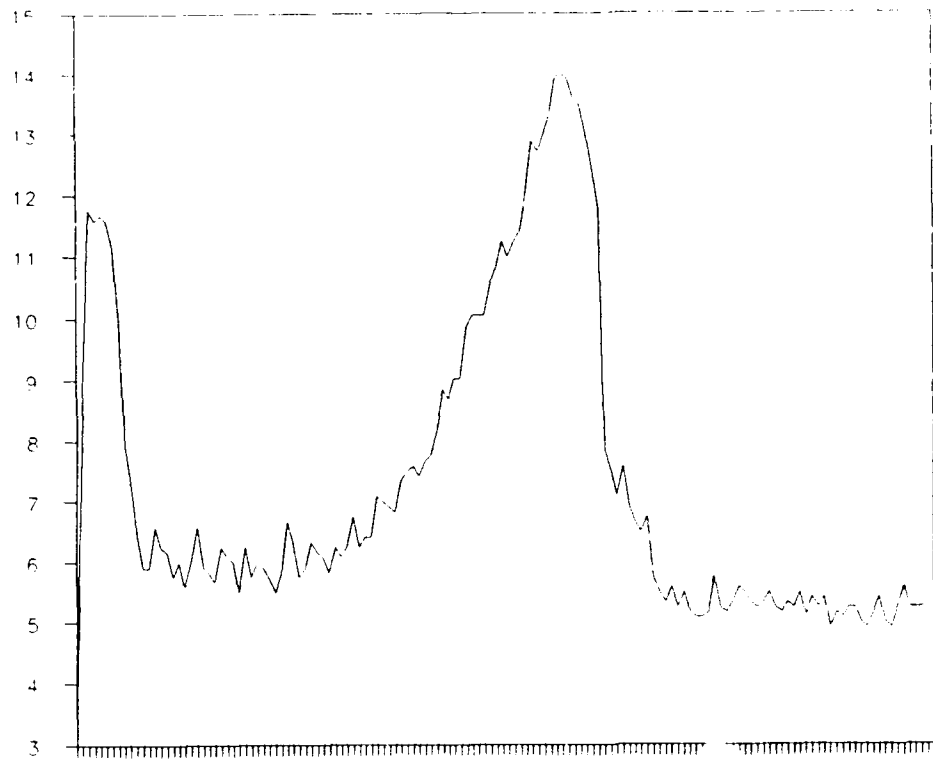
1.06 Nd:YAG, SMALL APERTURE



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NOV8.1-INDIA INK CONTROLLED AT 100

1.06 MB YAG, SMALL APERTURE

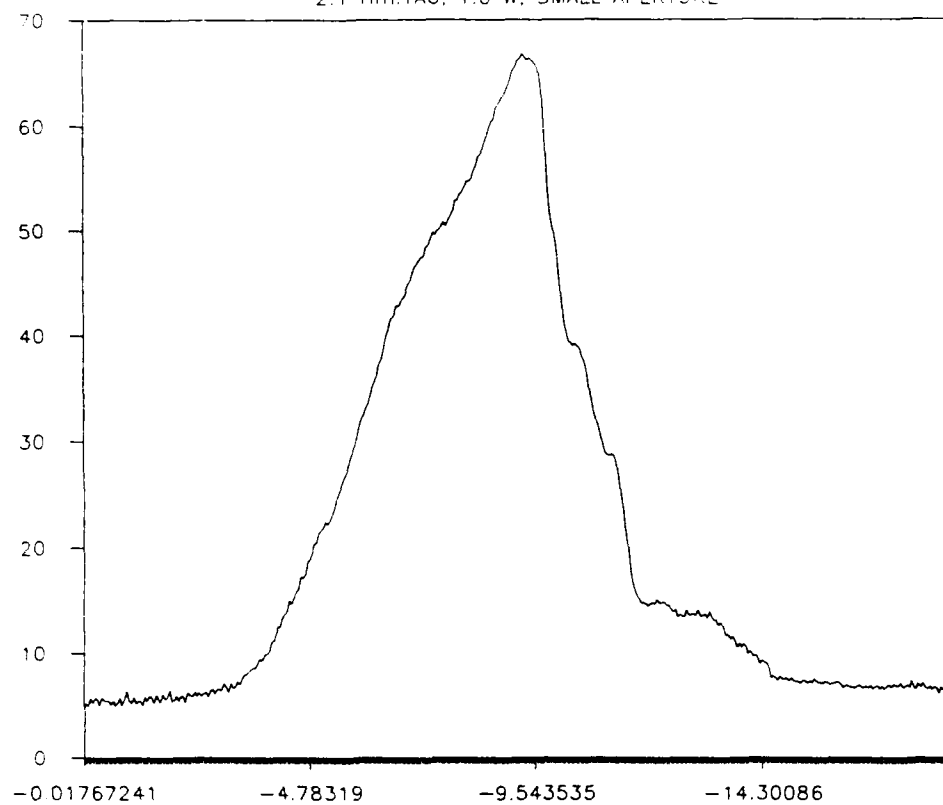


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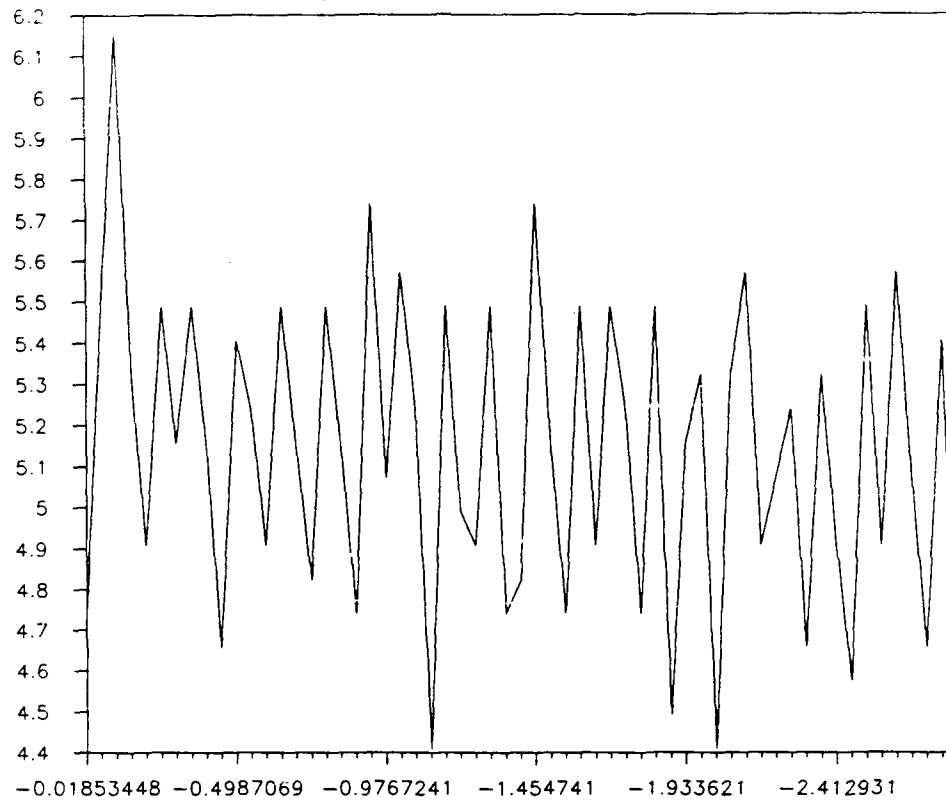
DEC17A-ONE STRIP UNWELDED CONTROL

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



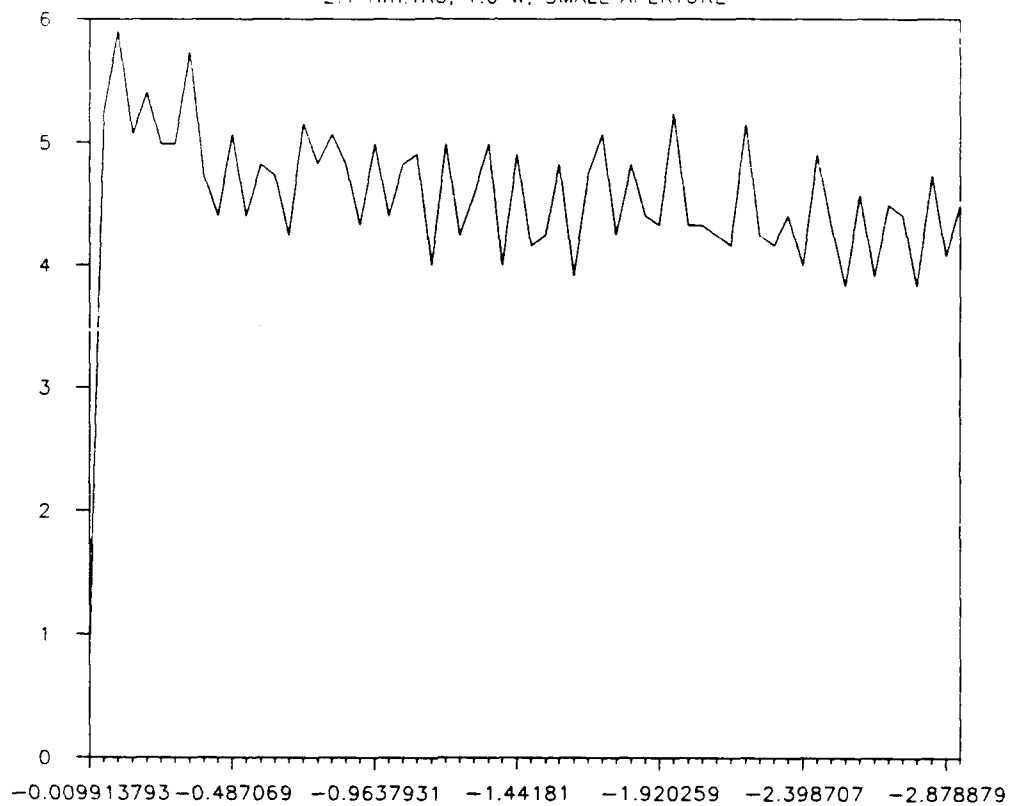
DEC17B-TWO STRIP UNWELDED CONTROL

2.1 Hm:YAG, 1.0 W SMALL APERTURE



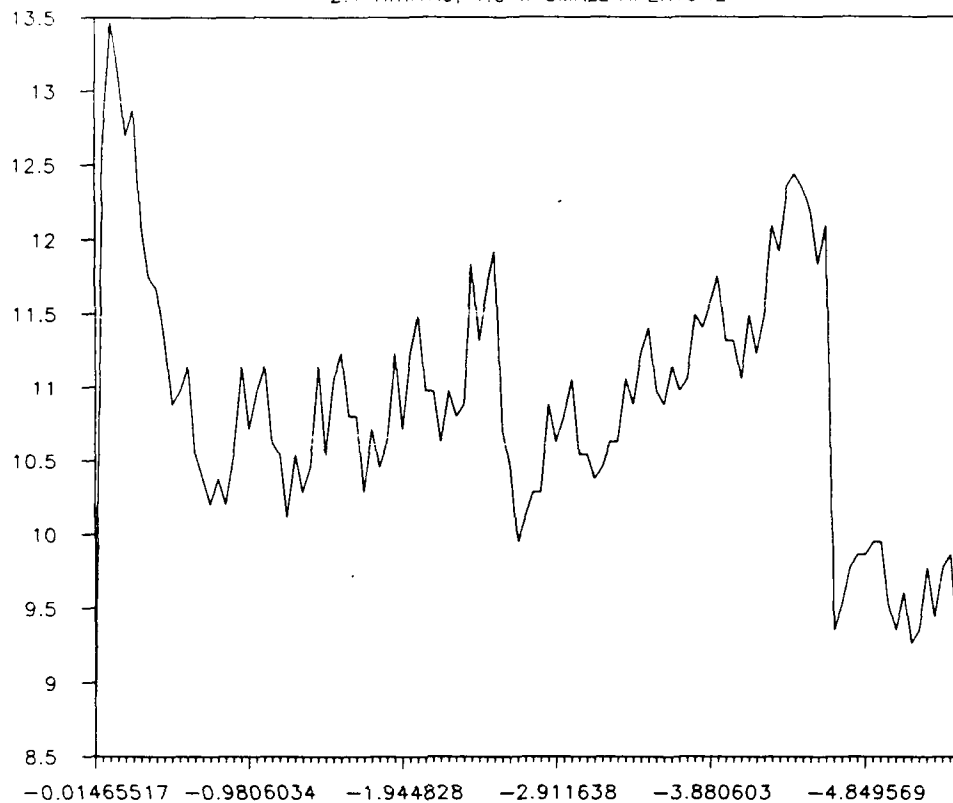
DEC17C-TWO STRIP INDIA INK UNWELDED

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



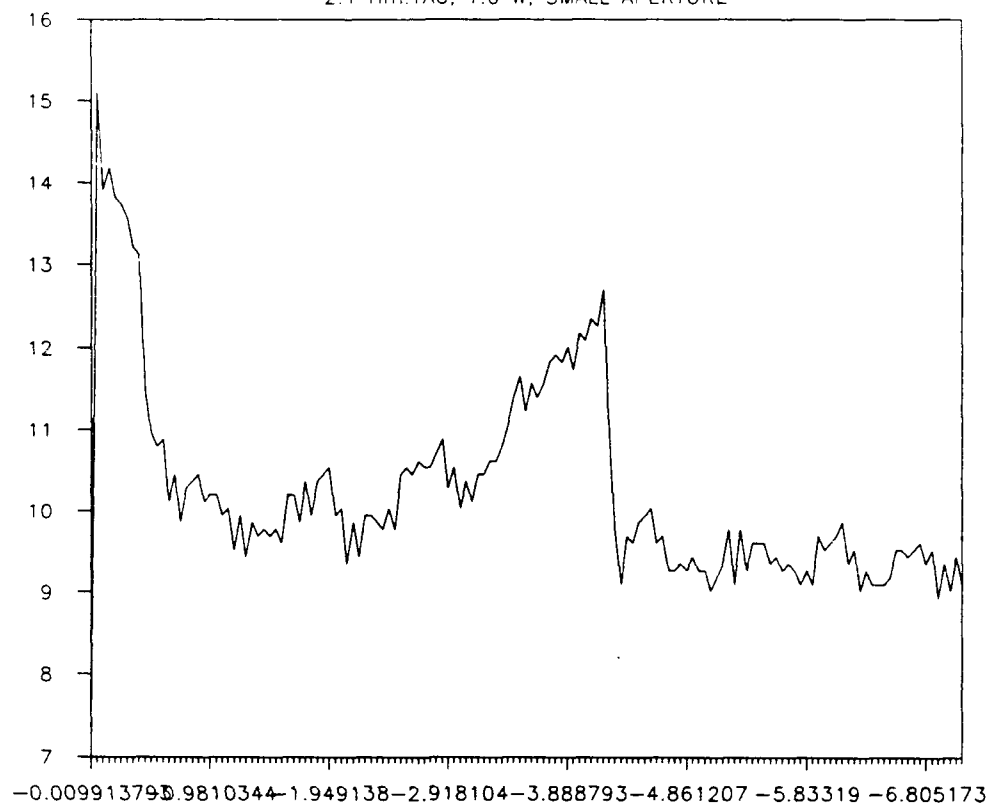
DEC17E-INDIA INK CONTROLLED AT 100

2.1 Hm:YAG, 1.0 W SMALL APERTURE



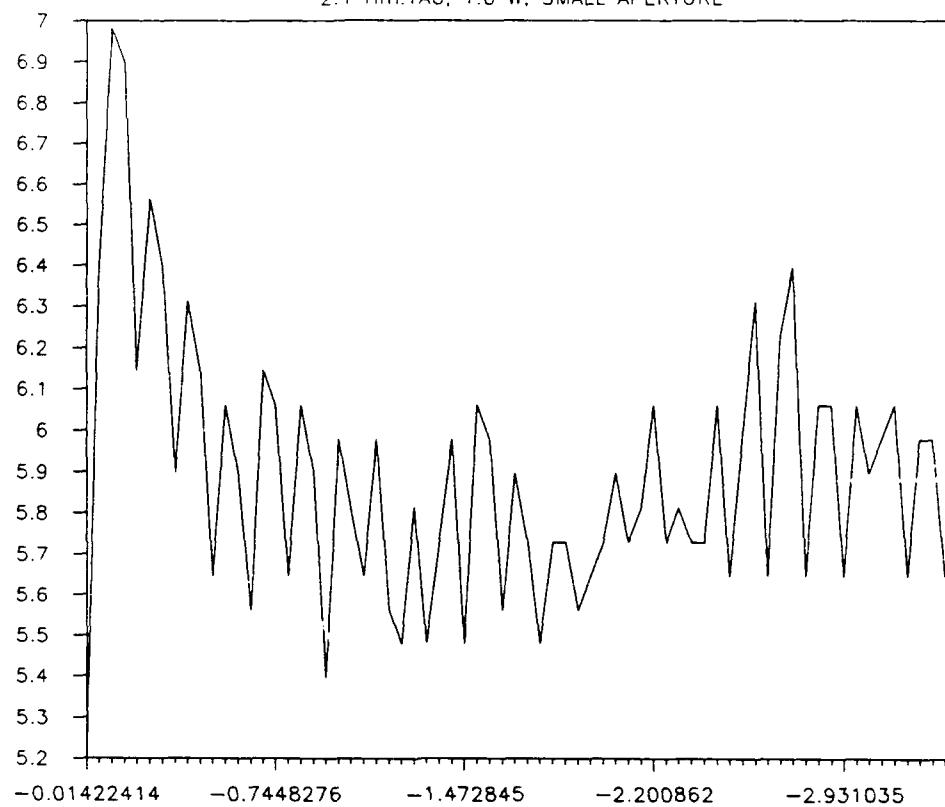
DEC17F- NO CHROMO SET=100, TC MAX=70

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



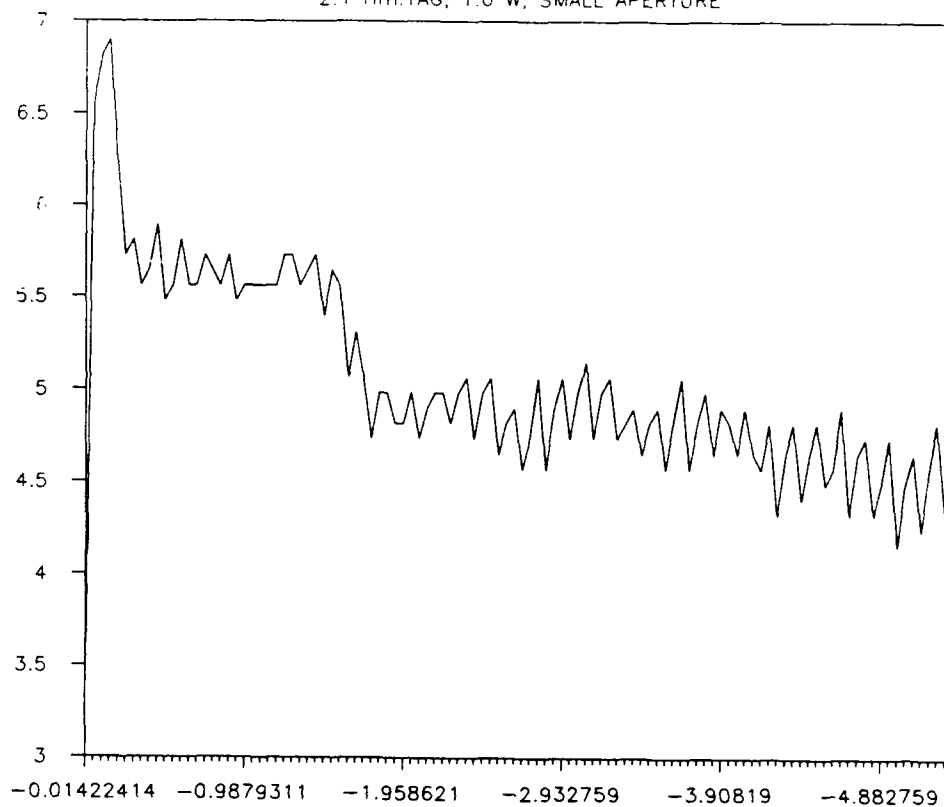
DEC17G-INDIA INK CONTROLLED AT 50, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



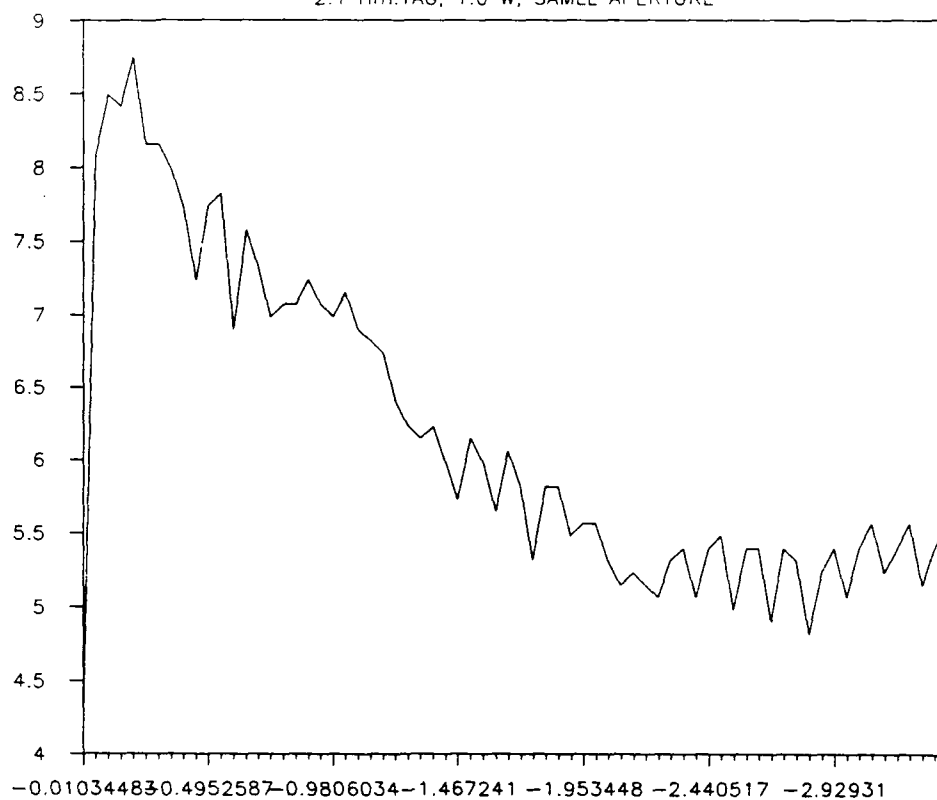
DEC17H-INDIA INK CONTROLLED AT 60, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



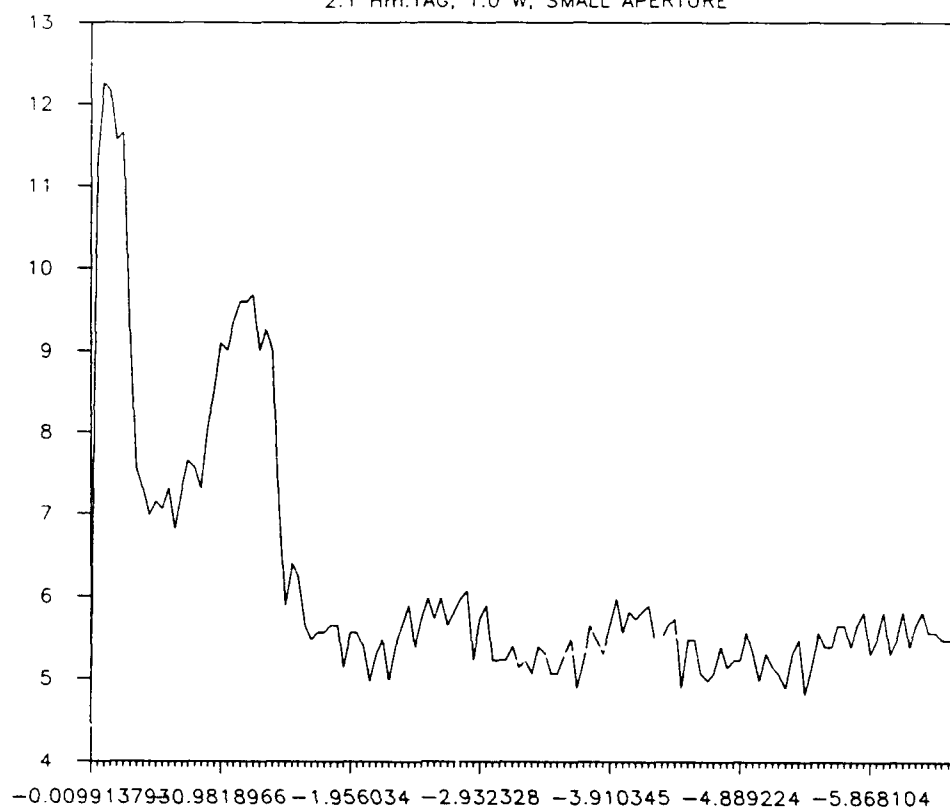
DEC17I-INDIA INK CONTROLLED AT 70, 10 s

2.1 Hm:YAG, 1.0 W, SAMLL APERTURE



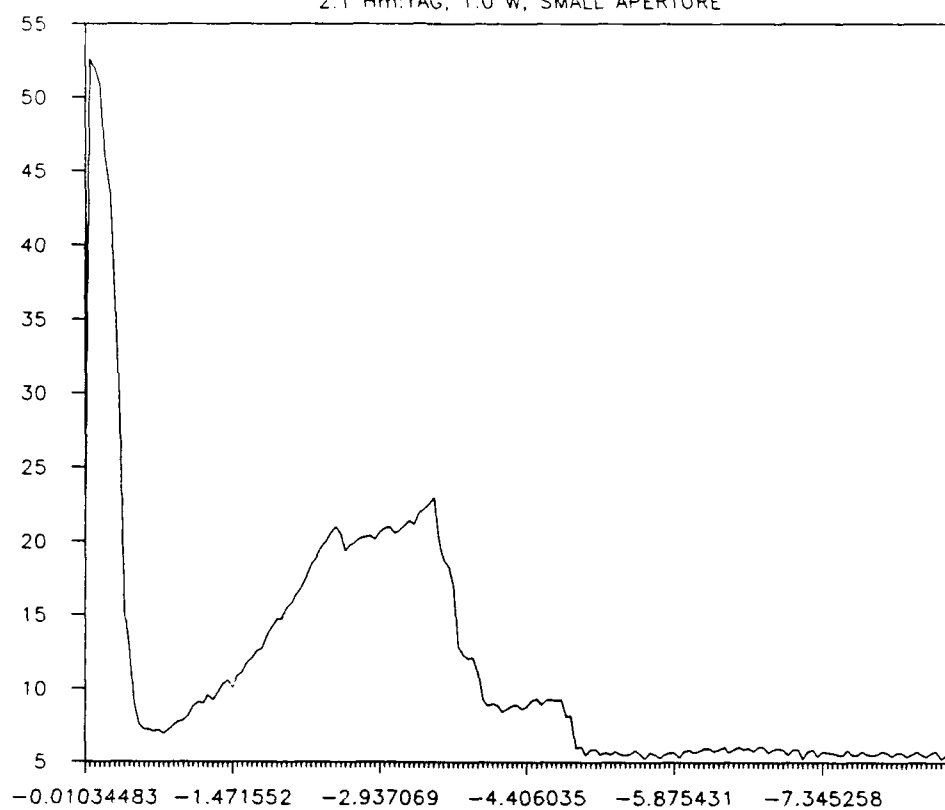
DEC17J-INDIA INK CONTROLLED AT 80, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



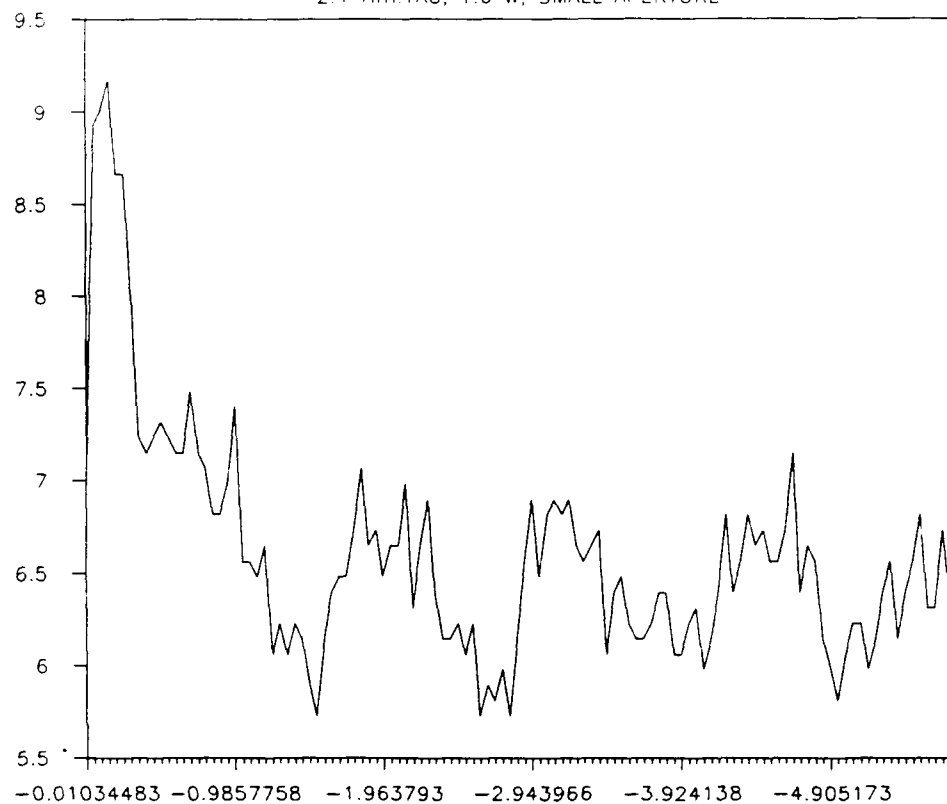
DEC17K-INDIA INK CONTROLLED AT 100, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



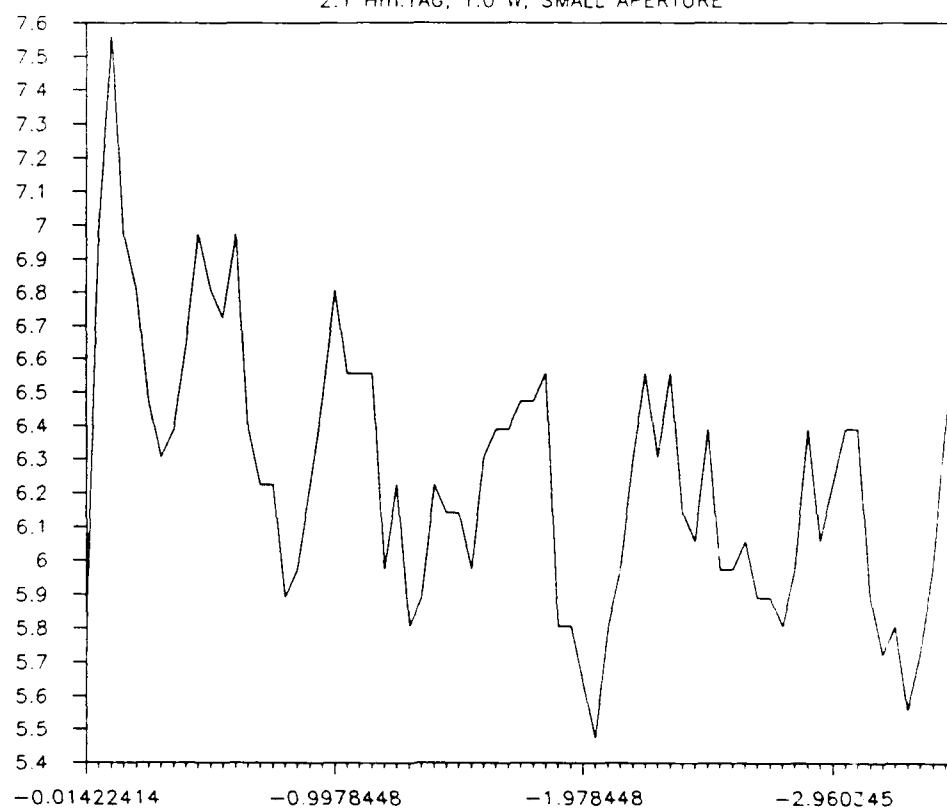
DEC17L-INDIA INK CONTROLLED AT 100, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



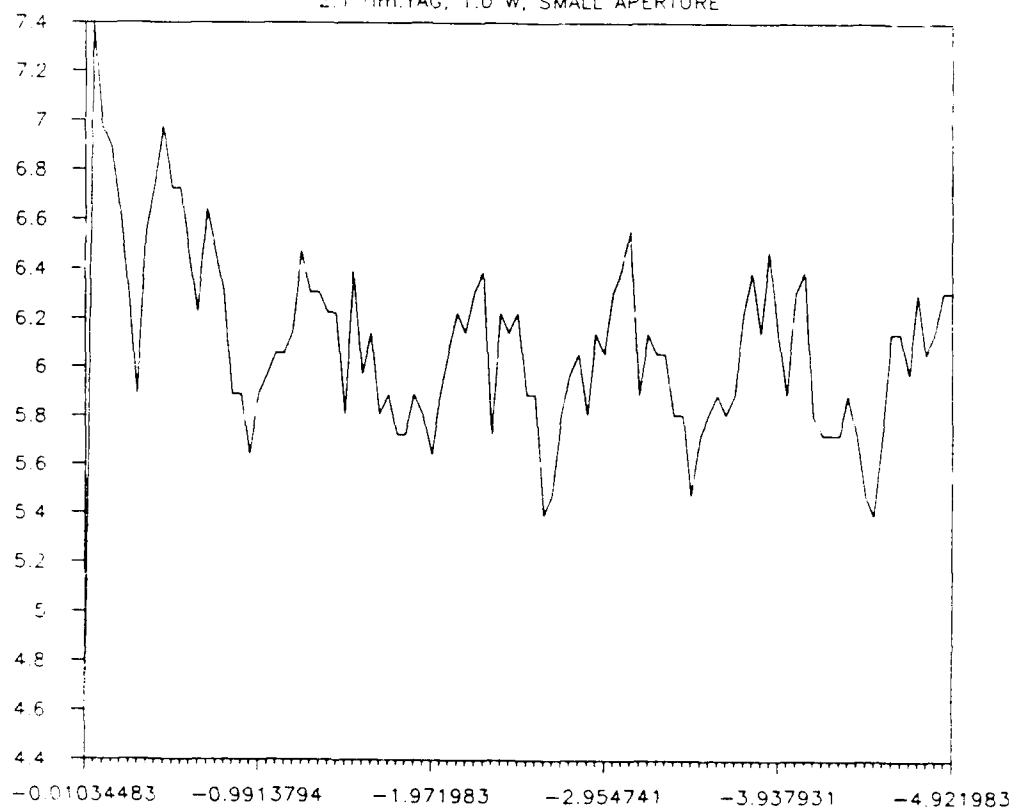
DEC17M-NO CHROMO, CONTROLLED AT 50, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



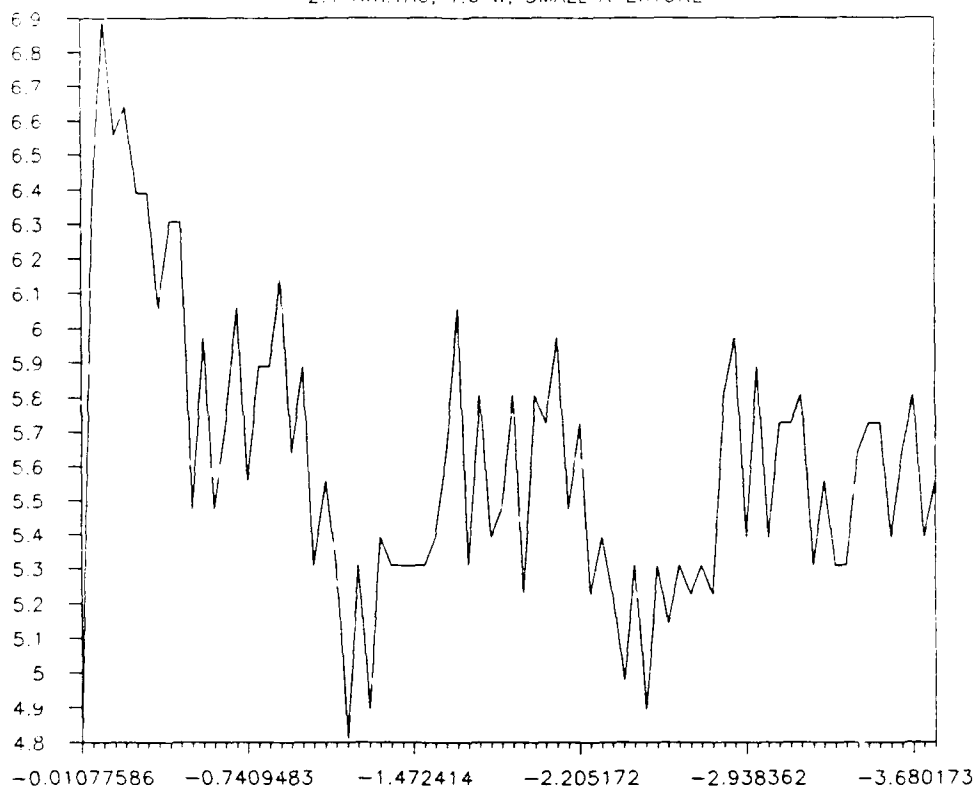
DEC17N-NO CHROMO CONTROLLED AT 60, 10s

2.1 μ m:YAG, 1.0 W, SMALL APERTURE



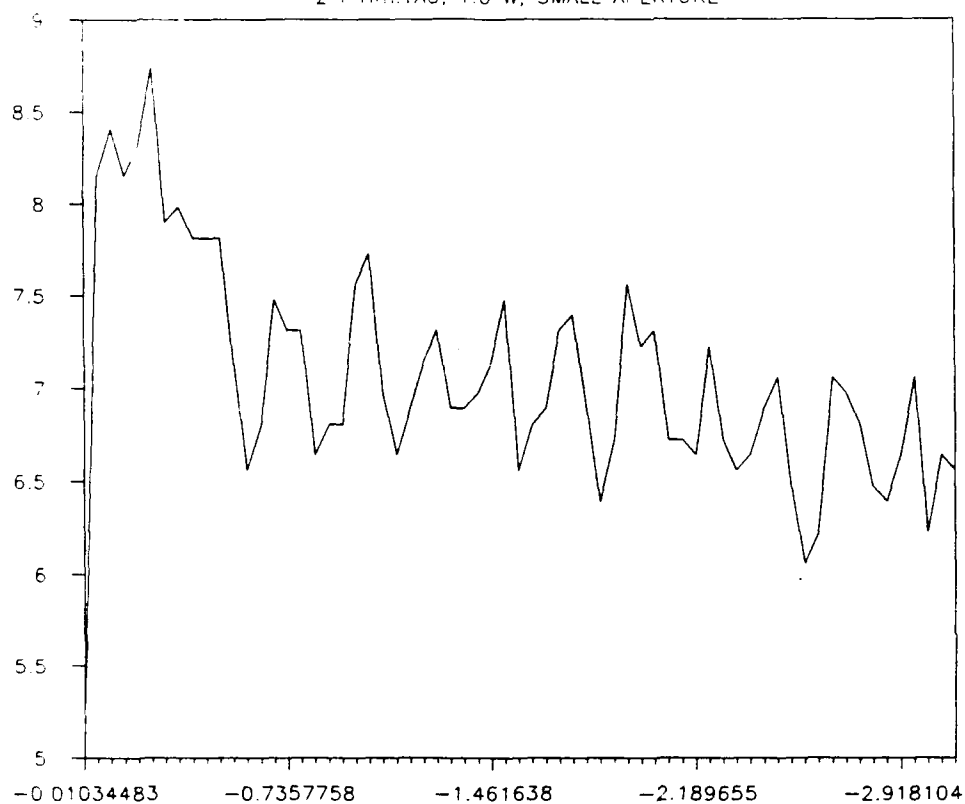
DEC170-NO CHROMO CONTROLLED AT 70, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



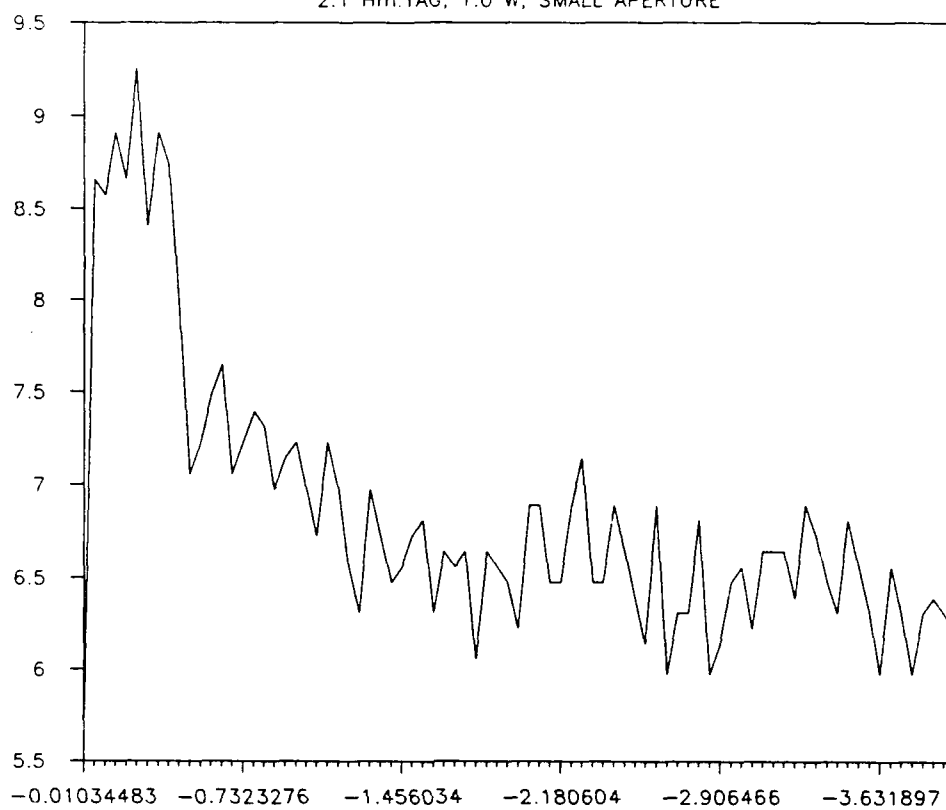
DEC17P-NO CHROMO CONTROLLED AT 80, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



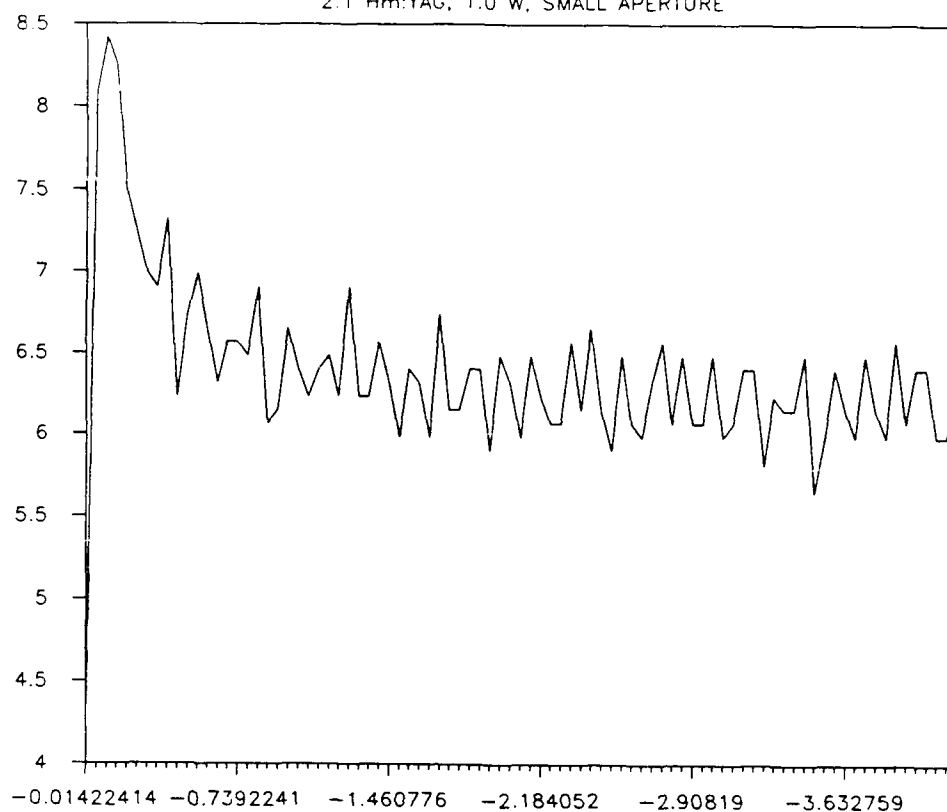
DEC17Q-NO CHROMO CONTROLLED AT 100, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



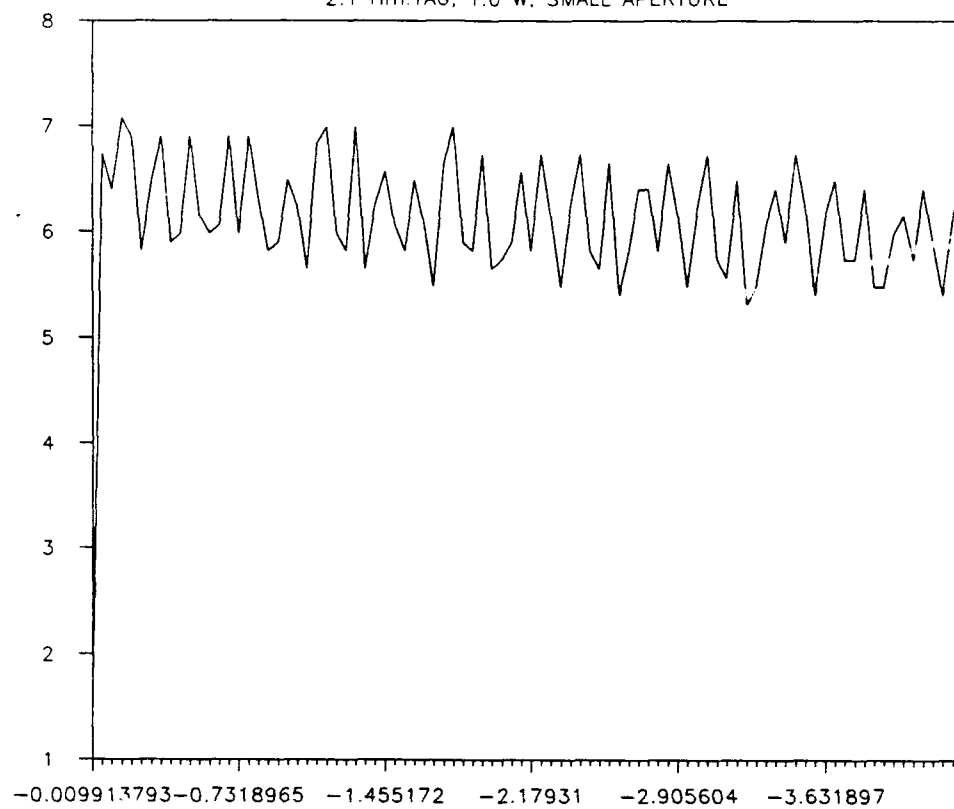
DEC17R-2X ICG CONTROLLED AT 50, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



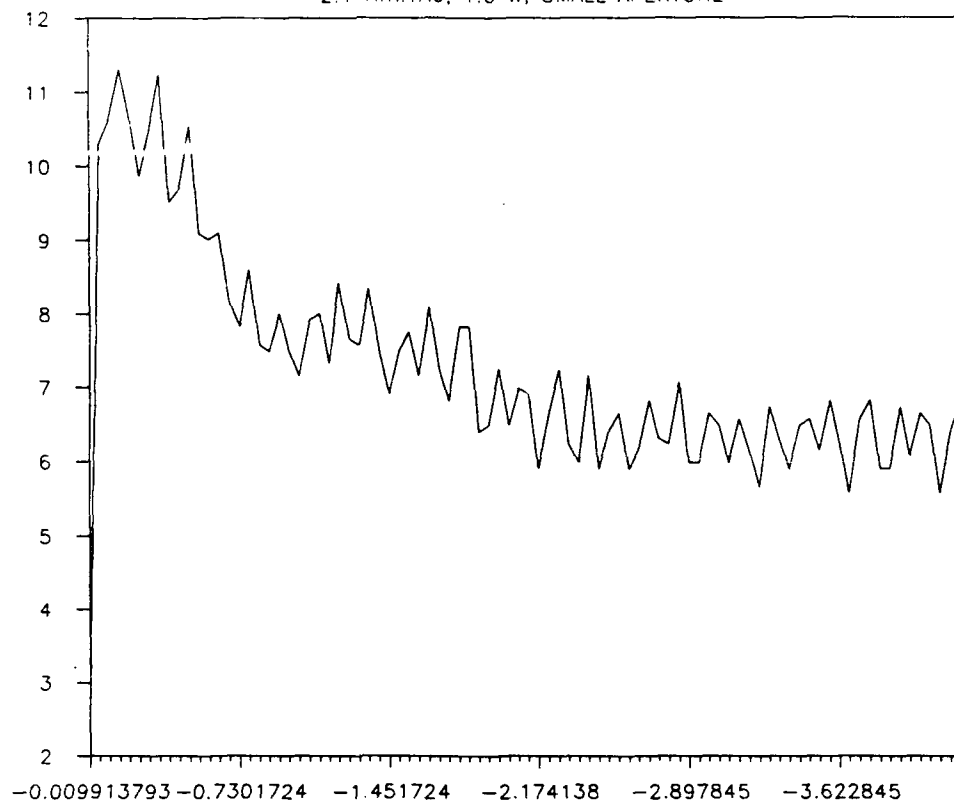
DEC17S- 2X ICG CONTROLLED AT 60, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



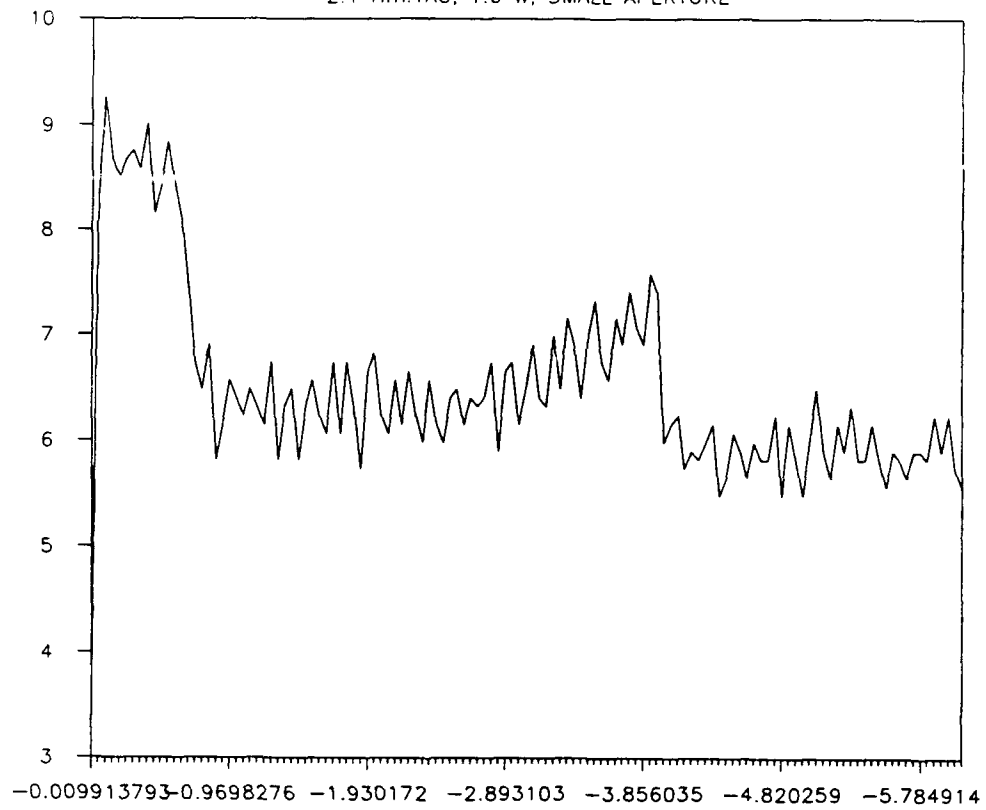
DEC17T-2X ICG CONTROLLED AT 70, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



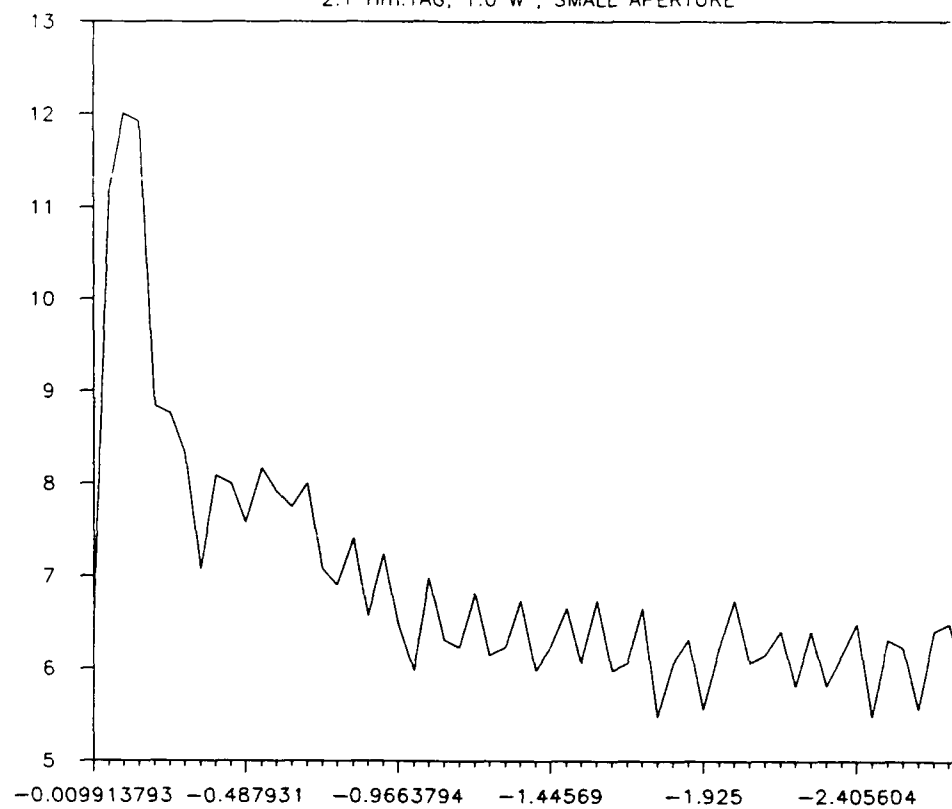
DEC17U-2X ICG CONTROLLED AT 80, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



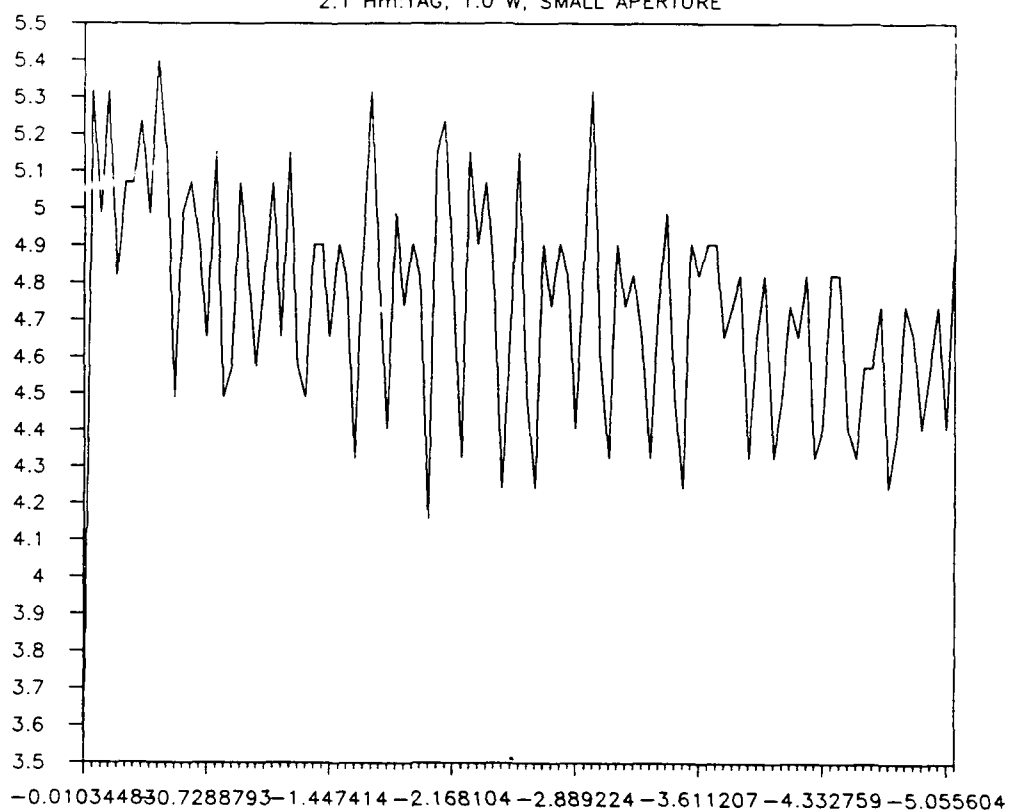
DEC17V-2X ICG SET AT 100, TC MAX=90,

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



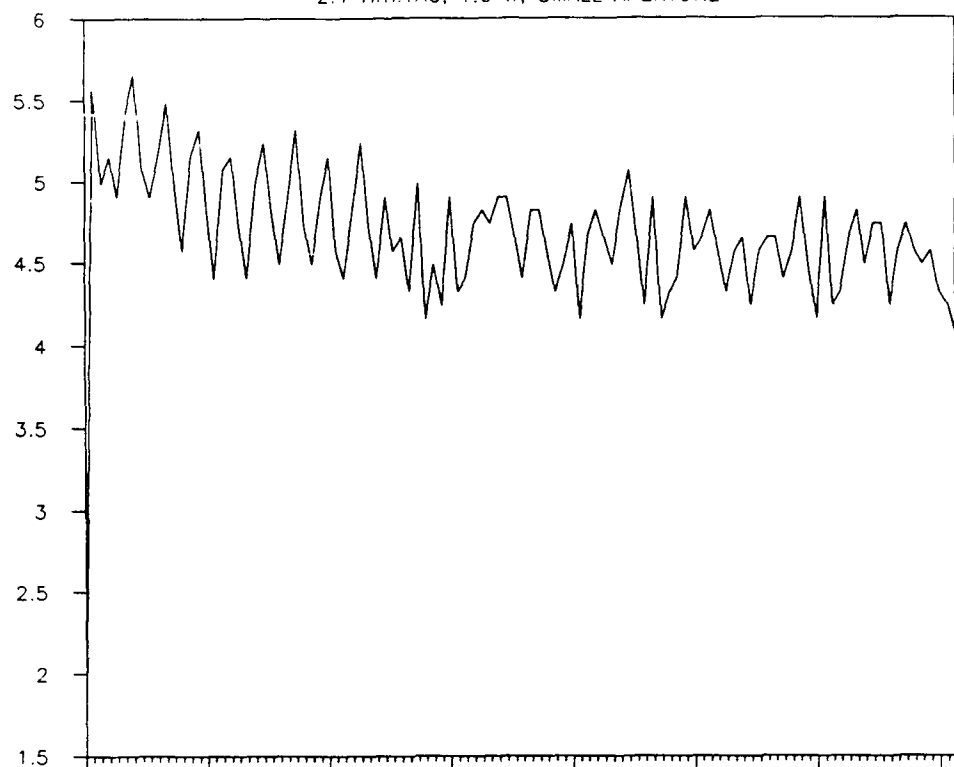
DEC17W- 2X ICG UNWELDED CONTROL

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



DEC17X-BLOOD UNWELDED CONTROL

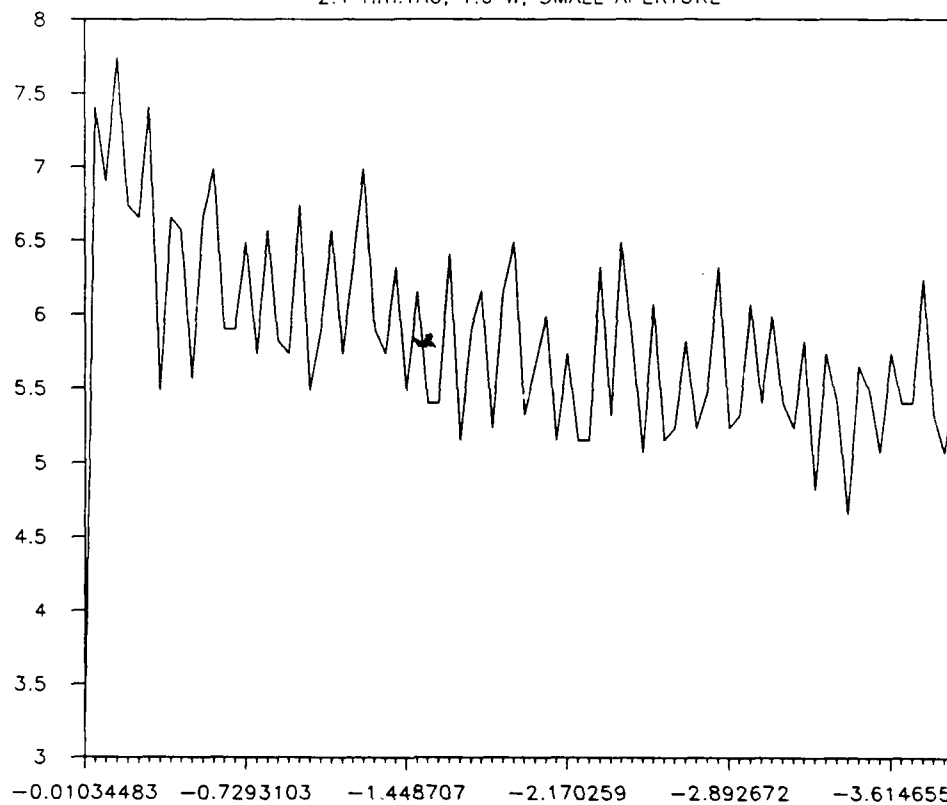
2.1 Hm:YAG, 1.0 W, SMALL APERTURE



-0.00991379 0.7306035 -1.452586 -2.174138 -2.896983 -3.621121 -4.344828 -5.069828

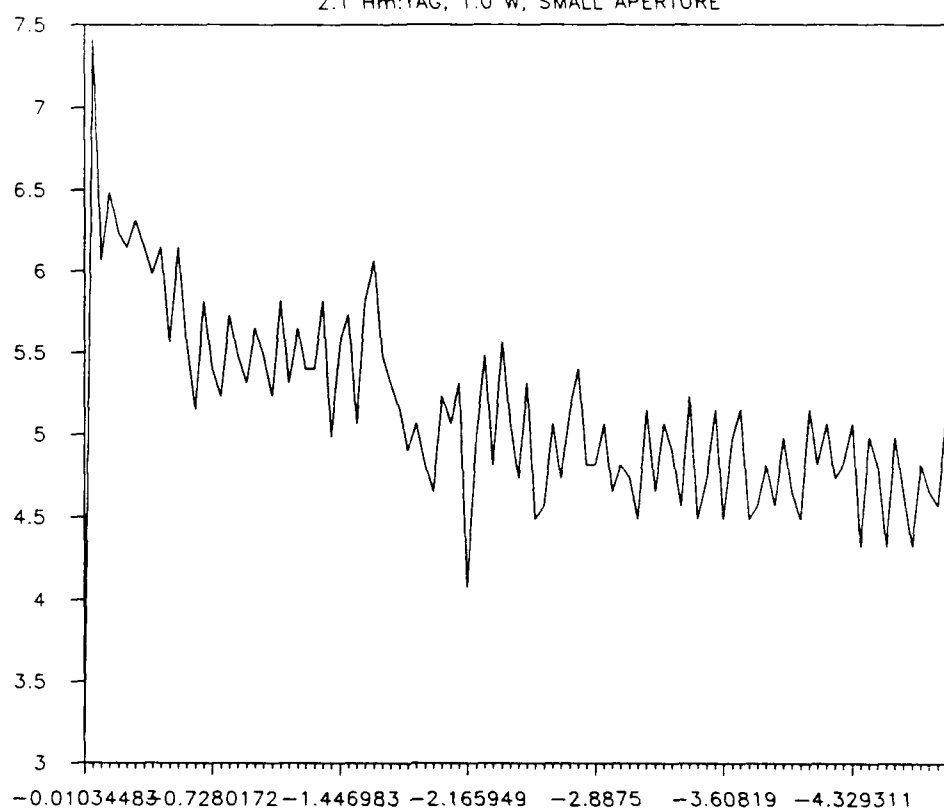
DEC17Y- BLOOD CONTROLLED AT 50, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



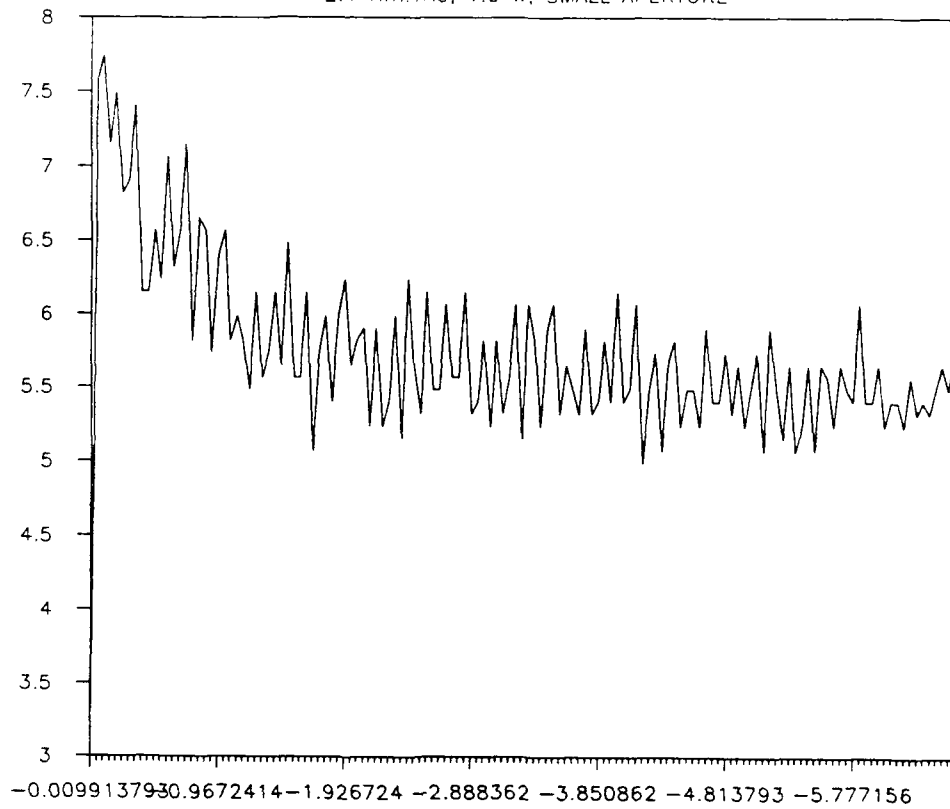
DEC17Z-BLOOD CONTROLLED AT 60, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



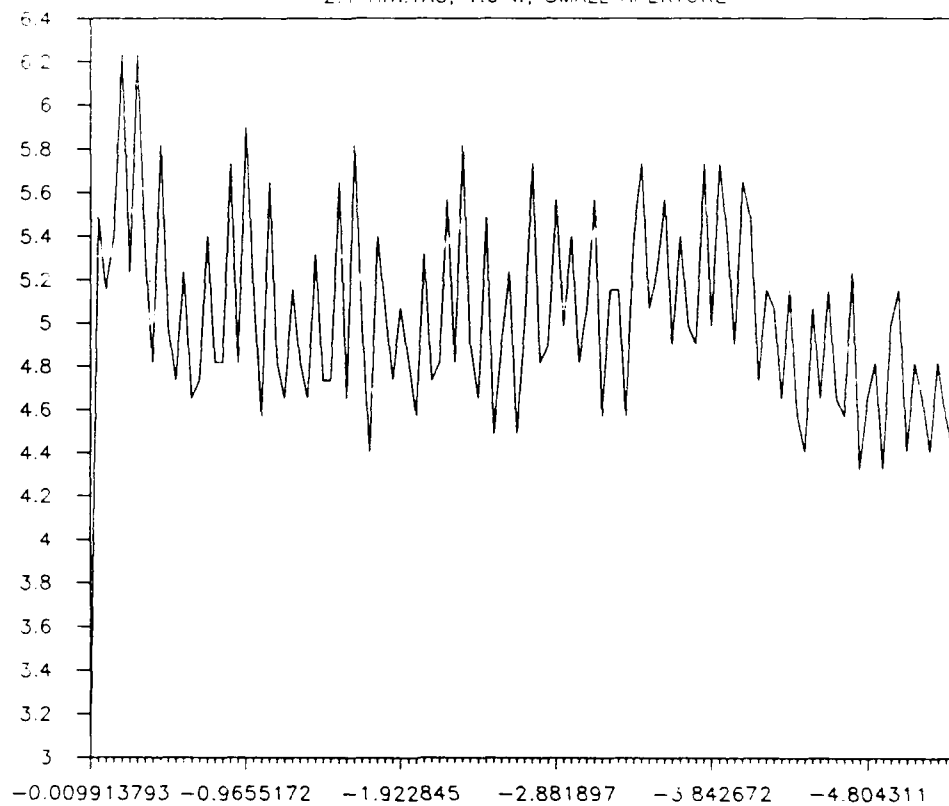
DEC17AA- BLOOD CONTROLLED AT 70, 10s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



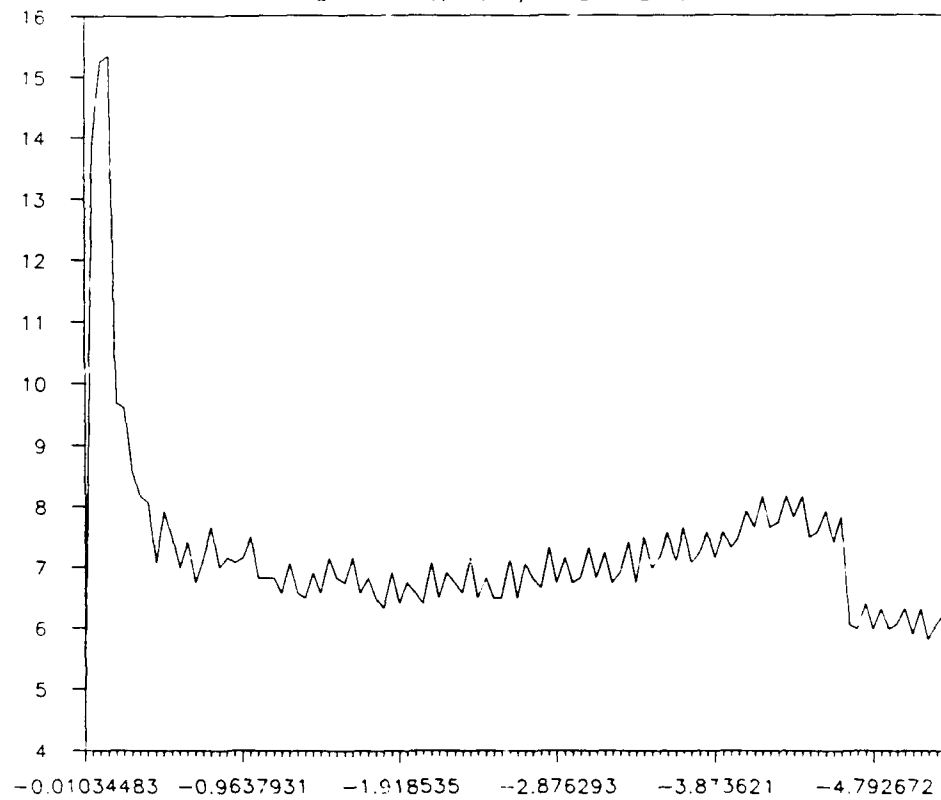
DEC17AB- BLOOD CONTROLLED AT 80, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



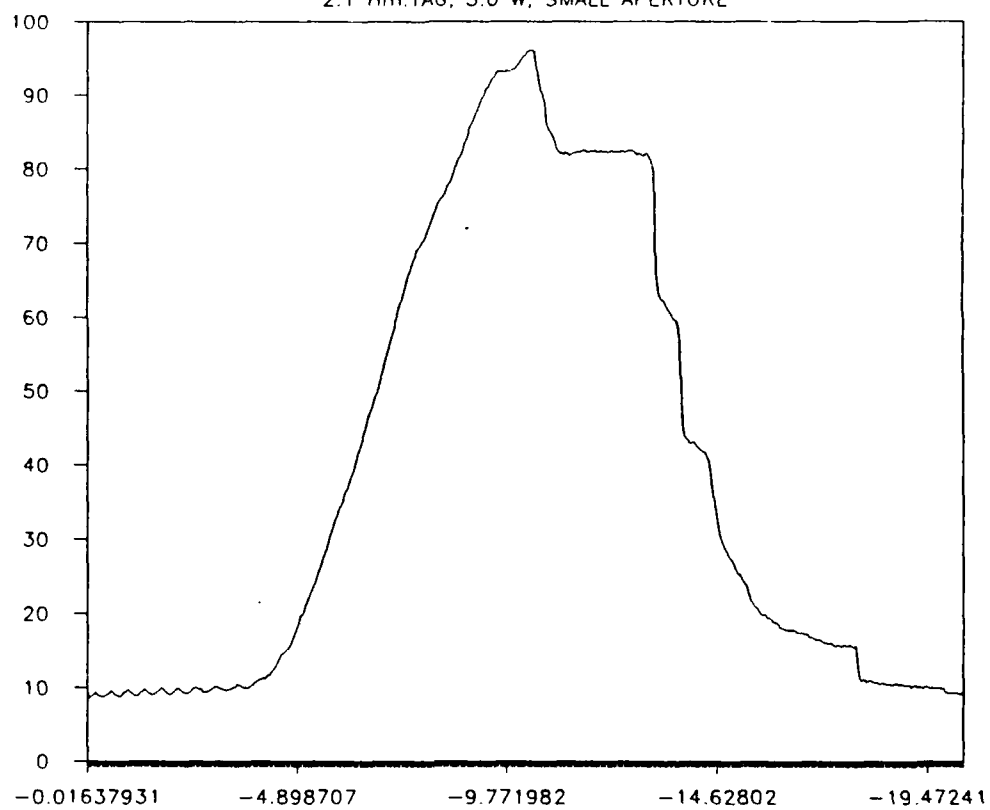
DEC17AC--BLOOD CONTROLLED AT 100, 10 s

2.1 Hm:YAG, 1.0 W, SMALL APERTURE



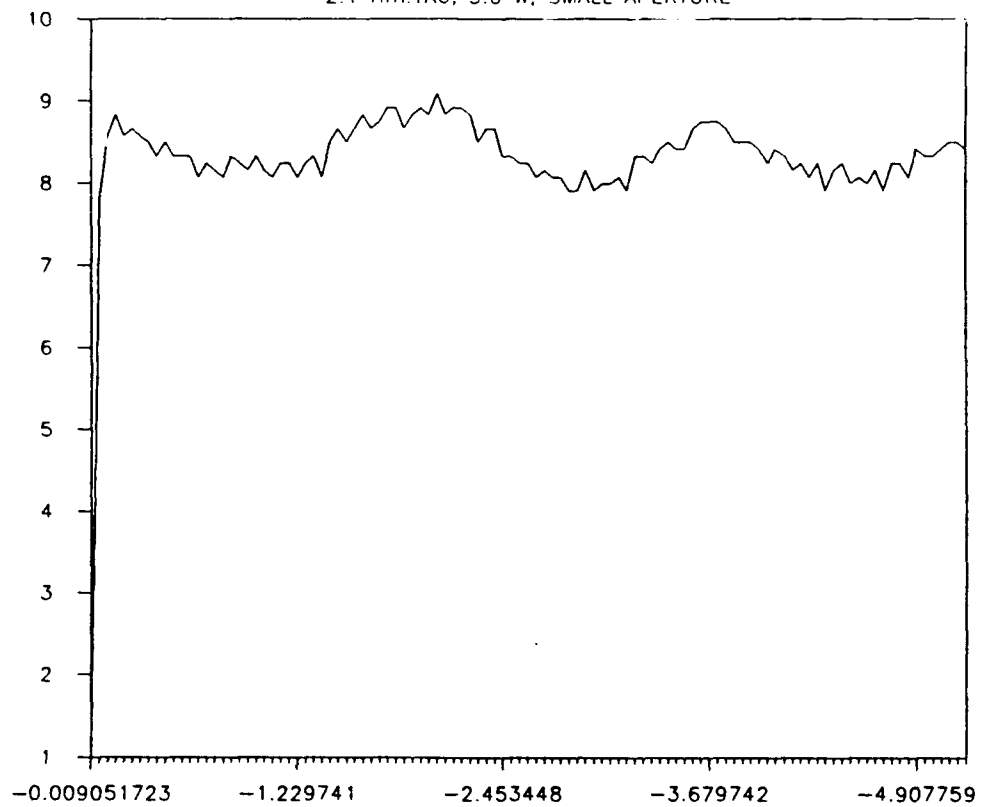
DEC18A- ONE STRIP UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



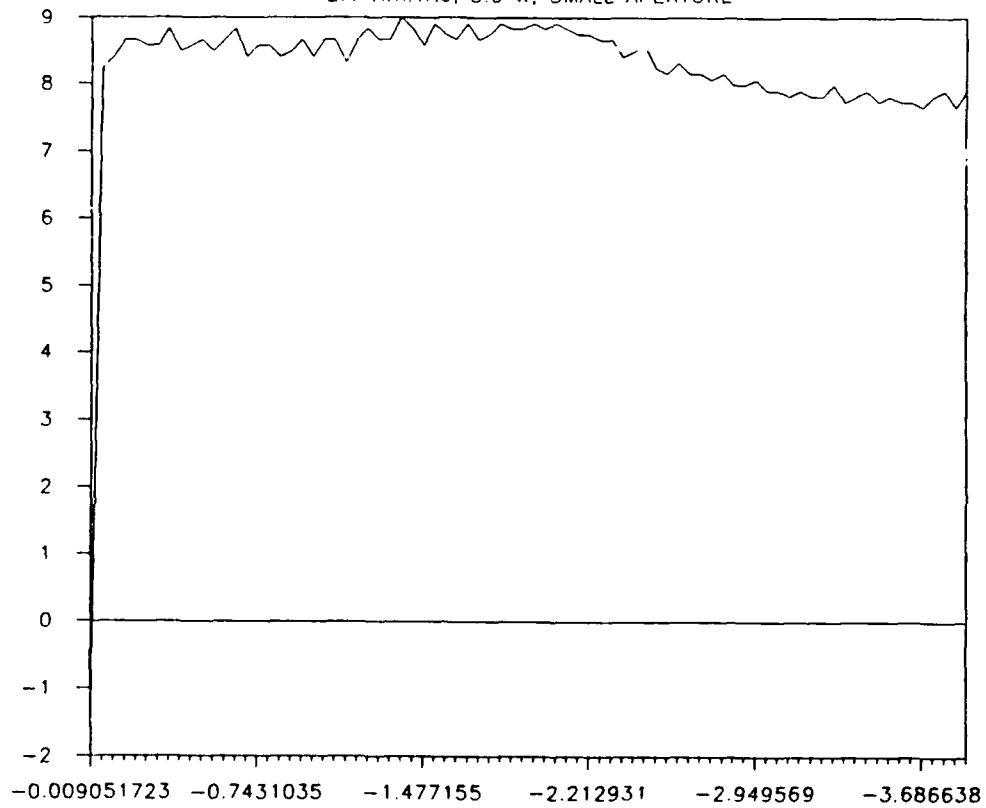
DEC18B-TWO STRIP UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



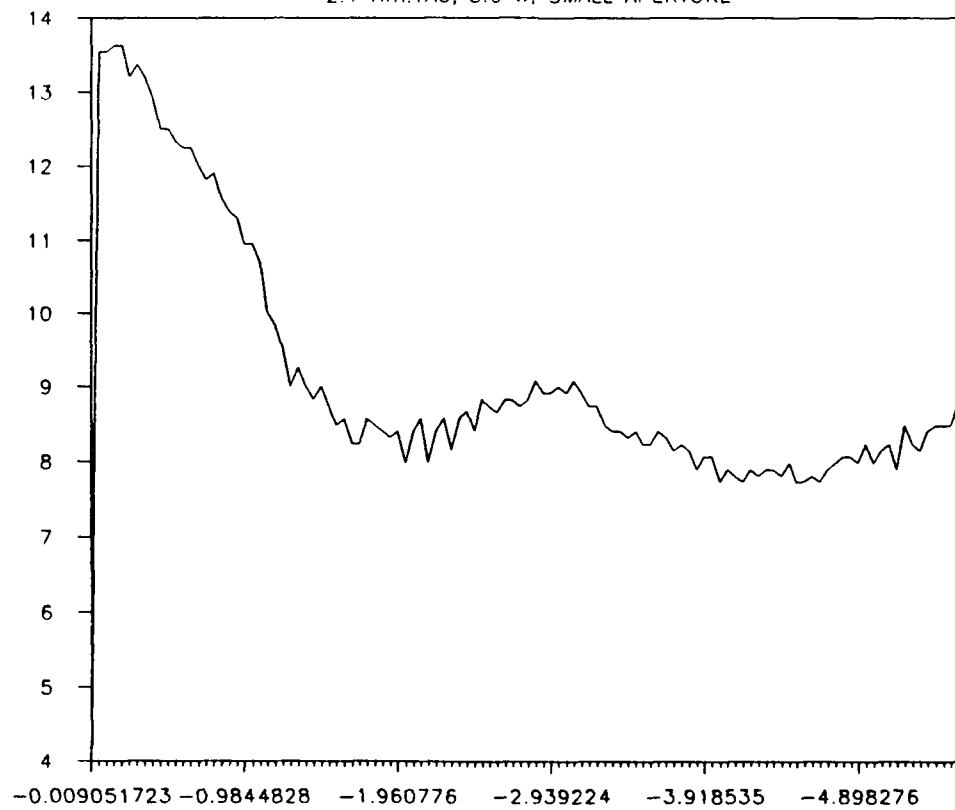
DEC18C- INDIA INK UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



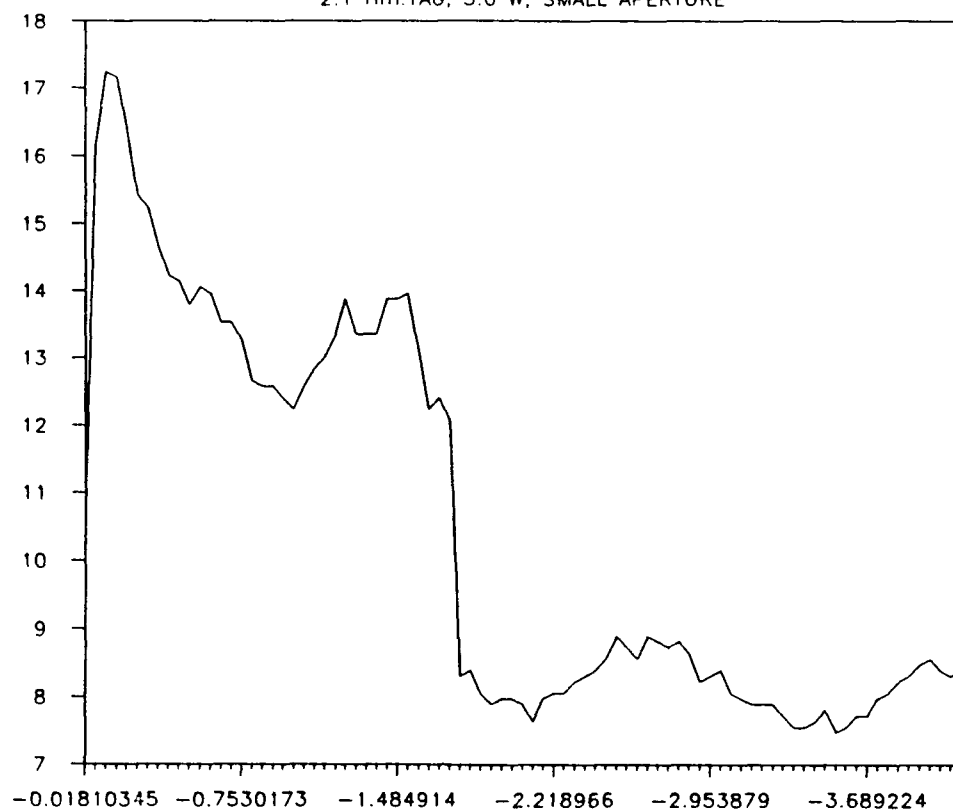
DEC18D-INDIA INK CONTROLLED AT 50, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



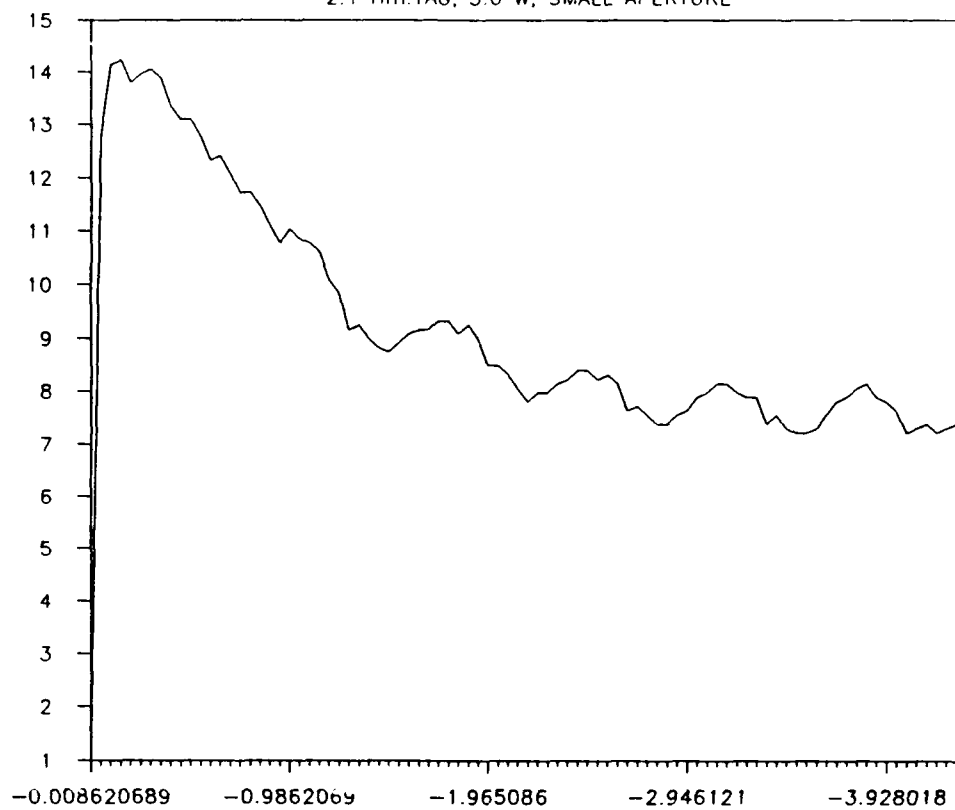
DEC18E1-INDIA INK CONTROLLED AT 60, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



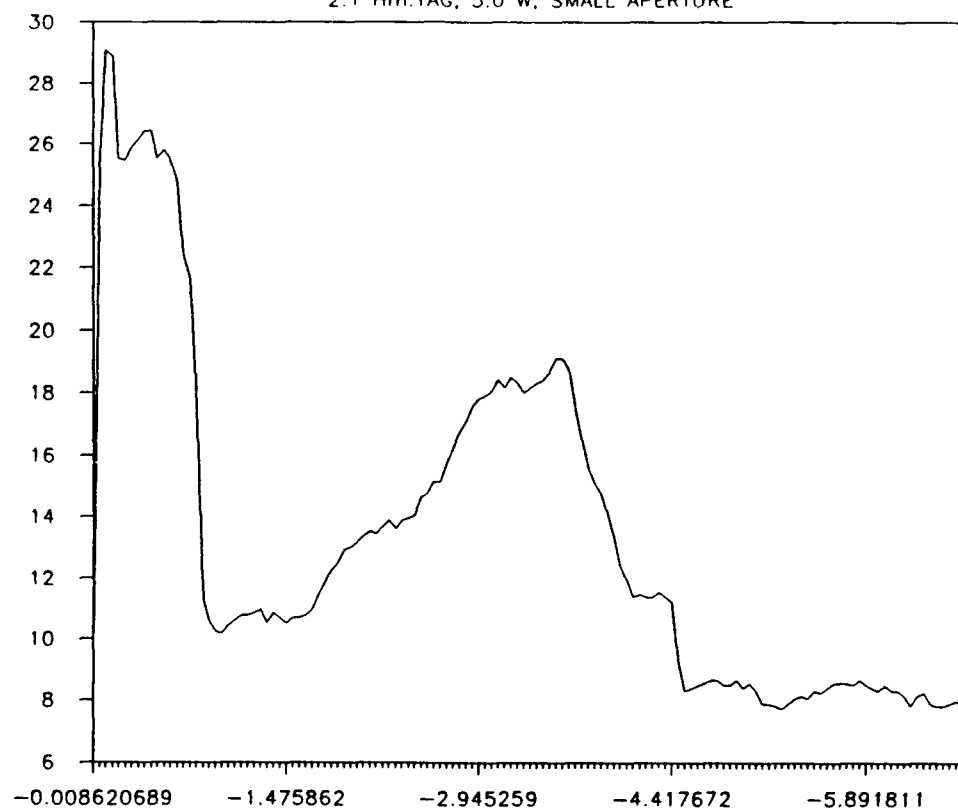
DEC18F-INDIA INK CONTROLLED AT 70, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



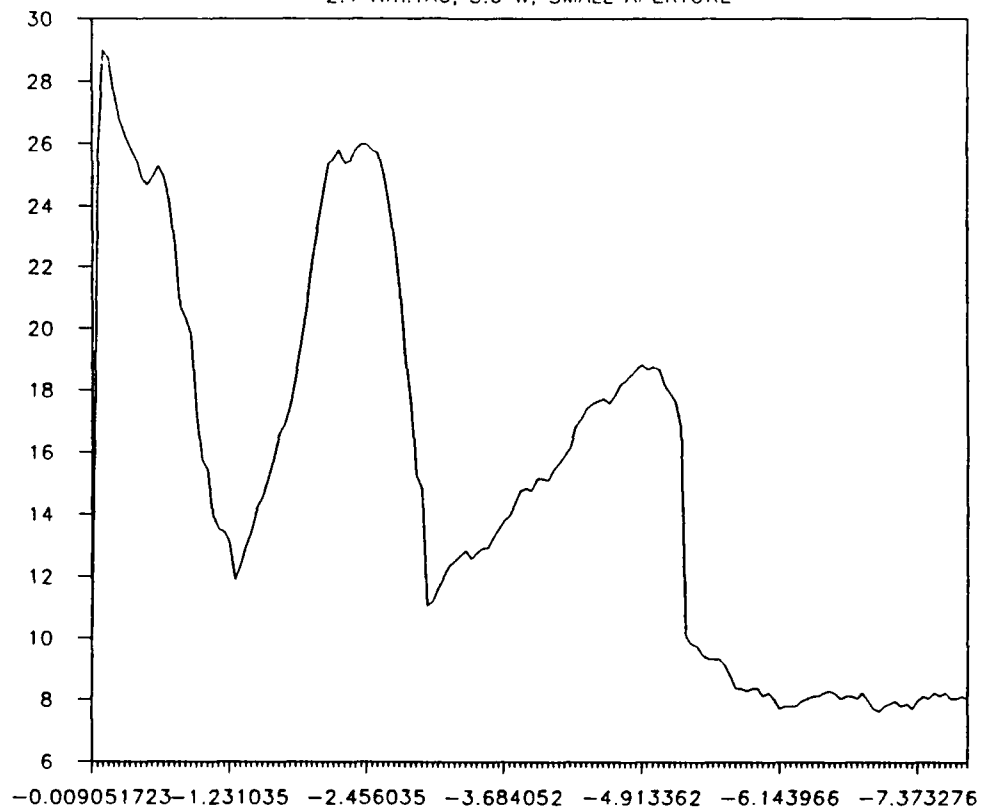
DEC18G- INDIA INK CONTROLLED AT 80, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



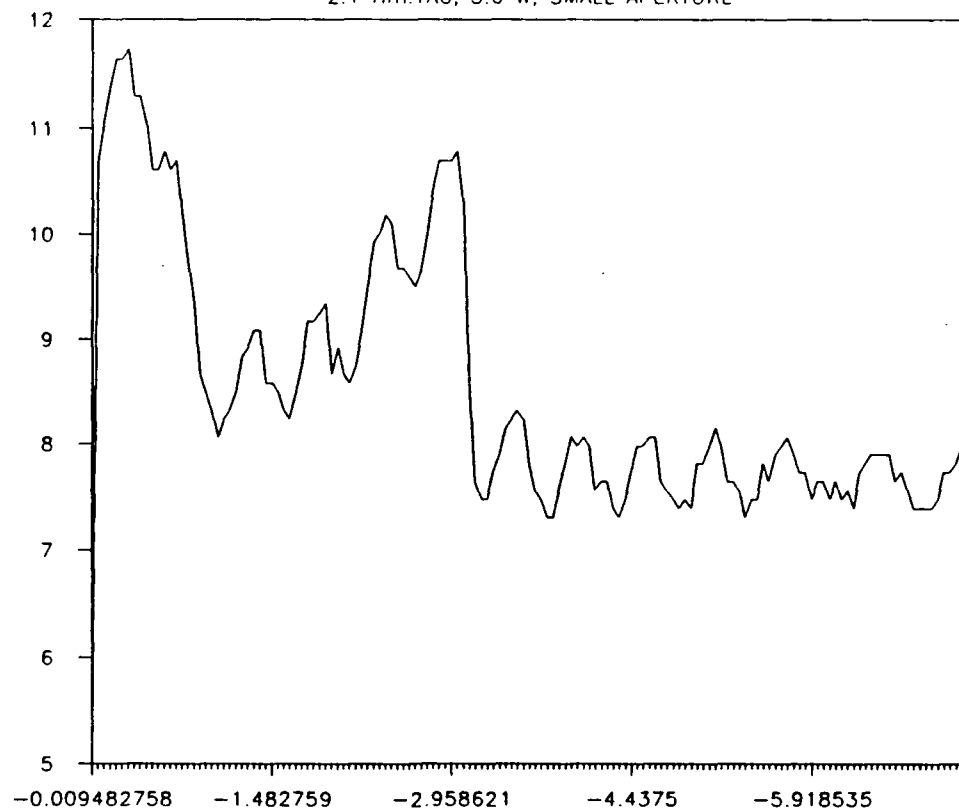
DEC18H-INDIA INK CONTROLLED AT 100, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



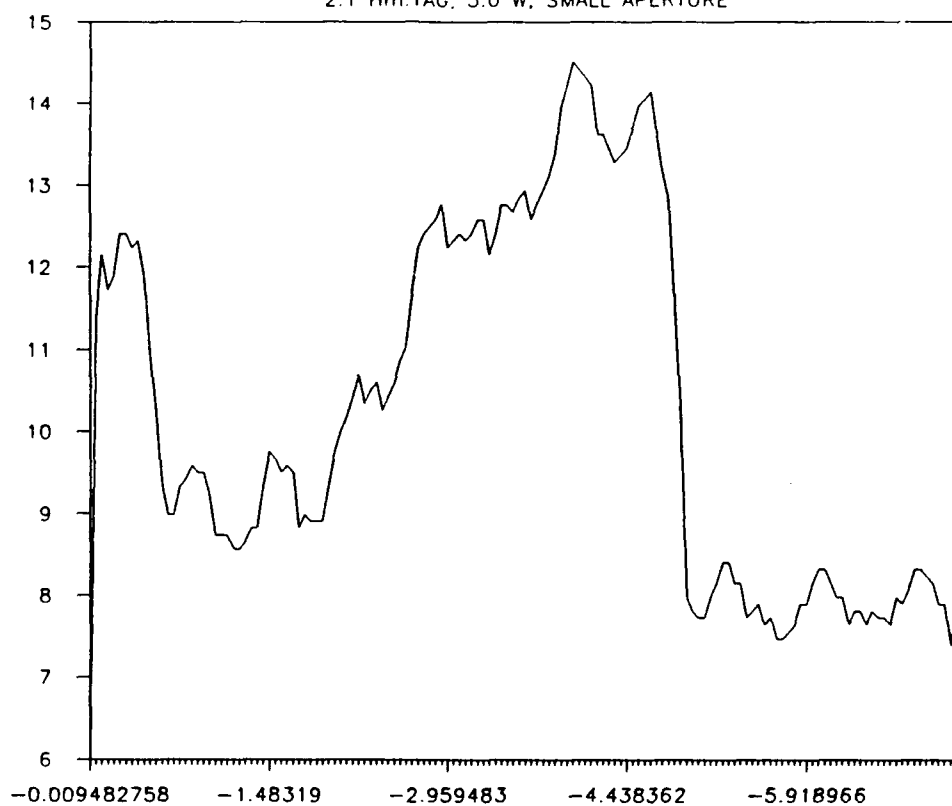
DEC18I- NO CHROM CONTROLLED AT 50, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



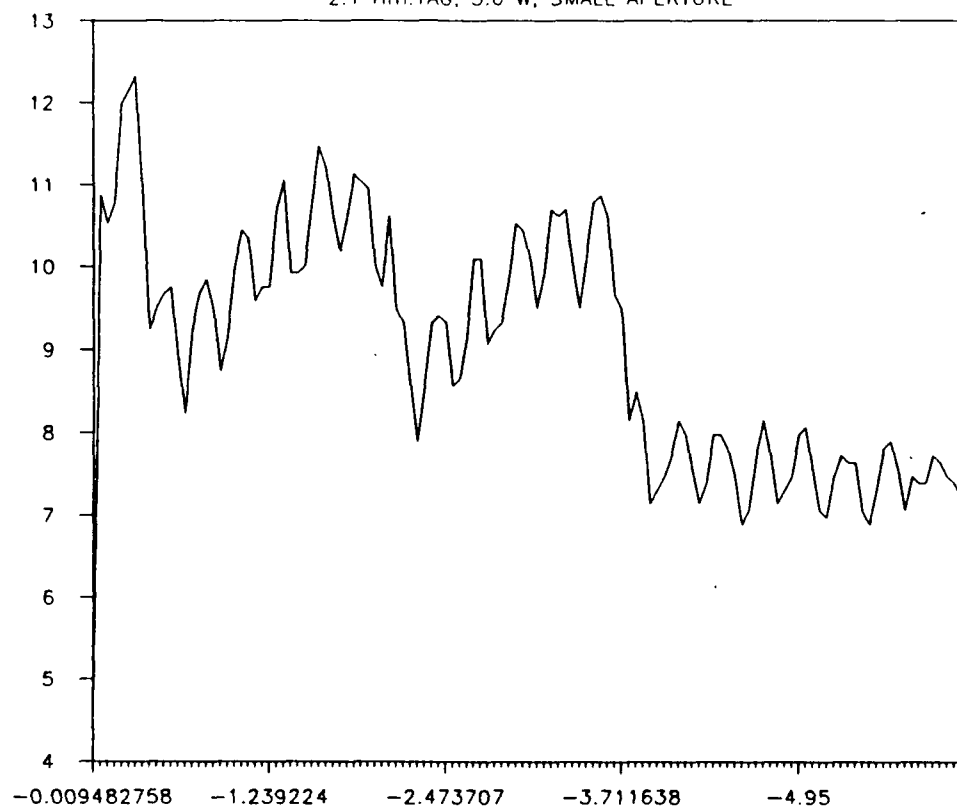
DEC18J-NO CHROMO CONTROLLED AT 60, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



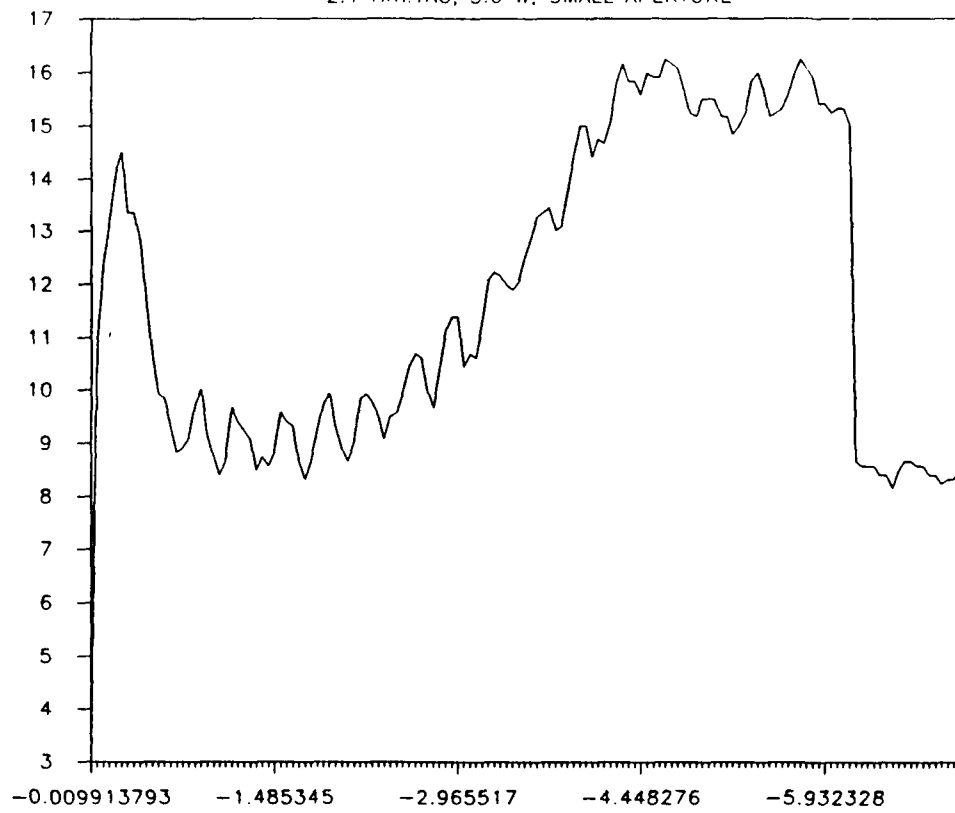
DEC18K- NO CHROMO CONTROLLED AT 60, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



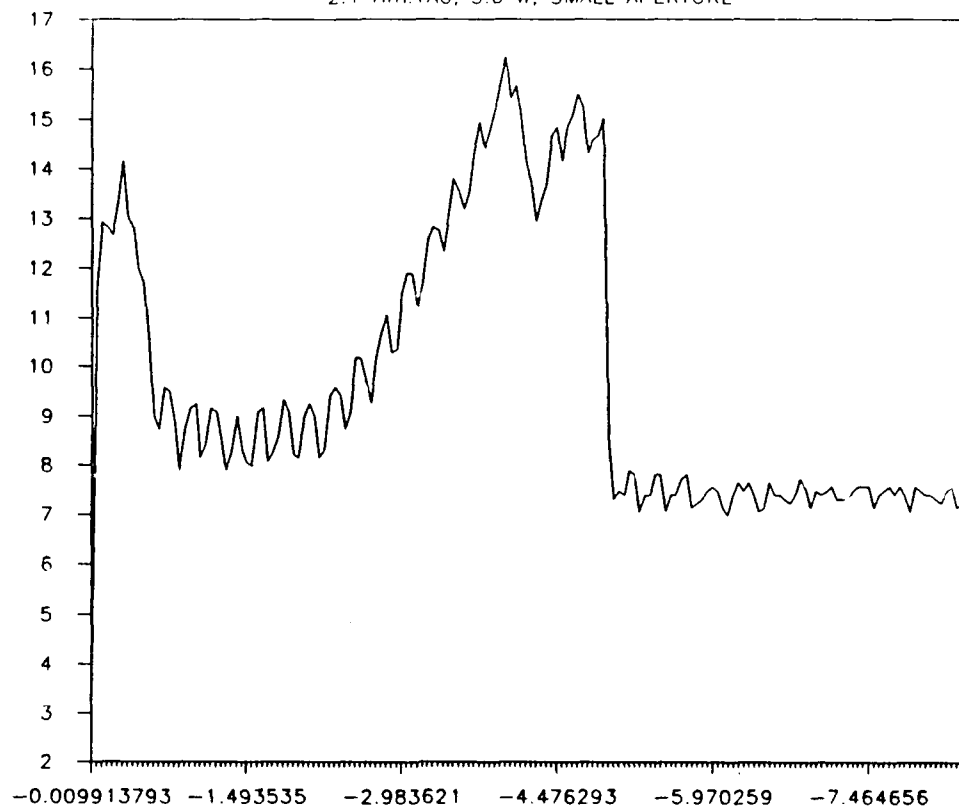
DEC18L-NO CHROMO CONTROLLED AT 70, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



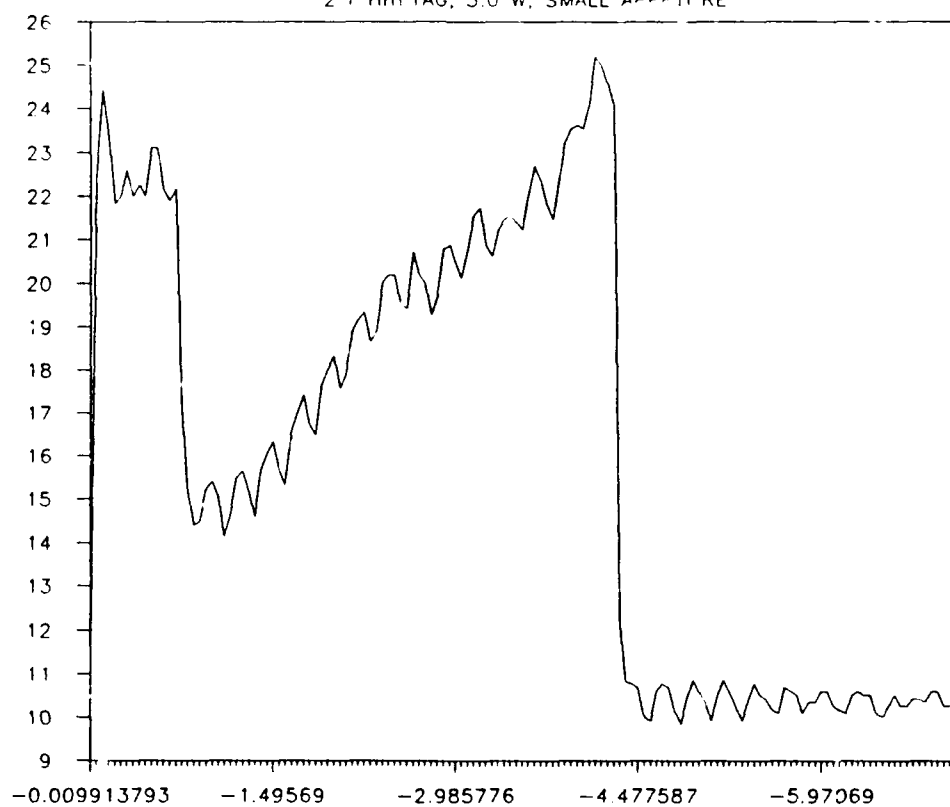
DEC18N-NO CHROMO-CONTROLLED AT 80, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



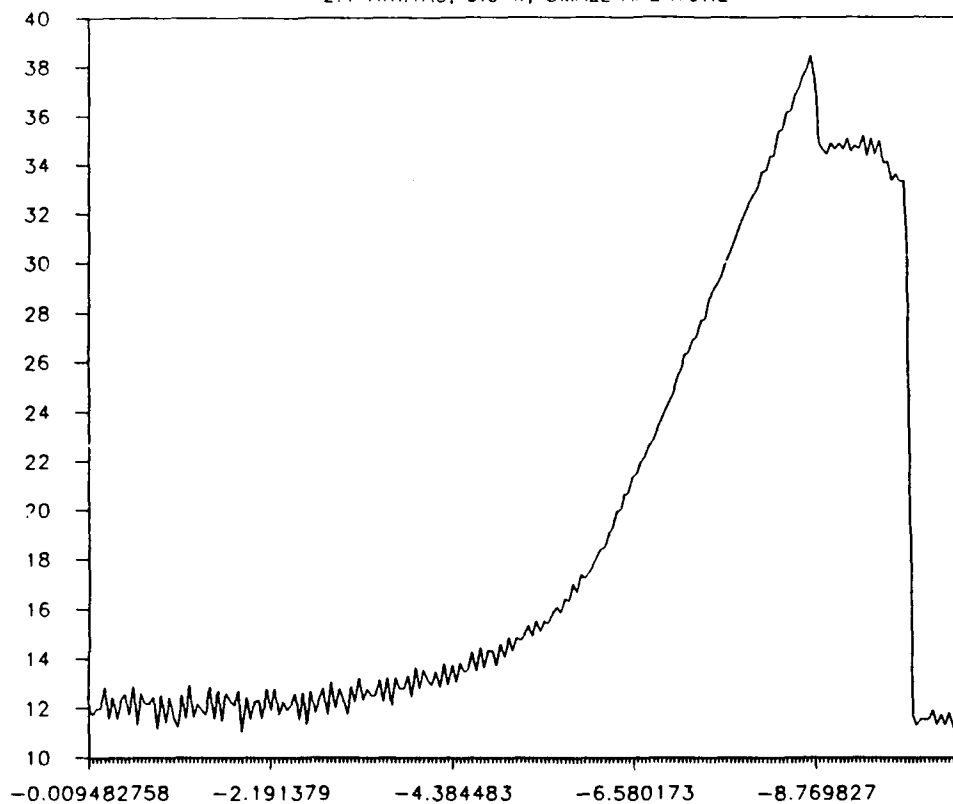
DEC 180- NO CHROMO CONTROLLED AT 100,10s

2.1 Hm YAG, 5.0 W, SMALL APERTURE



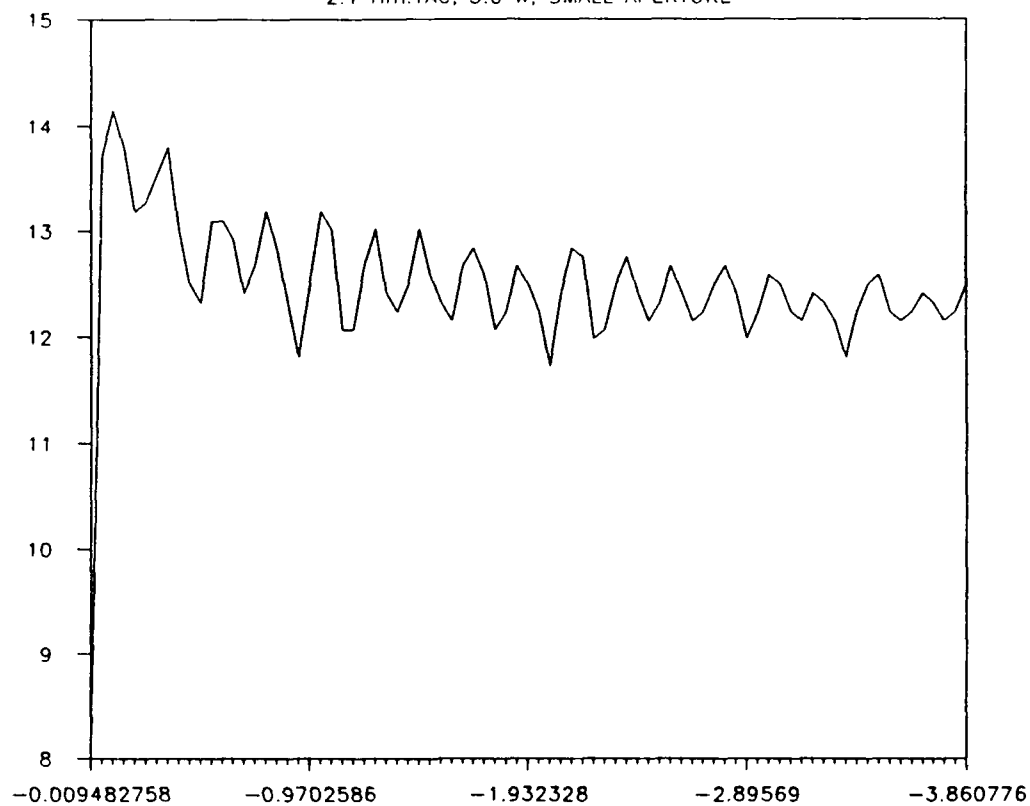
DEC18P-NO CHROMO CONTROLLED AT 100, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



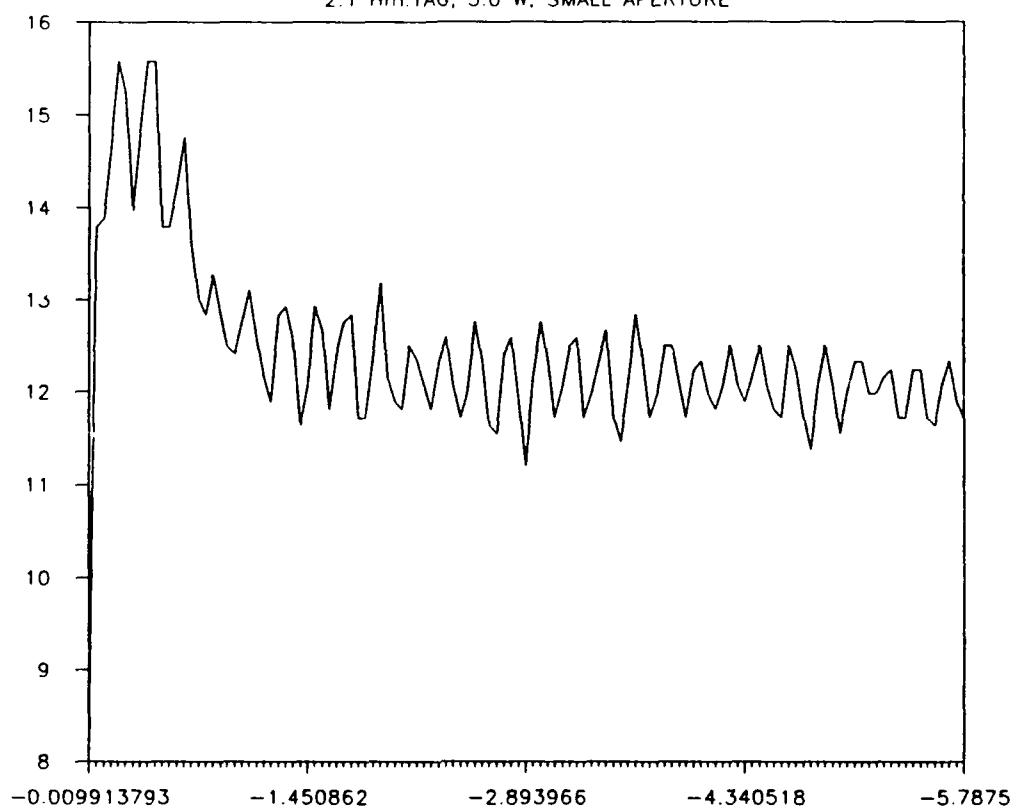
DEC18Q- 2X ICG UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



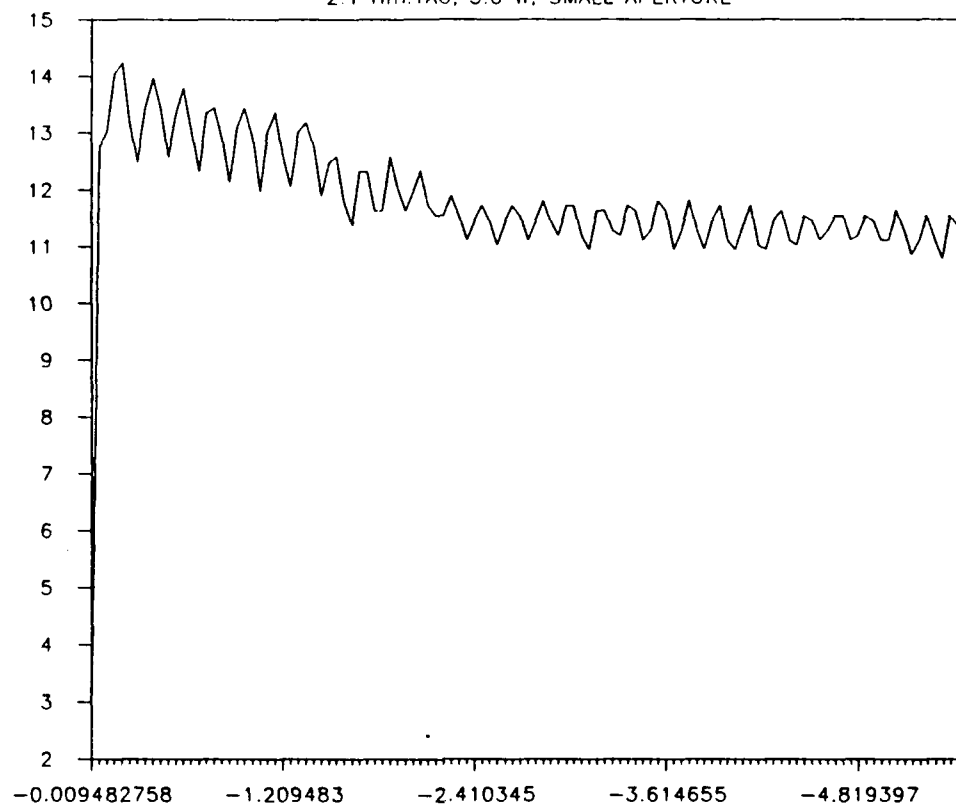
DEC18R- 2X ICG CONTROLLED AT 50,10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



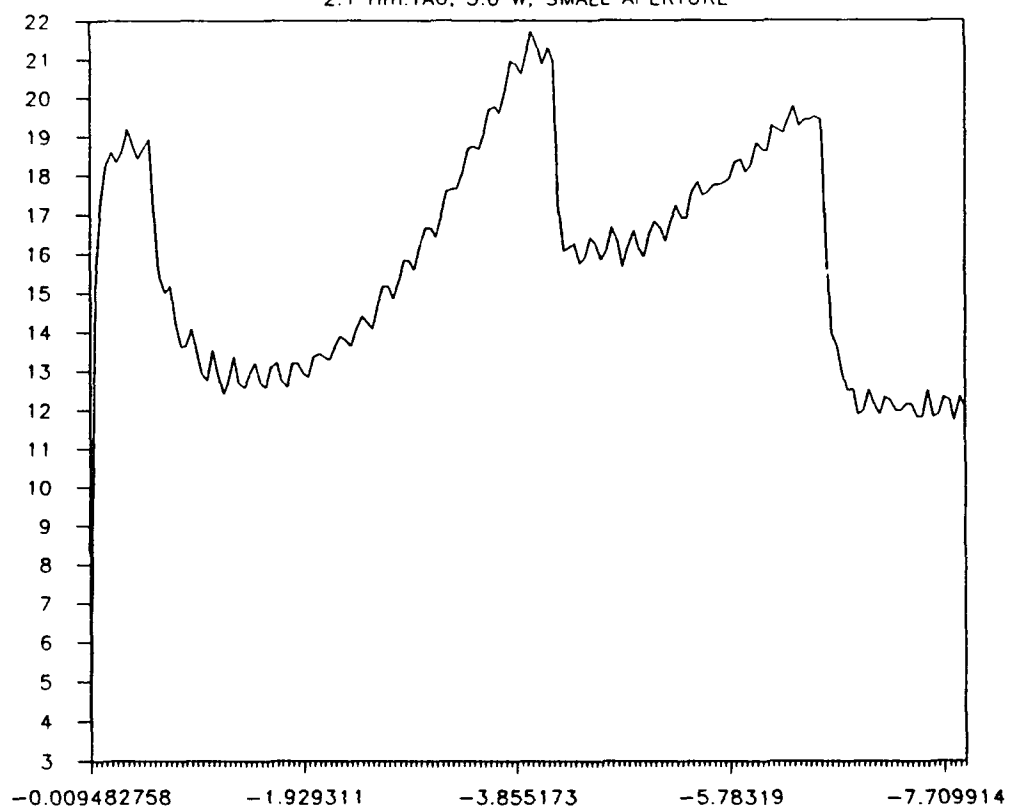
DEC18S- 2X ICG CONTROLLED AT 60, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



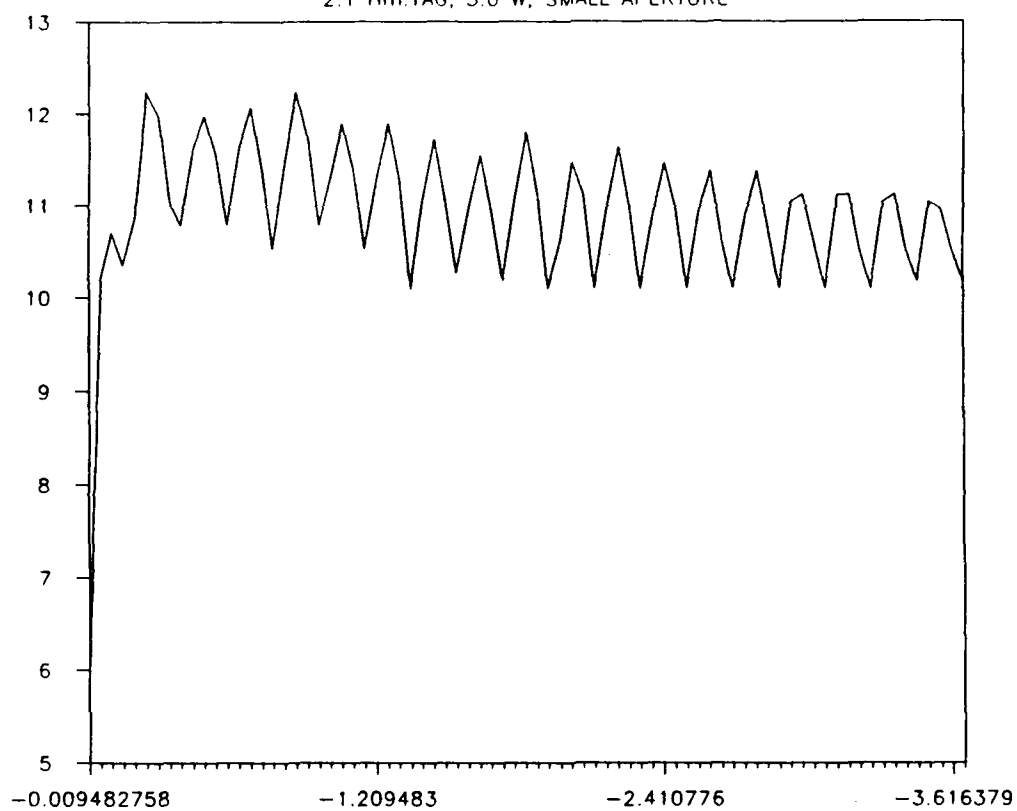
DEC18T- 2X ICG CONTROLLED AT 70, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



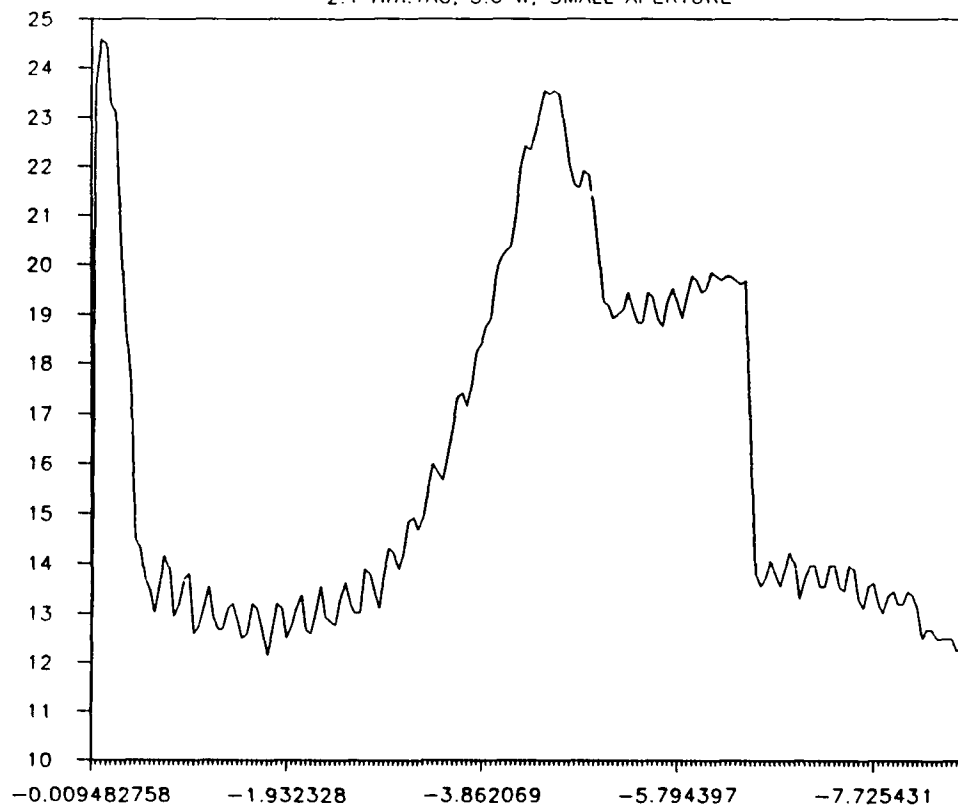
DEC18U- 2X ICG CONTROLLED AT 80, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



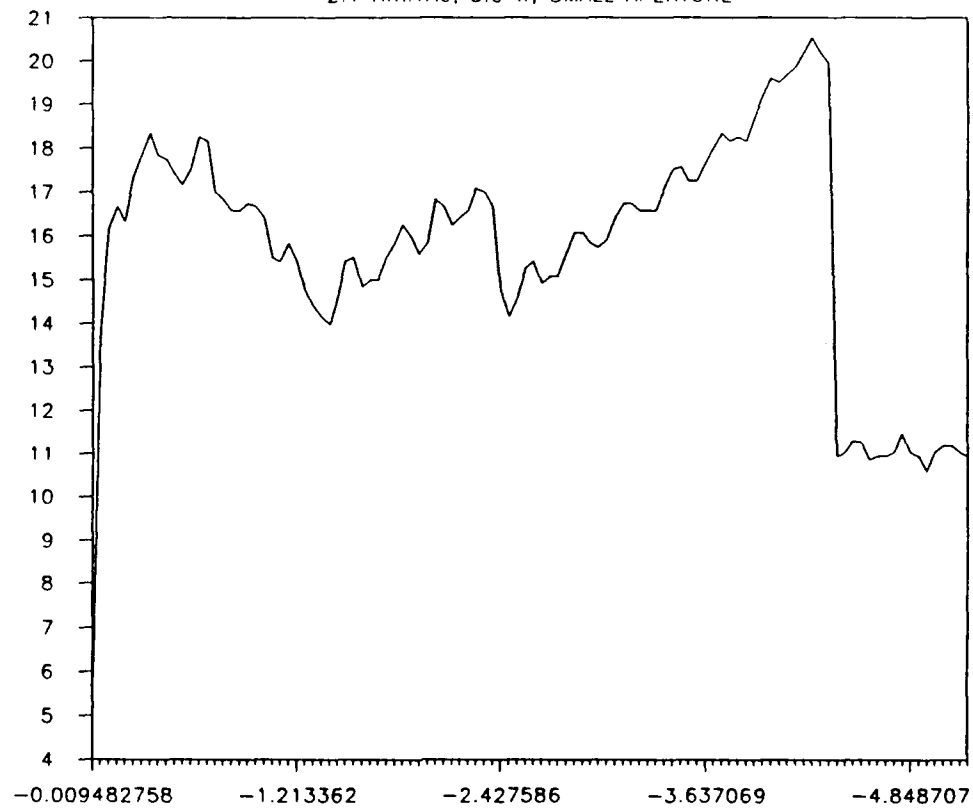
DEC18V- 2X CIG CONTROLLED AT 100, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



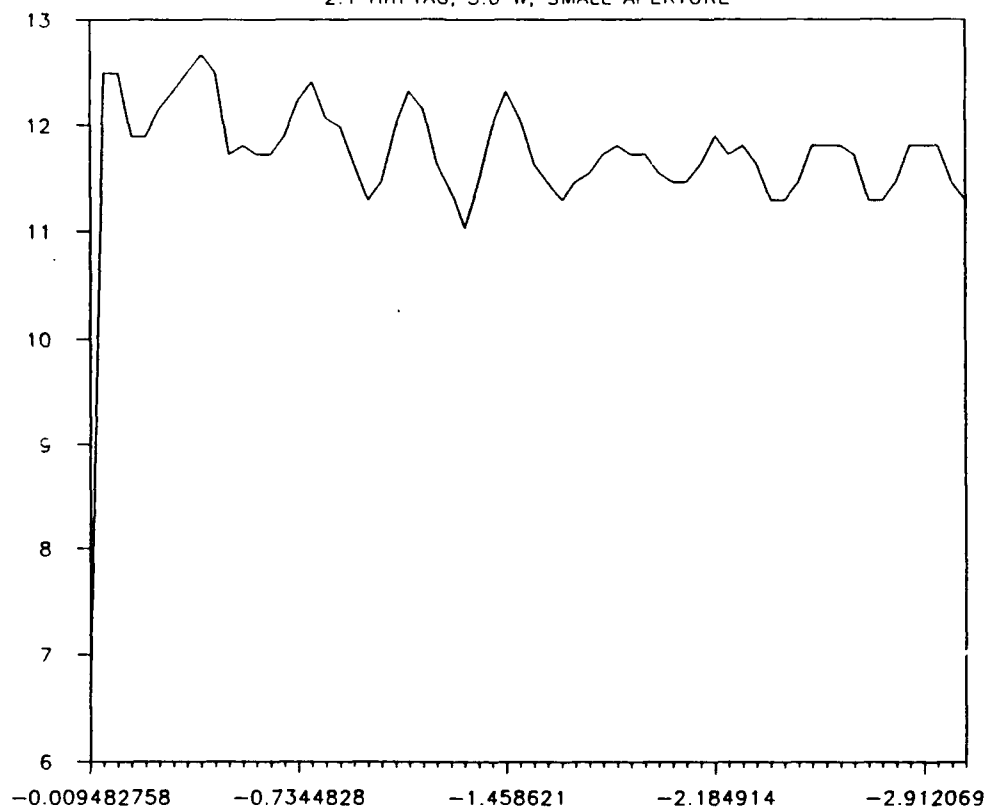
DEC18W1- 2X ICG CONTROLLED AT 80, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



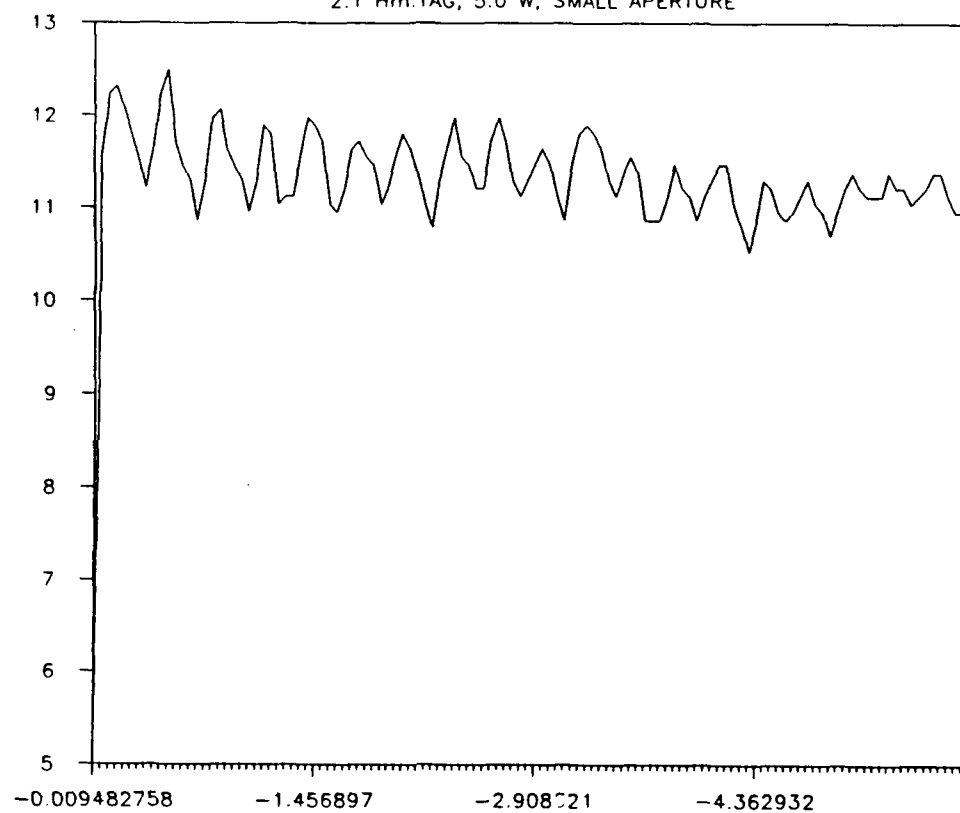
DEC18X- BLOOD UNWELDED CONTROL

2.1 Hm YAG, 5.0 W, SMALL APERTURE



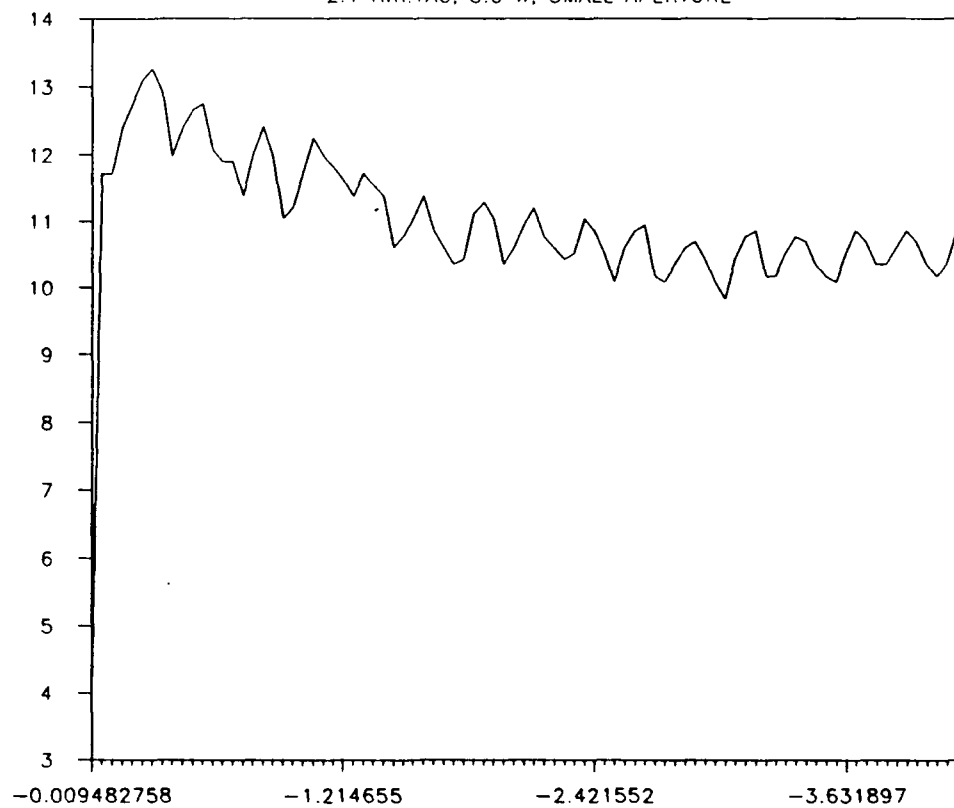
DEC18Y- BLOOD CONTROLLED AT 50, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



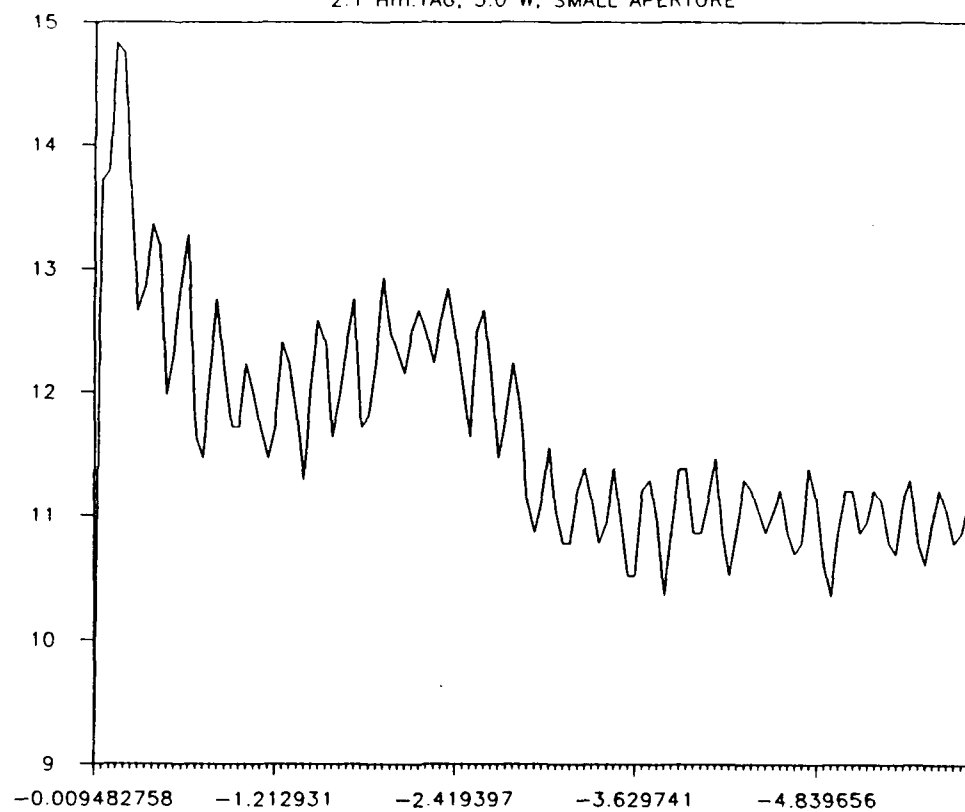
DEC18Z- BLOOD CONTROLLED AT 50, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



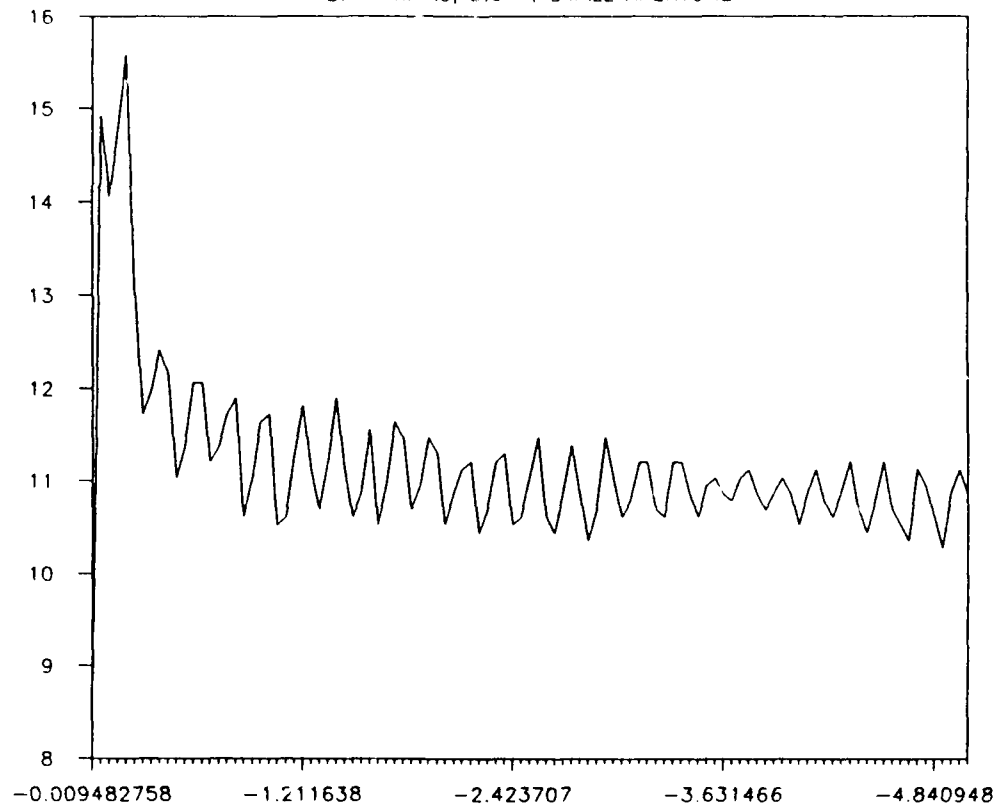
DEC18AA- BLOOD CONTROLLED AT 60, 10s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



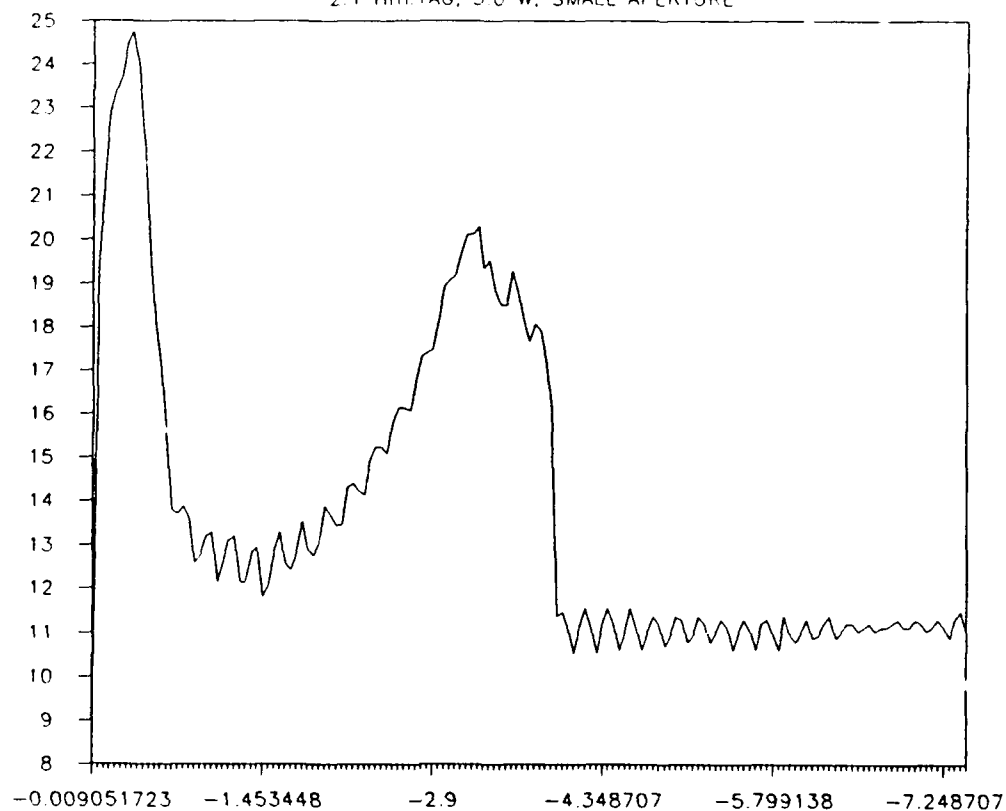
DEC18AB- BLOOD CONTROLLED AT 70, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



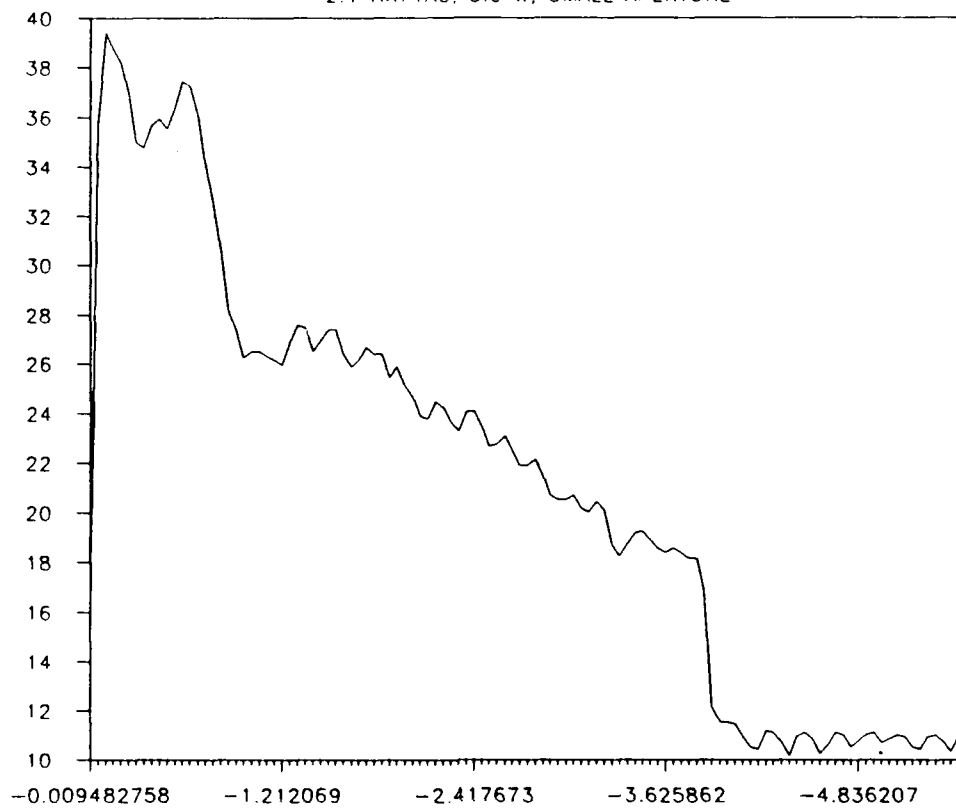
DEC18AC- BLOOD CONTROLLED AT 80, 10 s

2.1 Hm:YAG, 5.0 W, SMALL APERTURE



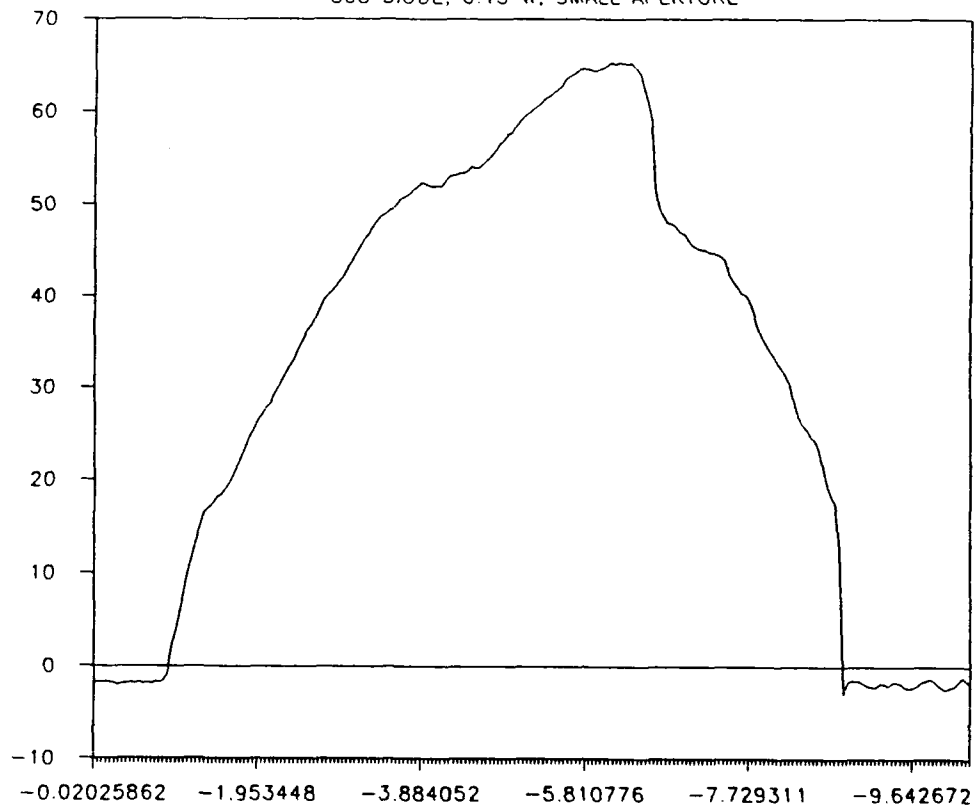
DEC18AD- BLOOD CONTROLLED AT 100, 10 s

2.1 Hm YAG, 5.0 W, SMALL APERTURE



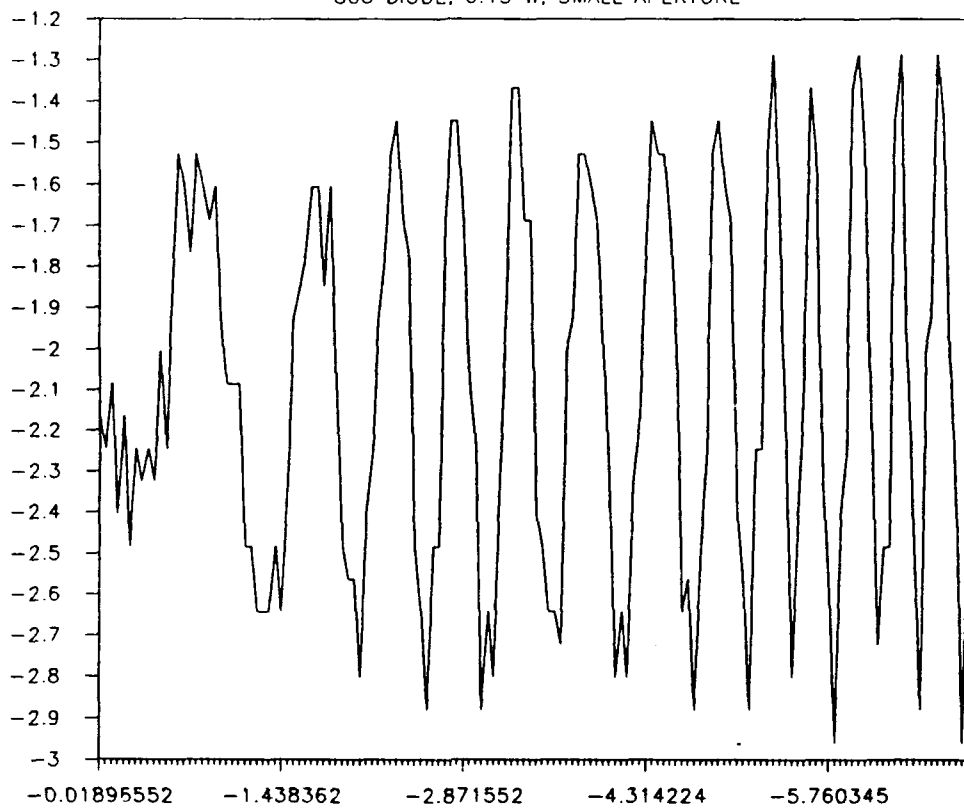
DEC19A- ONE STRIP UNWELDED CONTROL

808 DIODE, 0.15 W. SMALL APERTURE



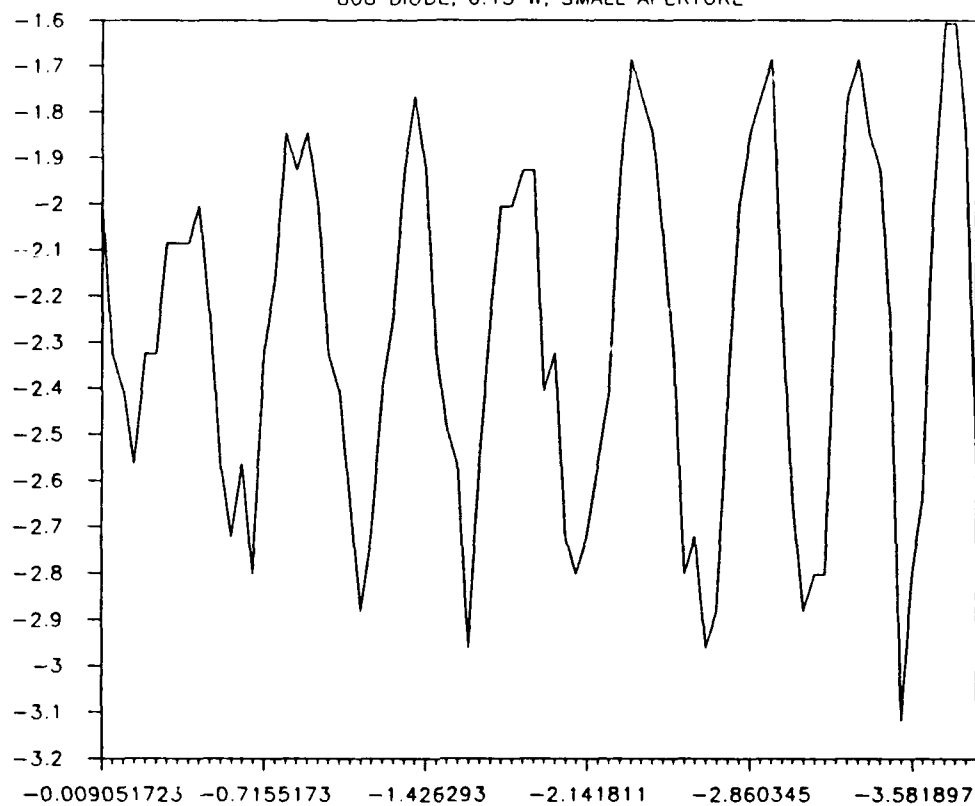
DEC19E- TWO STRIP UNWELDED CONTROL

808 DIODE, 0.15 W, SMALL APERTURE



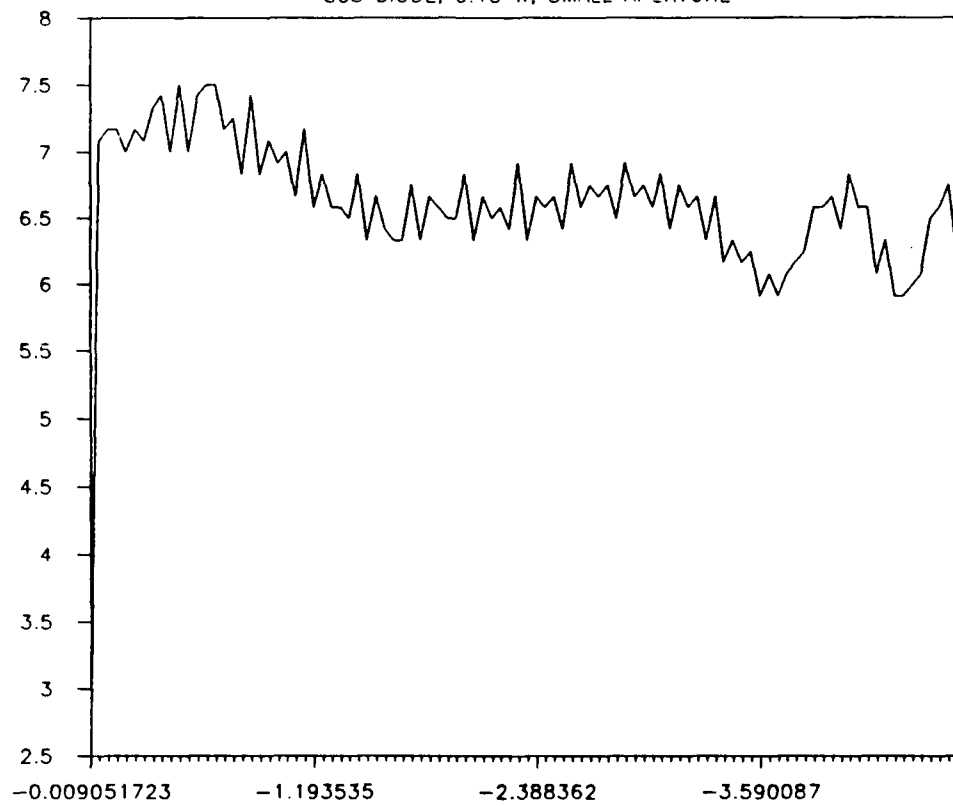
DEC19C-TWO STRIP 2X ICG UNWELDED CONTRO

808 DIODE, 0.15 W, SMALL APERTURE



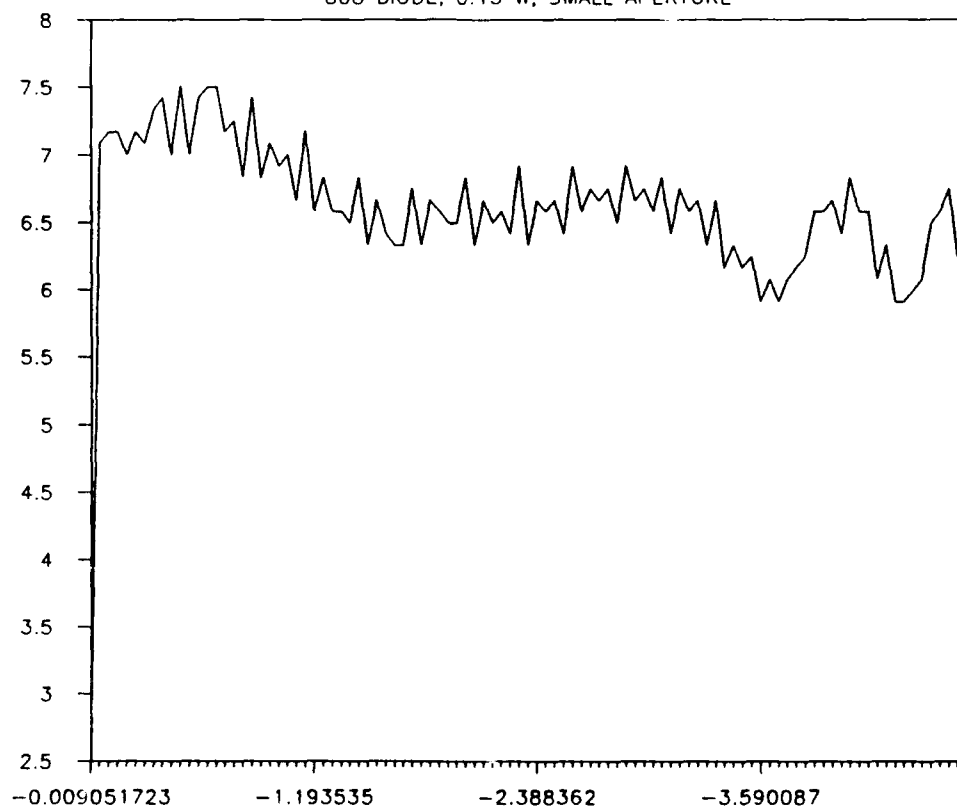
DEC19D-2X ICG SET=50, TC MAX=20

808 DIODE, 0.15 W, SMALL APERTURE



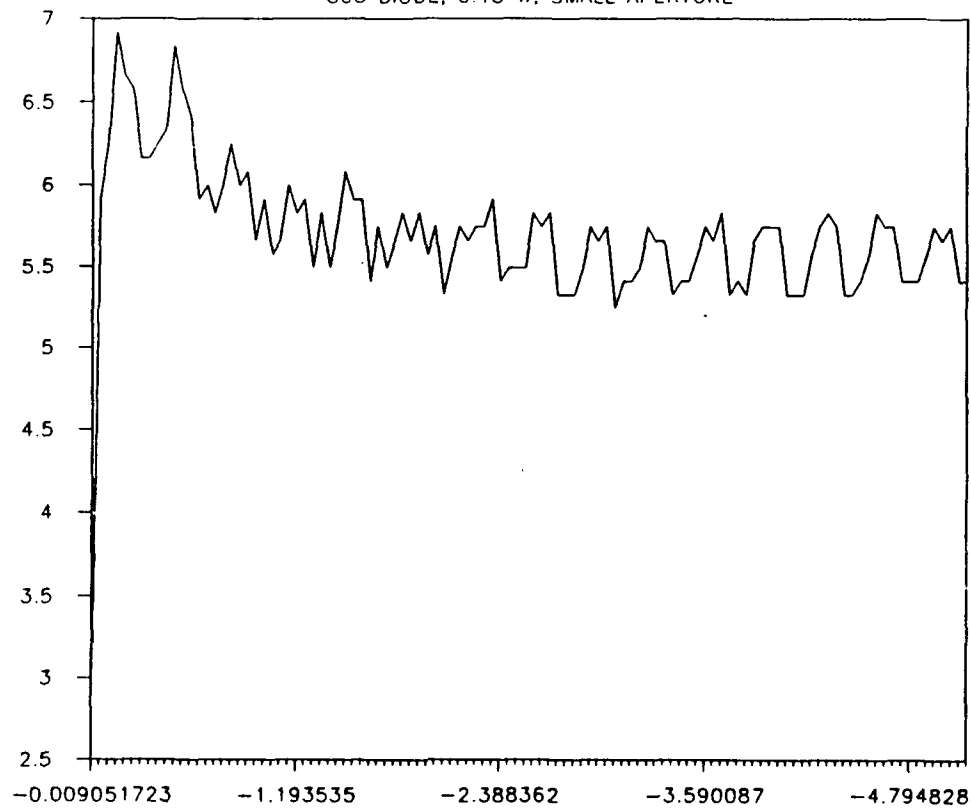
DEC19D-2X ICG SET=50, TC MAX=20

808 DIODE, 0.15 W, SMALL APERTURE



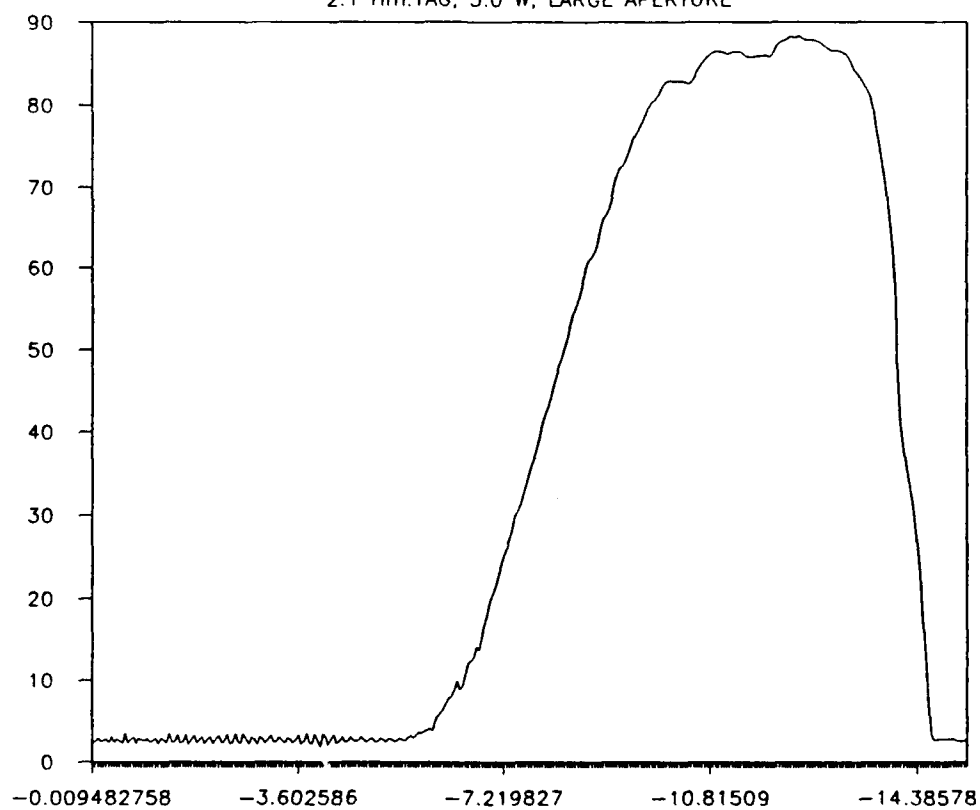
DEC19E-2X ICG SET=100, TC MAX=20

808 DIODE, 0.15 W. SMALL APERTURE



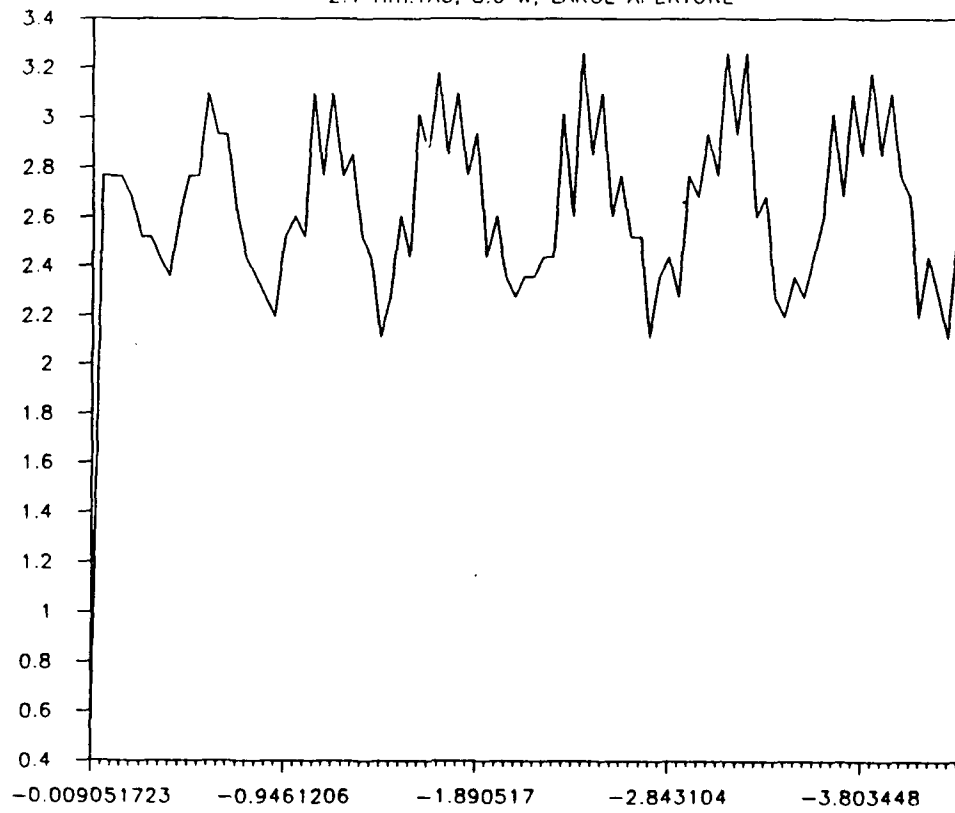
DEC19F-ONE STRIP UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



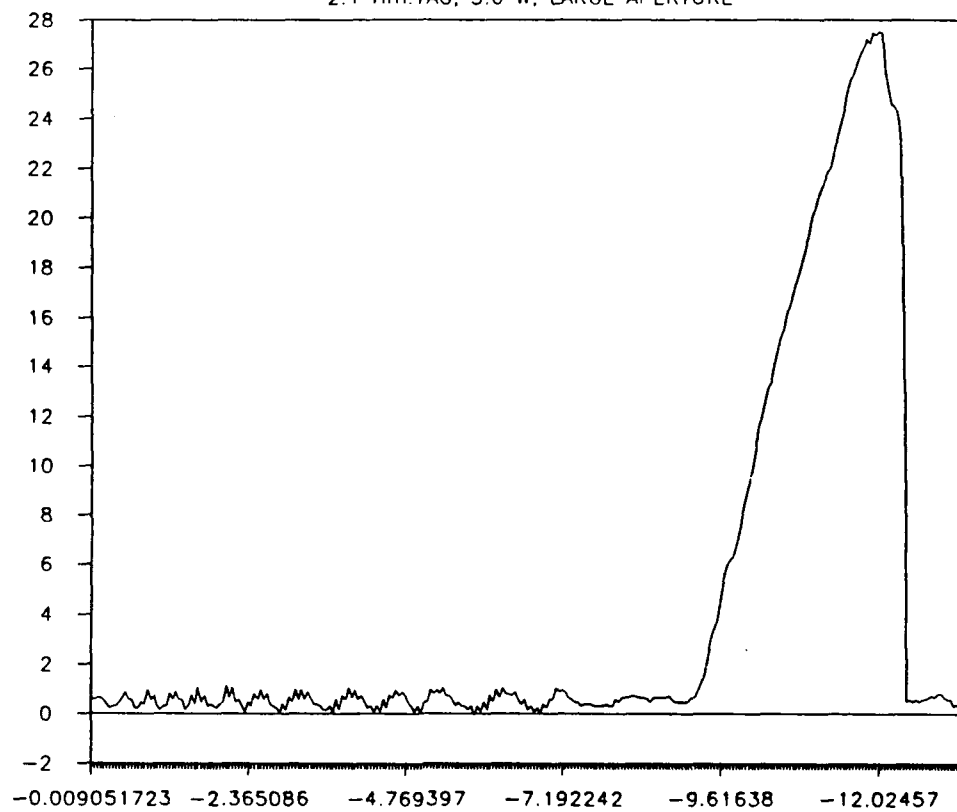
DEC19G-TWO STRIP UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



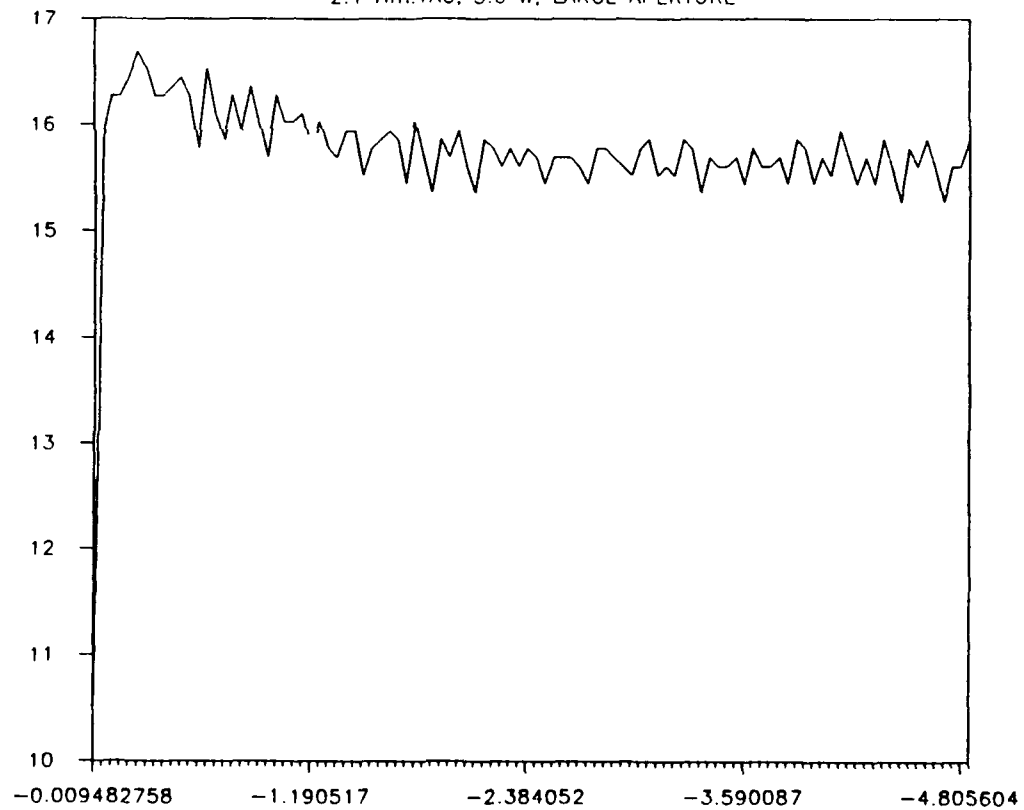
DEC19H-NO CHROMO CONTROLLED AT 50, 10 s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



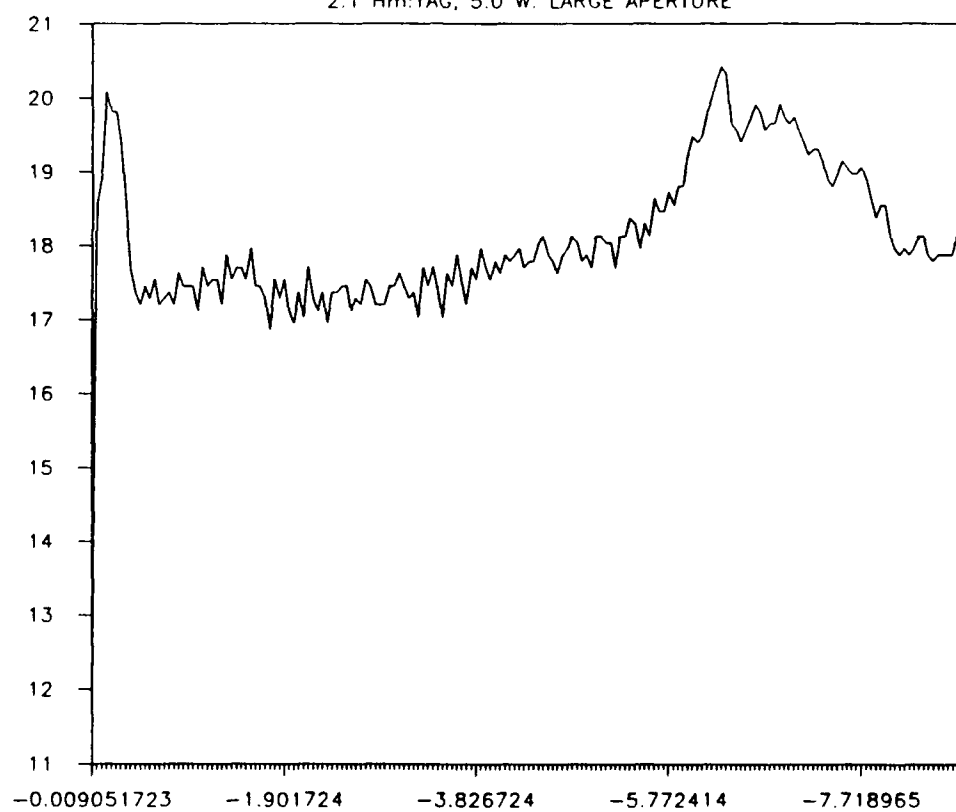
DEC19I-NO CHROMO CONTROLLED AT 60, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



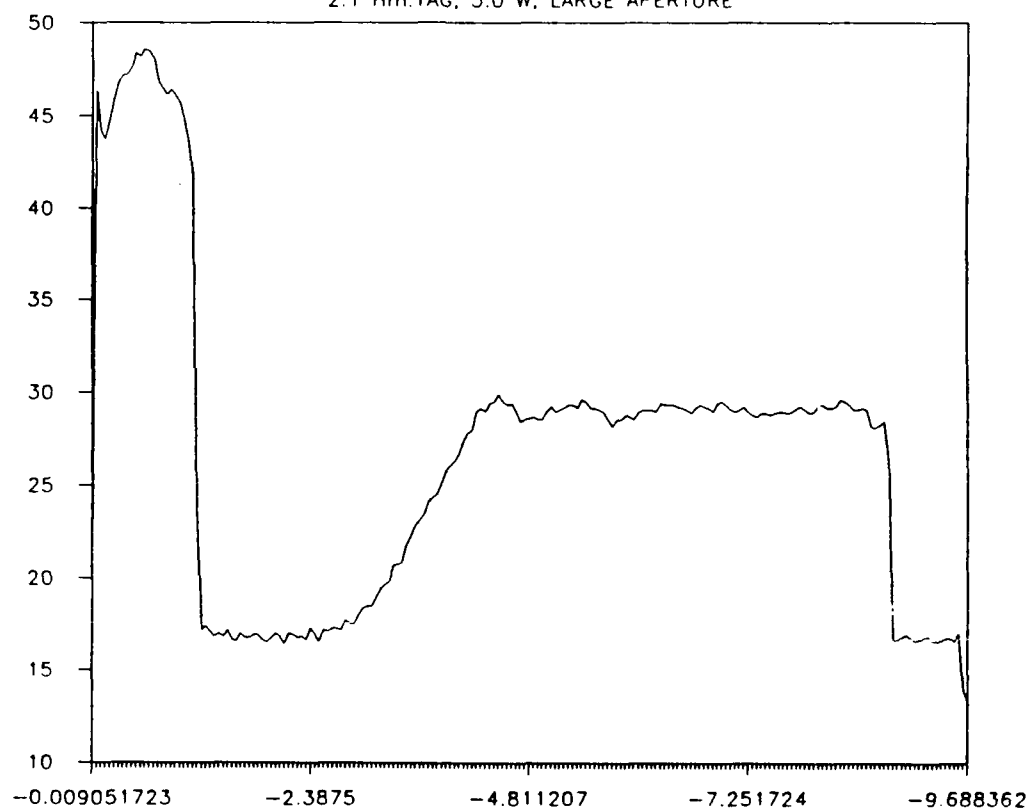
DEC19J-NO CHROMO CONTROLLED AT 70, 10 s

2.1 Hm:YAG, 5.0 W. LARGE APERTURE



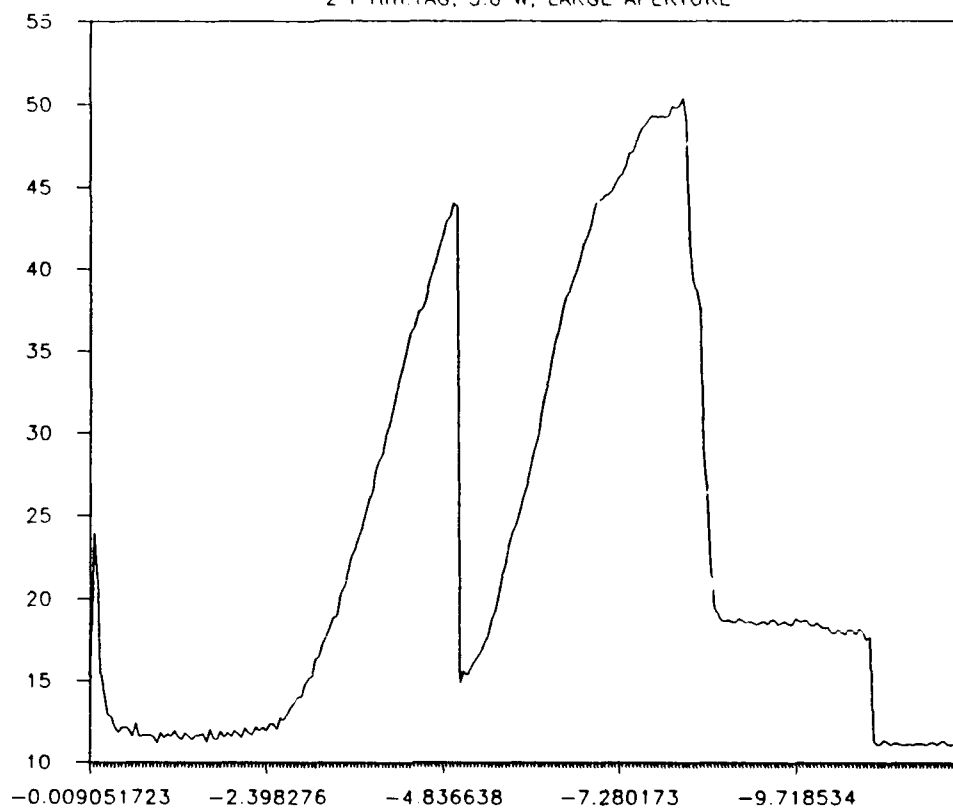
DEC19K- NO CHROMO CONTROLLED AT 80

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



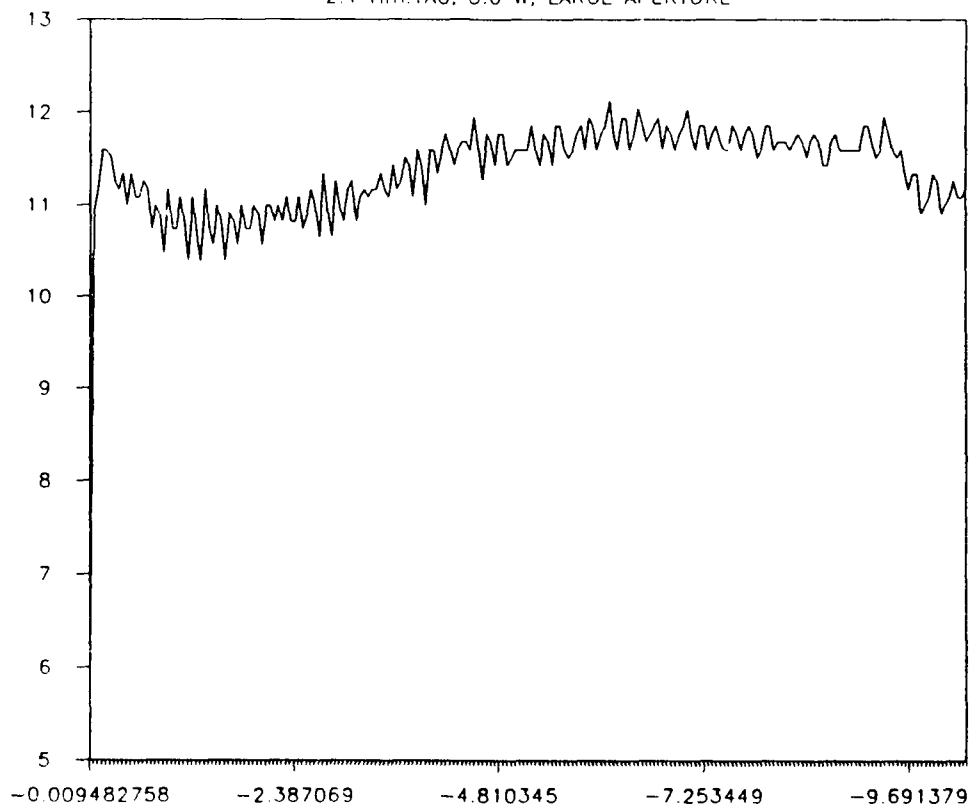
DEC19L-NO CHROMO CONTROLLED AT 100, 10s

2 1 Hm:YAG, 5.0 W, LARGE APERTURE



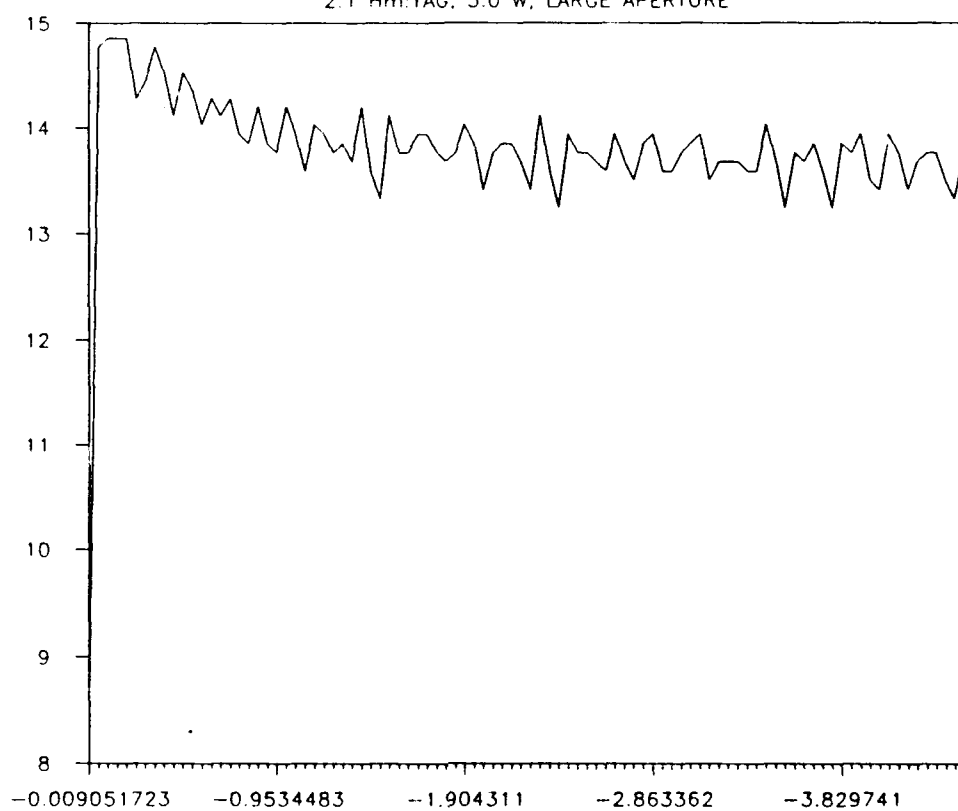
DEC19M- NO CHROMO CONTROLLED AT 50, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



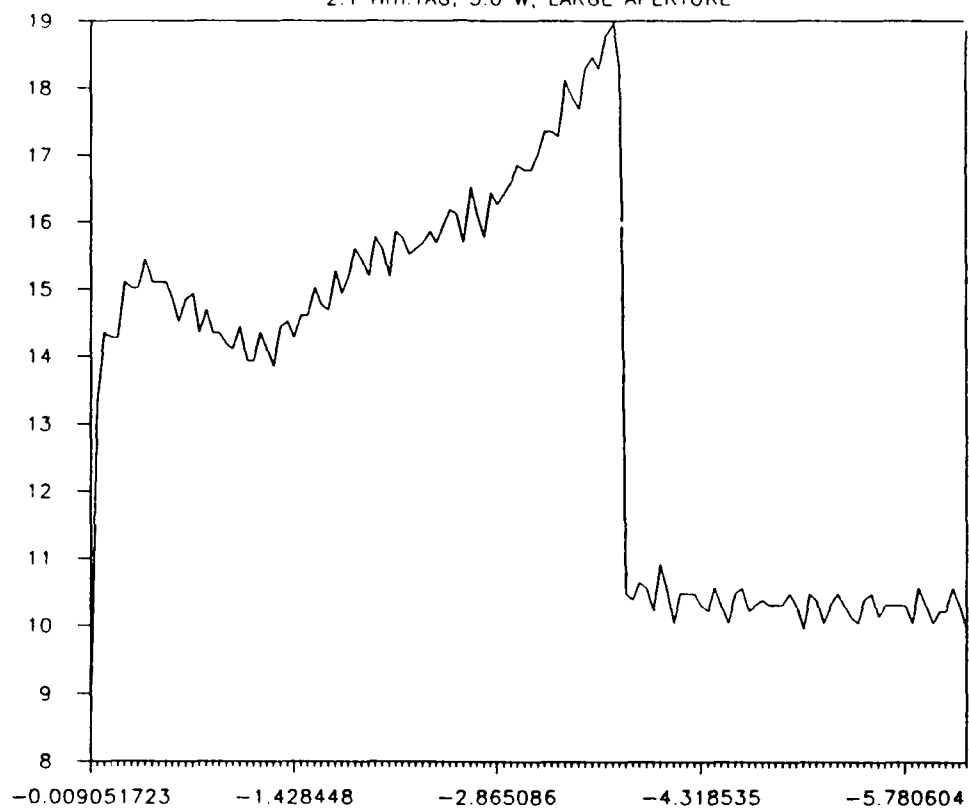
DEC19N- INDIA INK UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



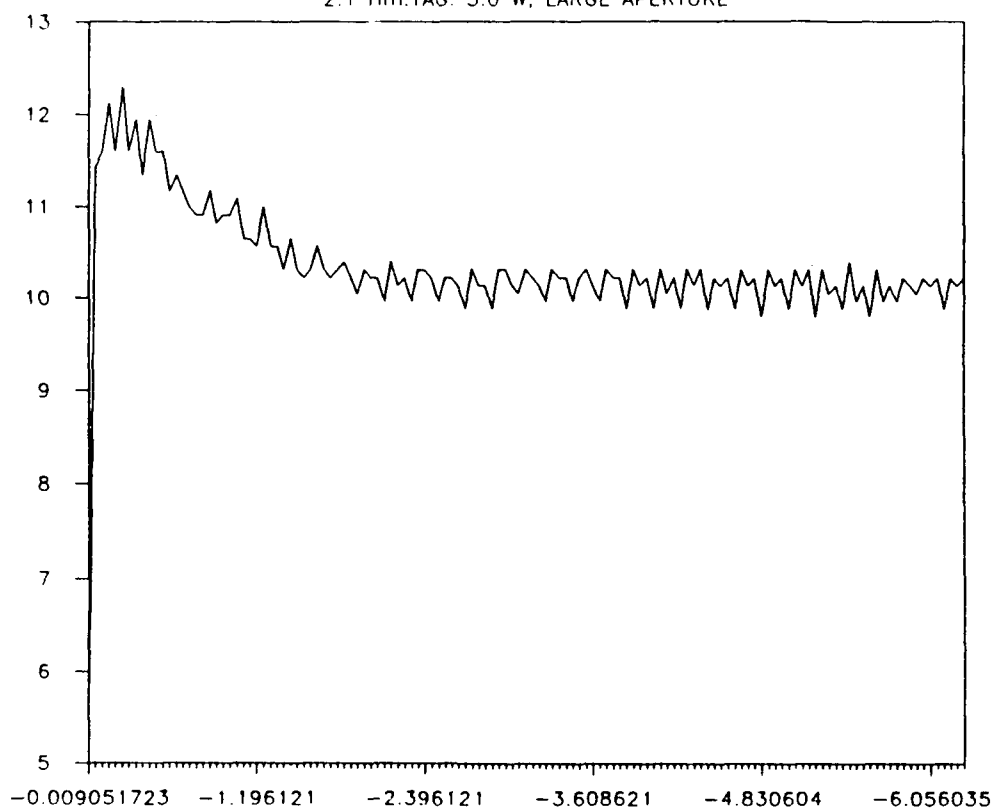
DEC190-INDIA INK CONTROLLED AT 50, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



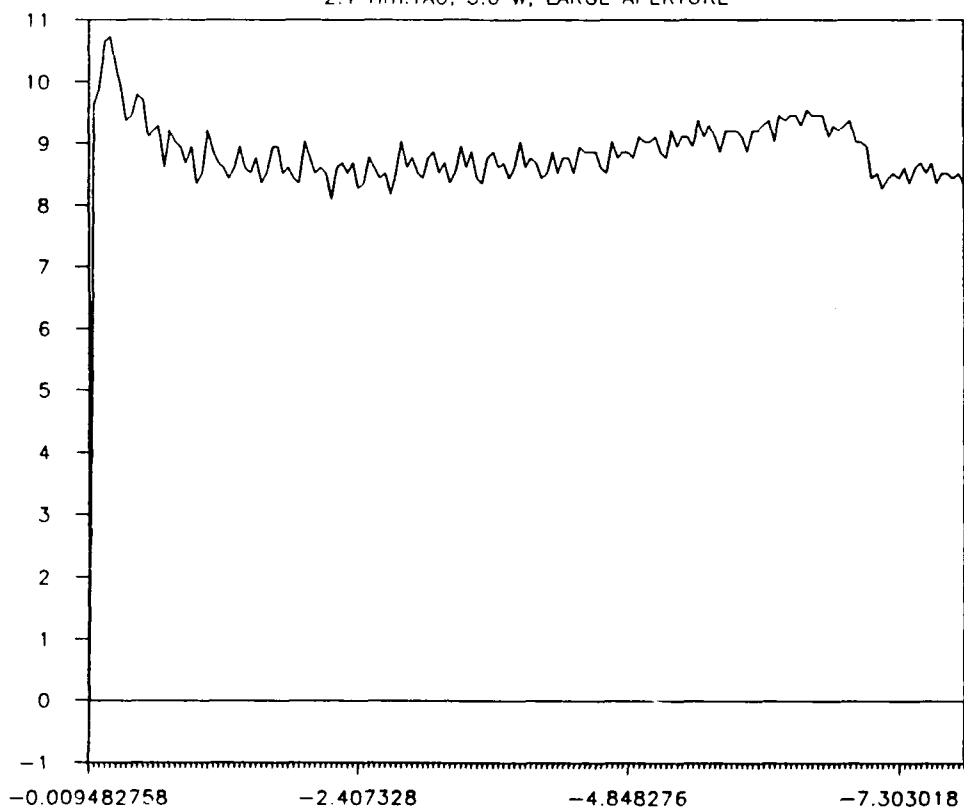
DEC19P1-INDIA INK CONTROLLED AT 50, '0s

2.1 Hm:YAG. 5.0 W, LARGE APERTURE



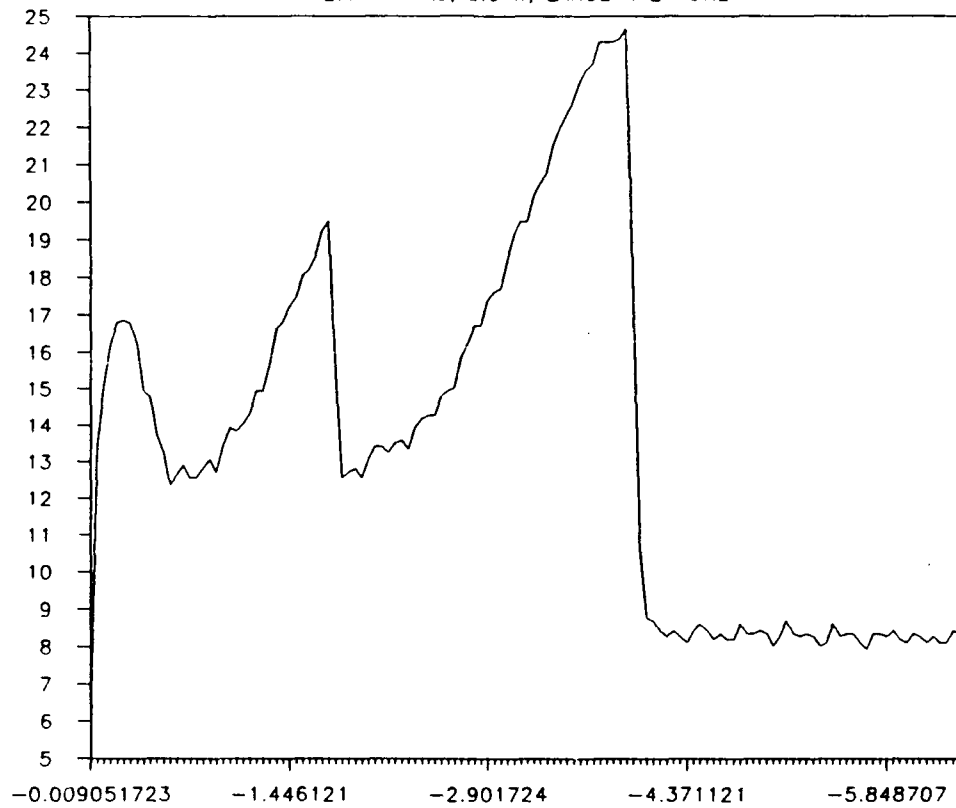
DEC19Q-INDIA INK CONTROLLED AT 60, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



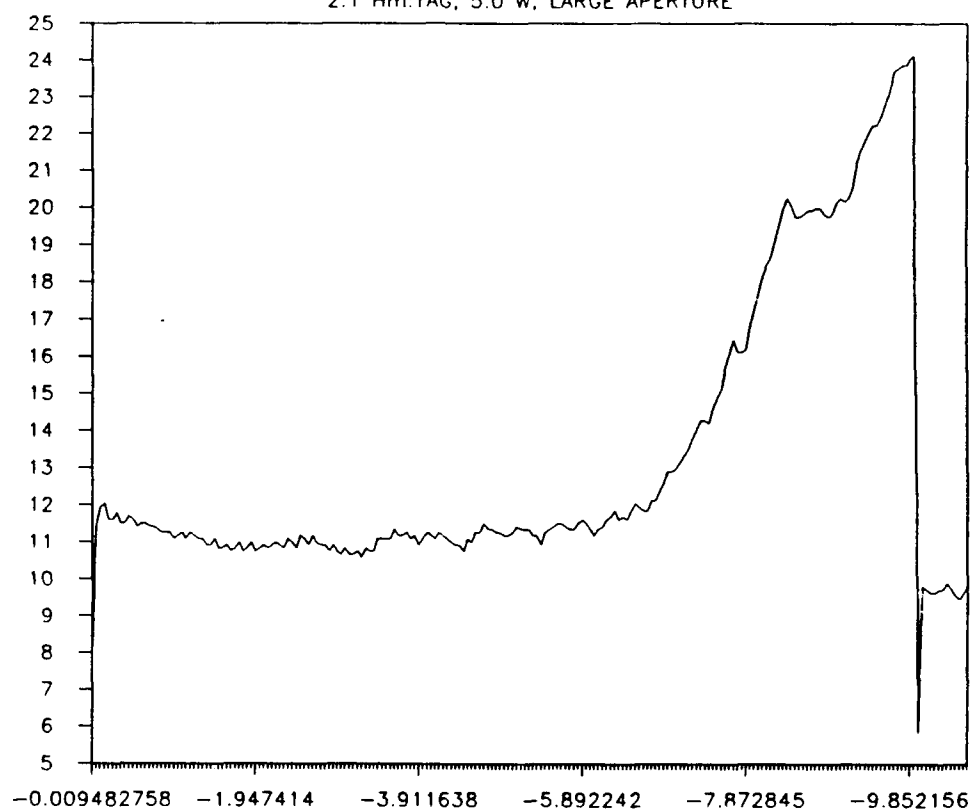
DEC19R- INDIA INK CONTROLLED AT 70, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



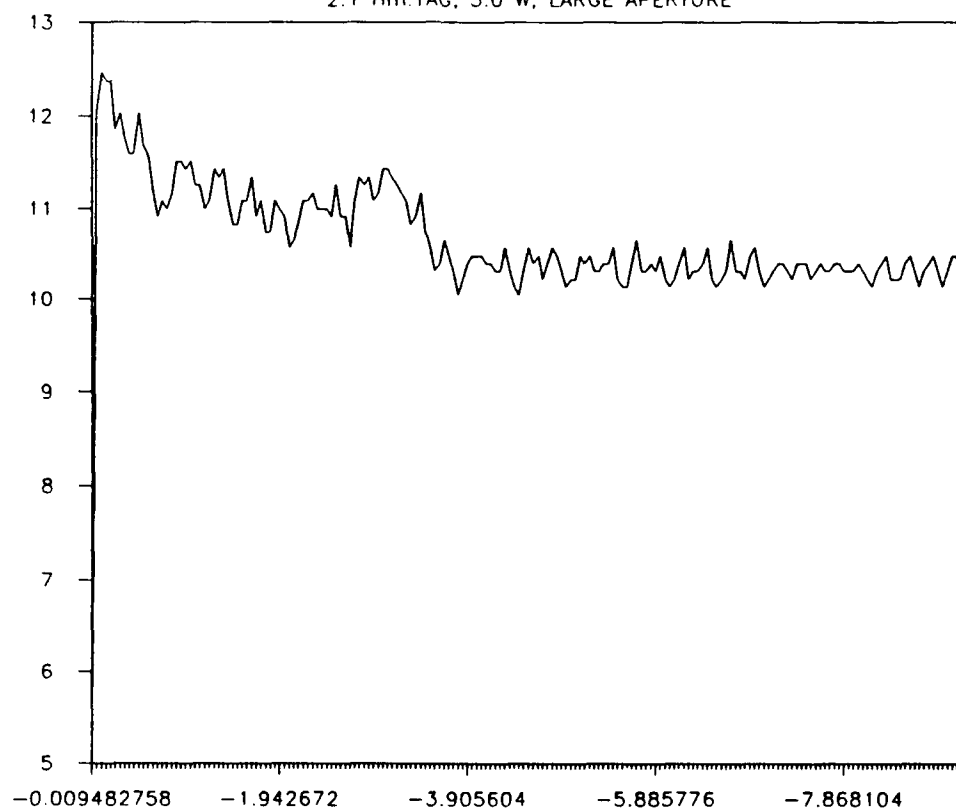
DEC19S- INDIA INK CONTROLLED AT 80, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



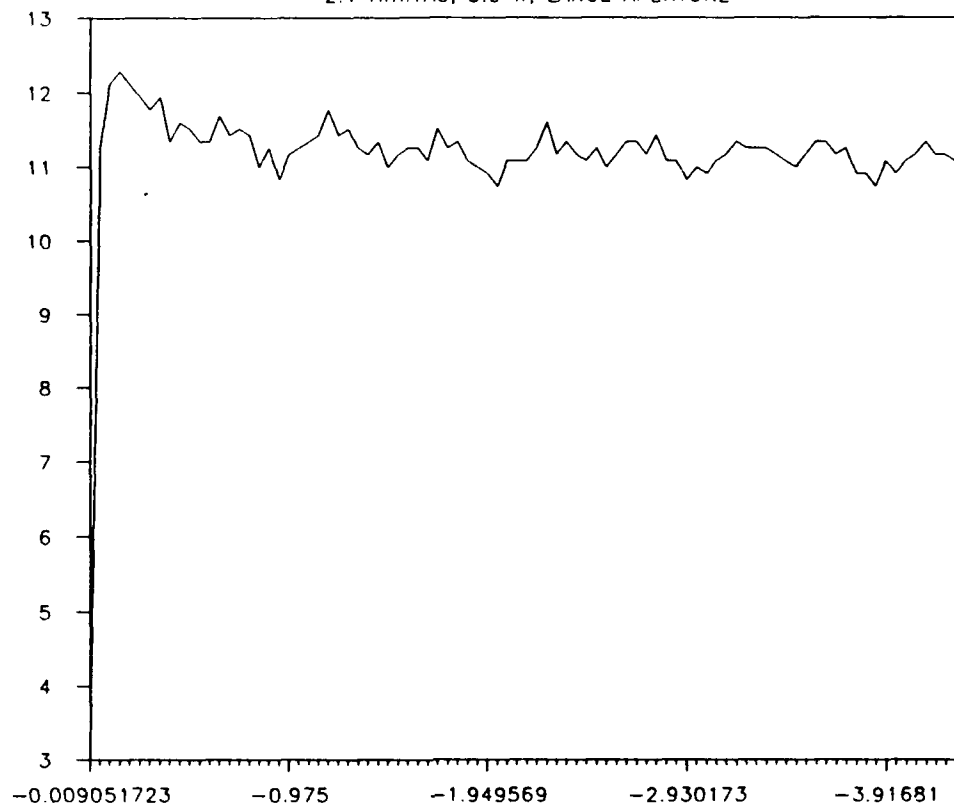
DEC19T-INDIA INK CONTROLLED AT 100, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



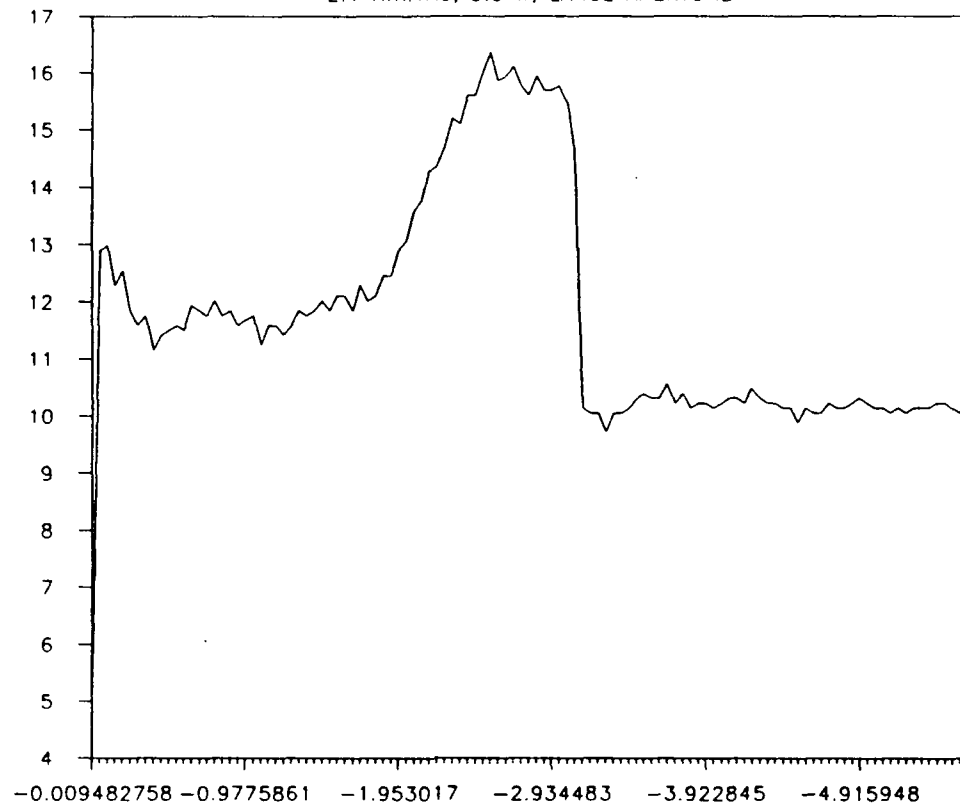
DEC19U-2X ICG UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



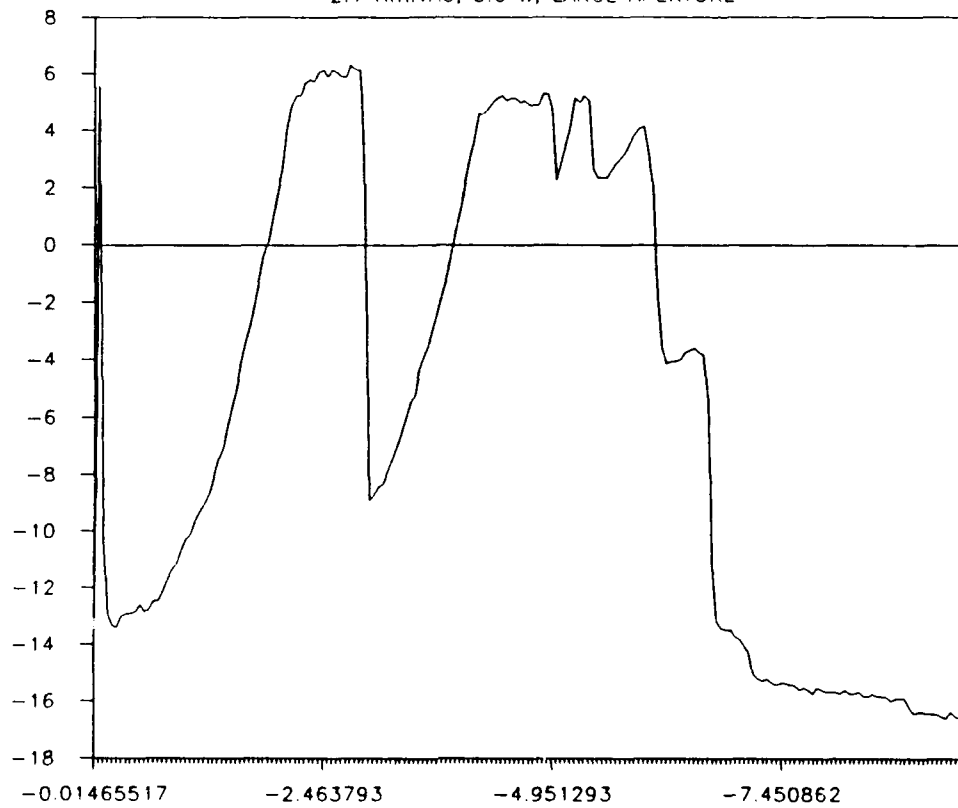
DEC19V- 2X ICG CONTROLLED AT 50, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



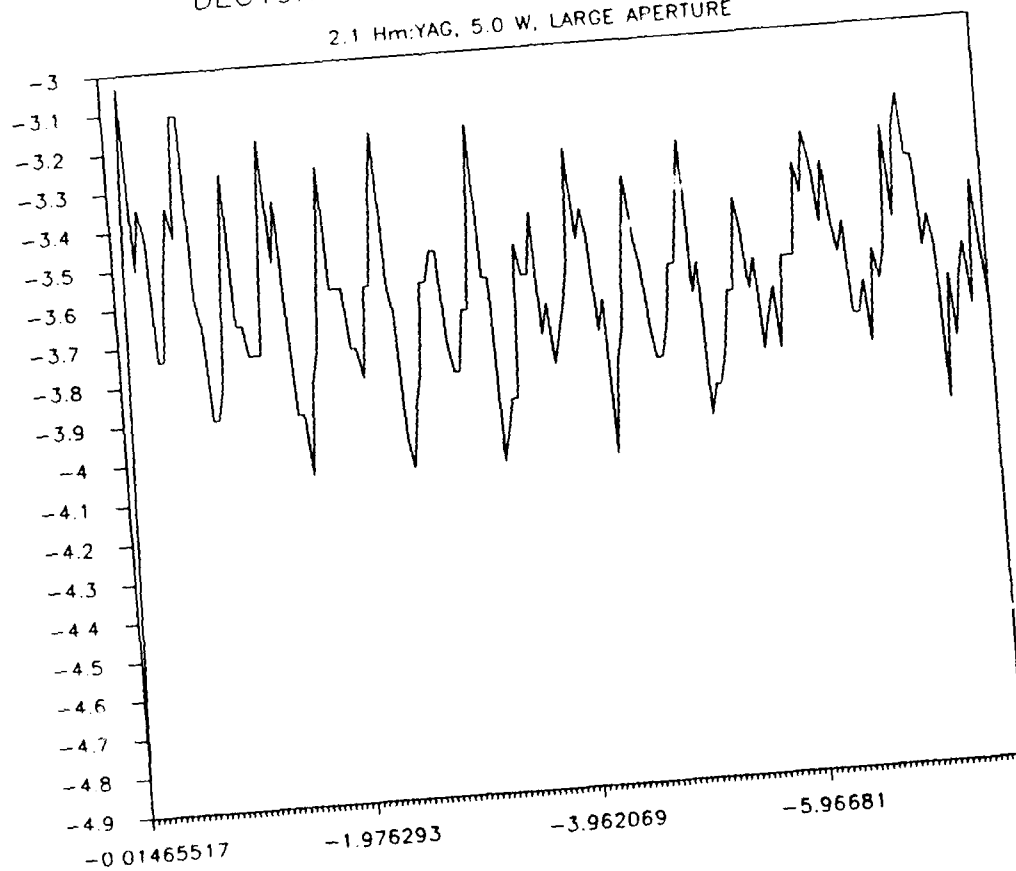
DEC19W-2X ICG CONTROLLED AT 60, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



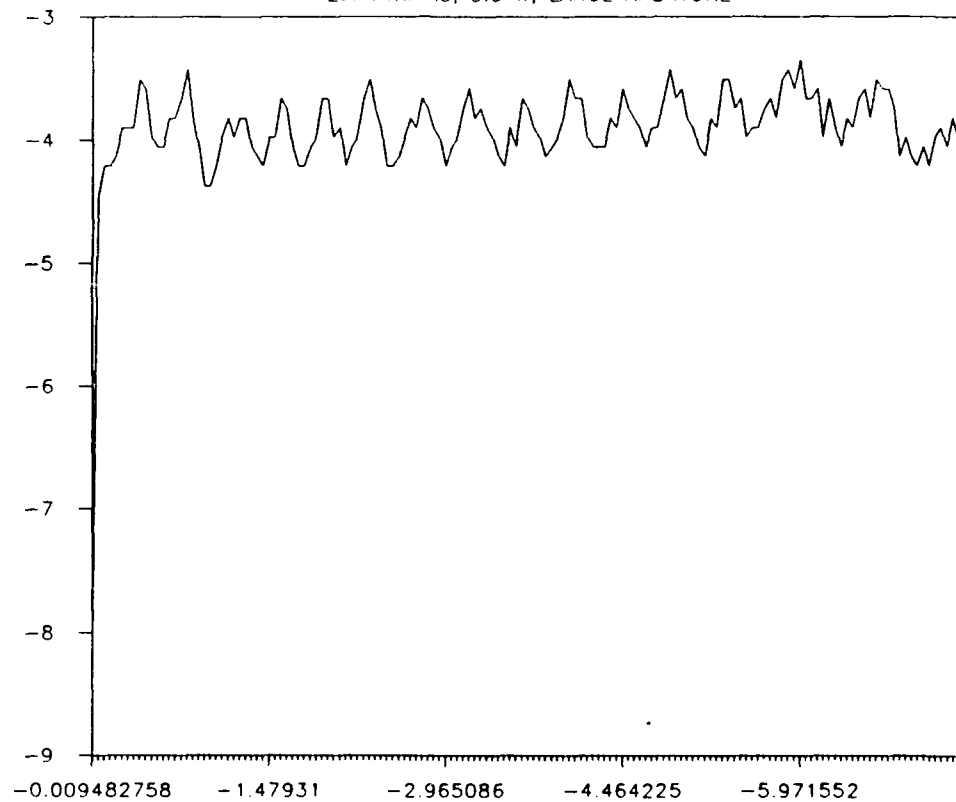
DEC19X-2X ICG CONTROLLED AT 70, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



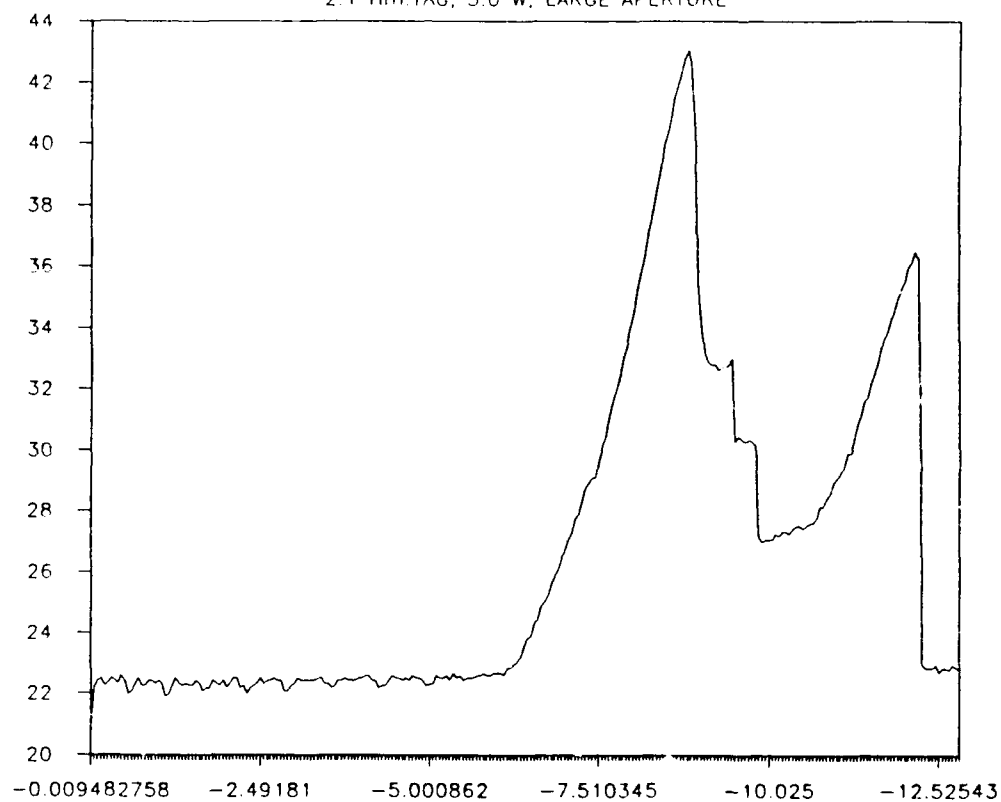
DEC19Y- 2X ICG CONTROLLED AT 80, 10s

2.1 Hm YAG, 5.0 W, LARGE APERTURE



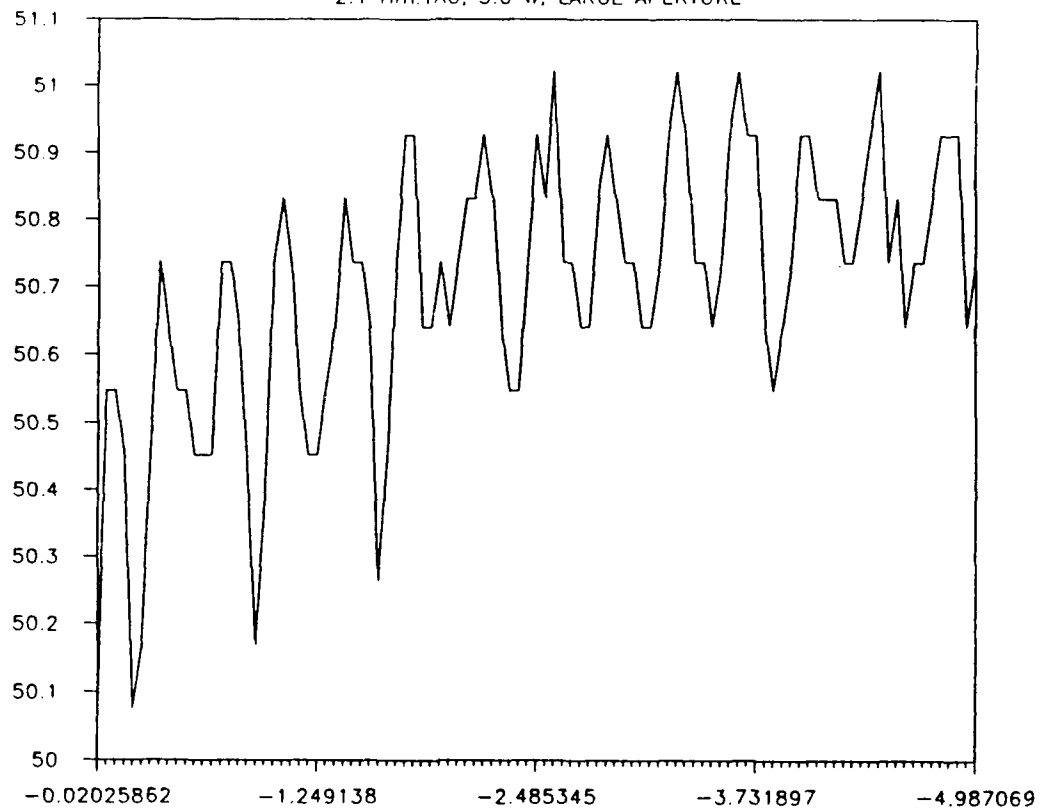
DEC19Z-2X ICG CONTROLLED AT 100, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



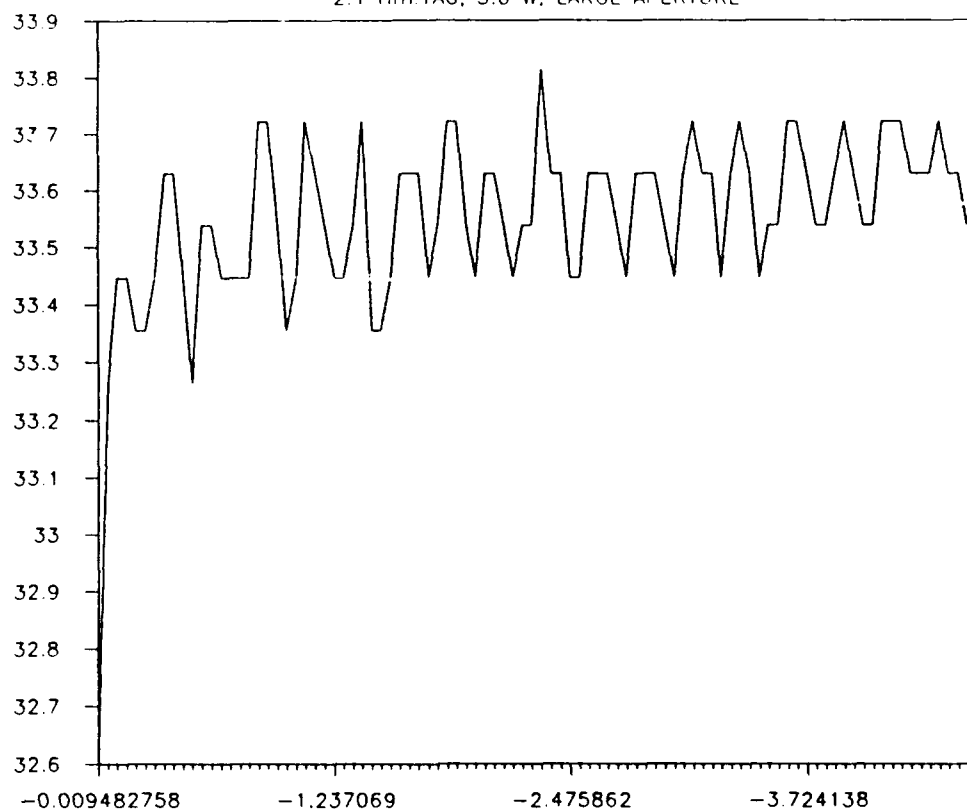
DEC19AA-BLOOD UNWELDED CONTROL

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



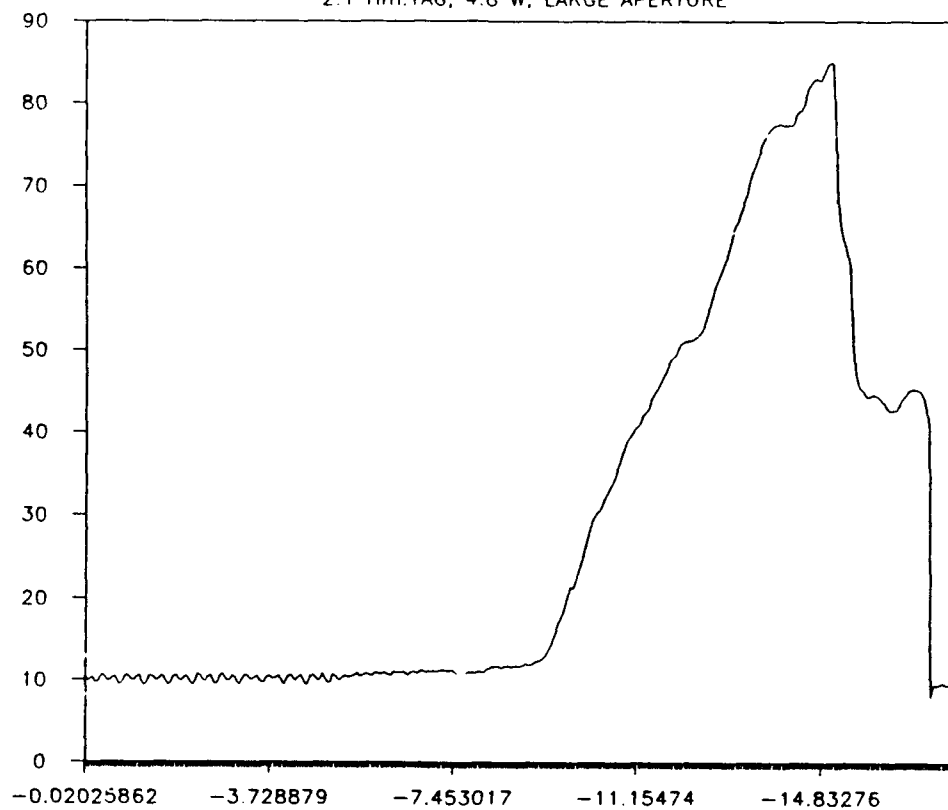
DEC19AB-BLOOD CONTROLLED AT 50, 10s

2.1 Hm:YAG, 5.0 W, LARGE APERTURE



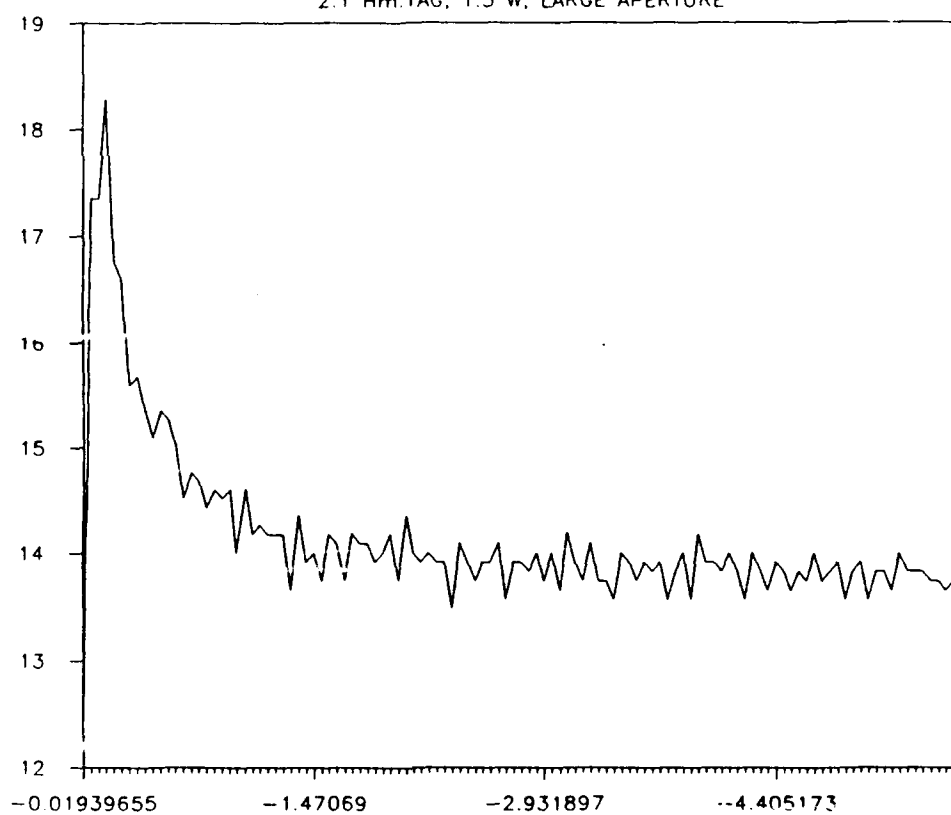
DEC21A-ONE STRIP UNWELDED CONTROL

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



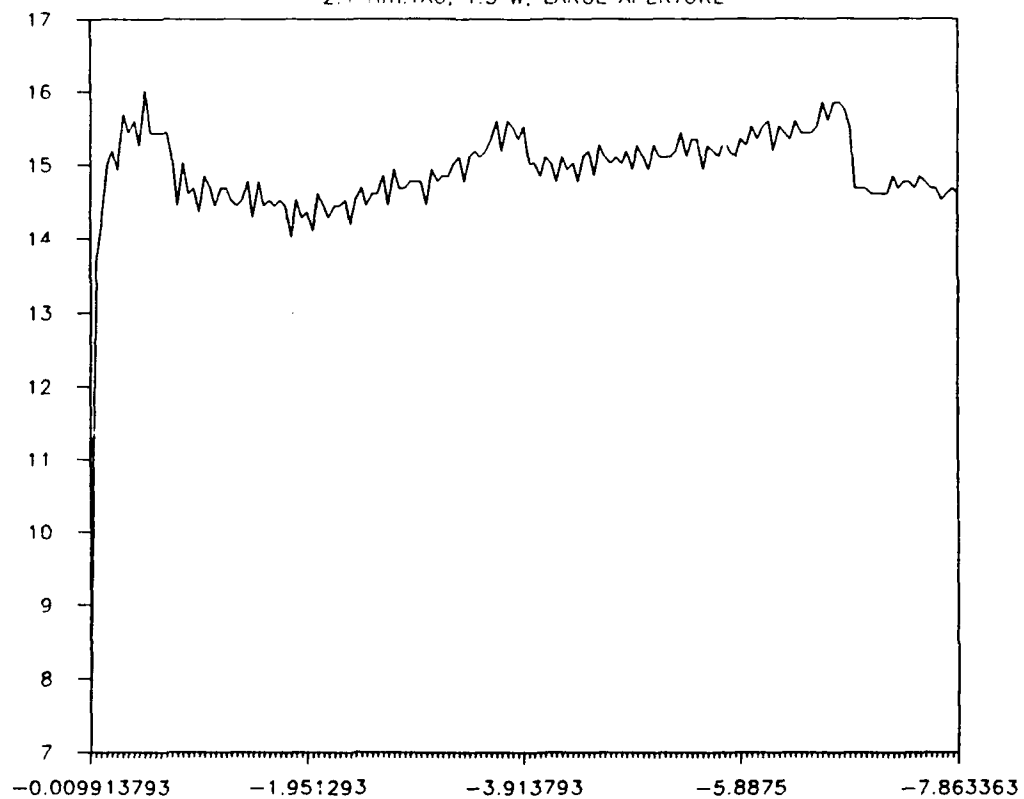
DEC21AA1-NO CHROMO CONTROLLED AT 70,10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



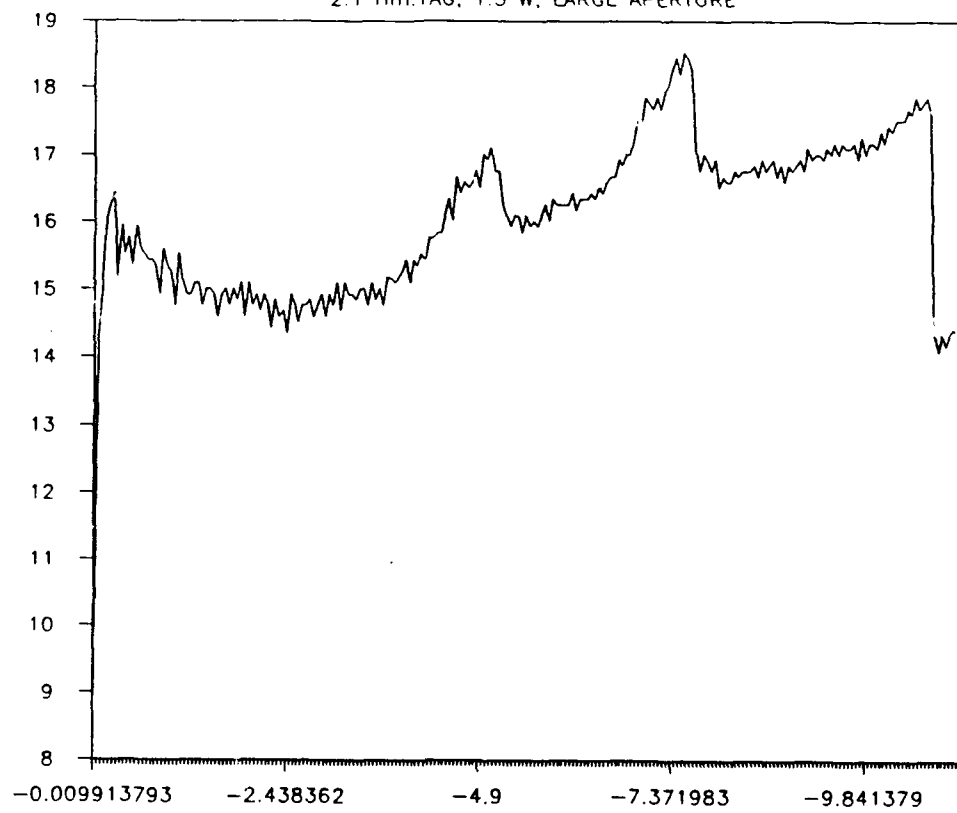
DEC21AB-NO CHROMO CONTROLLED AT 80, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



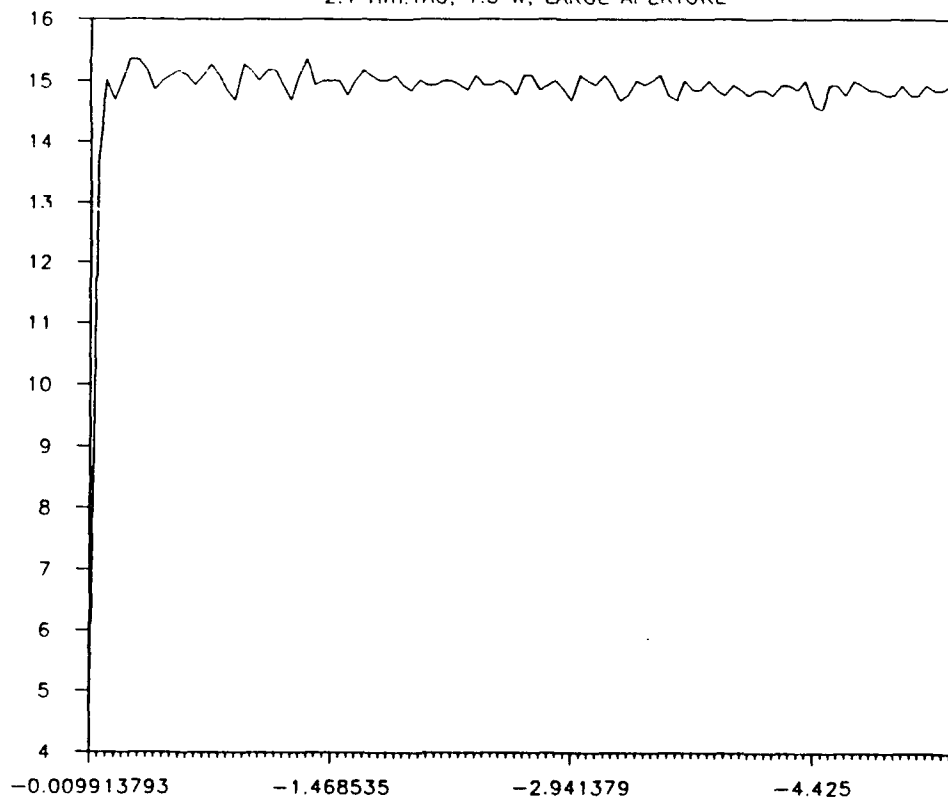
DEC21AC-NO CHROMO CONTROLLED AT 100,10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



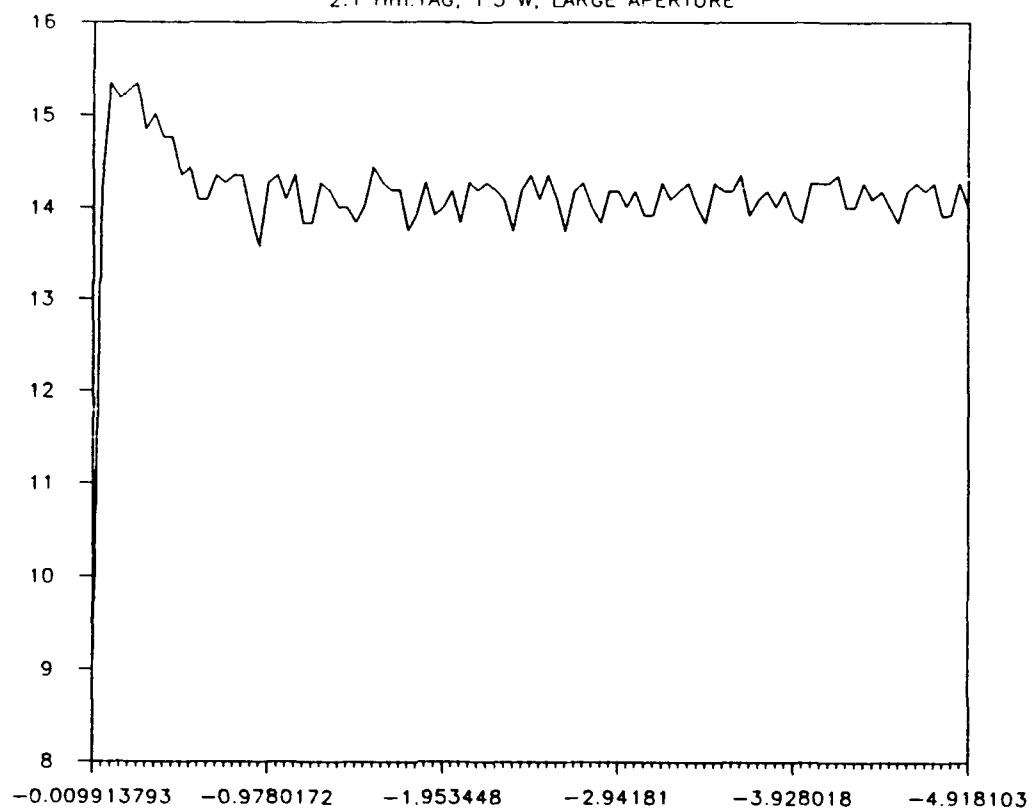
DEC21AD-INDIA INK UNWELDED CONTROL

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



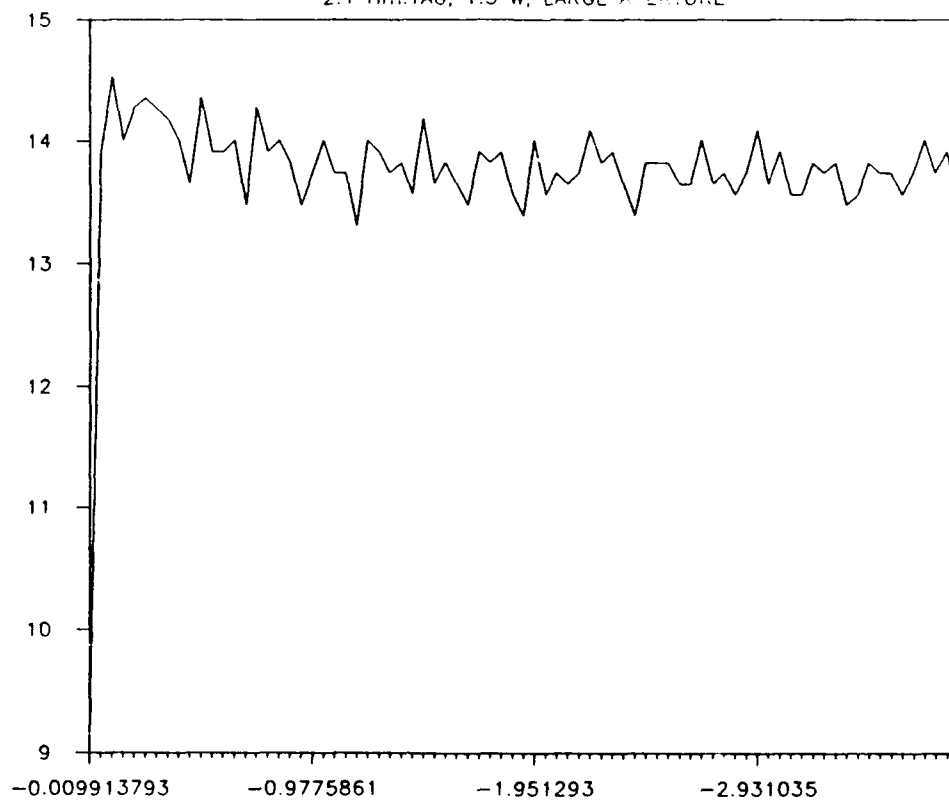
DEC21AE-INDIA INK CONTROLLED AT 50,10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



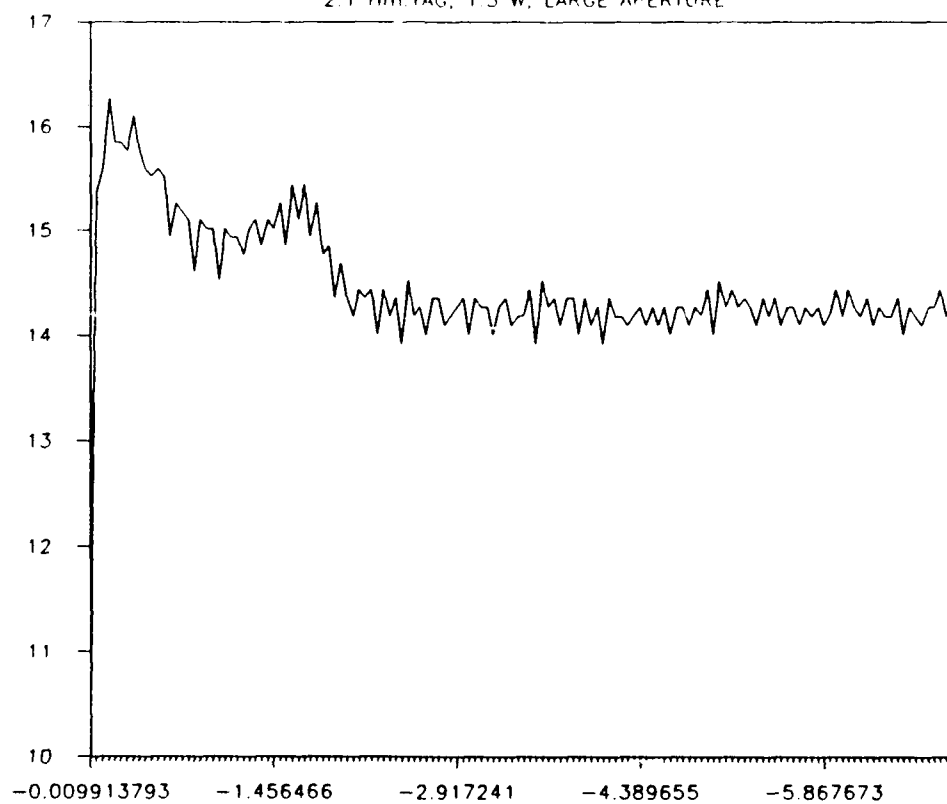
DEC21AF-INDIA INK CONTROLLED AT 60, 10s

2.1 Hm.YAG, 1.5 W, LARGE APERURE



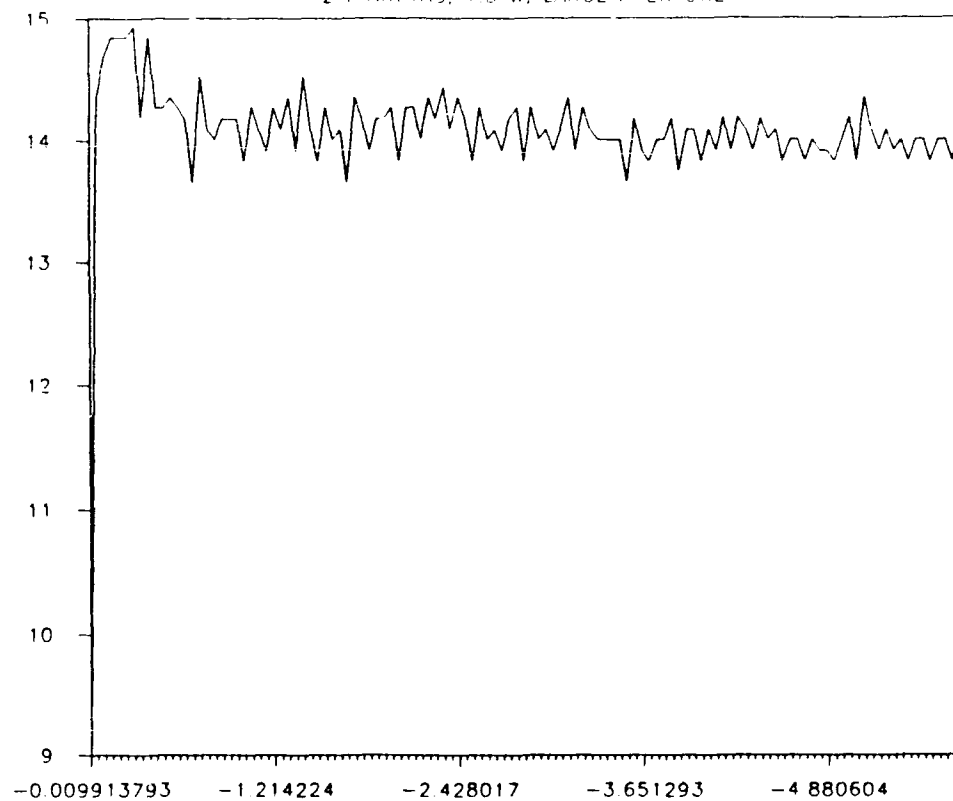
DEC21AG-INDIA INK CONTROLLED AT 70, 10s

2.1 Hm YAG, 1.5 W, LARGE APERTURE



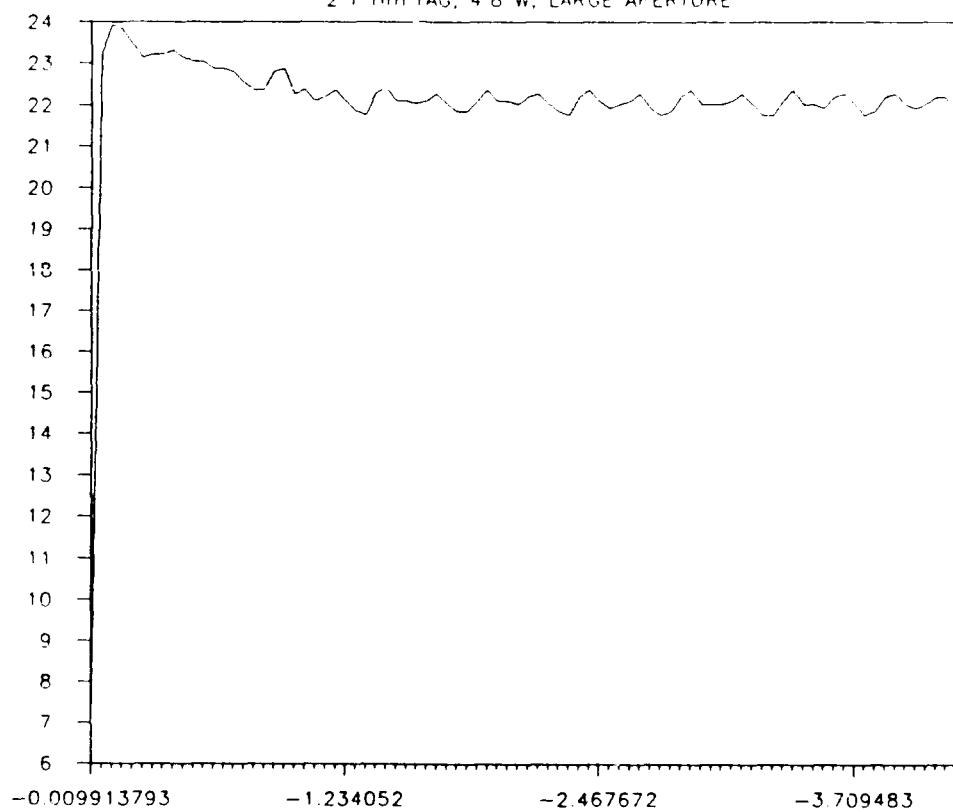
DEC21AH--INDIA INK CONTROLLED AT 80, 10s

2.1 Hm YAG, 1.5 W, LARGE APERTURE



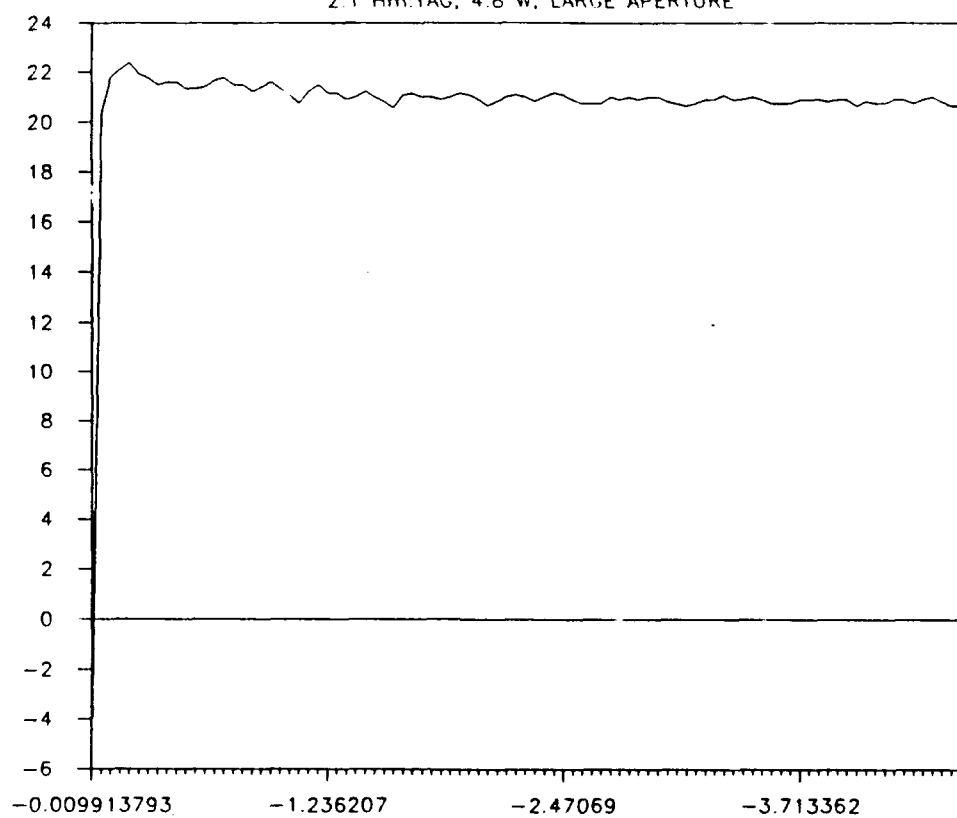
DEC21B-TWO STRIP UNWELDED CONTROL

2.1 HmYAG, 4.8 W, LARGE APERTURE



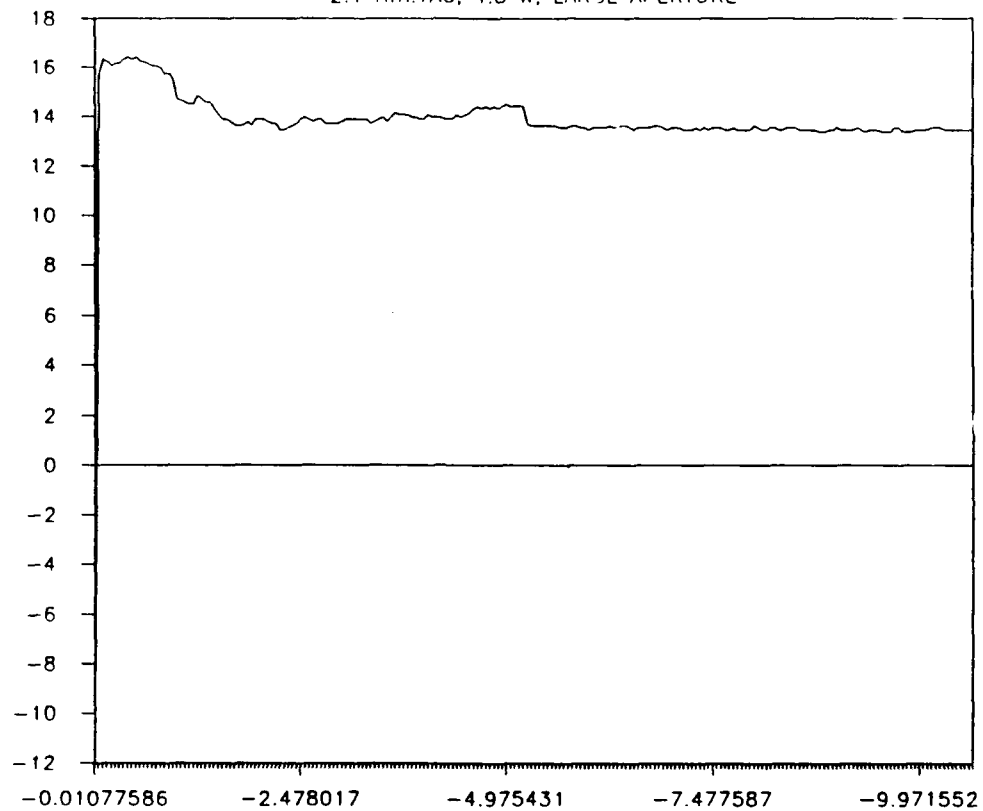
DEC21C-TWO STRIP 2X ICG UNWELDED CONTRO

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



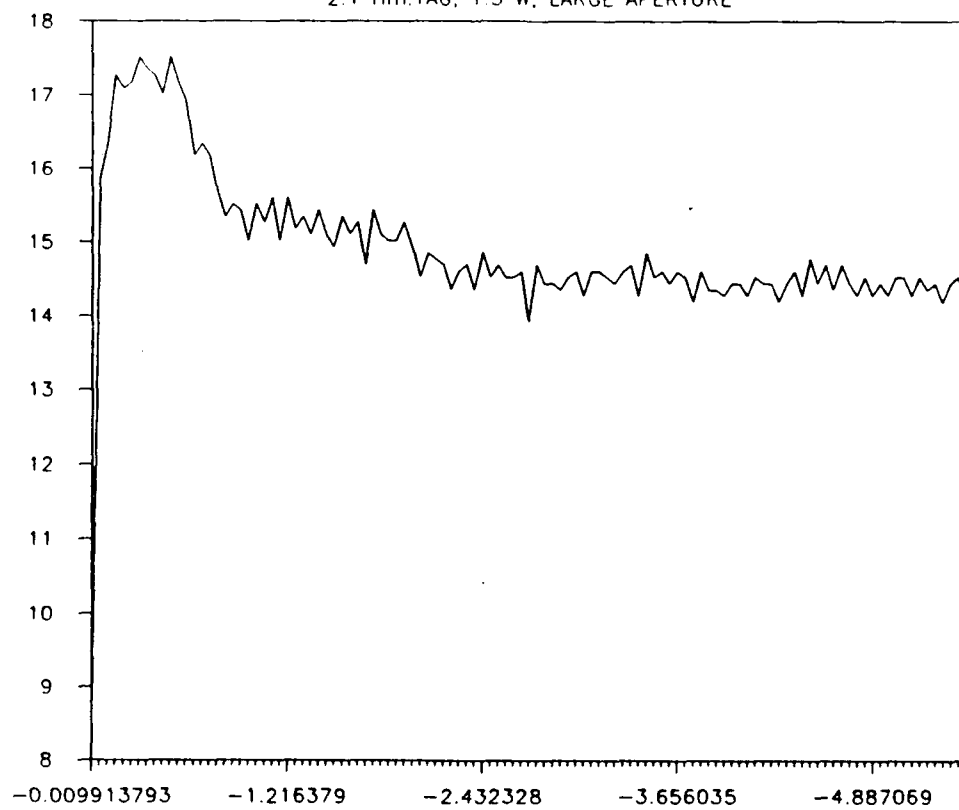
DEC21D-2X ICG CONTROLLED AT 50, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



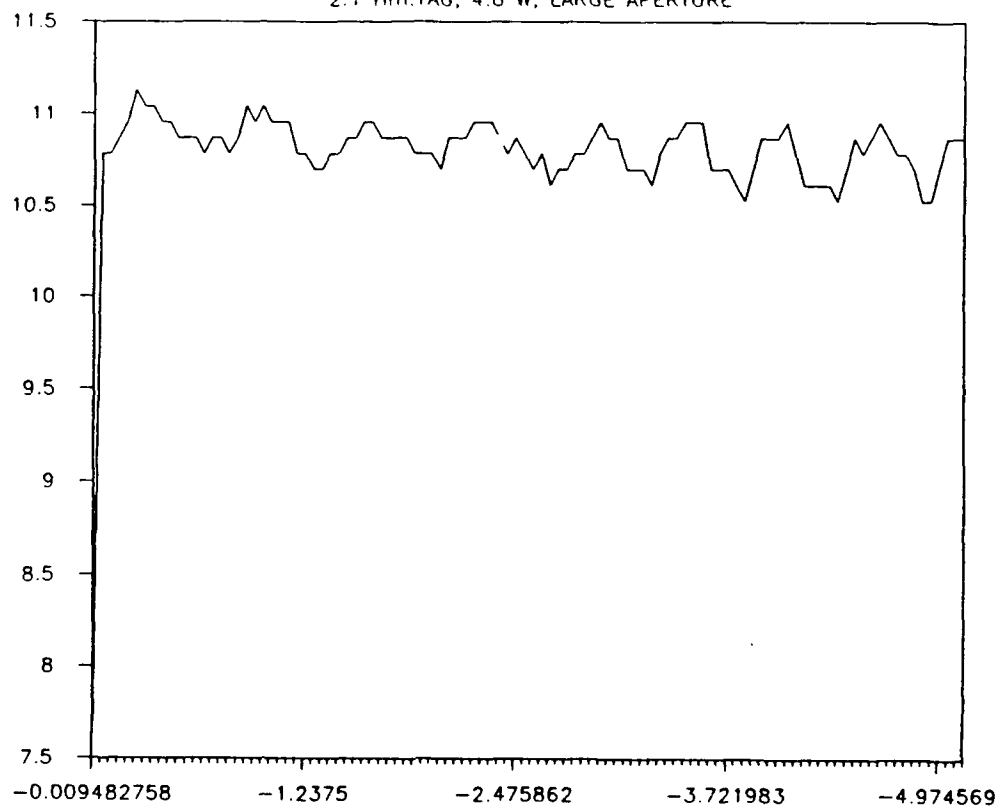
DEC21AI-INDIA INK CONTROLLED AT 100,10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



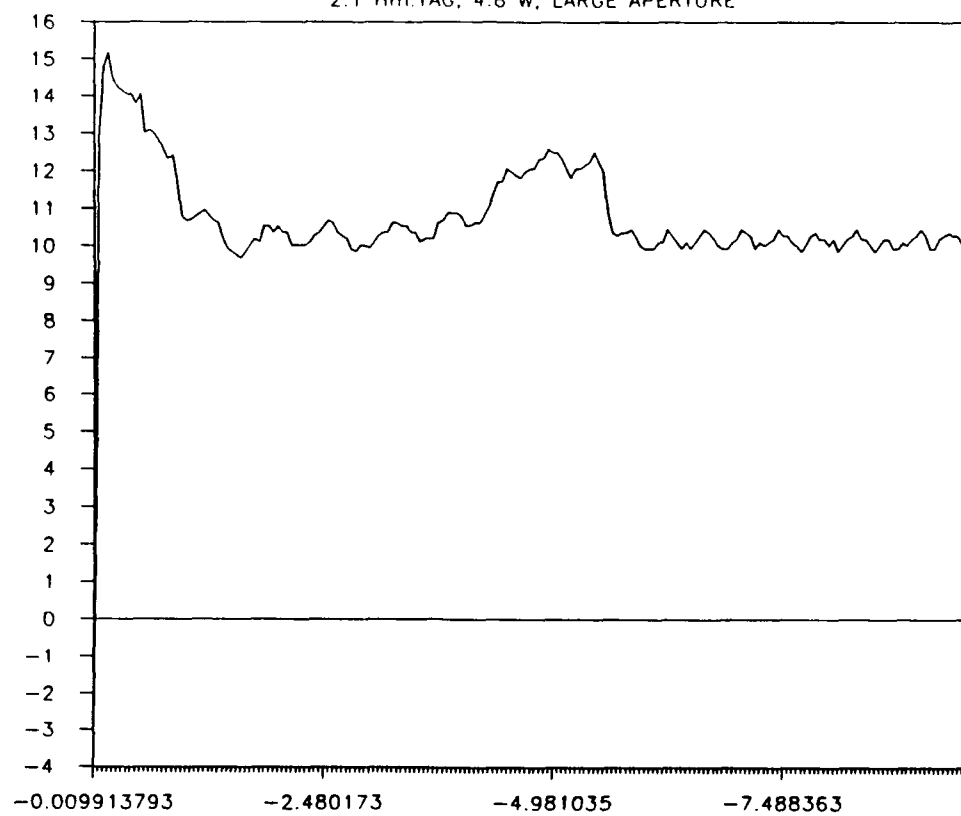
DEC21E-2X ICG CONTROLLED AT 60, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



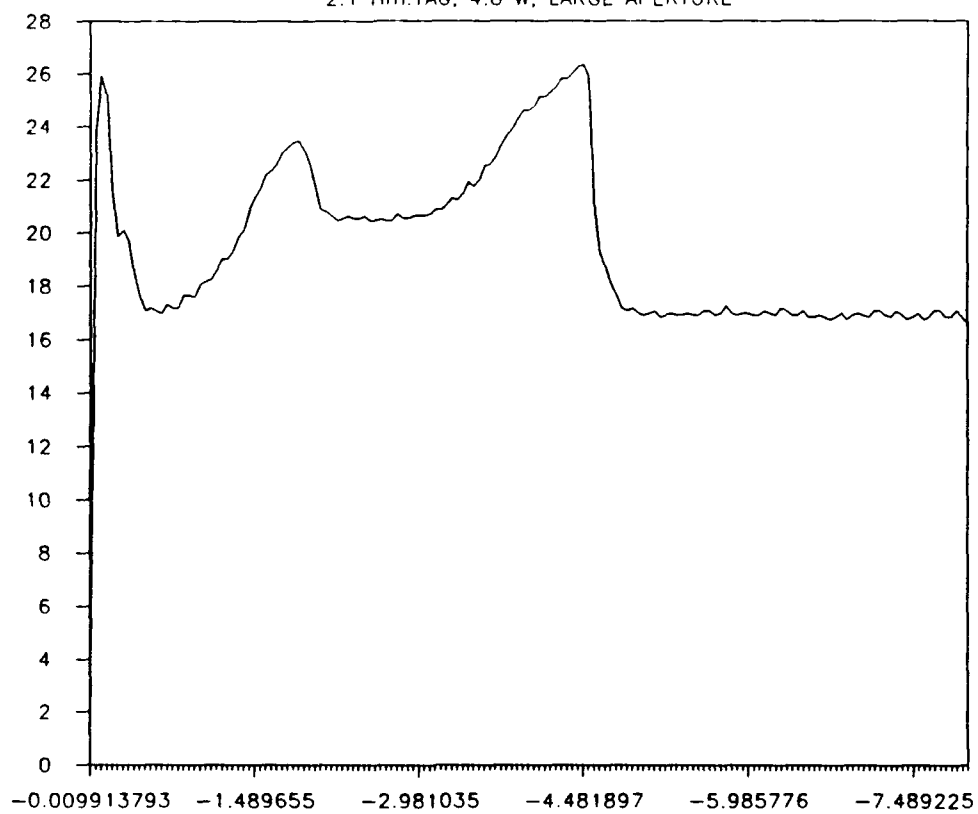
DEC21F-2X ICG CONTROLLED AT 70, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



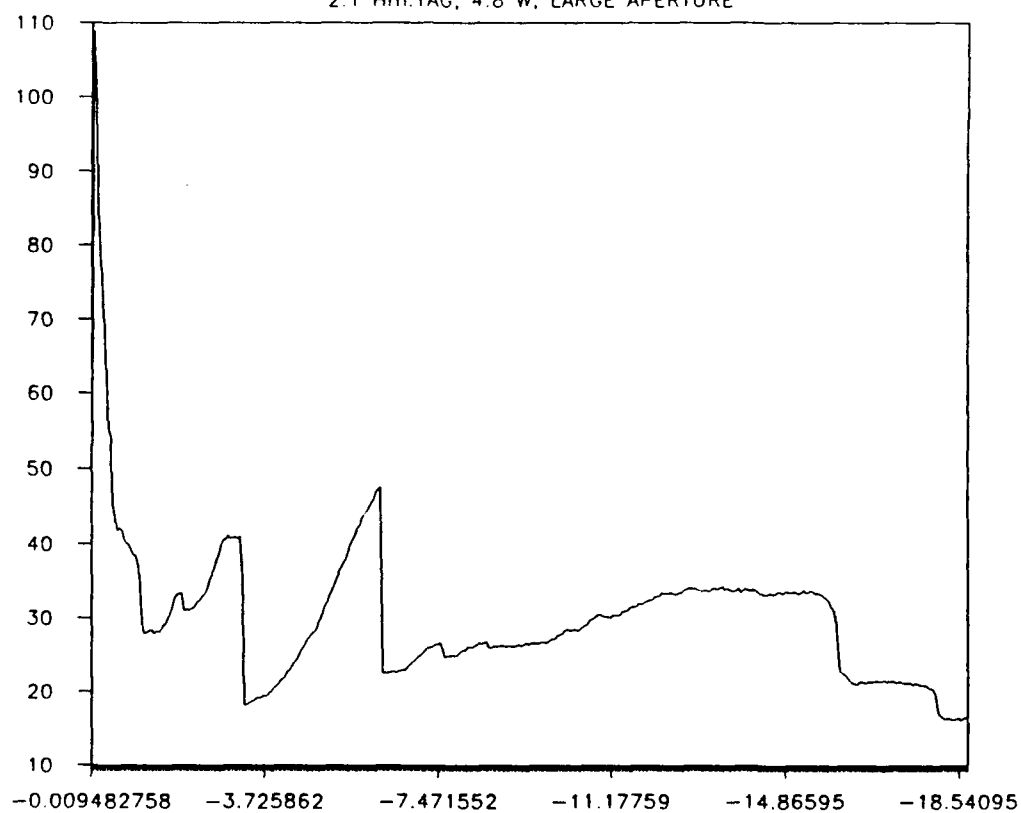
DEC21G-2X ICG CONTROLLED AT 80, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



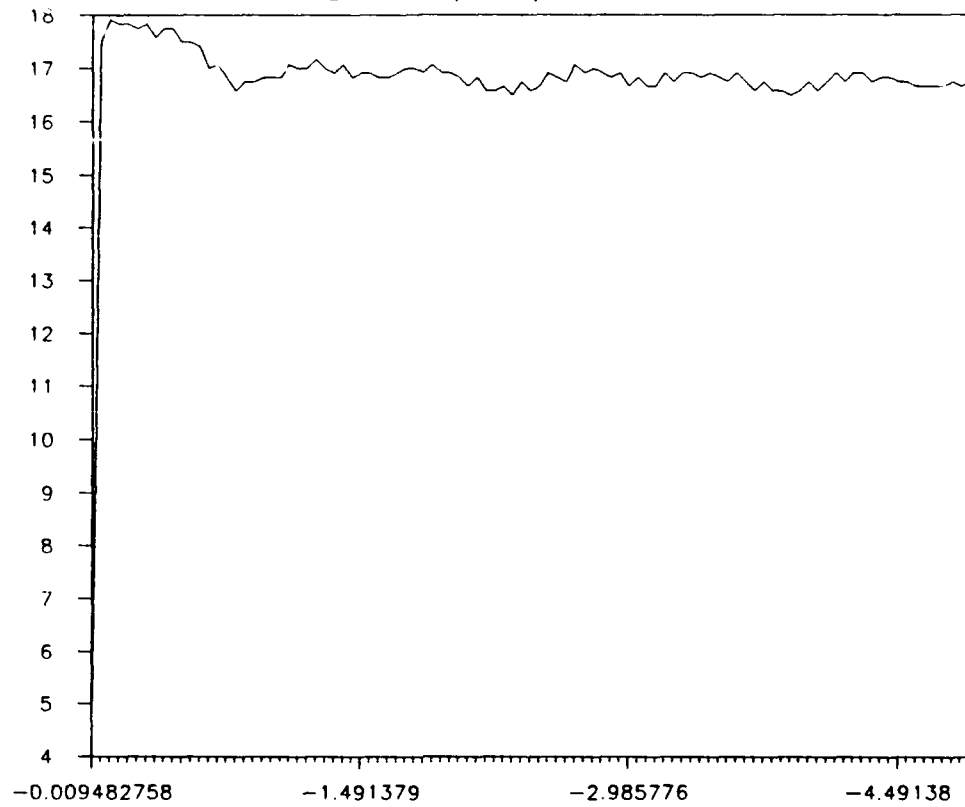
DEC21H-2X ICG CONTROLLED AT 100, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



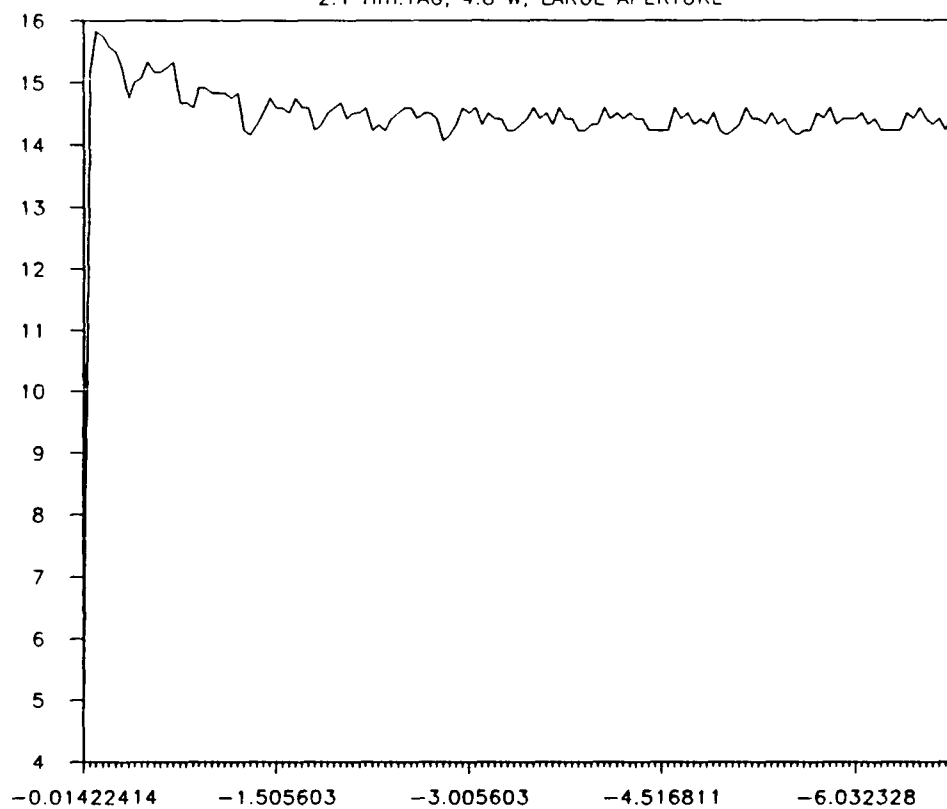
DEC21H-BLOOD UNWELDED CONTROL

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



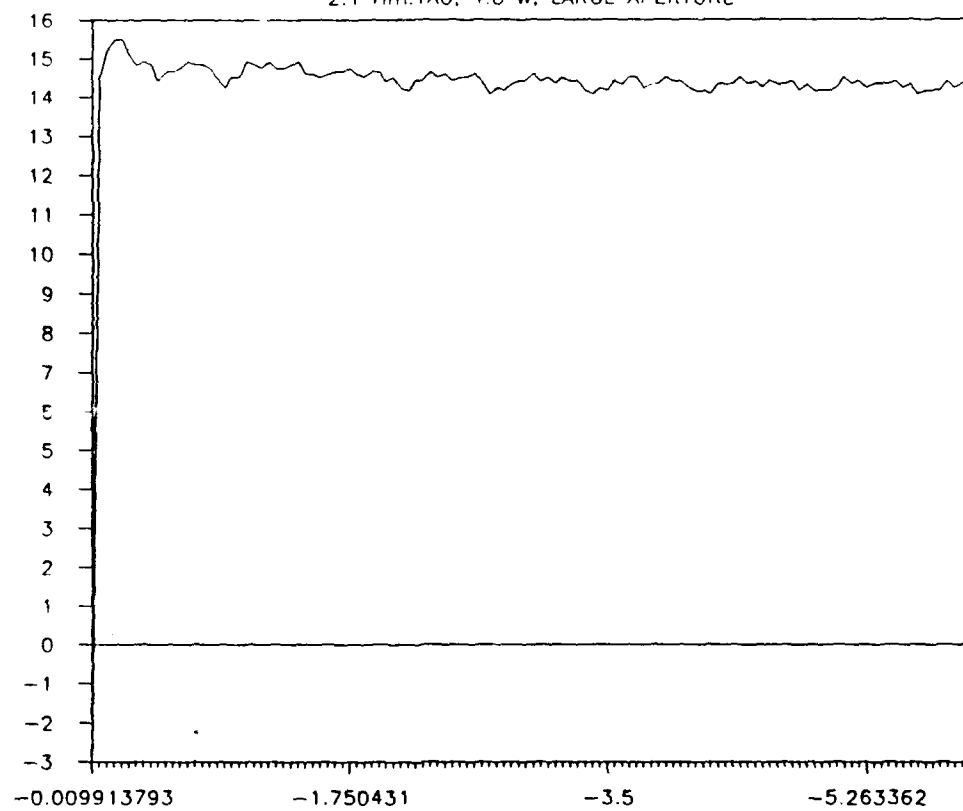
DEC21J-BLOOD CONTROLLED AT 50, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



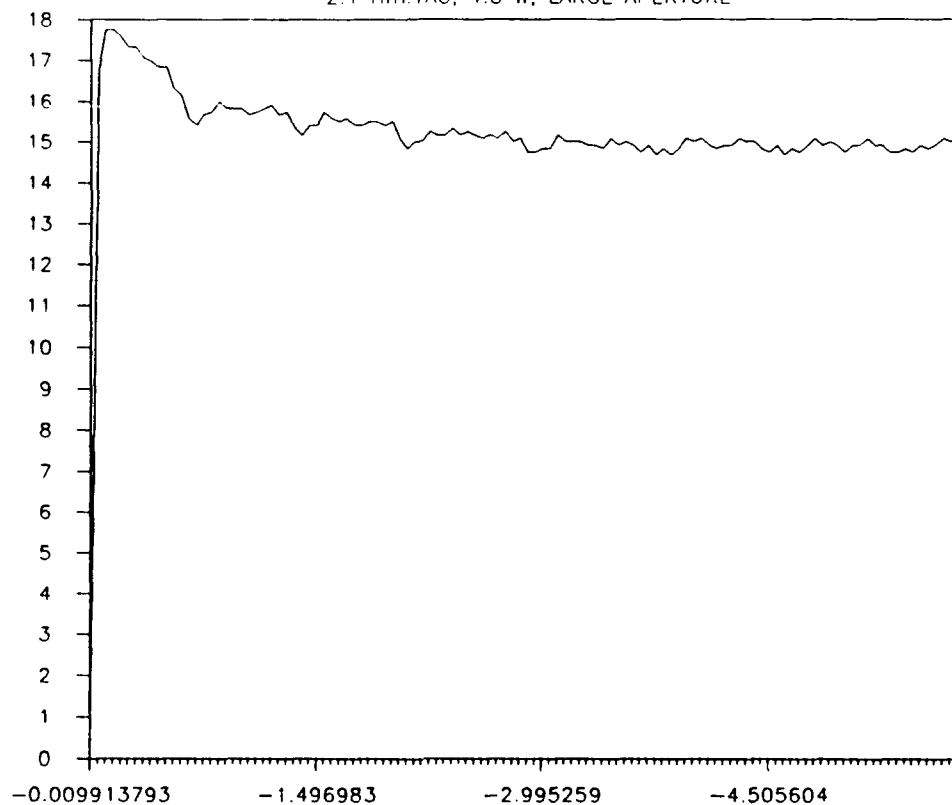
DEC21K-BLOOD CONTROLLED AT 60, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



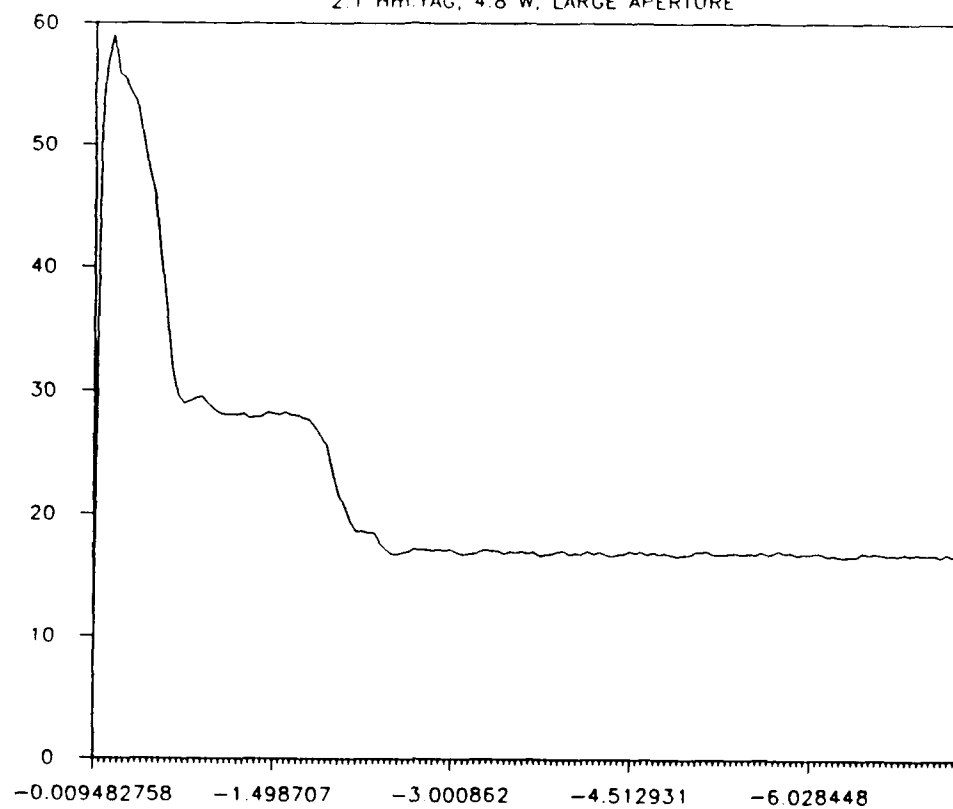
DEC21L- BLOOD CONTROLLED AT 70, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



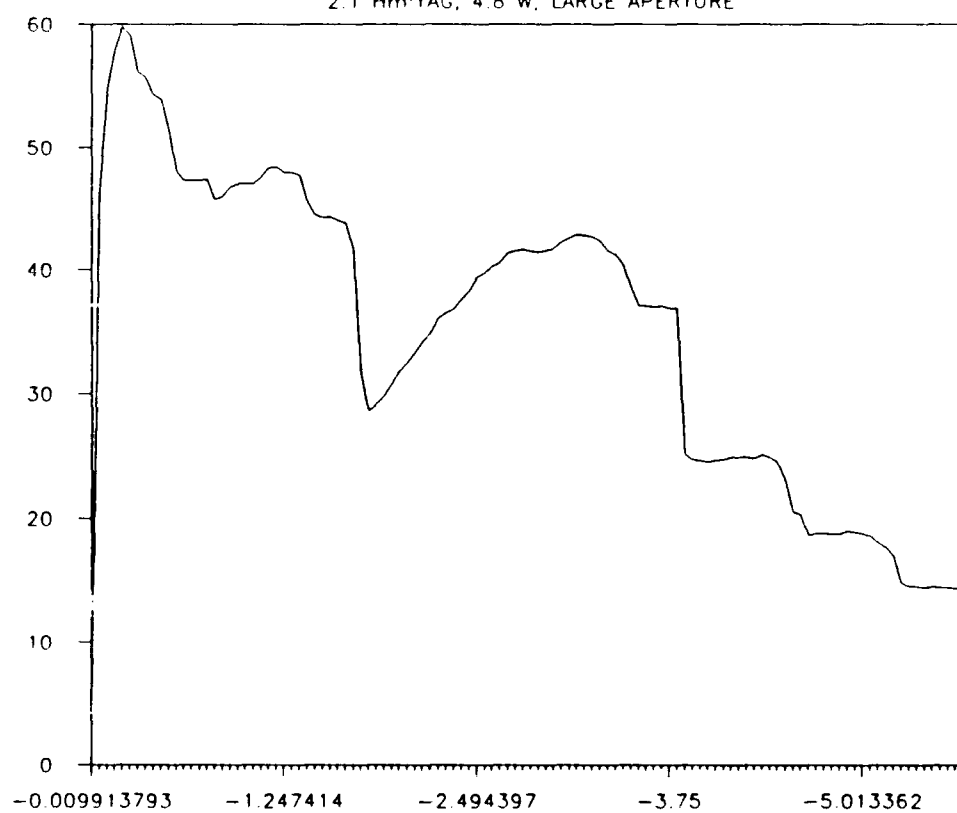
DEC21M- BLOOD CONTROLLED AT 80, 10s

2.1 Hm:YAG, 4.8 W, LARGE APERTURE



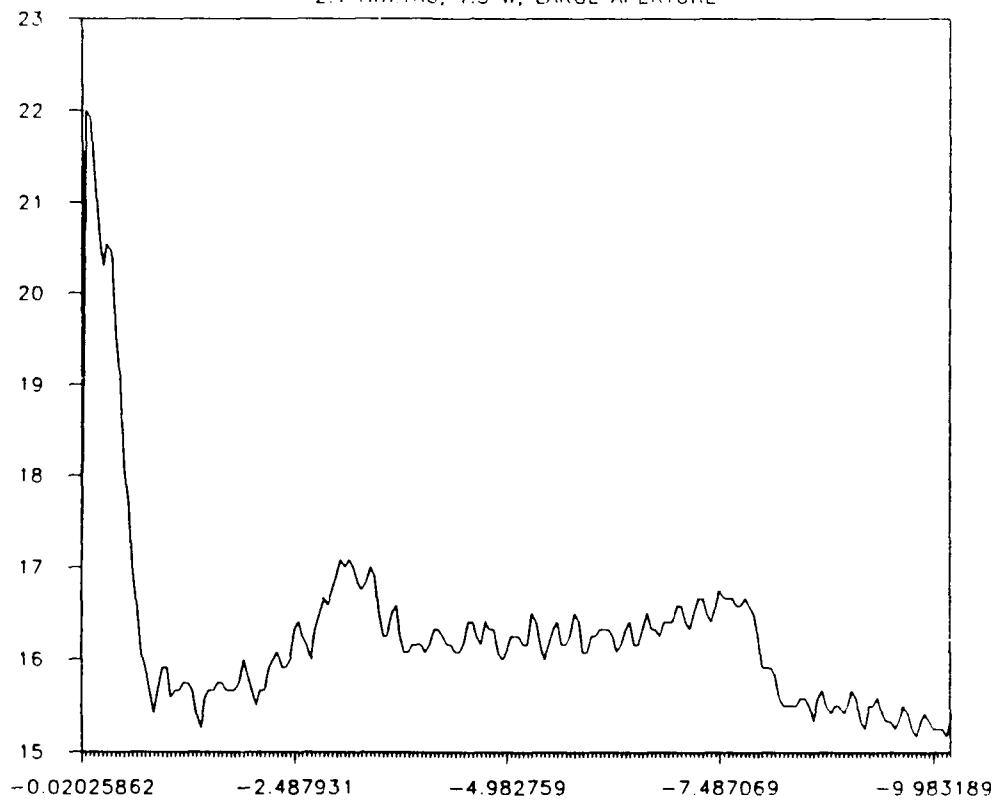
DEC21N-BLOOD CONTROLLED AT 100, 10s

2.1 Hm YAG, 4.8 W, LARGE APERTURE



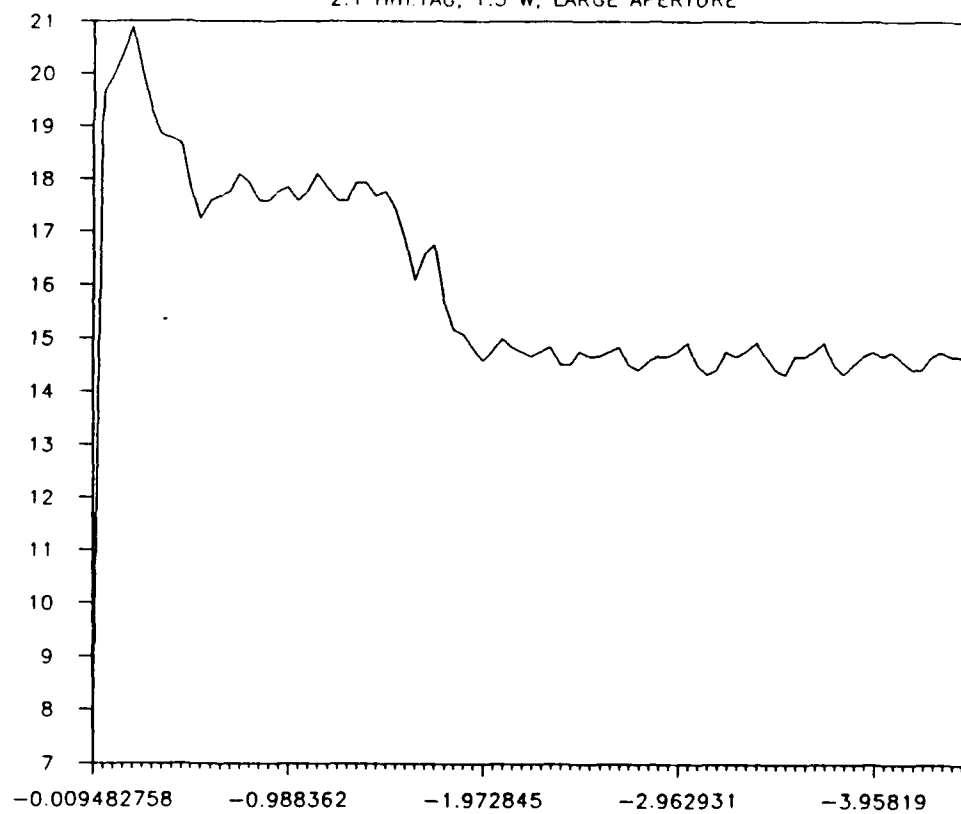
DEC2101-BLOOD CONTROLLED AT 50, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



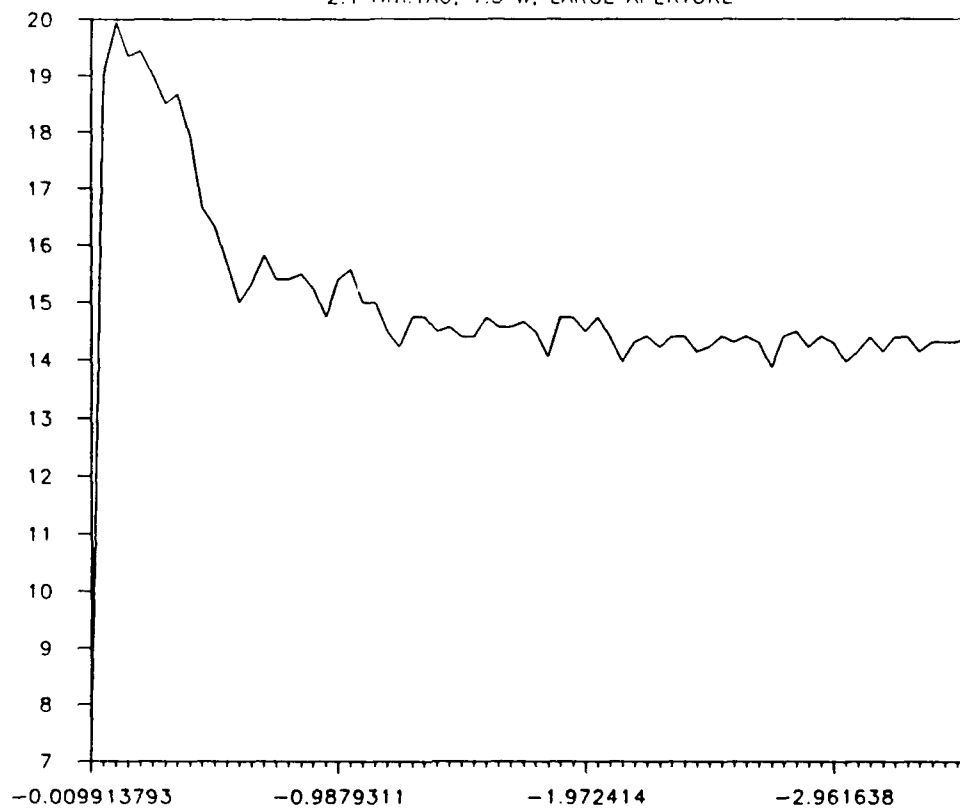
DEC21P-BLOOD CONTROLLED AT 60, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



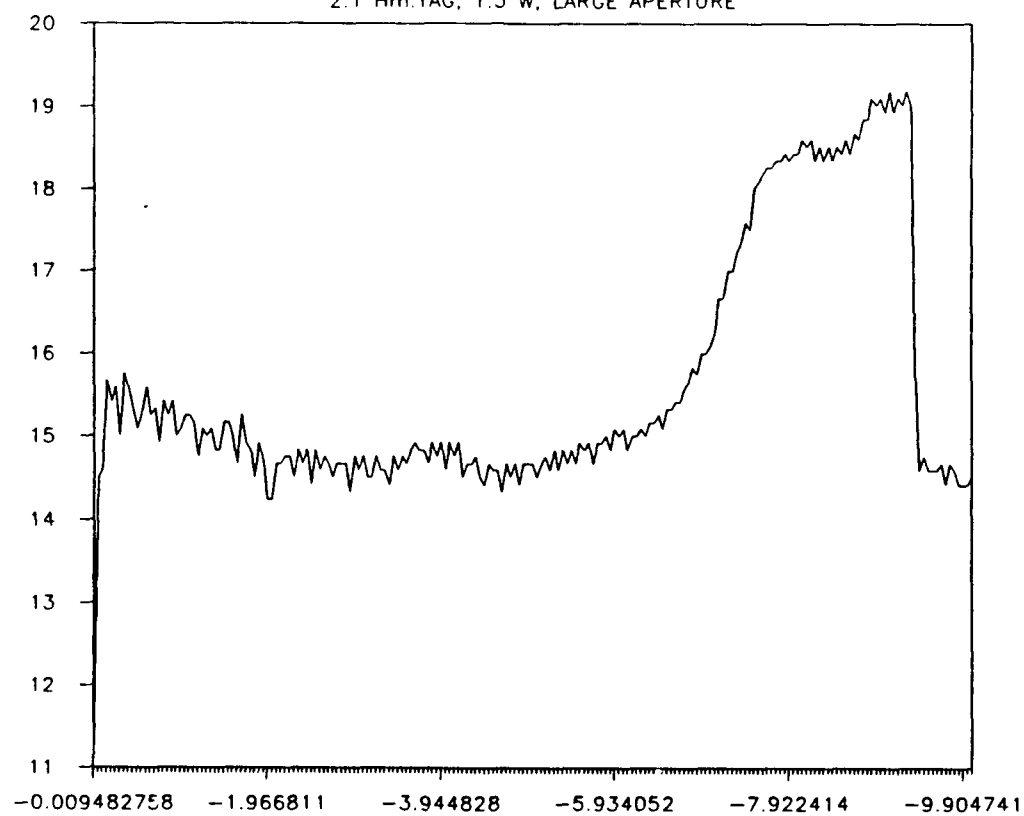
DEC21Q-BLOOD CONTROLLED AT 70, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



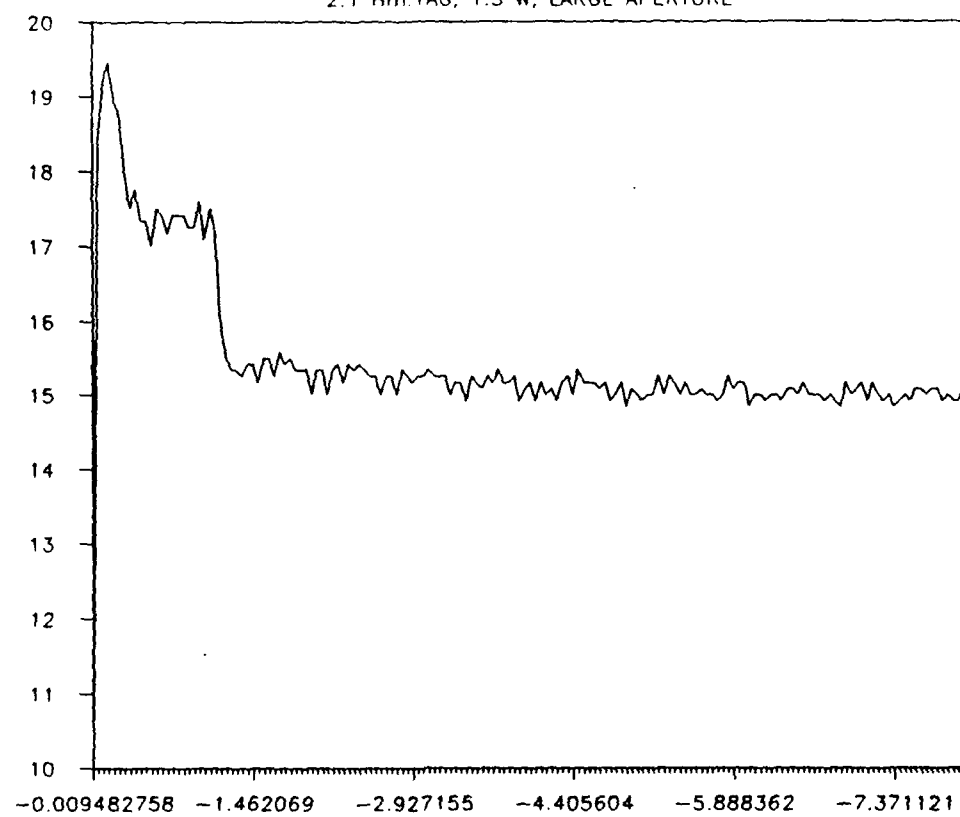
DEC21R-BLOOD CONTROLLED AT 80, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



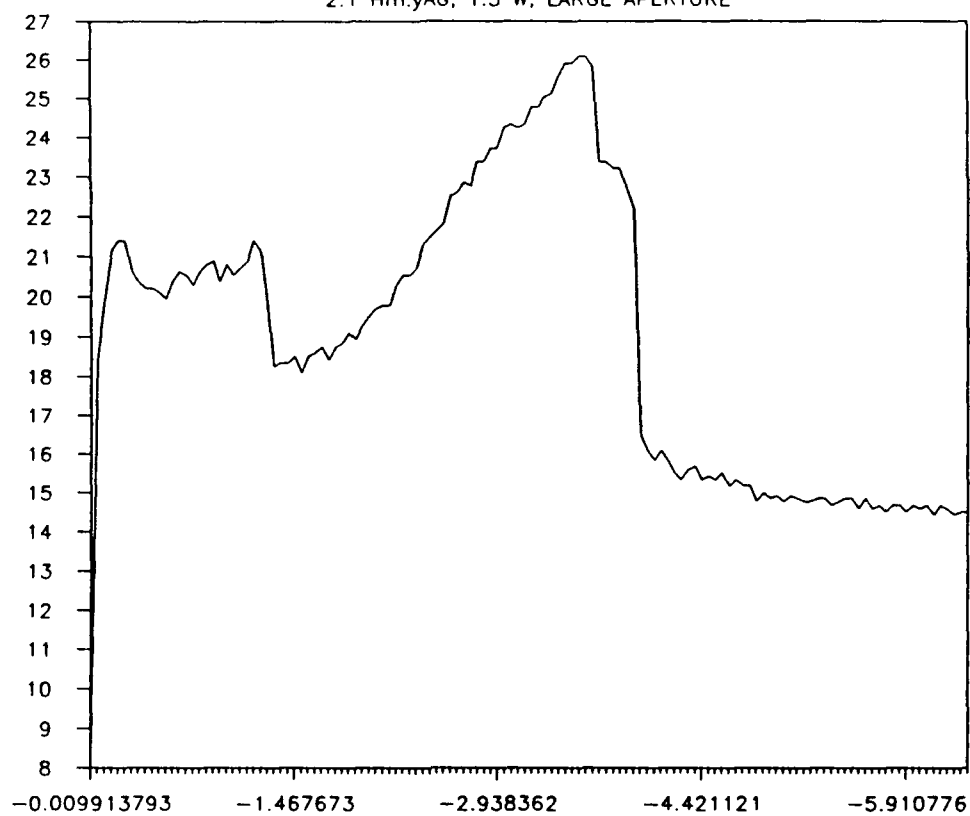
DEC21T-2X ICG CONTROLLED AT 50, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



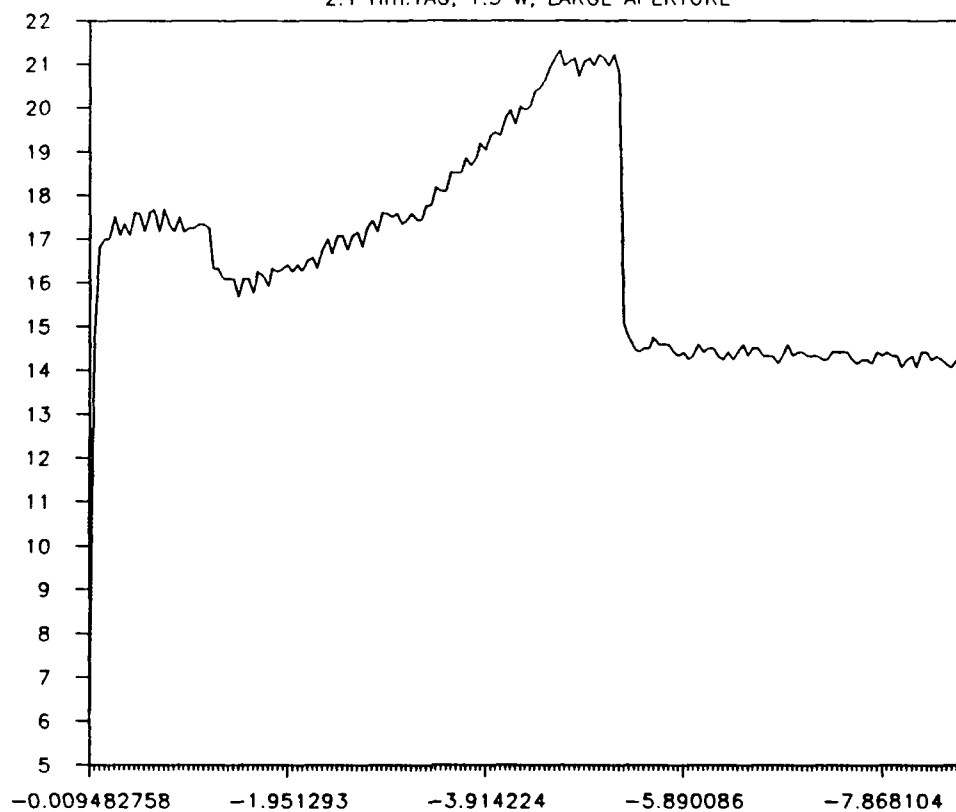
DEC21S-BLOOD CONTROLLED AT 100, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



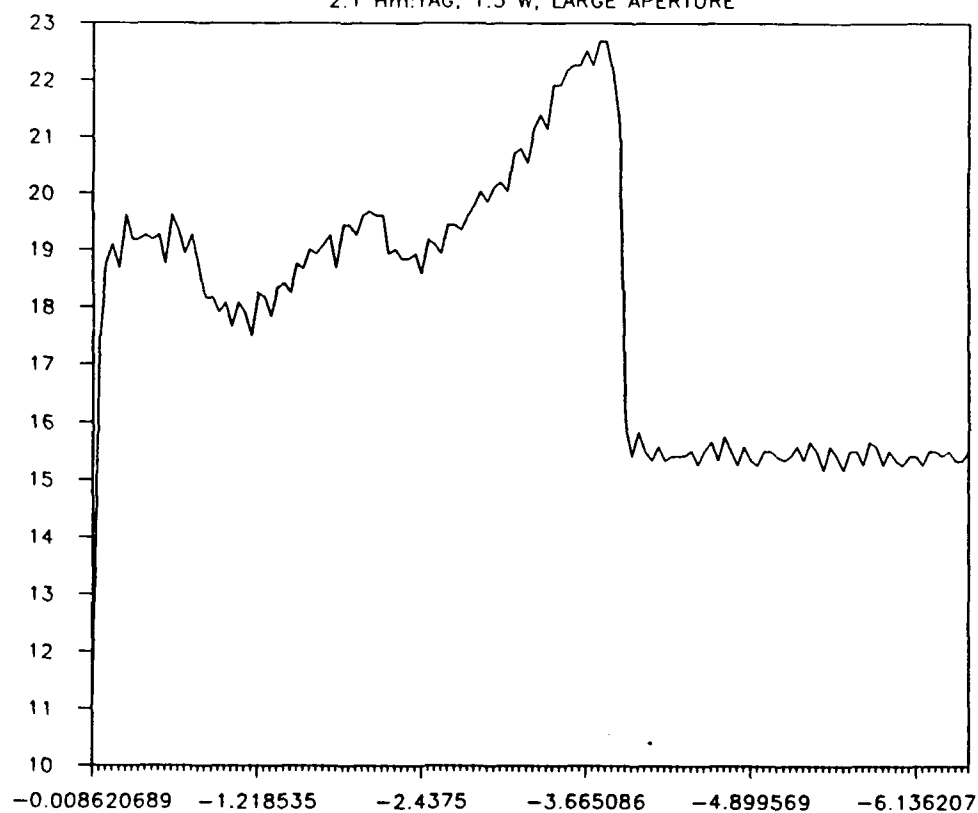
DEC21U-2X ICG CONTROLLED AT 60, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



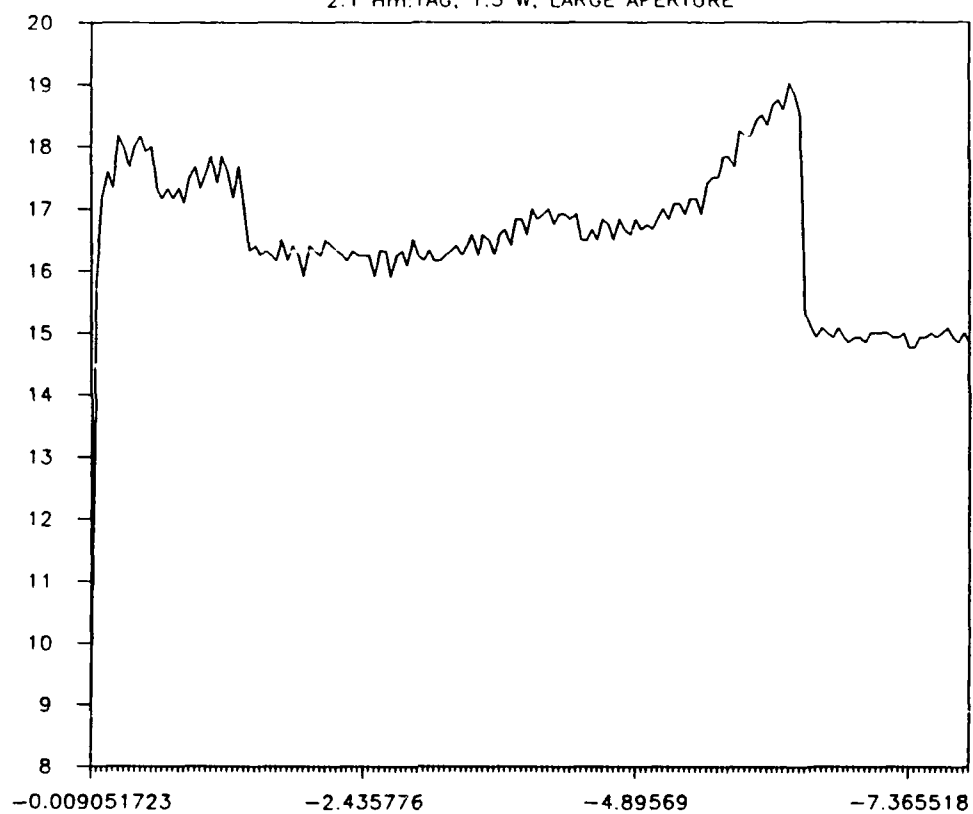
DEC21V-2X ICG CONTROLLED AT 70, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



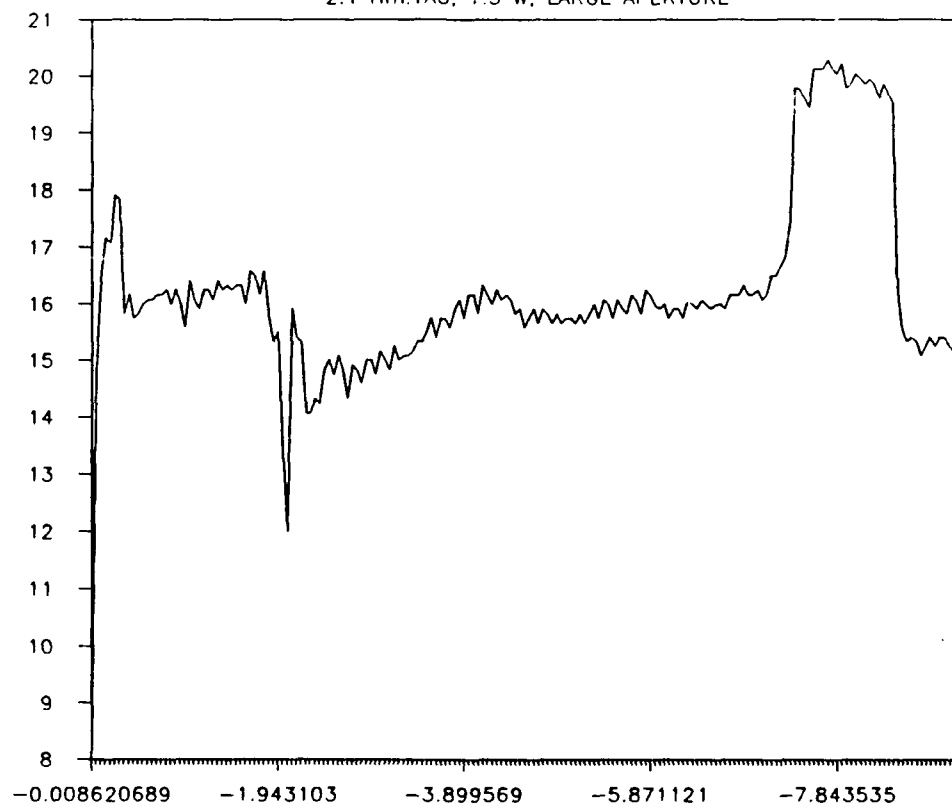
DEC21W-2X ICG CONTROLLED AT 80, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



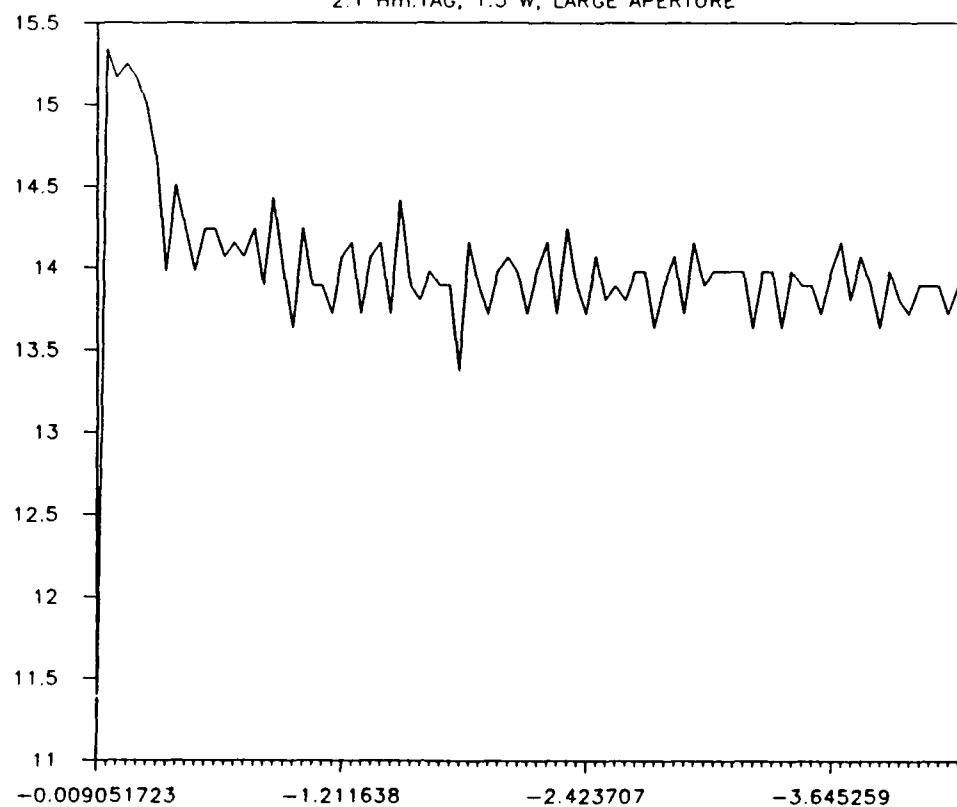
DEC21X-2X ICG CONTROLLED AT 100, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE



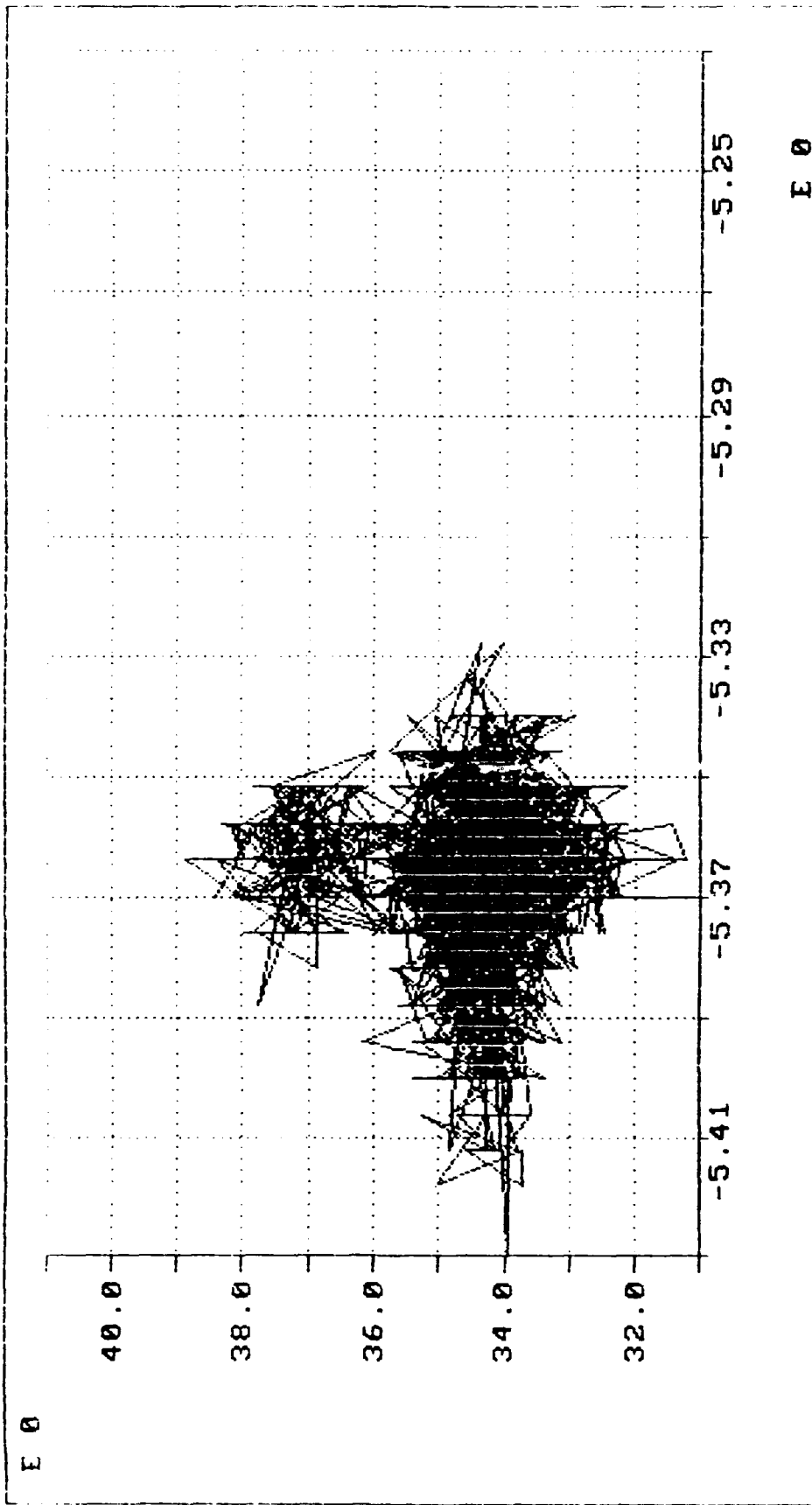
DEC21Y-NO CHROMO CONTROLLED AT 50, 10s

2.1 Hm:YAG, 1.5 W, LARGE APERTURE

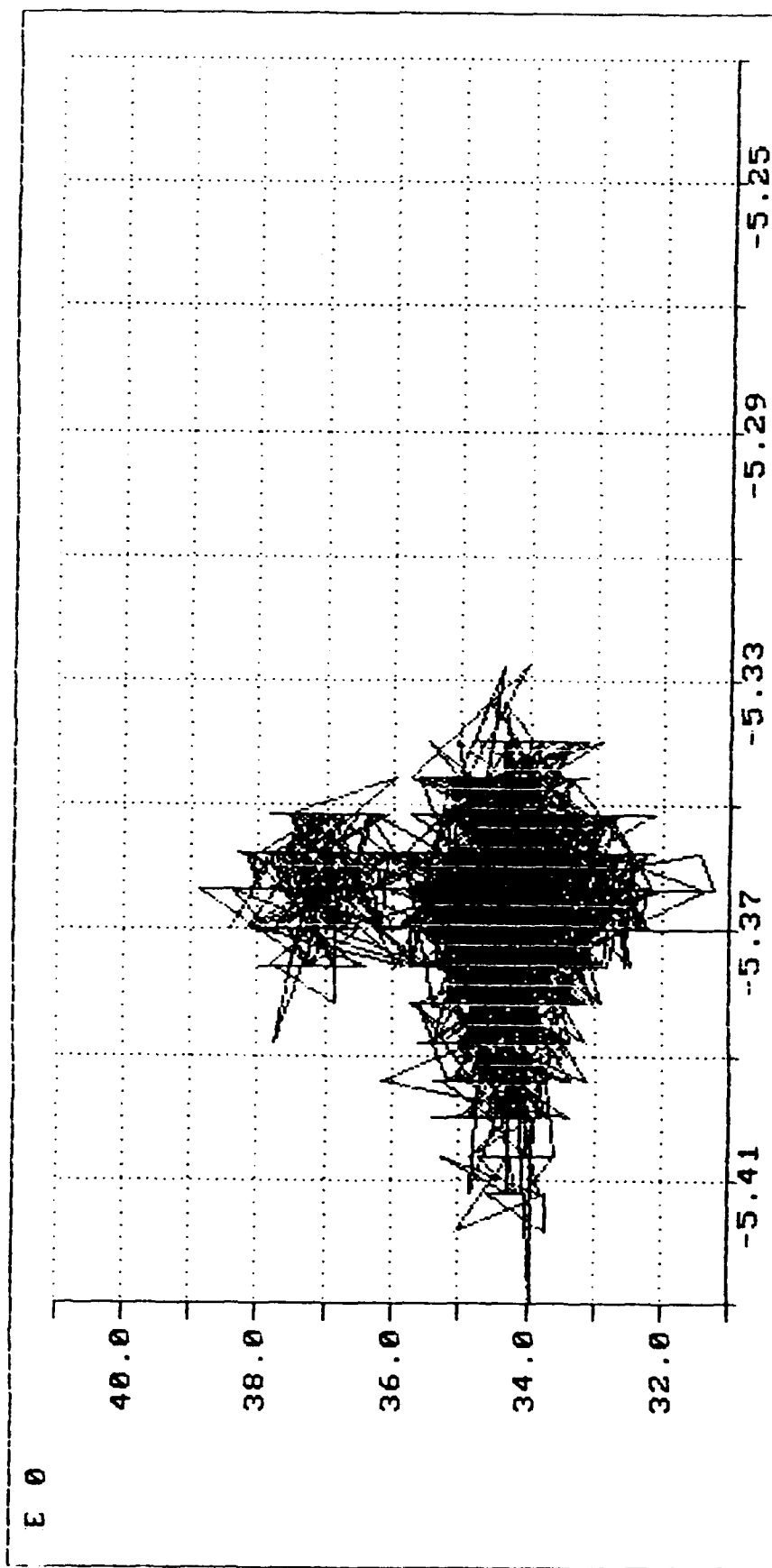


Appendix B- Excluded Data

3/13/69

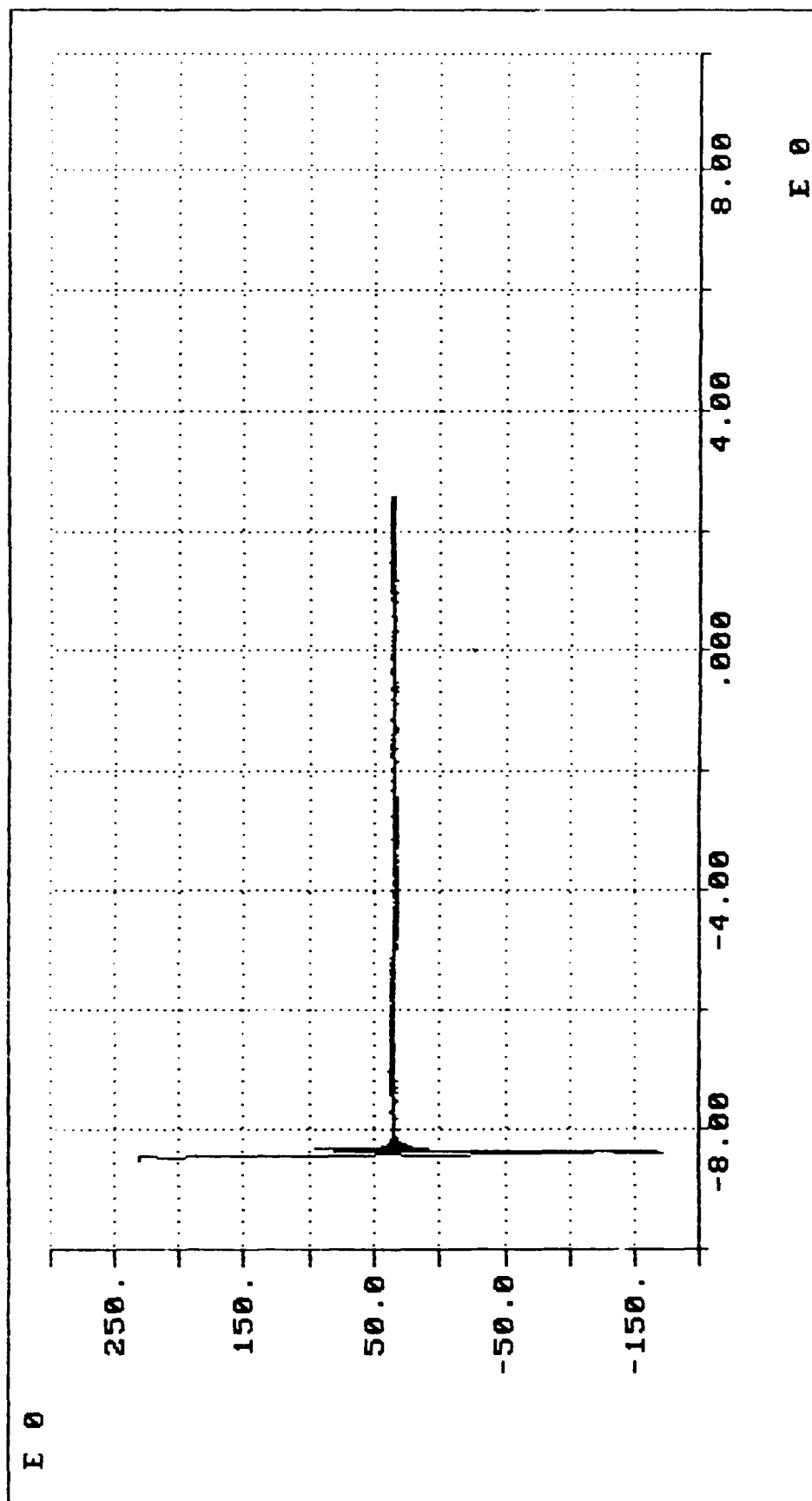


500000

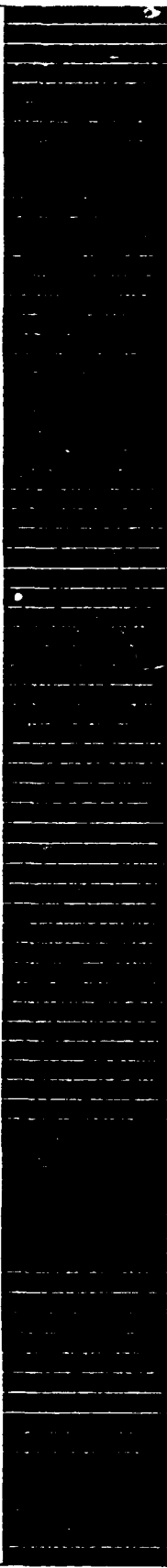
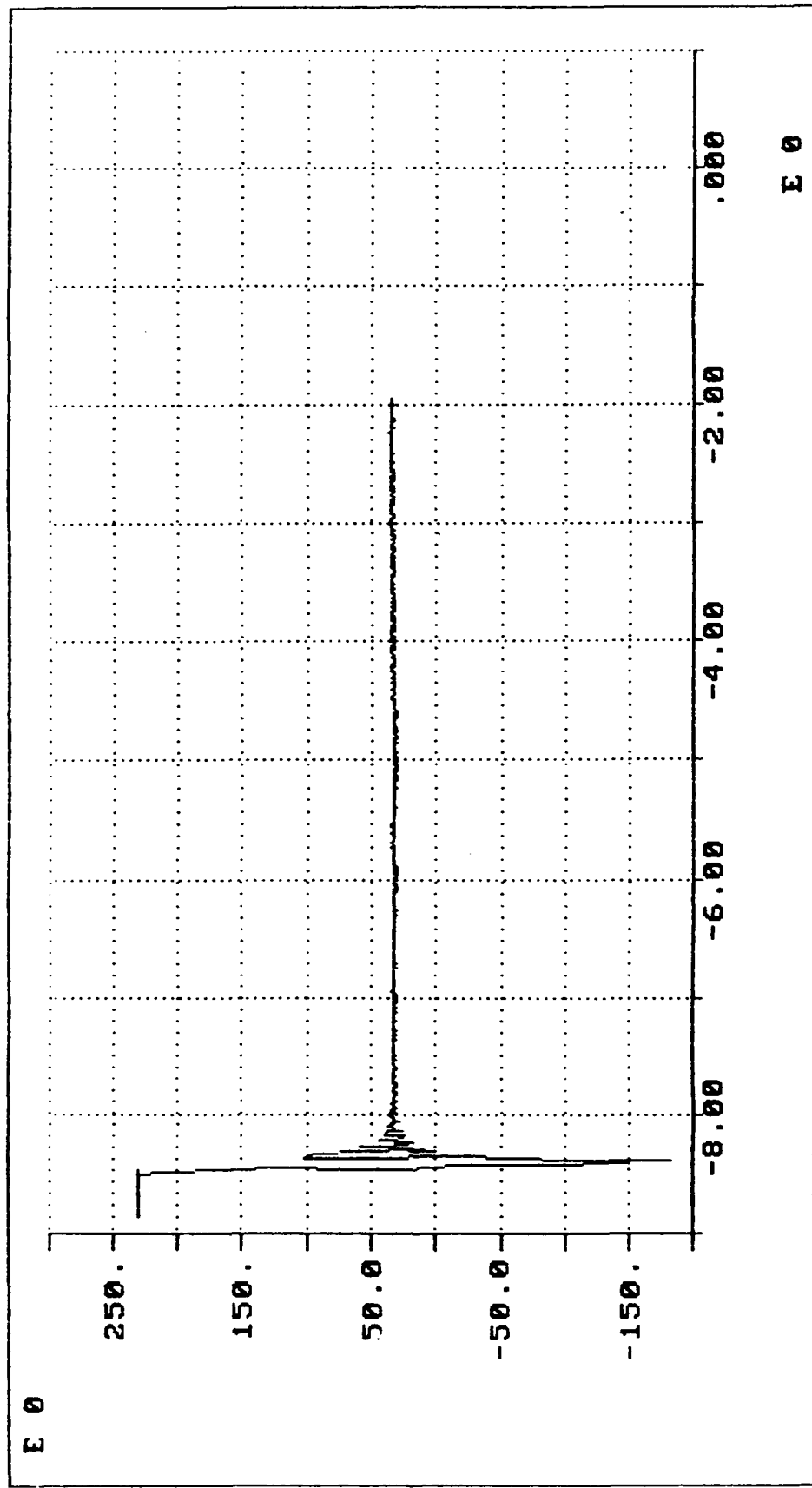


E 0

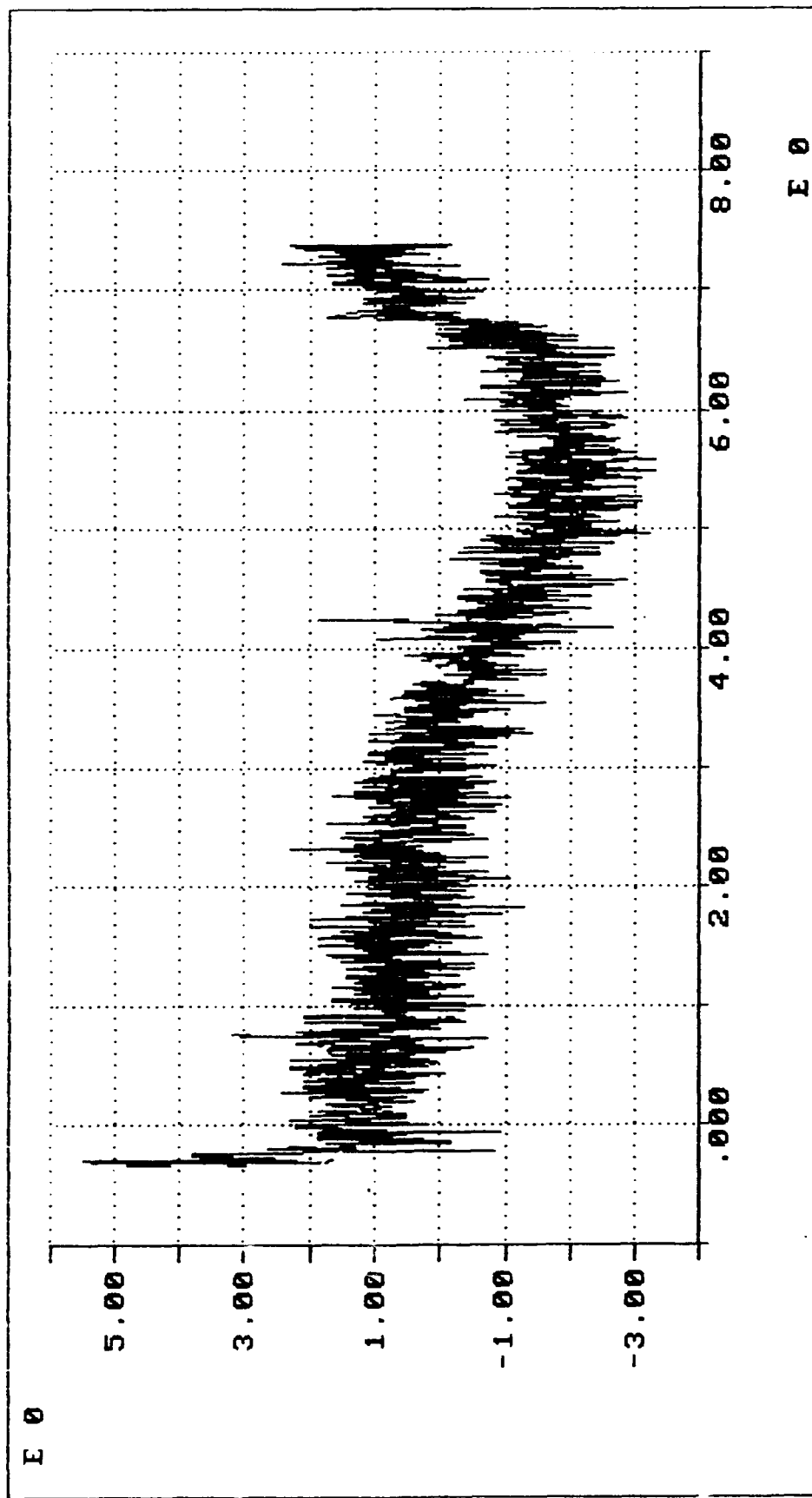
35P 105



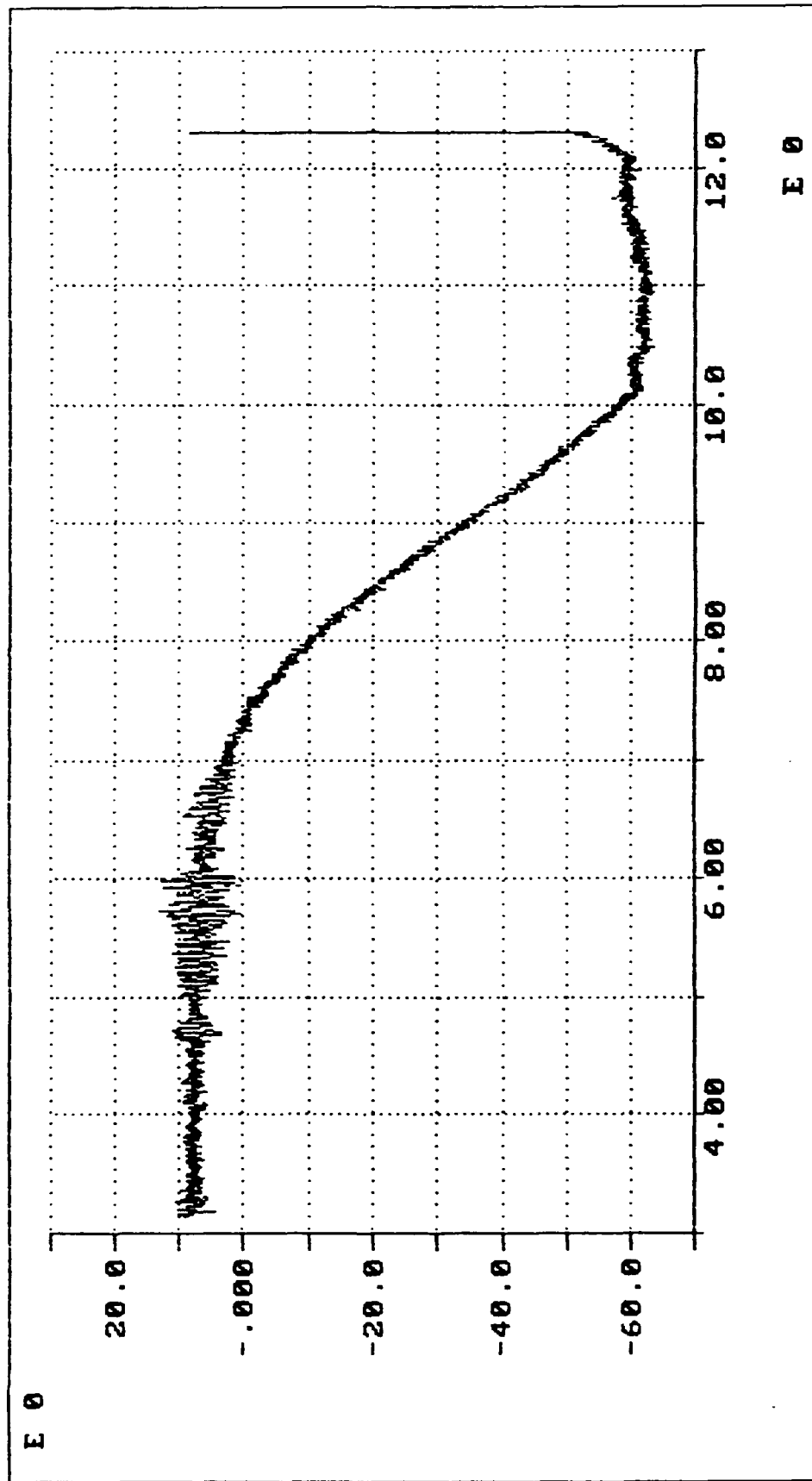
2000 105



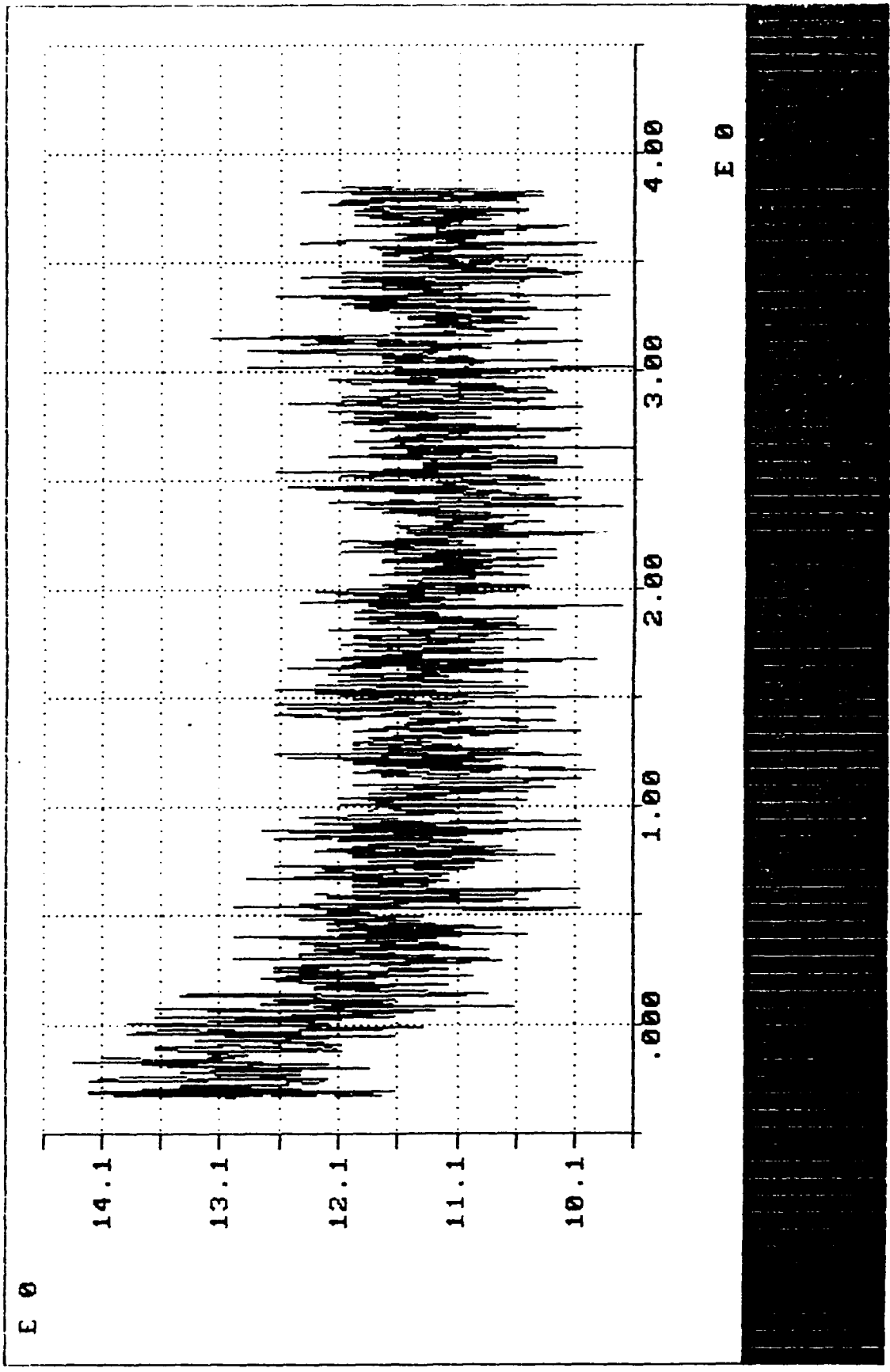
57107



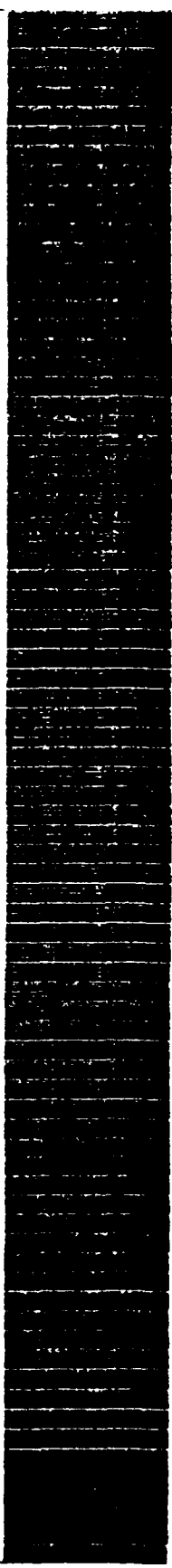
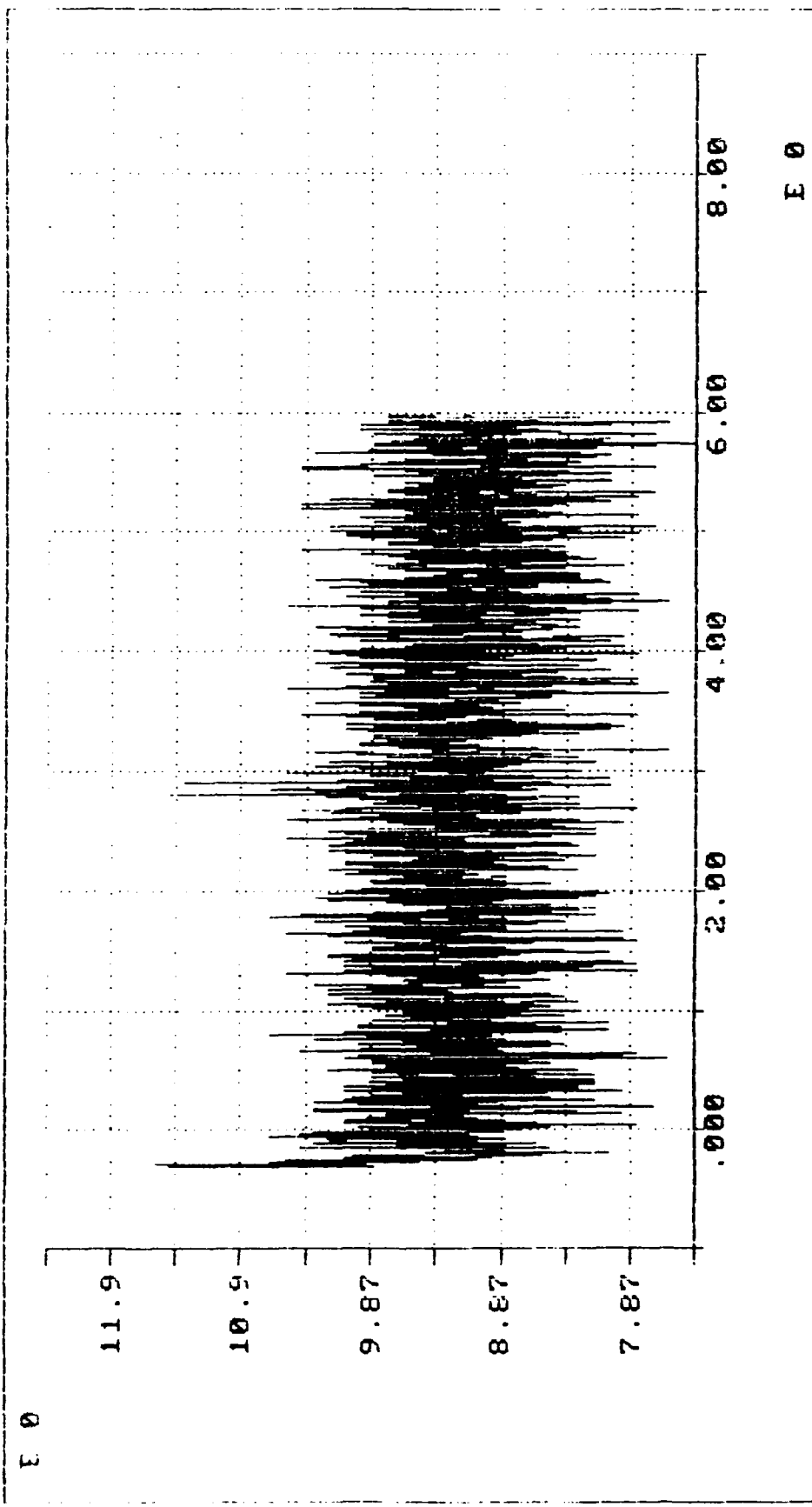
501 012



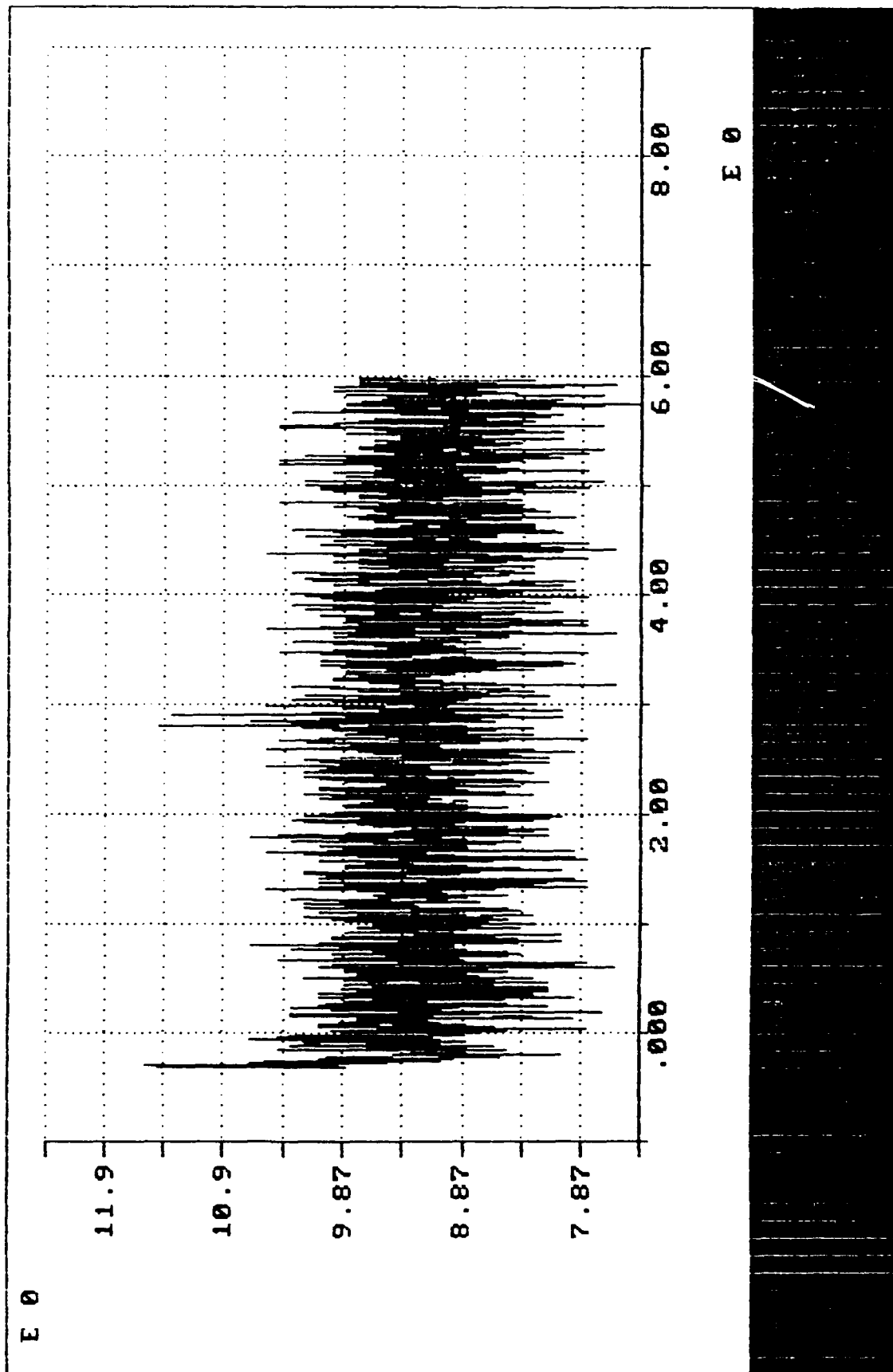
501210



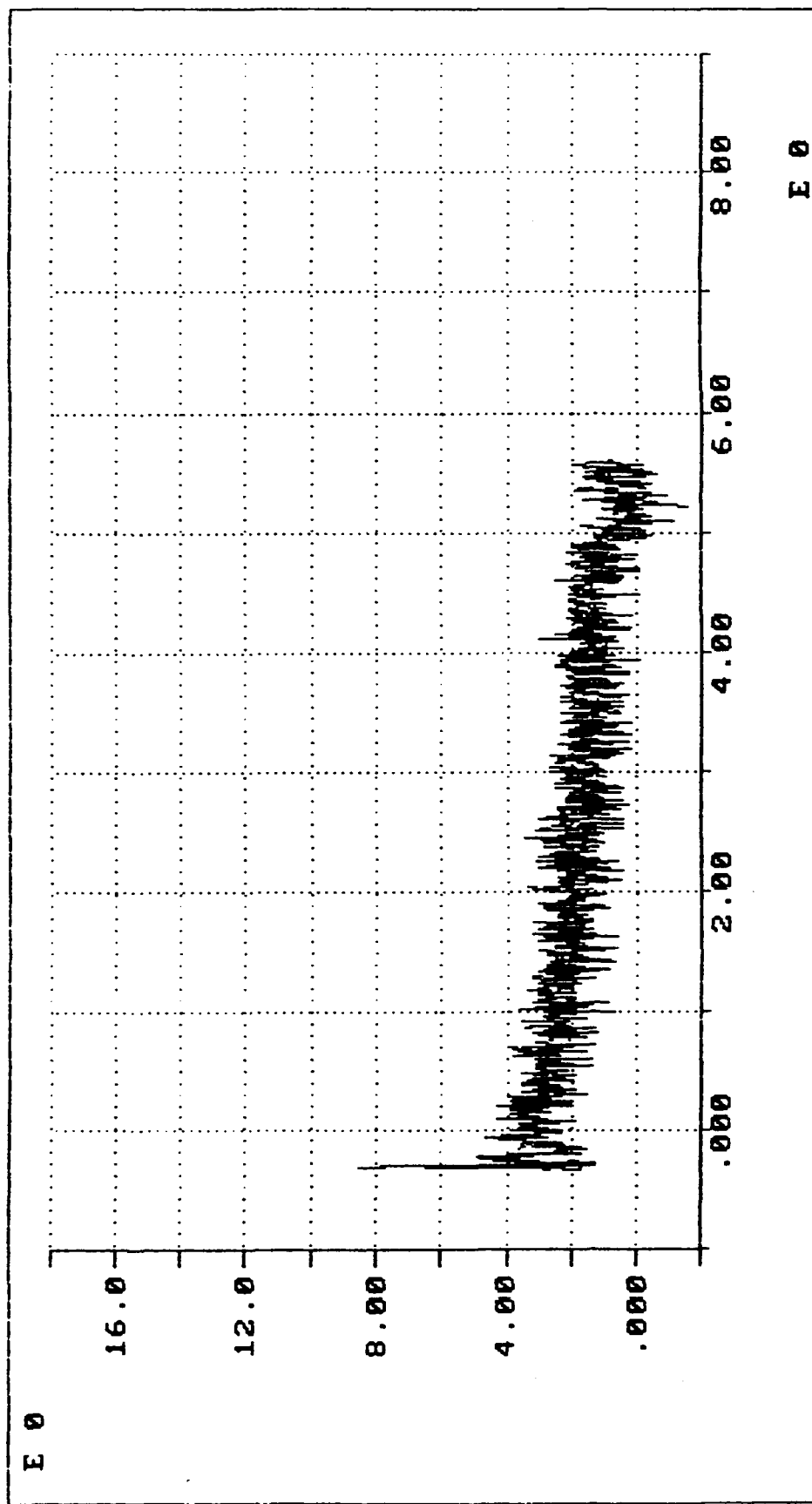
Jul 27 +



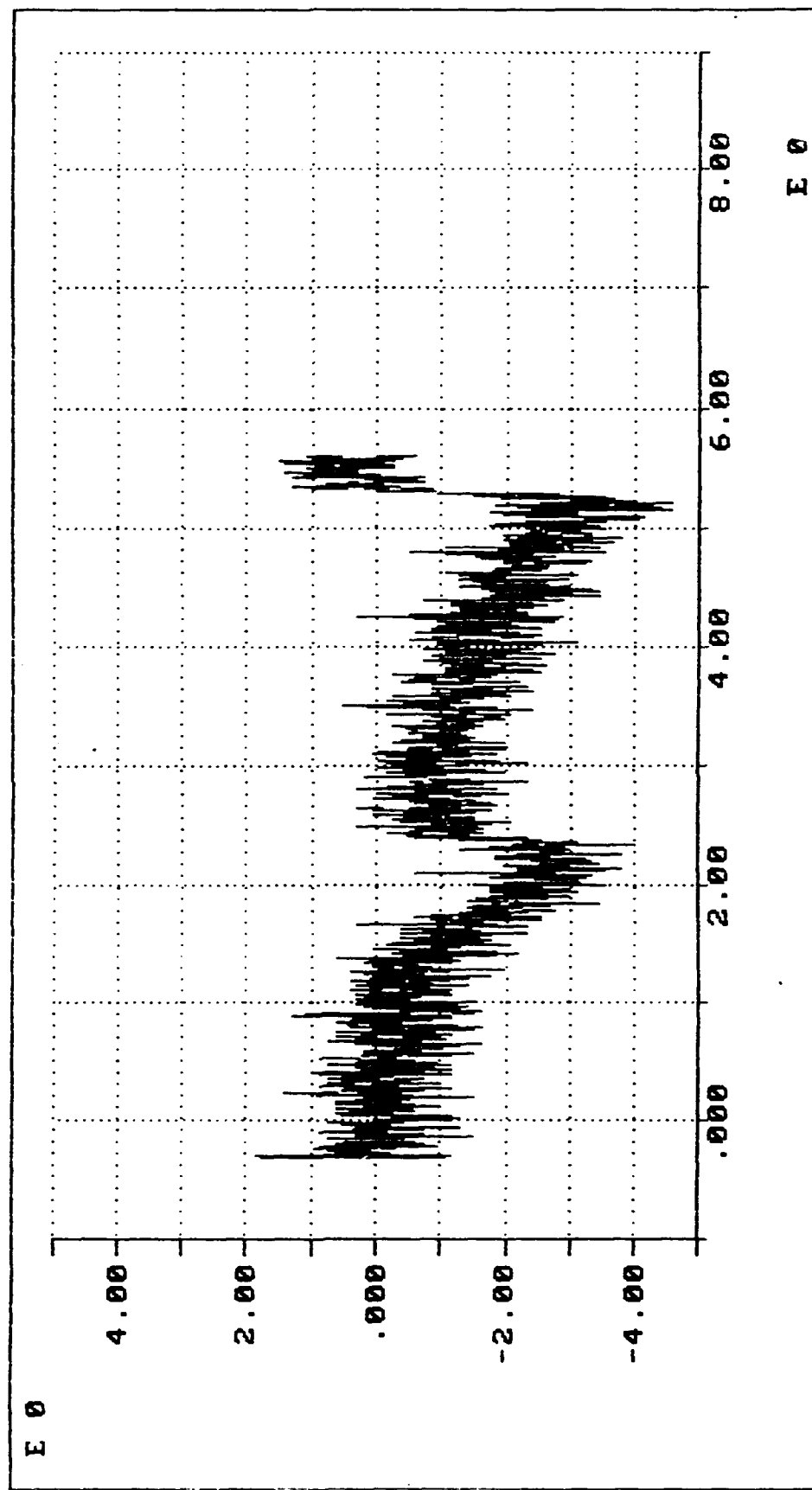
07025



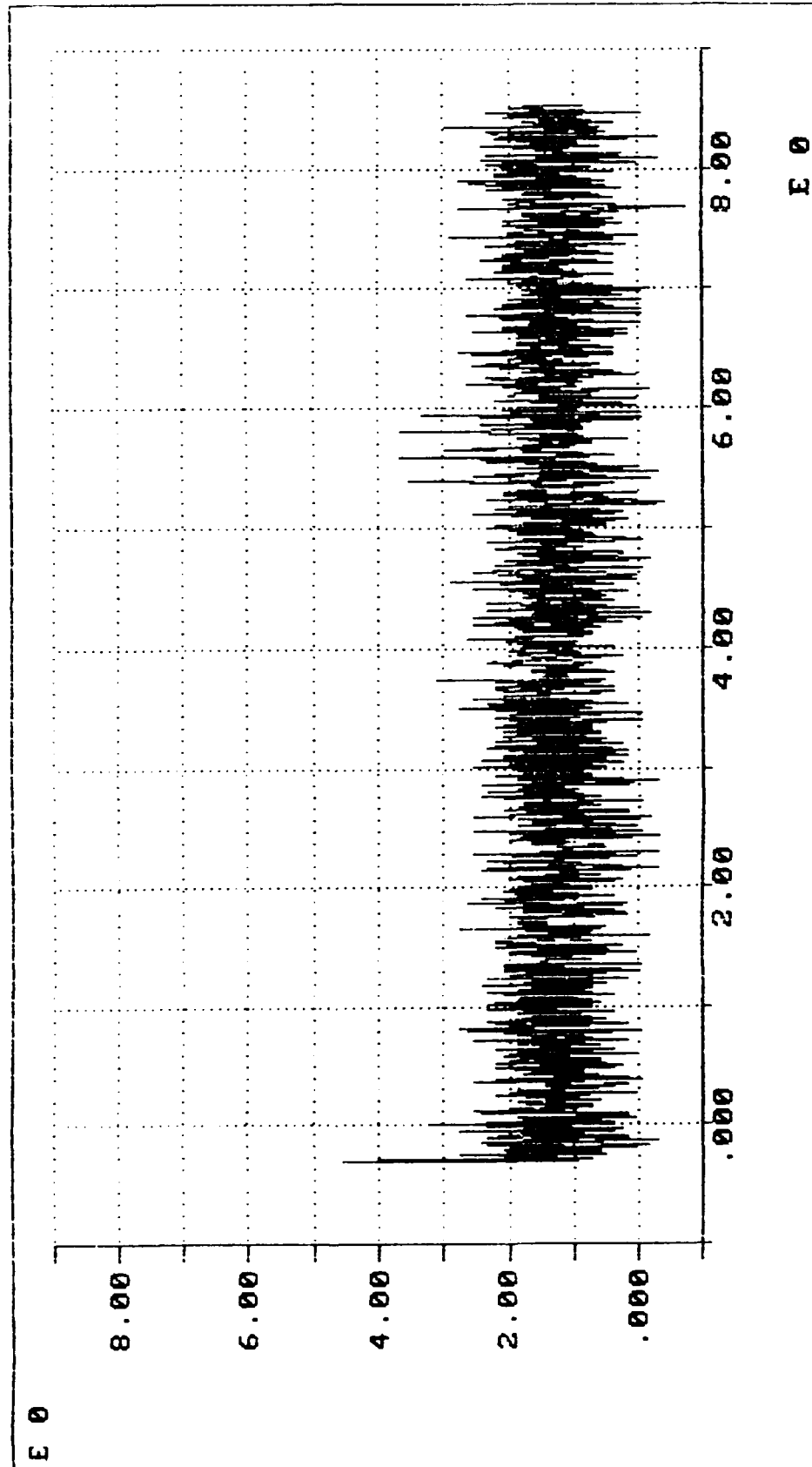
JUL 27 I



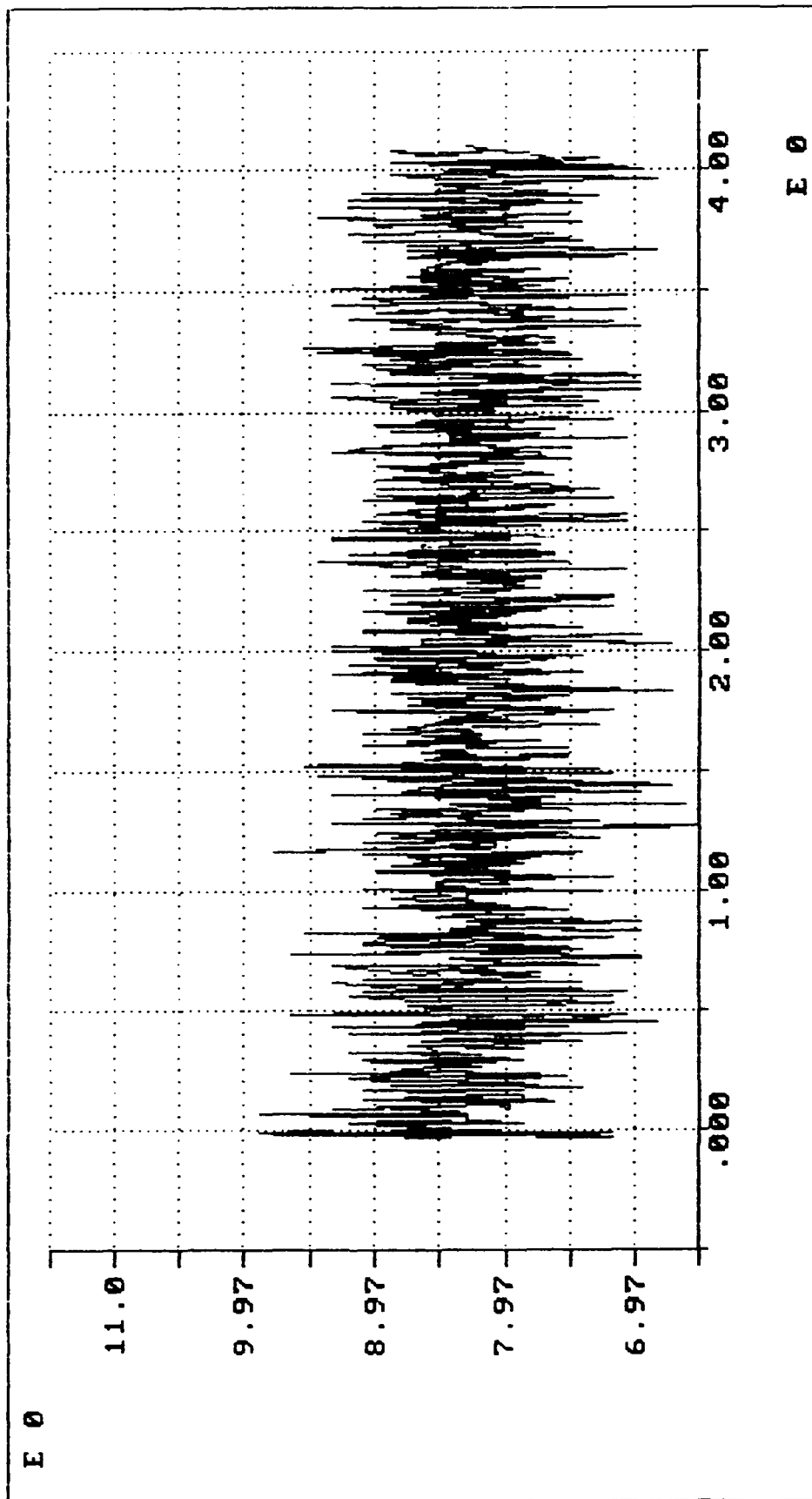
501 275



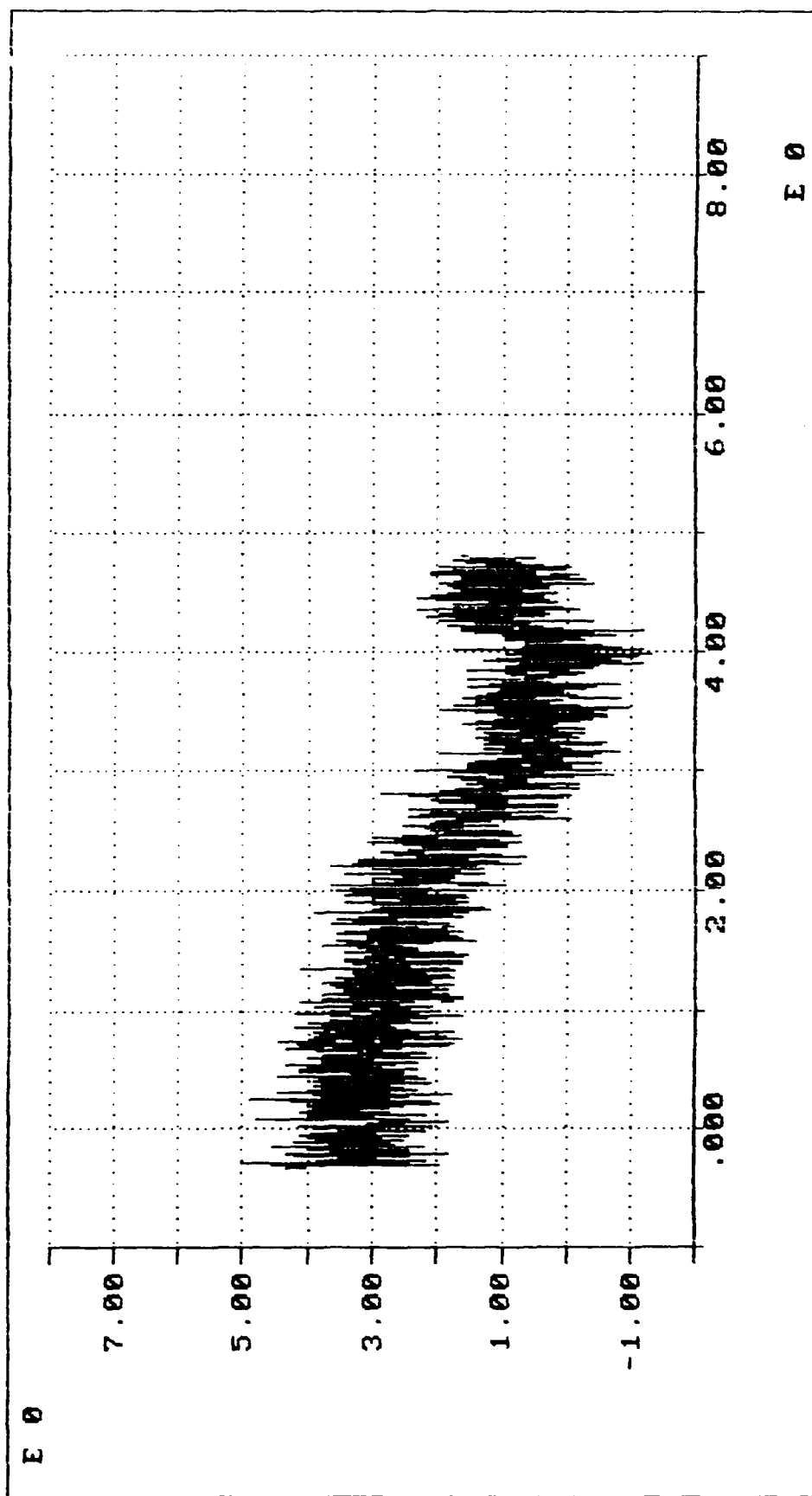
5012713



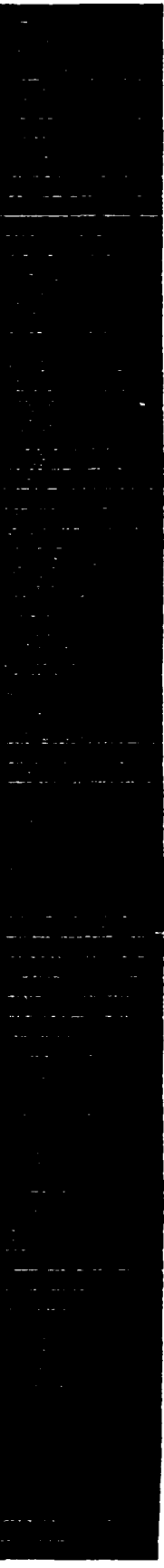
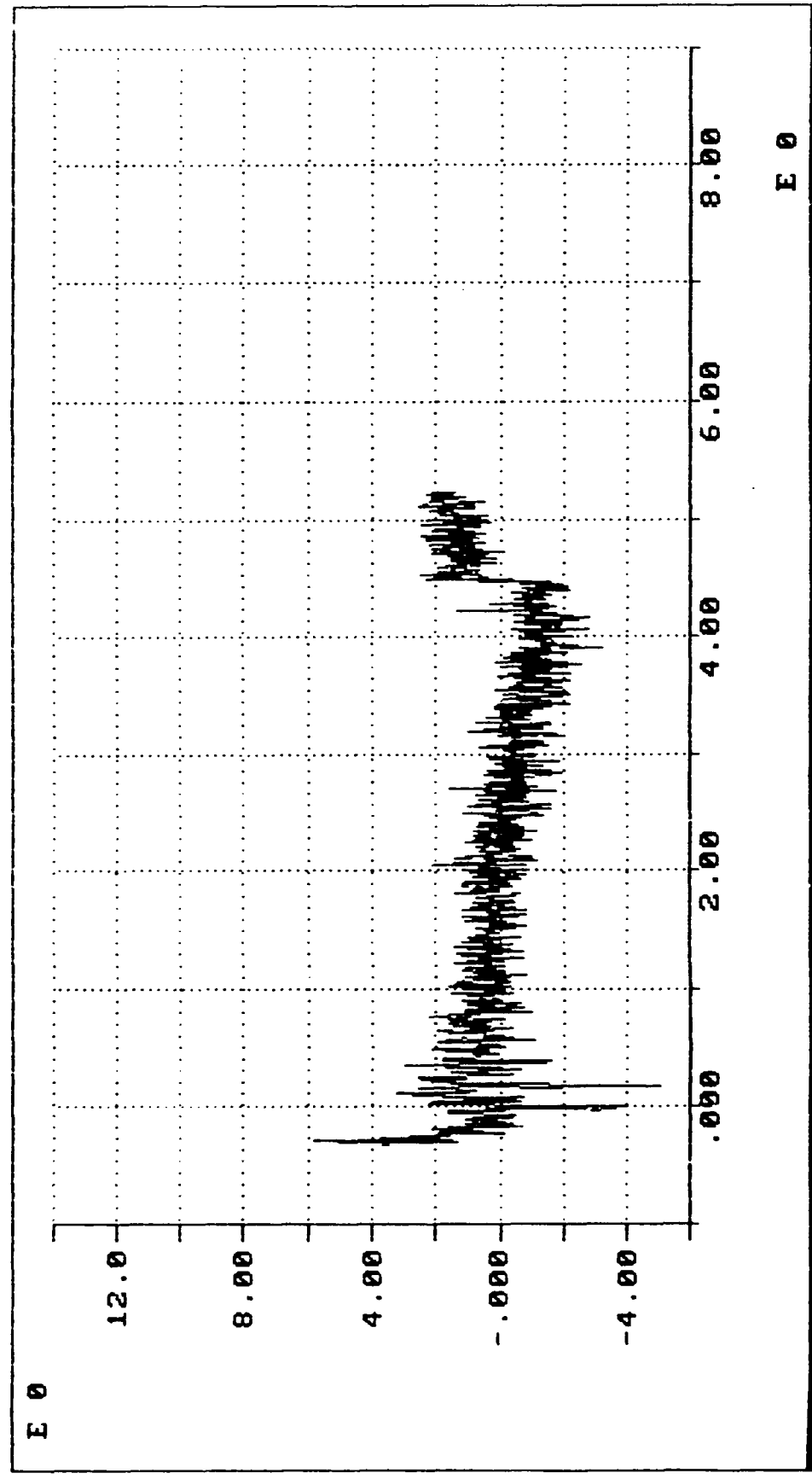
501 27 G



50137 K



718125



5012111

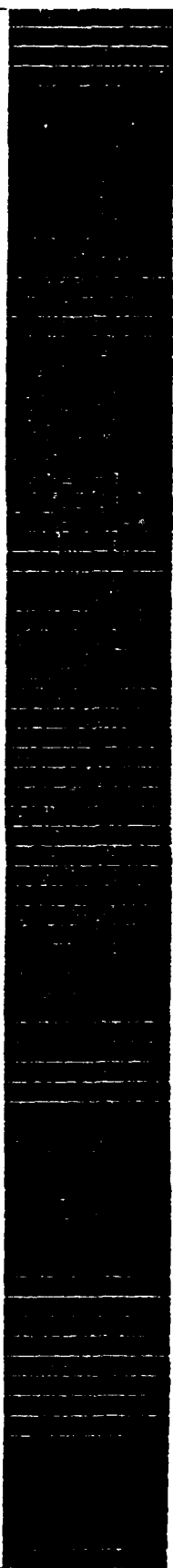
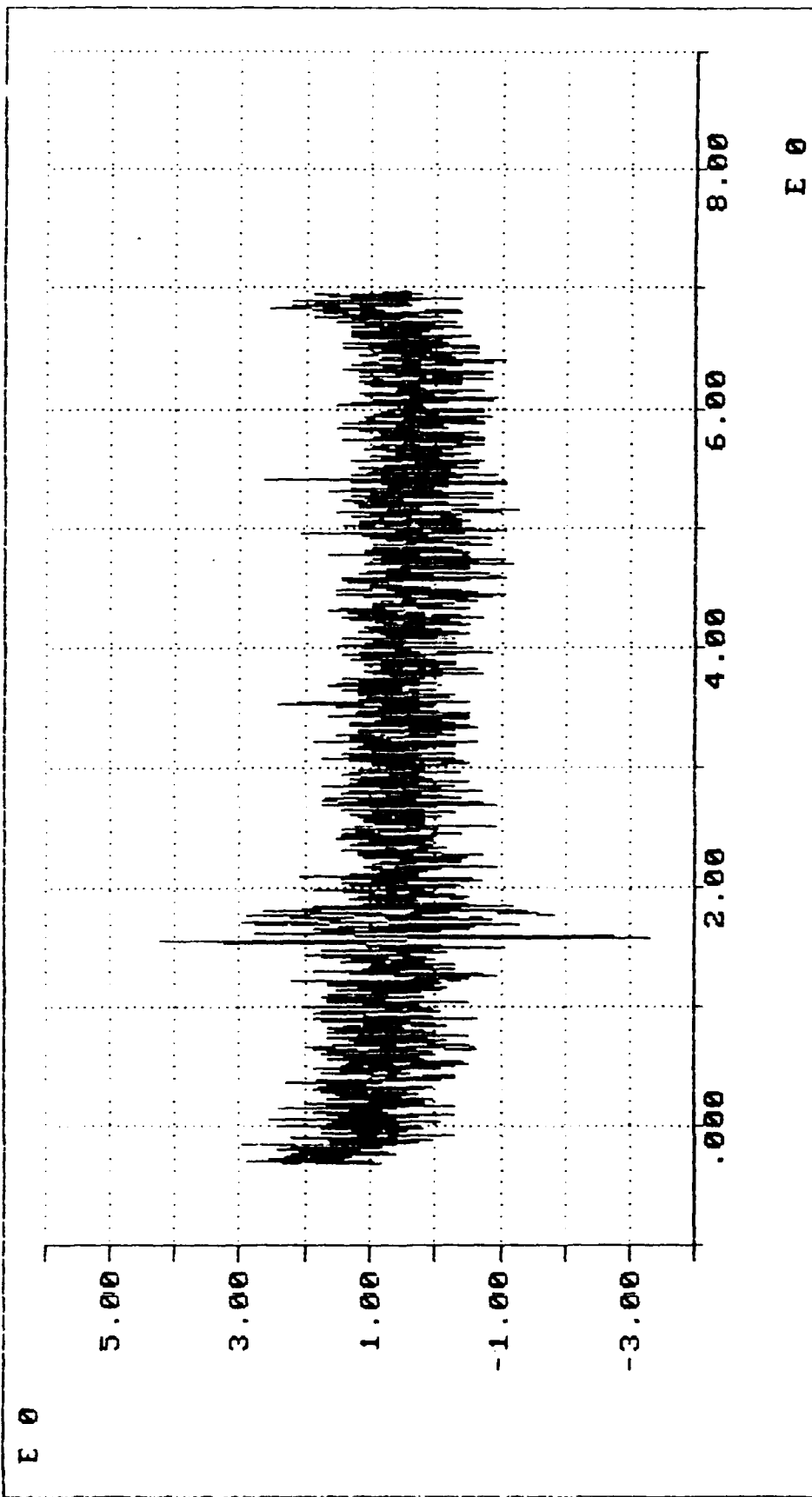
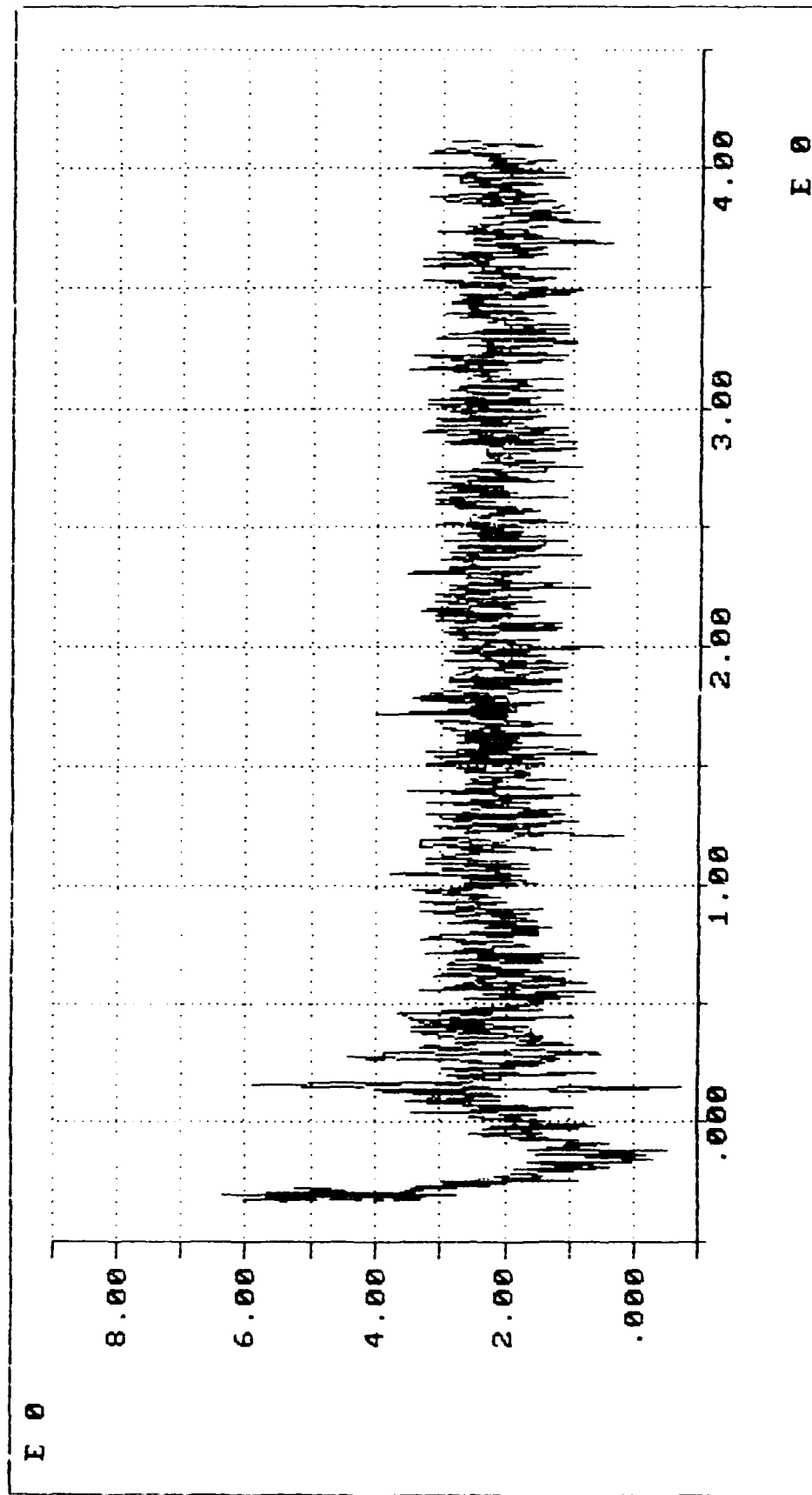
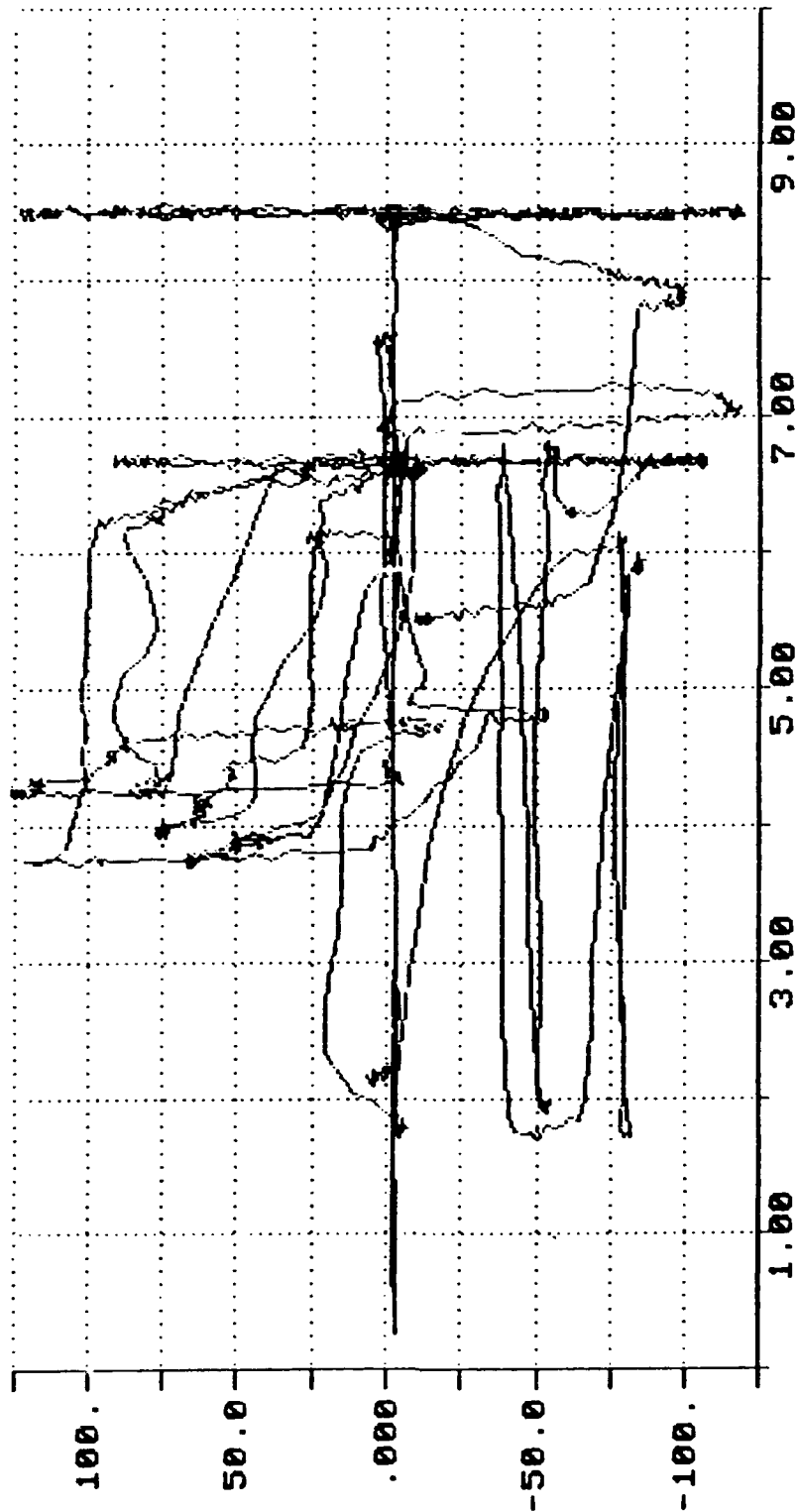


Fig 2



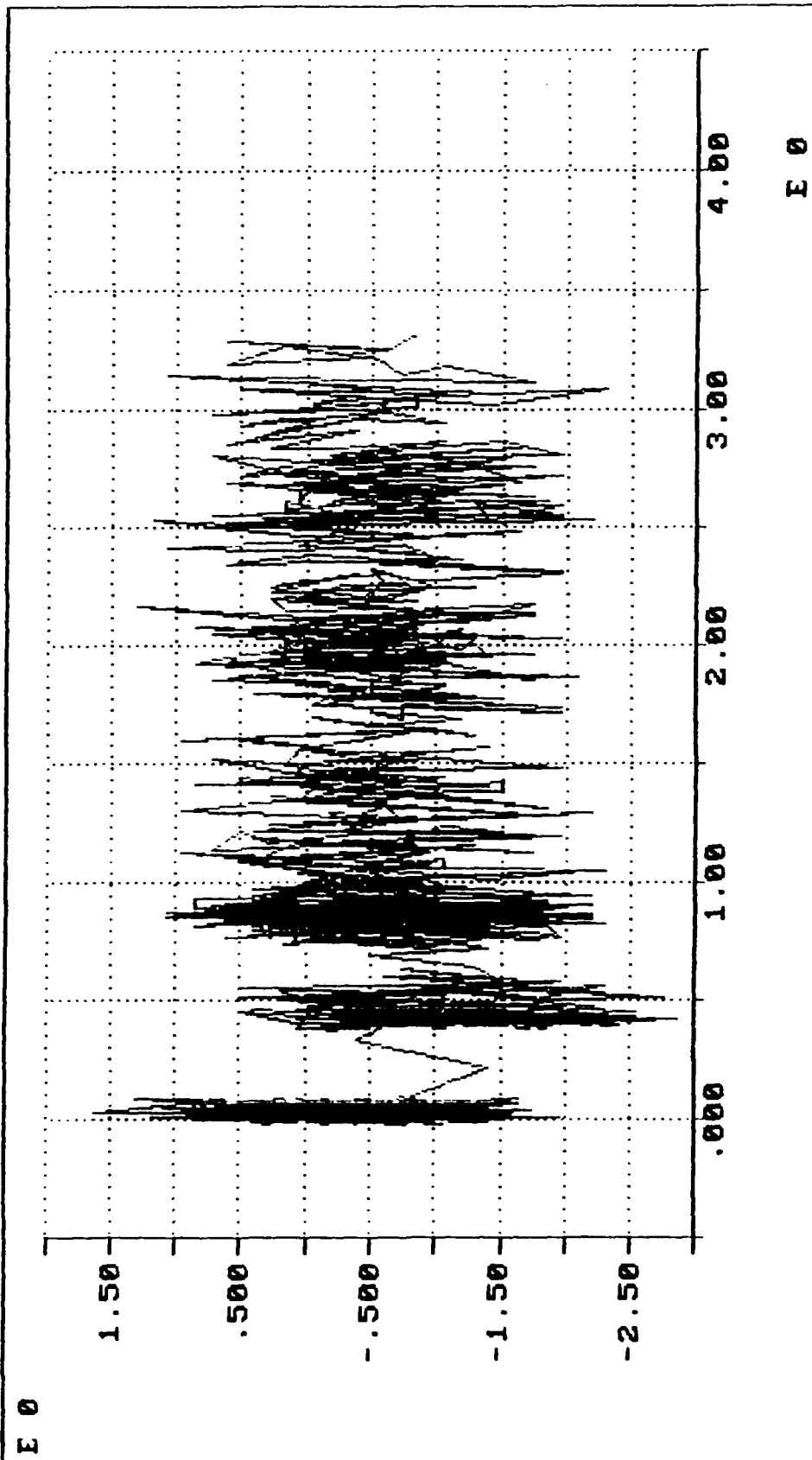
AUG 7C

E 0

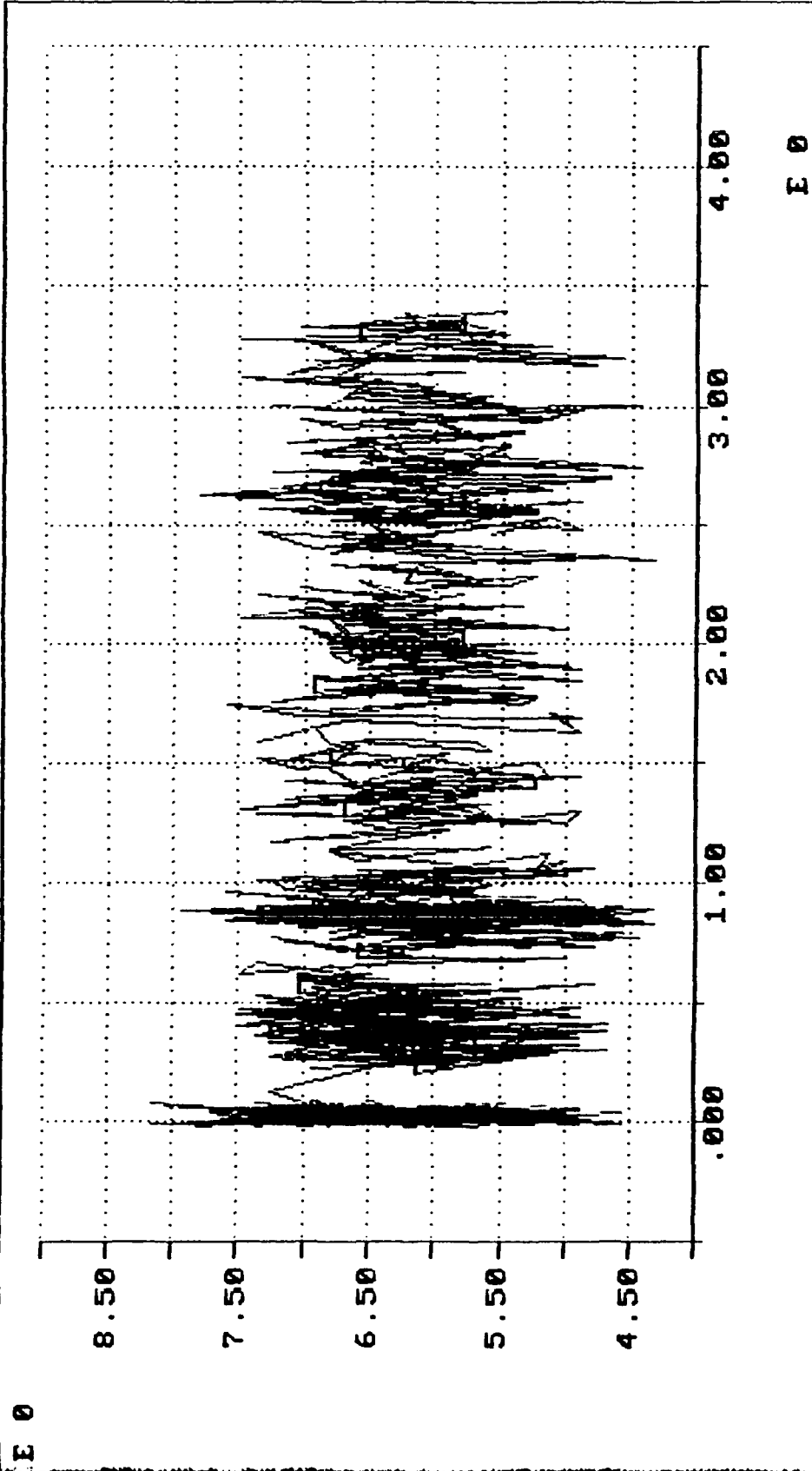


E 0

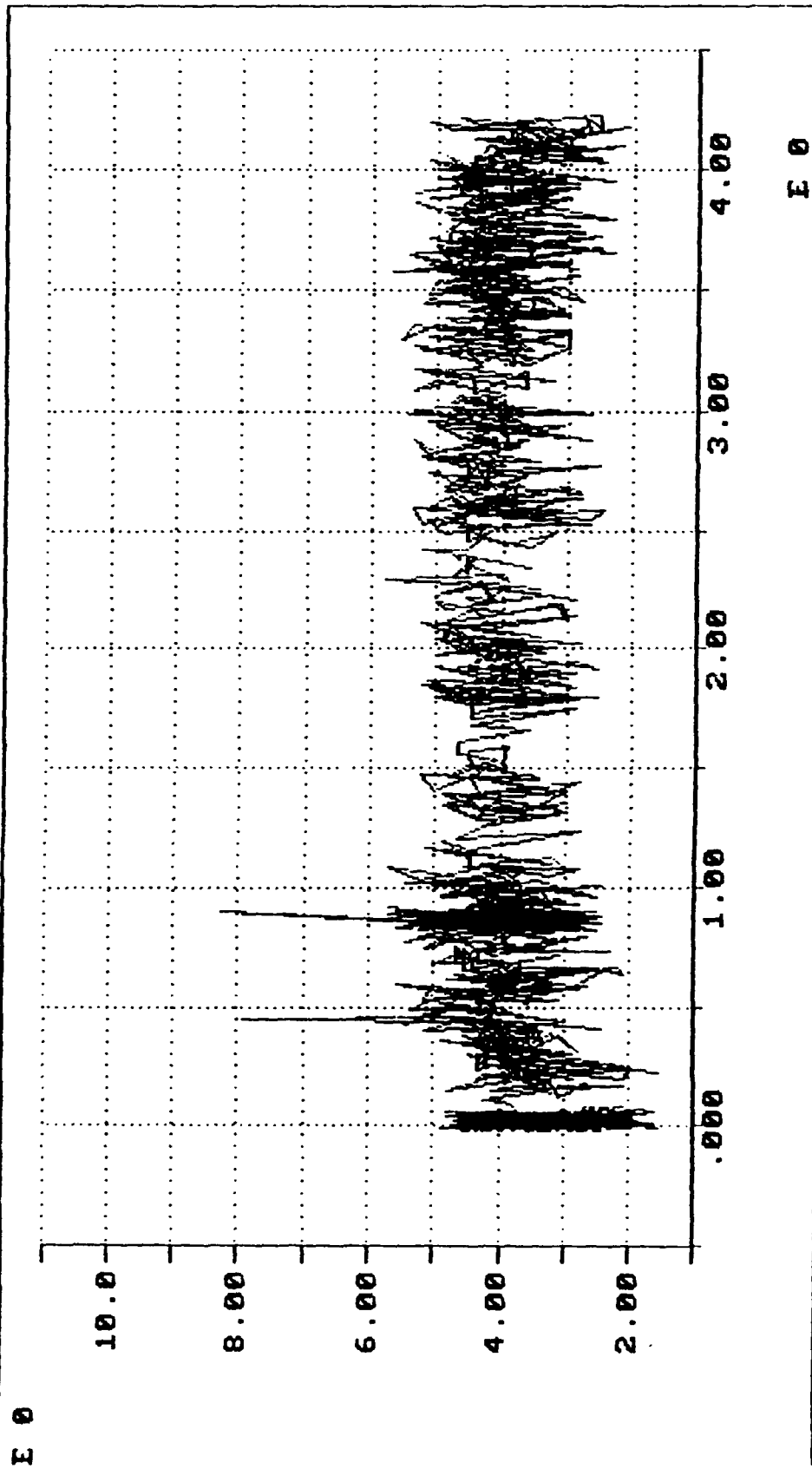
Aug 70



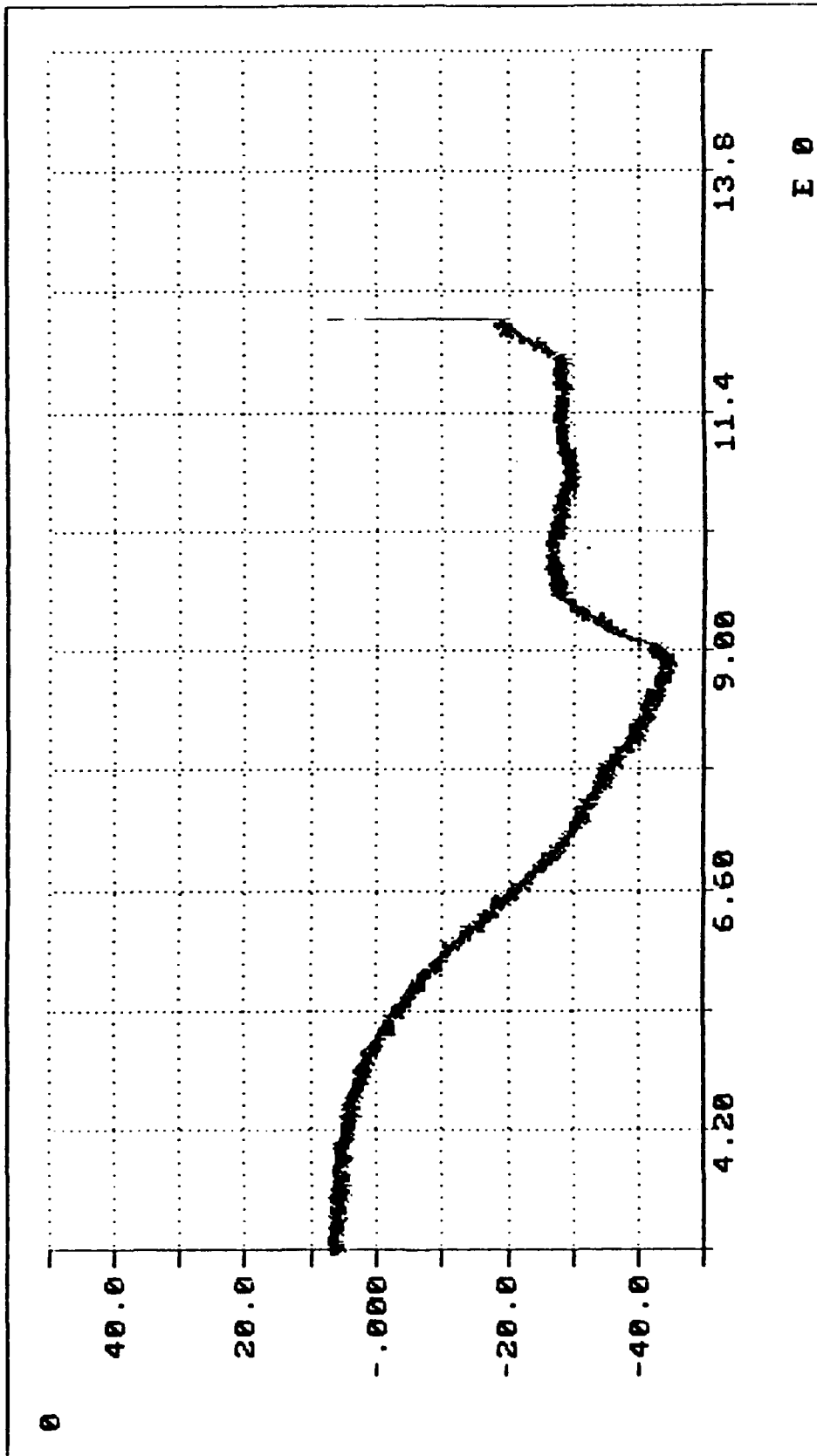
Aug 7 11



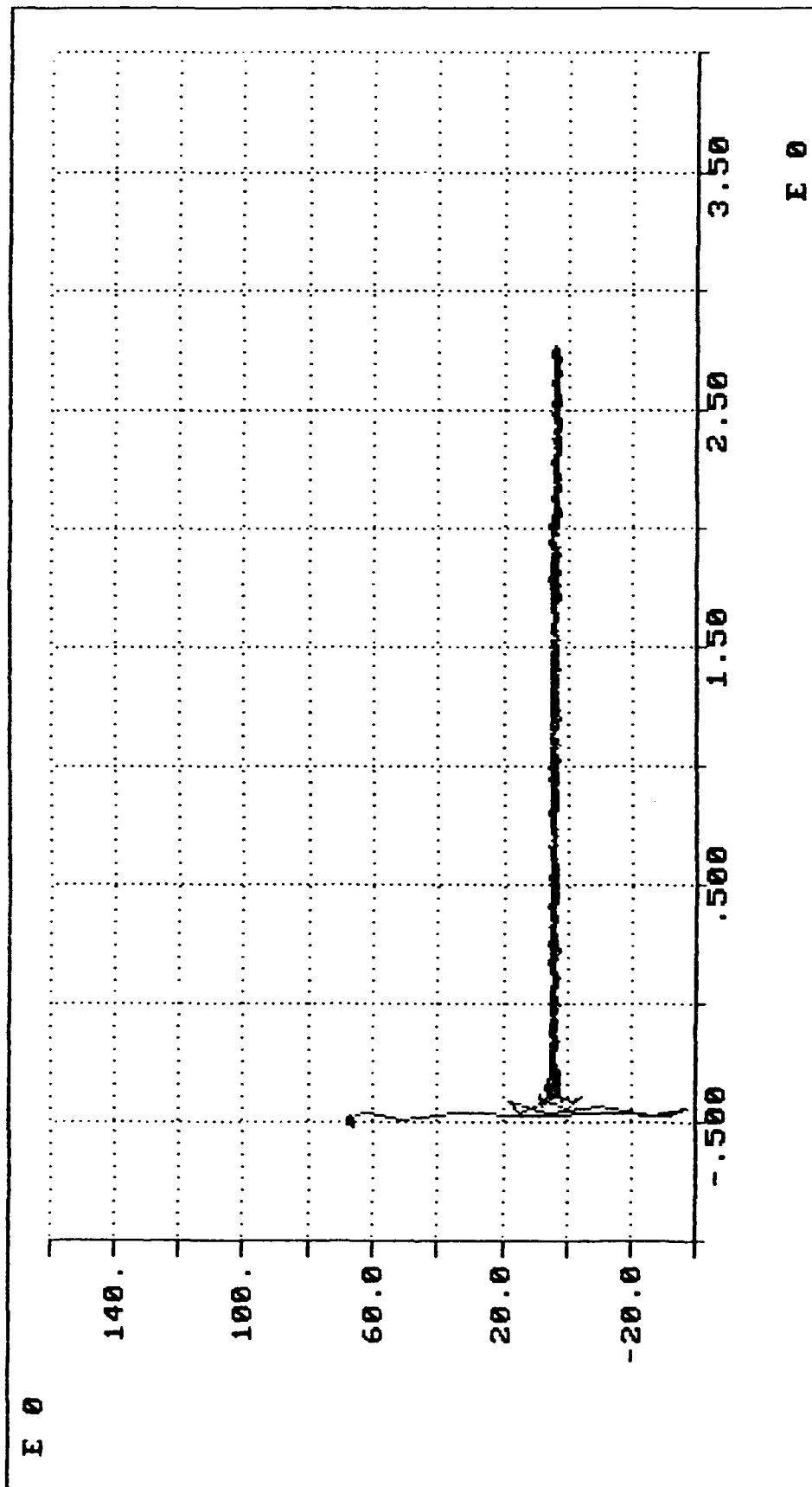
AUG 84



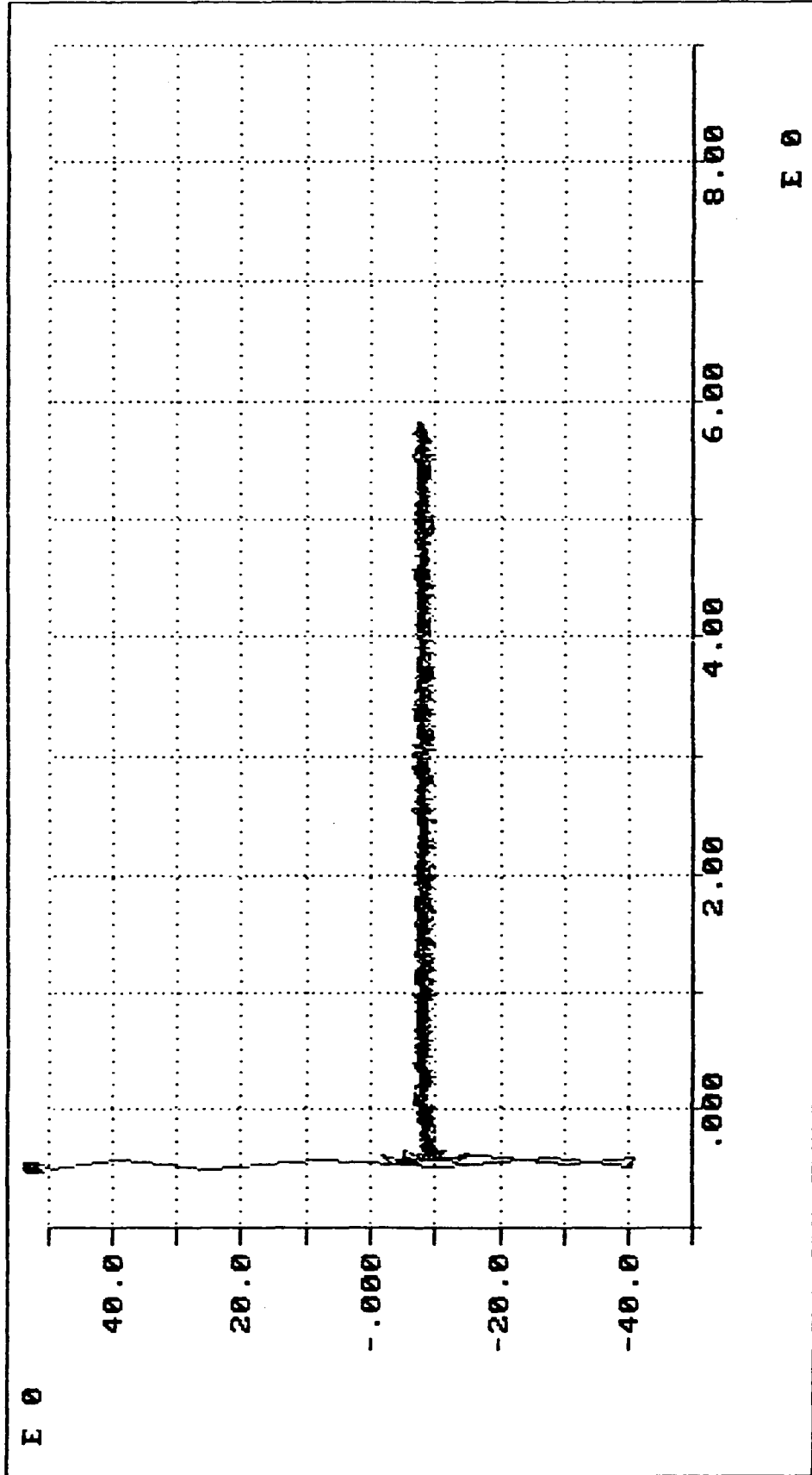
AUG 8B



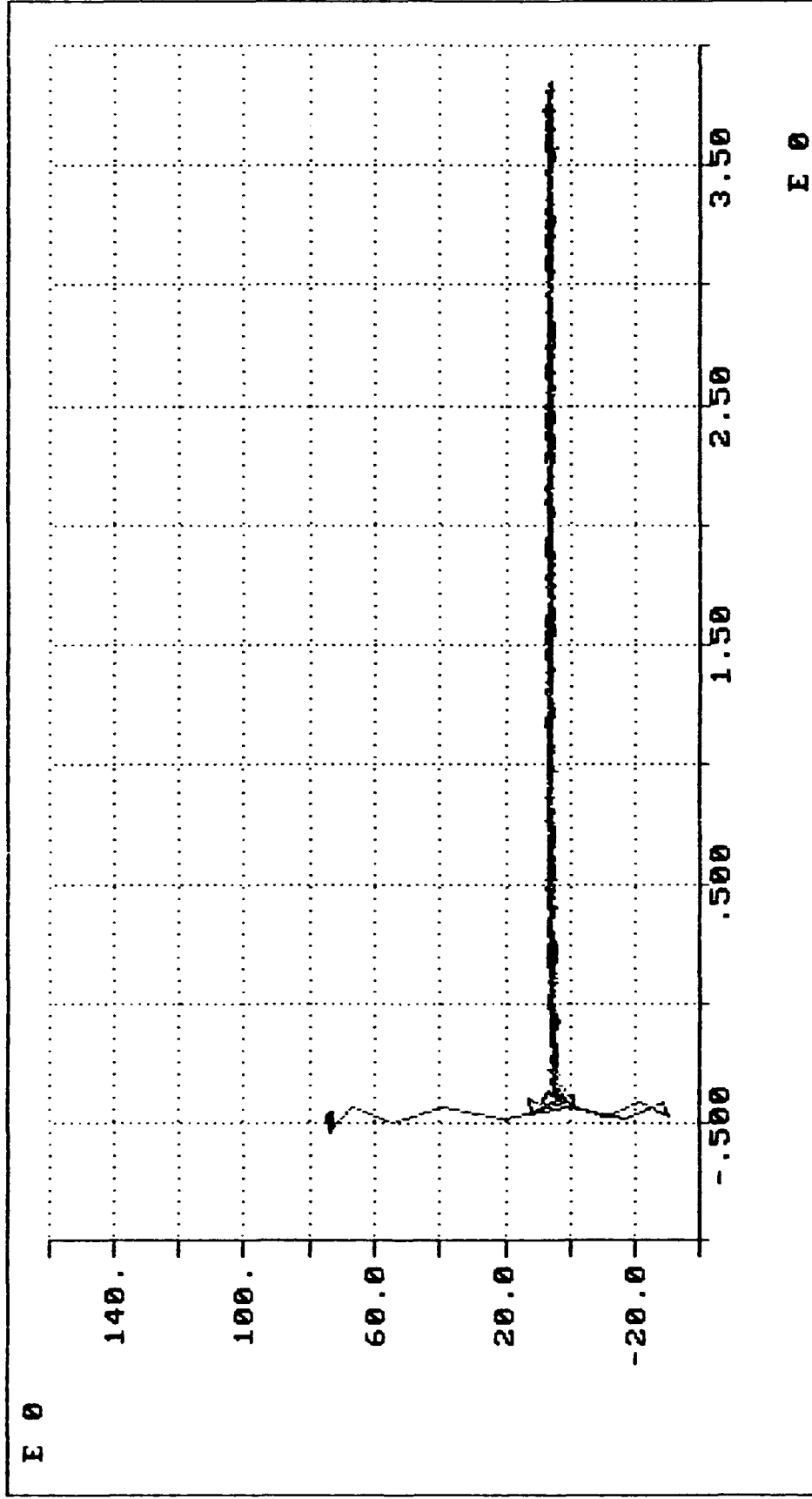
AUG 8 C



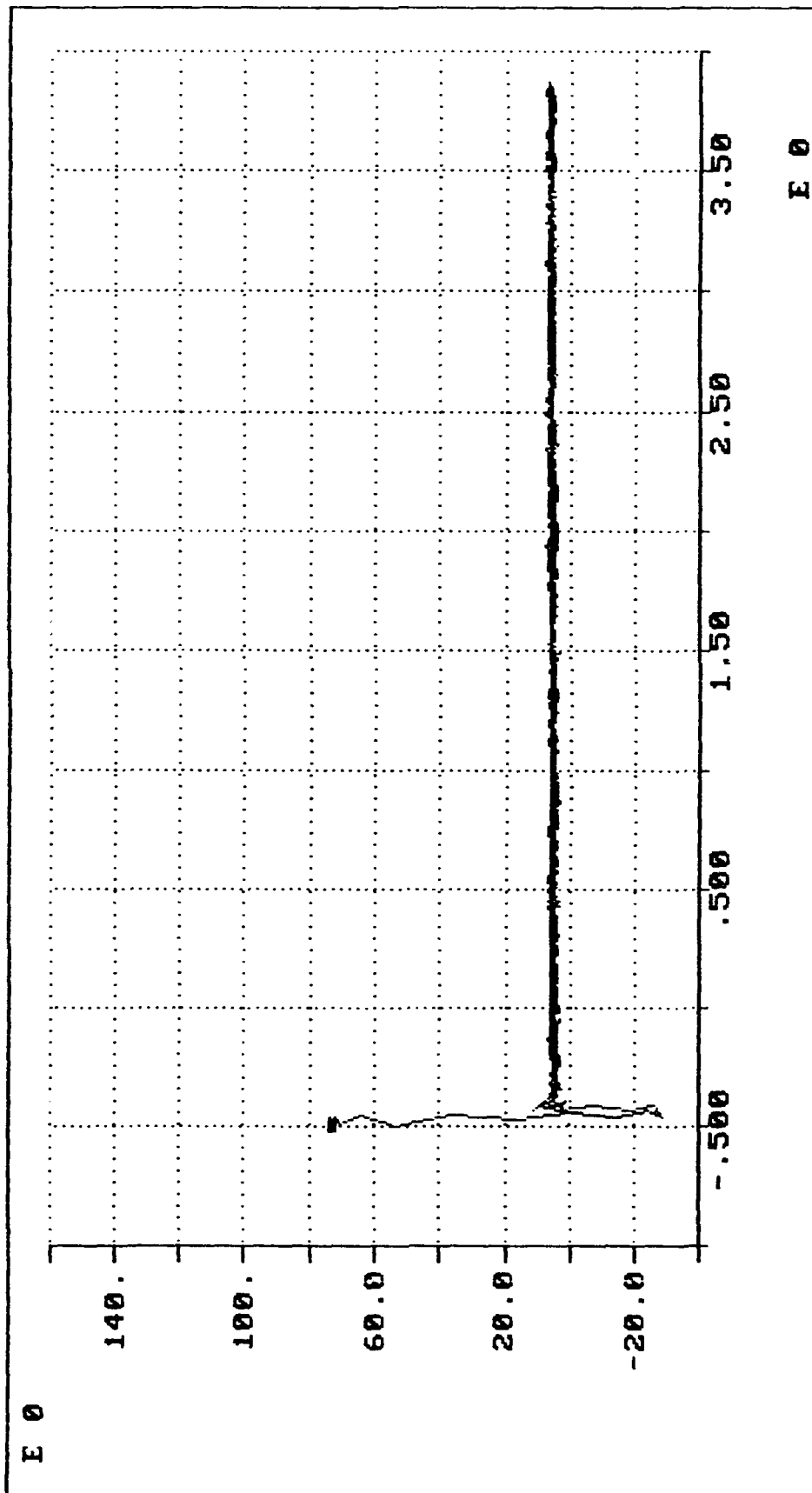
AUG 8 D



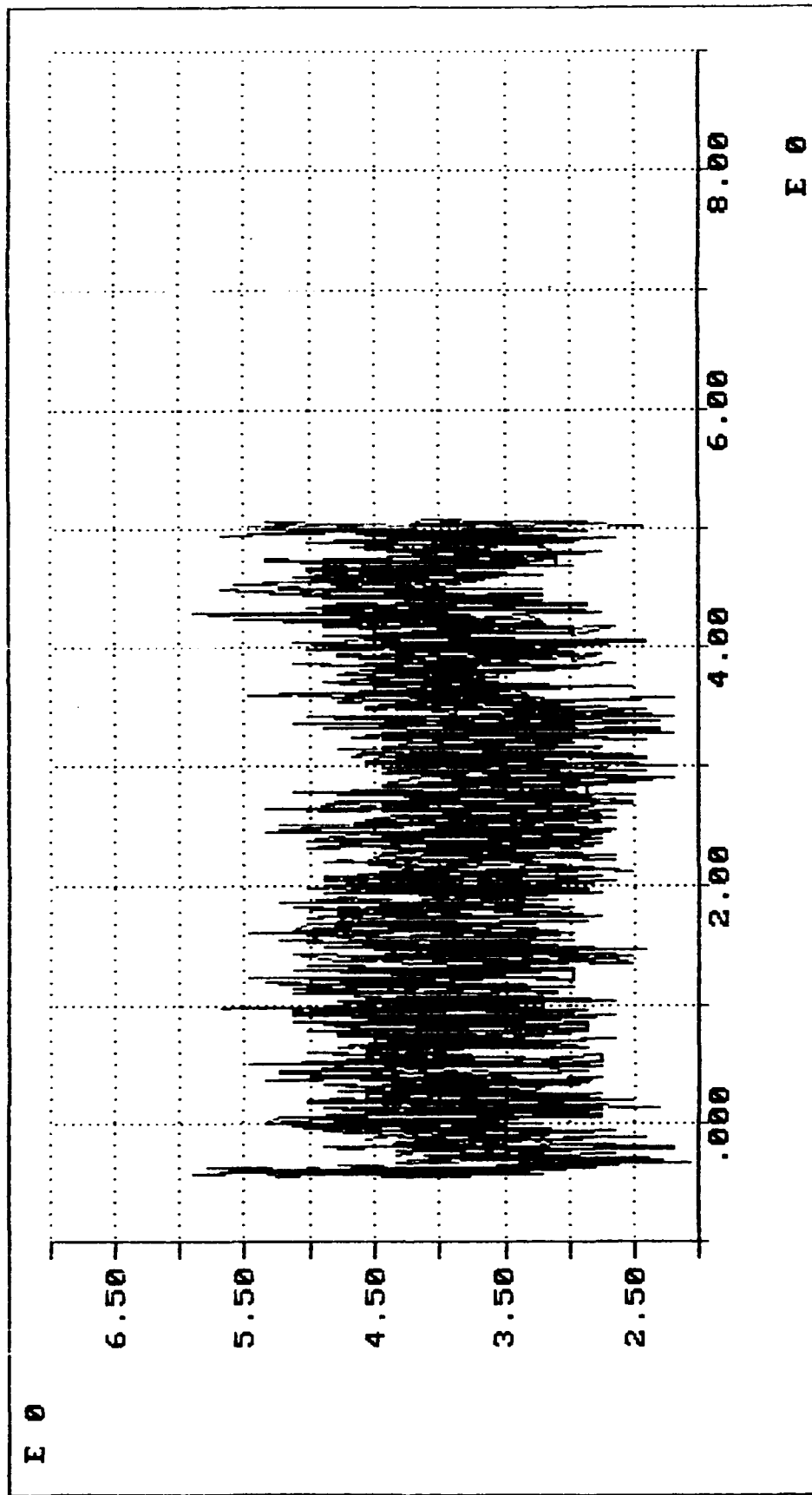
AUG 8 E



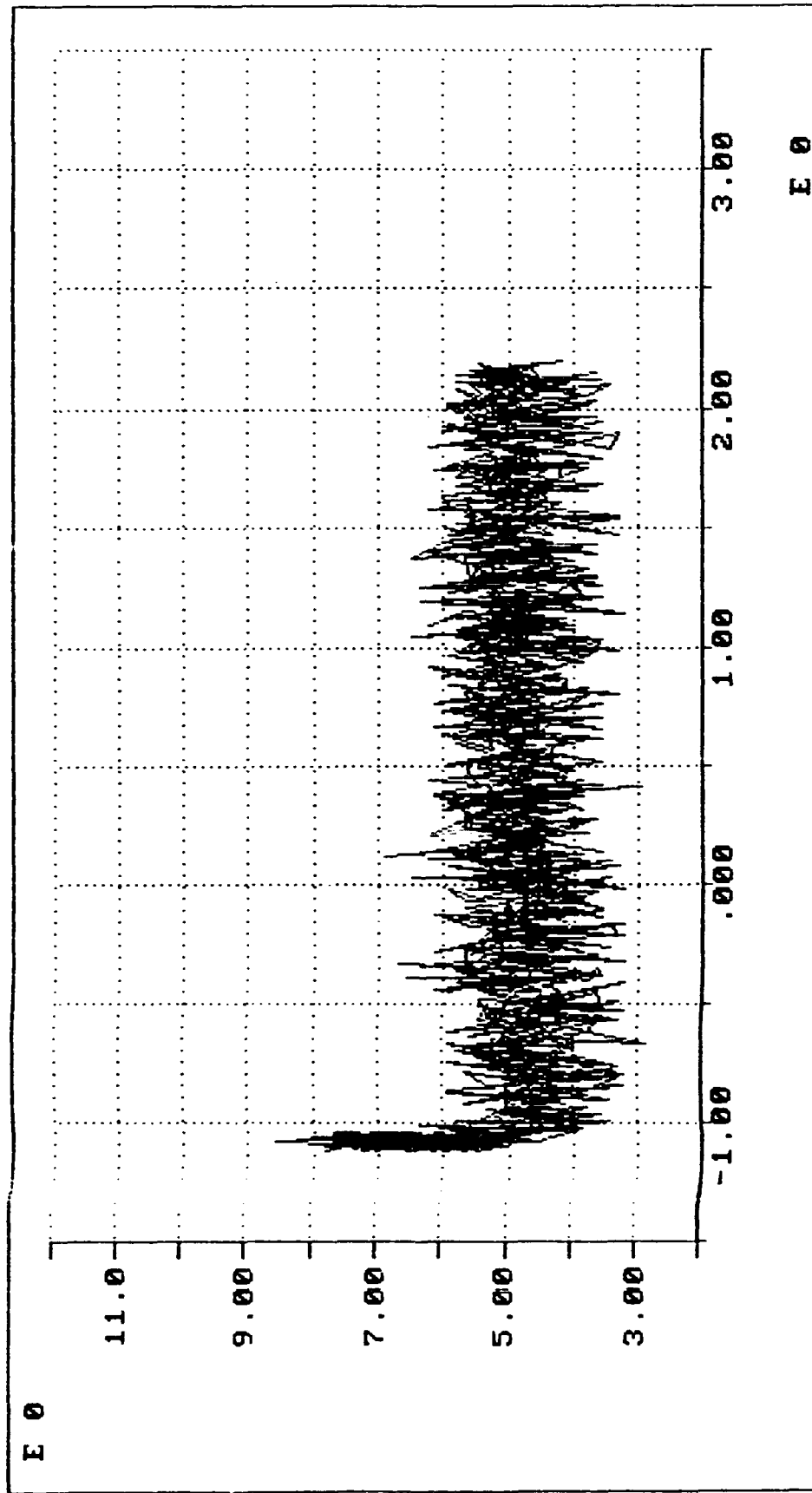
Aug 84



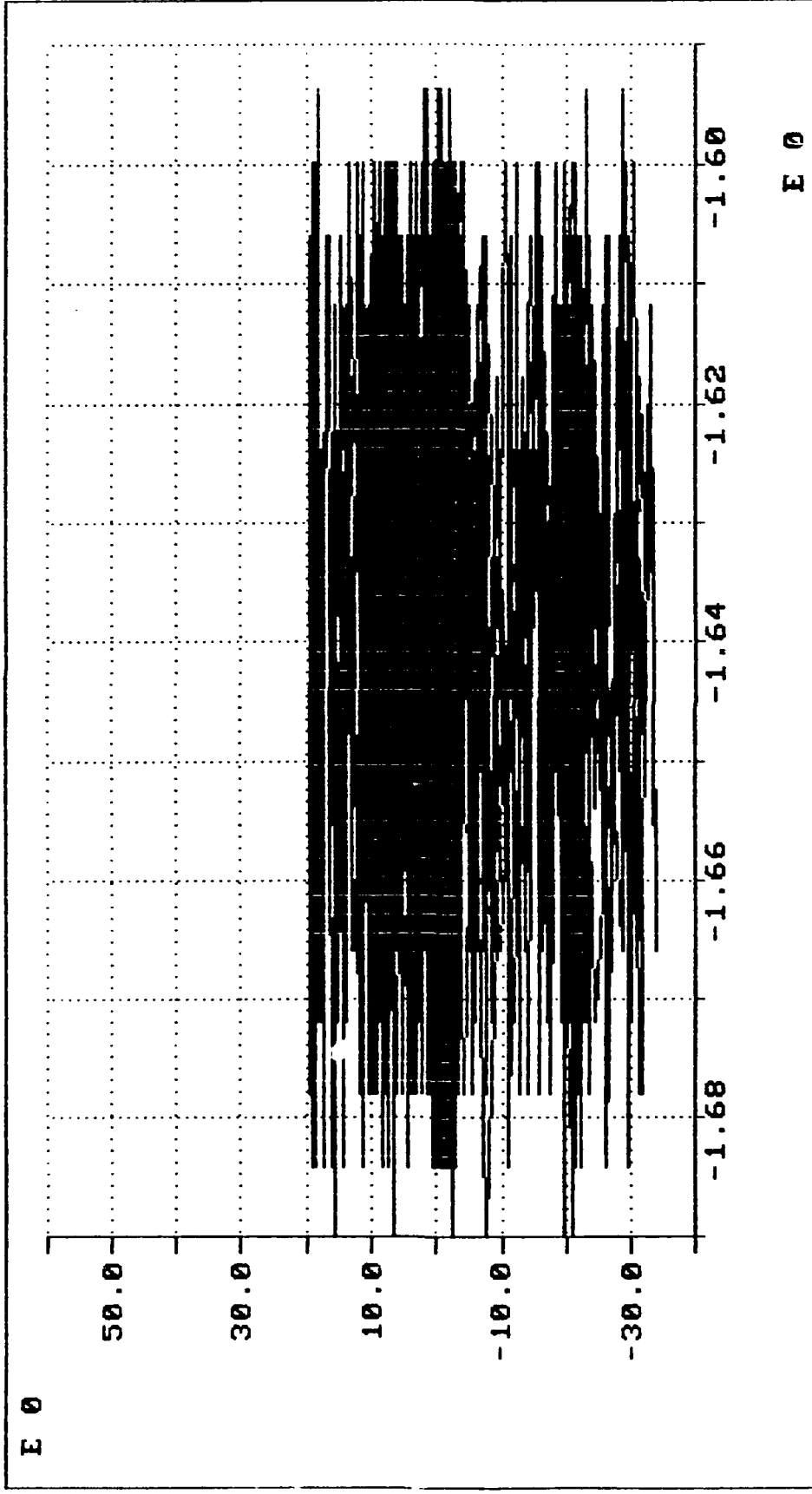
AUG 86



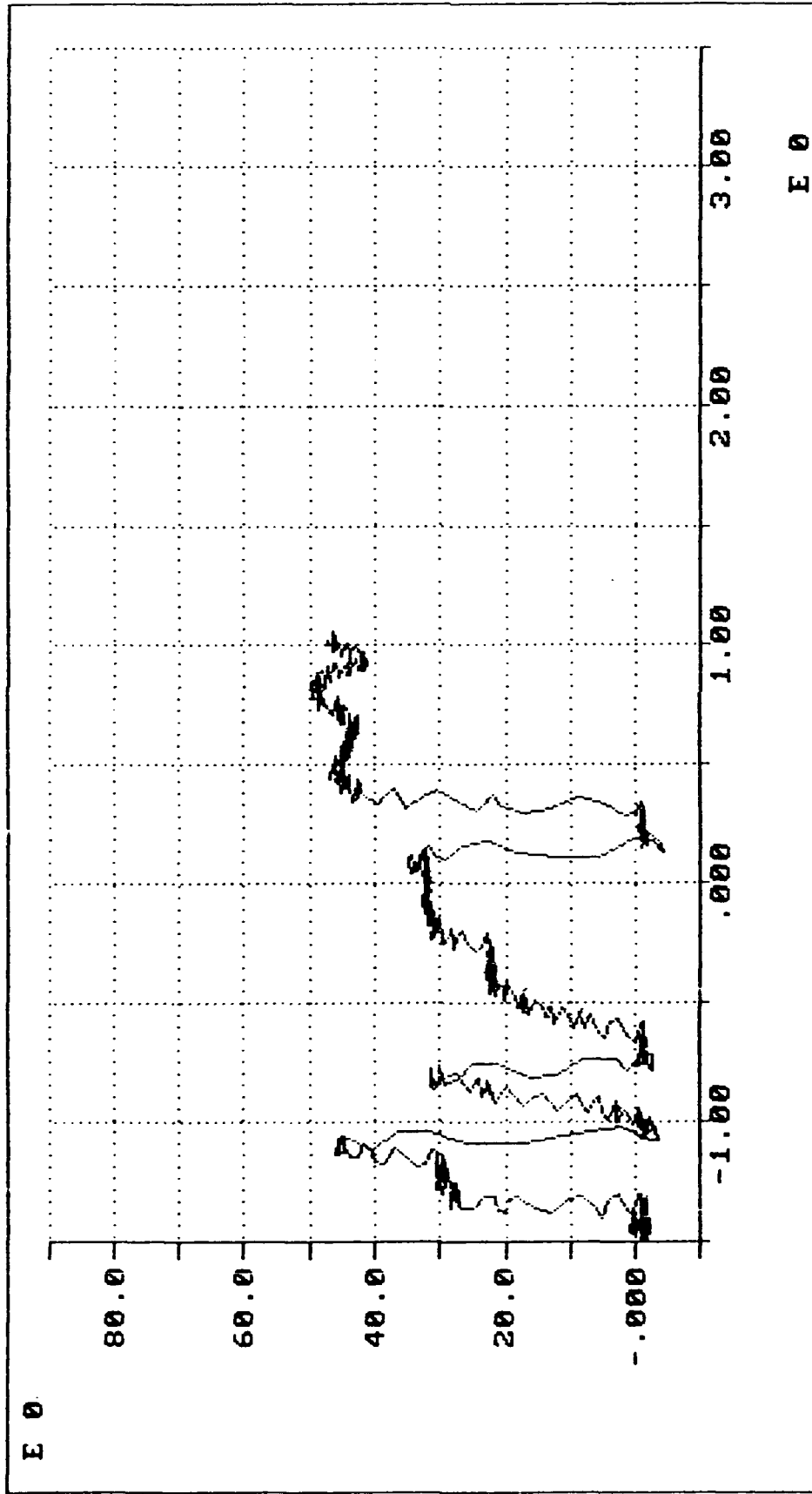
AUG 9 4



Aug 9 12



JUL 26



File Name: <B:AUG28V.USR>

Quit/Continue: *

8 Comments

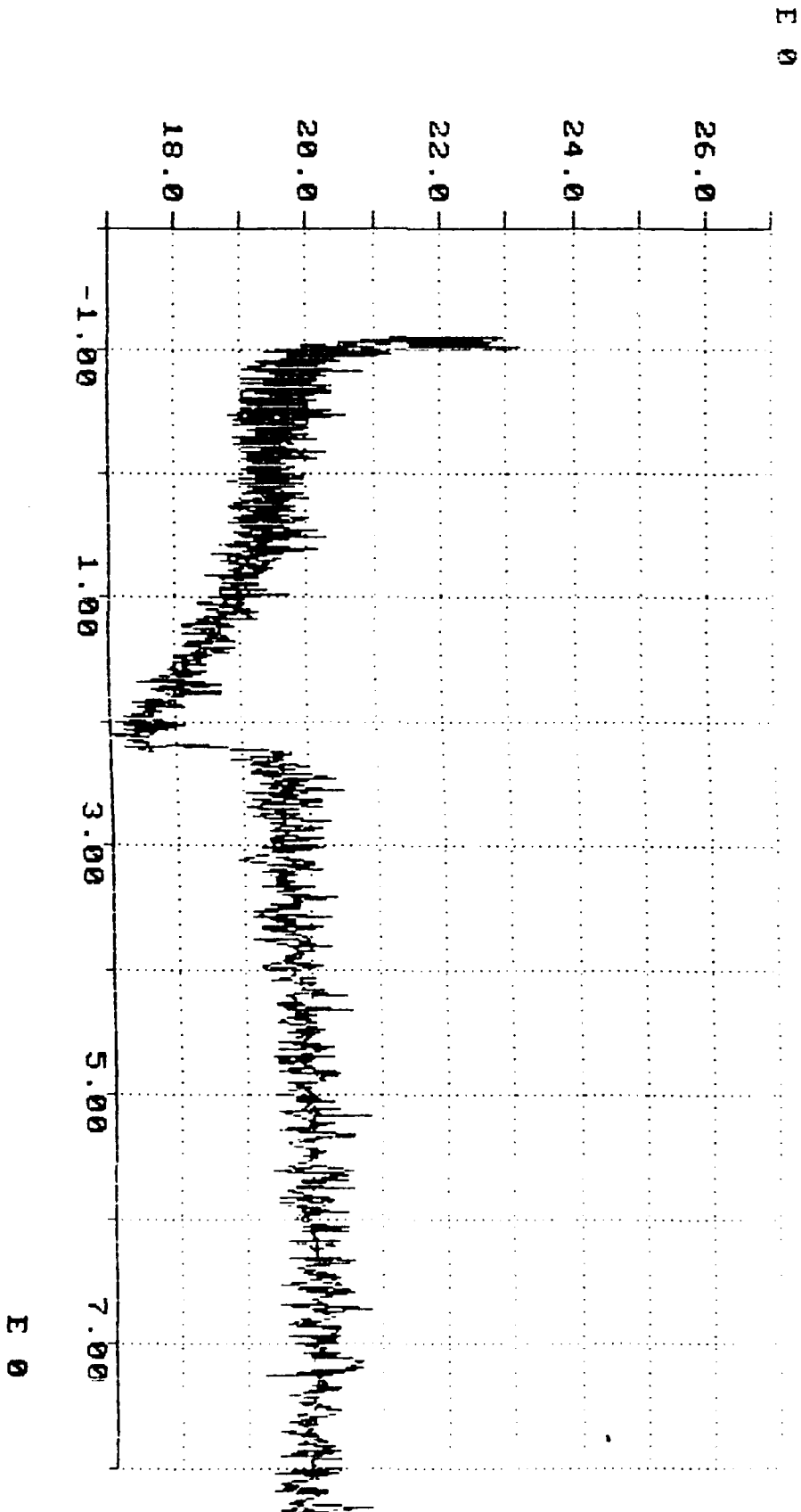
Subfiles (total #: 7)

- 1> FERRONYL, 100 DEGREES CONTROLLED
- 2> SOME BLANCHING
- 3> ONE OF THE BEST WELDS TODAY

: Start# Shape #Repts :
: 1 2 x 256 7 :

AUG 28 V

Fresh Expt-1
Ferronyl Temp=100



Quit/Continue: *

8 Comments

Subfiles (Total #: 9)

[illegible]

> FERRONYL, 50 DEGREES CONTROLLED

: Start#

Shape

#Repts :

> NO VISUAL CHANGES

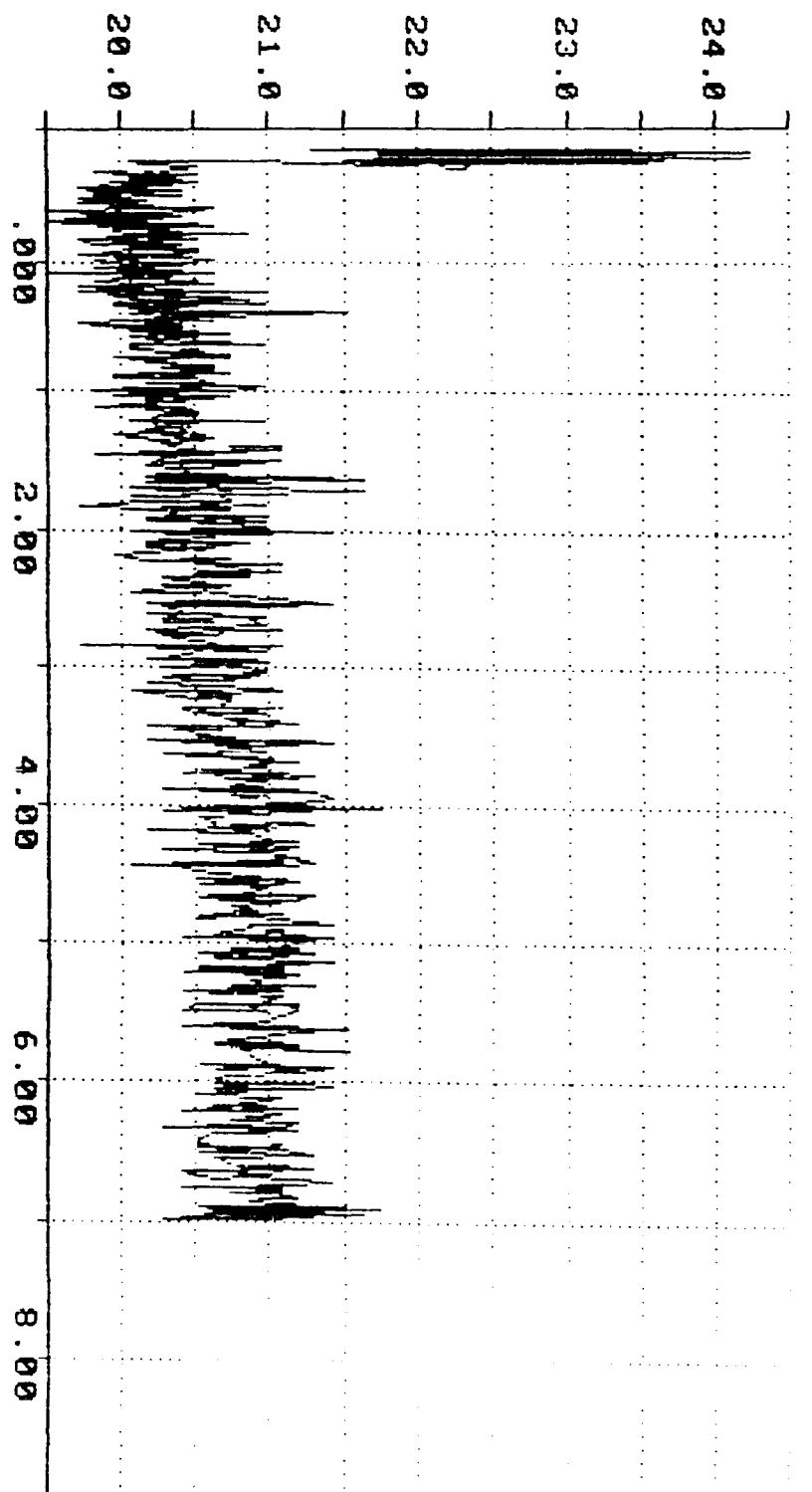
1

2 x 256

9

5> NOT A VERY GOOD WELD

> BURLEIGH STAGE DID NOT MOVE AT THE BEGINN:



AUG 28W

Temp = 50
Fresh Bone

File Name: <B:AUG28X.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 6)

1> FERRONYL-60 DEGREES CONTROLLED

: Start#

Shape

#Repts :

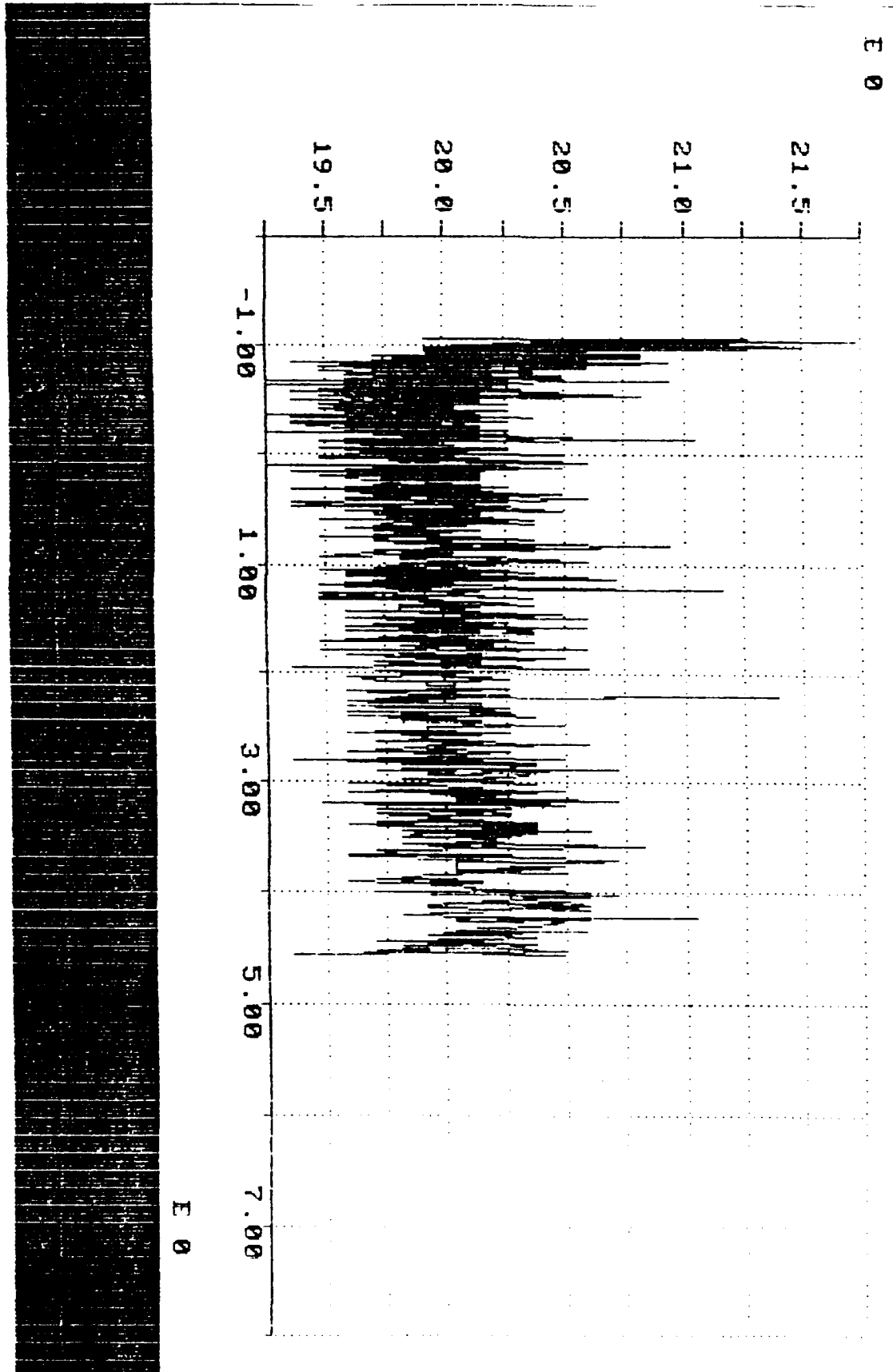
2> NO VISUAL CHANGES

: 1

2 x 256

6

3> ONE OF THE BETTER WELDS



AUG 28 '78

Fresh Bond

File Name: <B:AUG28Y.USR>

Quit/Continue: *

8 Comments

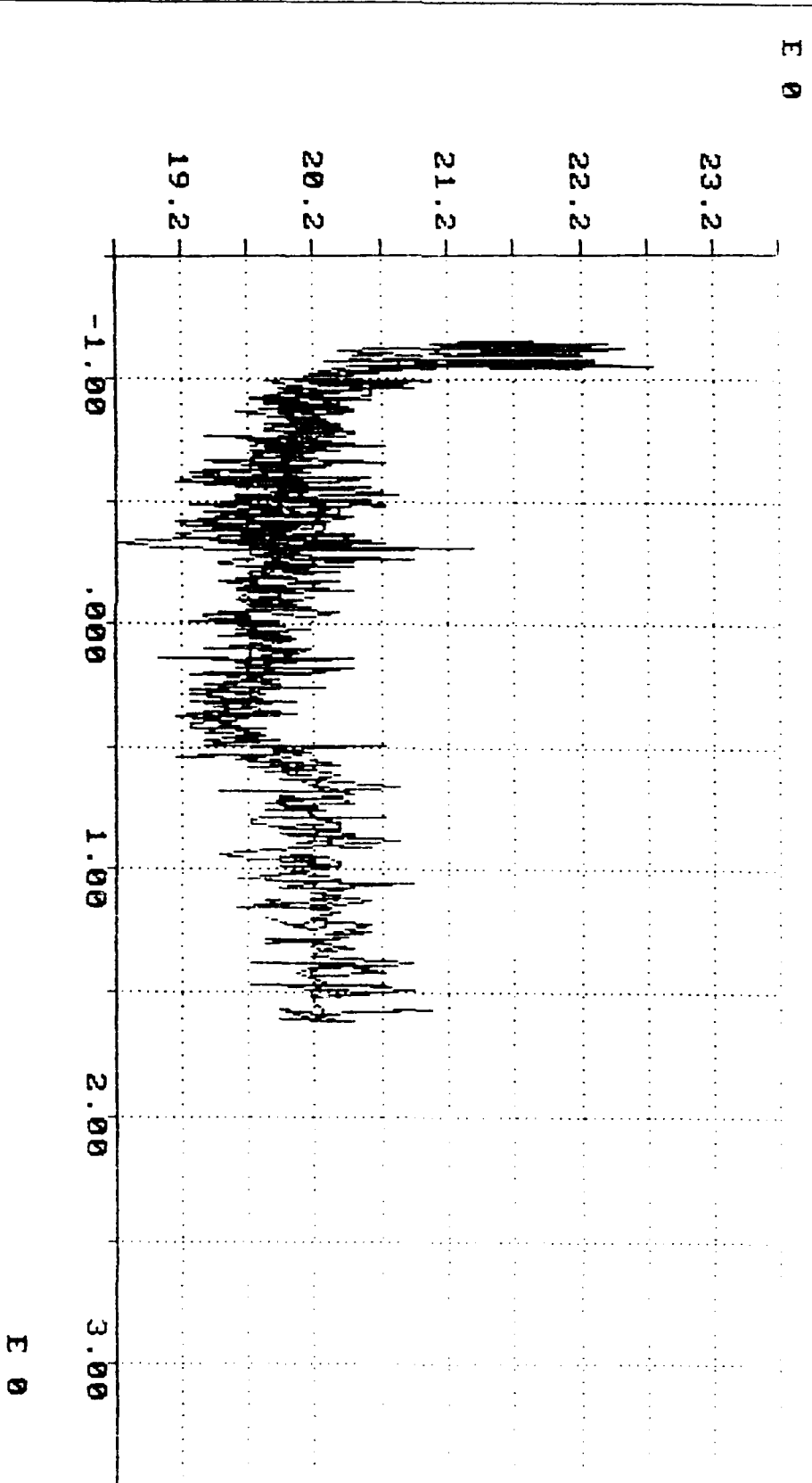
Subfiles (Total #: 4)

- 1> INDIA INK, TEMP CONTROLLED AT 60
- 2> SLIGHT DESSICATION
- 3> A GOOD WELD
- 4> LOOKS BETTER THAN FERRONYL

: Start# Shape #Repts :
: 1 2 x 256 4 :

AUG 28 Y

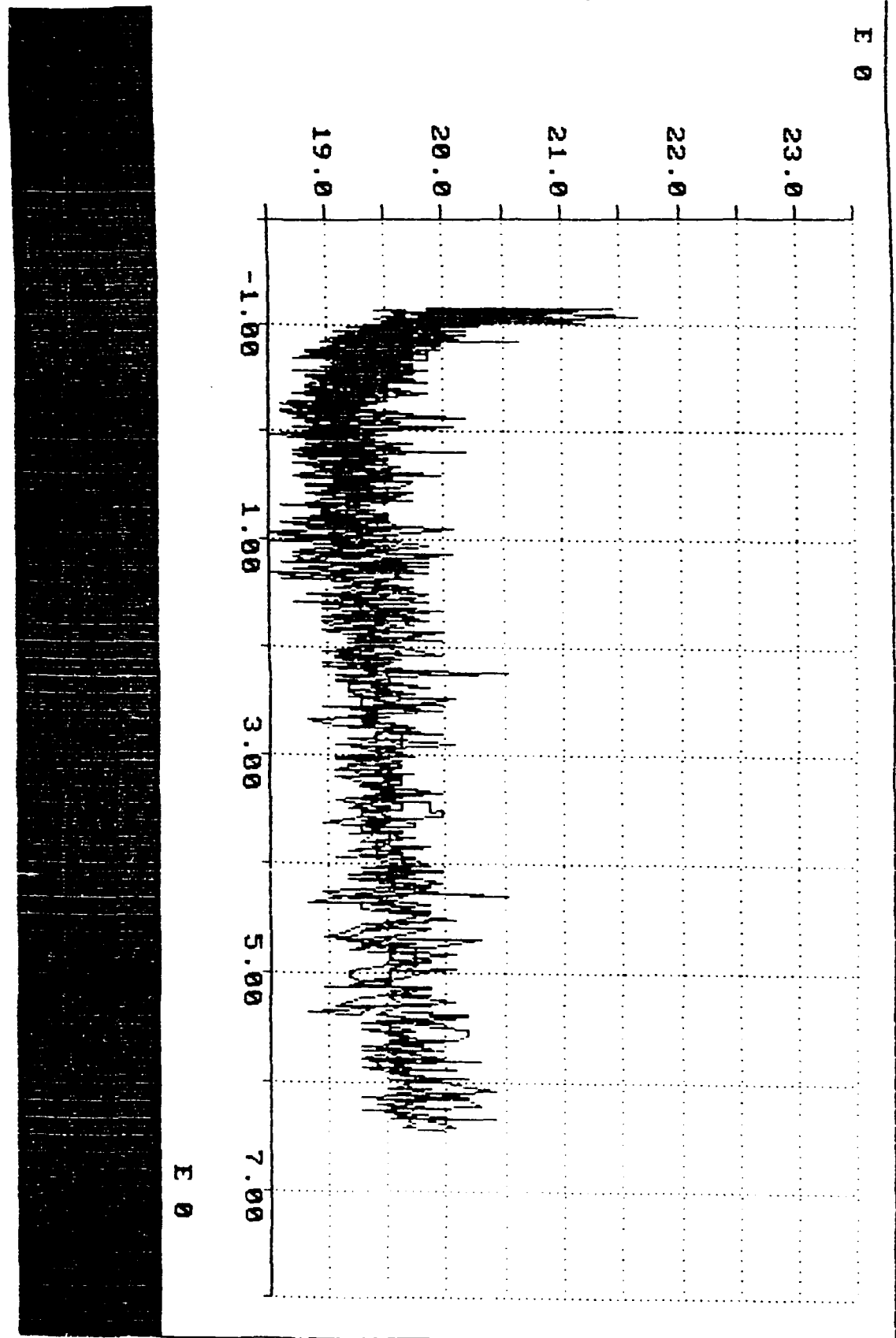
India Ink Temp - 60
Peak Power



File Name: <B:AUG28AB.USR> Quit/Continue: *
8 Comments Subfiles (Total #: 7)
1> INDIA INK, 60 DEGREES, LARGE APERTURE, SL: Start# Shape #Repts :
2> WELDED. ONE OF THE BETTER WELDS : 1 2 x 256 7 :
3>

AUG 28 1975

Large aperture
India Ink
Temp = 60°



File Input/Output

File Name: <B:AUG28AA.USR>

Quit/Continue: *

8 Comments

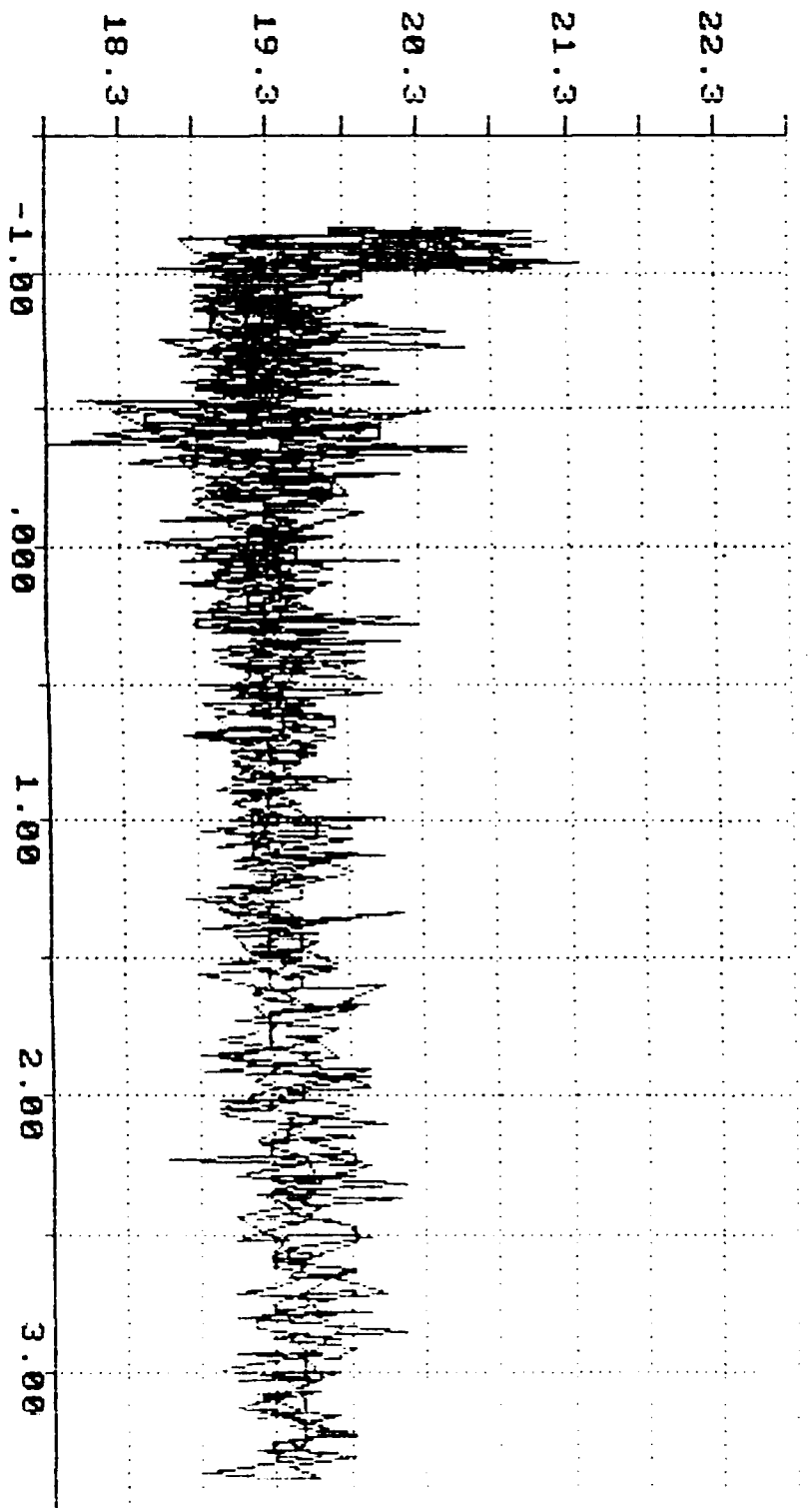
Subfiles (Total #: 5)

- 1> LARGE APERTURE, INDIA INK, 50 DEGREES
- 2> WELDED

Start# Shape #Repts : 1 2 x 256 5

AUG 28 AA

Large Aperture
India Ink
Temp = 50



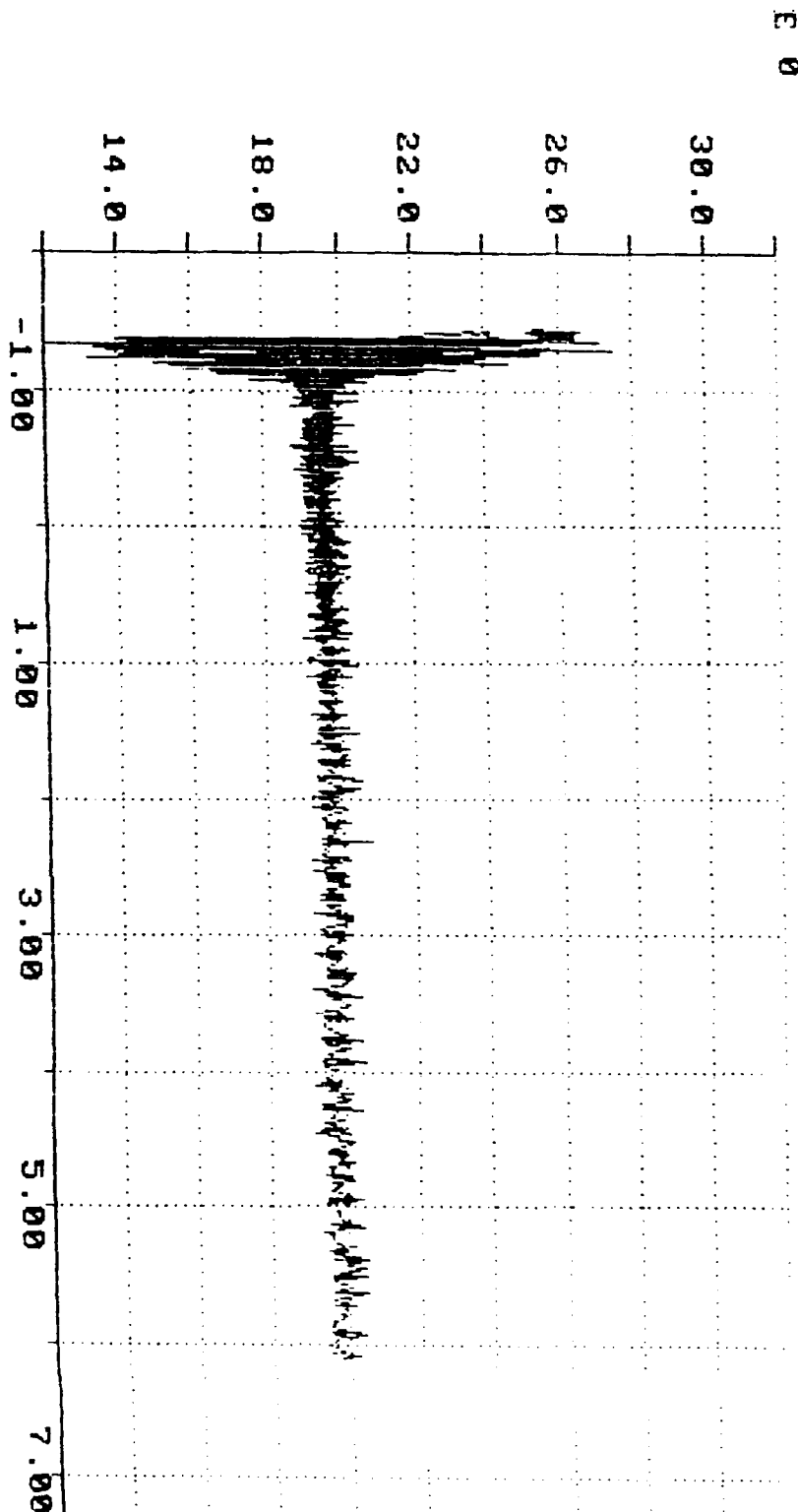
File Name: <B:AUG28Q.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 7)

- 1> FERRONYL, TEMP SET = 80 DEGREES, TC MAX =: Start# Shape #Repts :
 2> TOO DEEP. : 1 2 x 256 7 :
 3> NOT A GREAT WELD :



AUG 28Q

Ferronyl Temp 80°
 TC too deep

File Name: <B:AUG28R.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 7)

1> REPEAT FERRONYL-TEMP = 80

: Start#

Shape

#Repts :

2> BETTER TC PLACEMENT

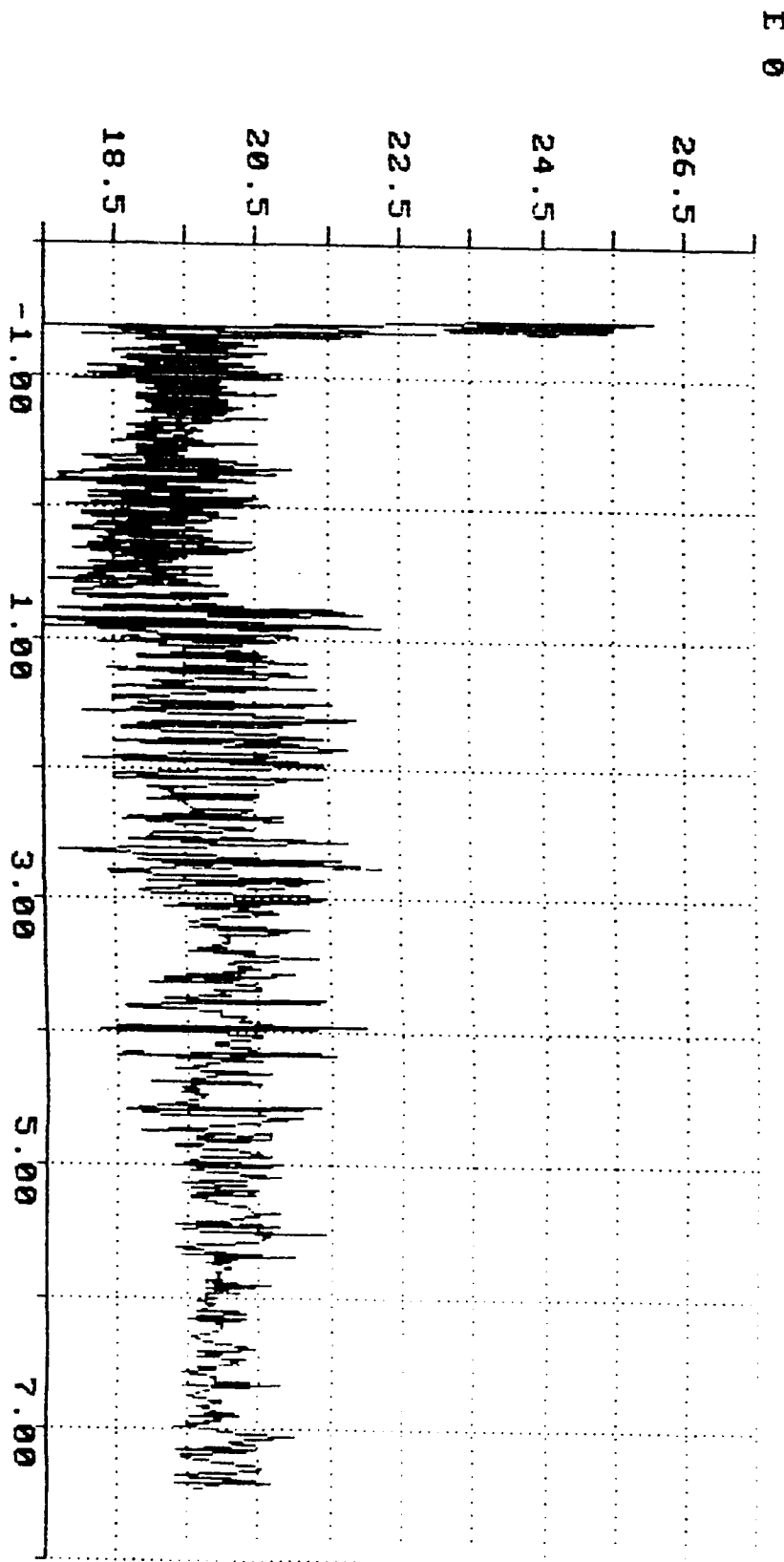
: 1

2 x 256

7

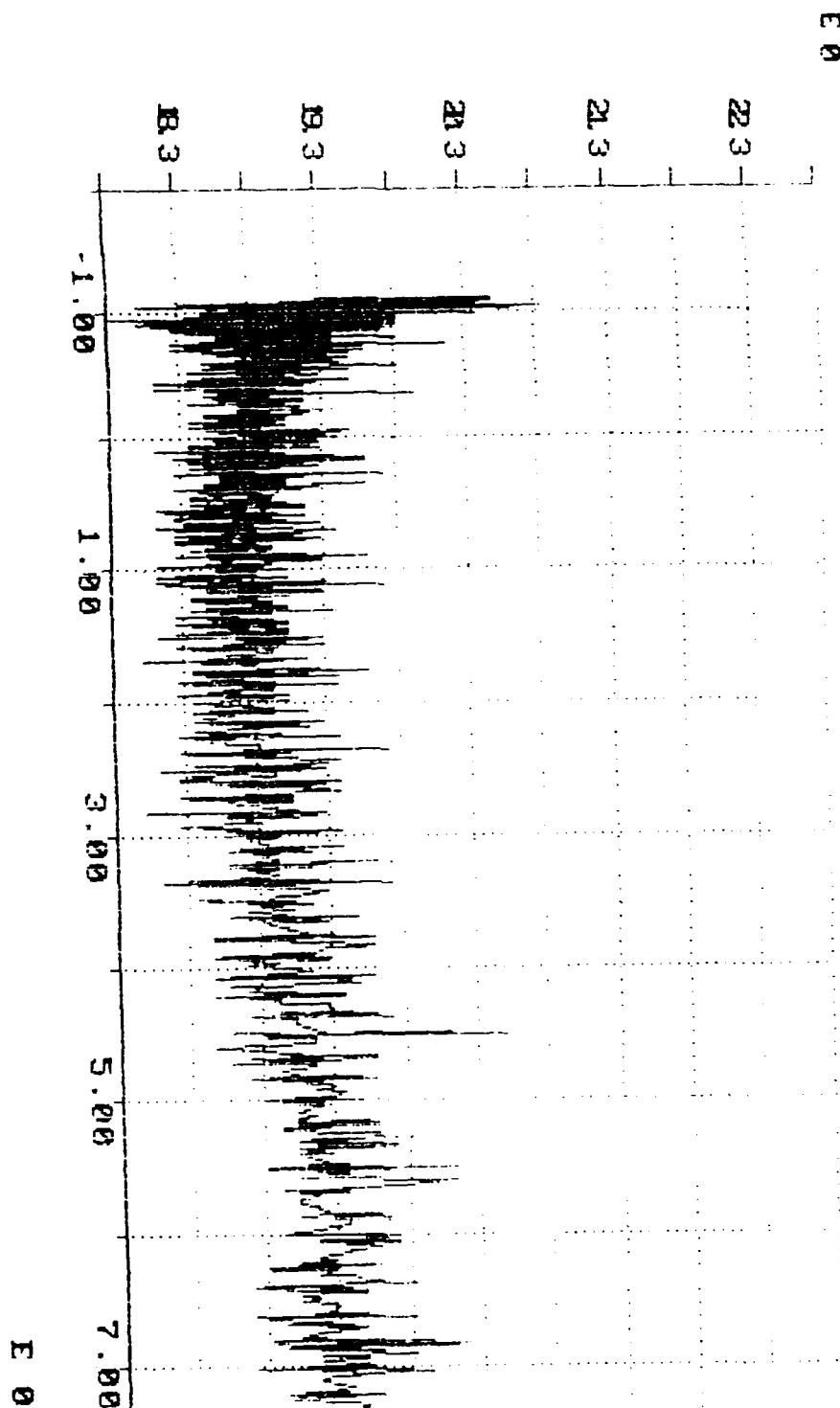
3> SOME BLANCHING

4> WELDED



Ferronyl Temp 80°

五



```

:
:
: File Name: <B:AUG28S.USR>                               Quit/Continue: *
:
: 8 Comments                                                Subfiles (Total #: 8)
:
: 1> FERRONYL TEMPERATURE AT 100 DEGREES                   : Start#           Shape           #Repts :
: 2> SOME BLANCHING AND DESSICATION                         : 1               2 x 256           8       :
: 3> WELD WAS NOT VERY STRONG                               :
:

```

File Name: <B:AUG28T.USR>

Quit/Continue: *

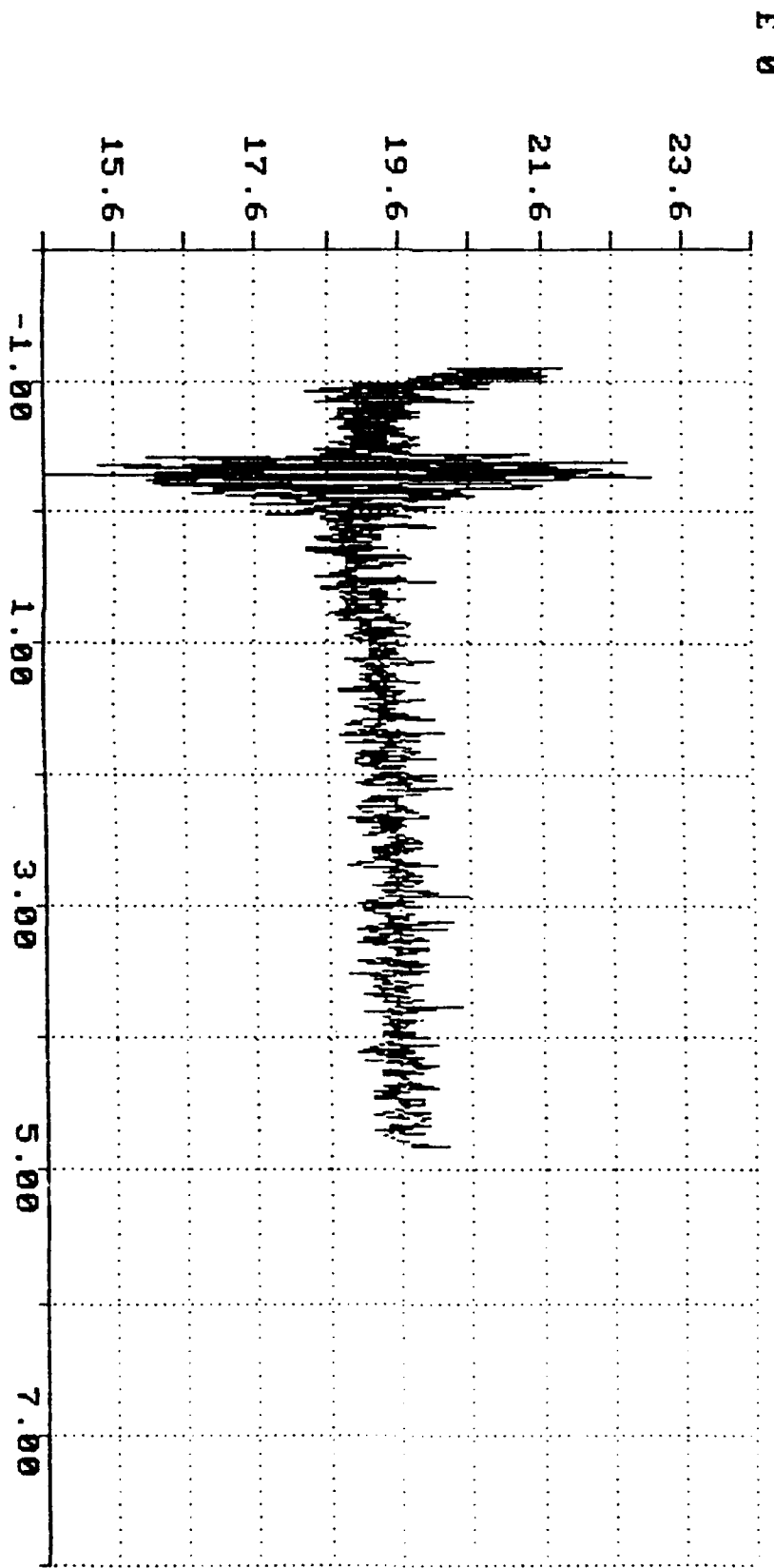
8 Comments

Subfiles (Total #: 5)

1> FERRONYL, 70 DEGREES, TC MAX=55, TC TOO D: Start# Shape #Repts :

2> WE HAVE A WELD

: 1 2 x 256 5 :



AUG 28 +

Fresh Bond
Ferronyl Temp = 70

File Name: <B:AUG26U.JSR>

Quit/Continue: *

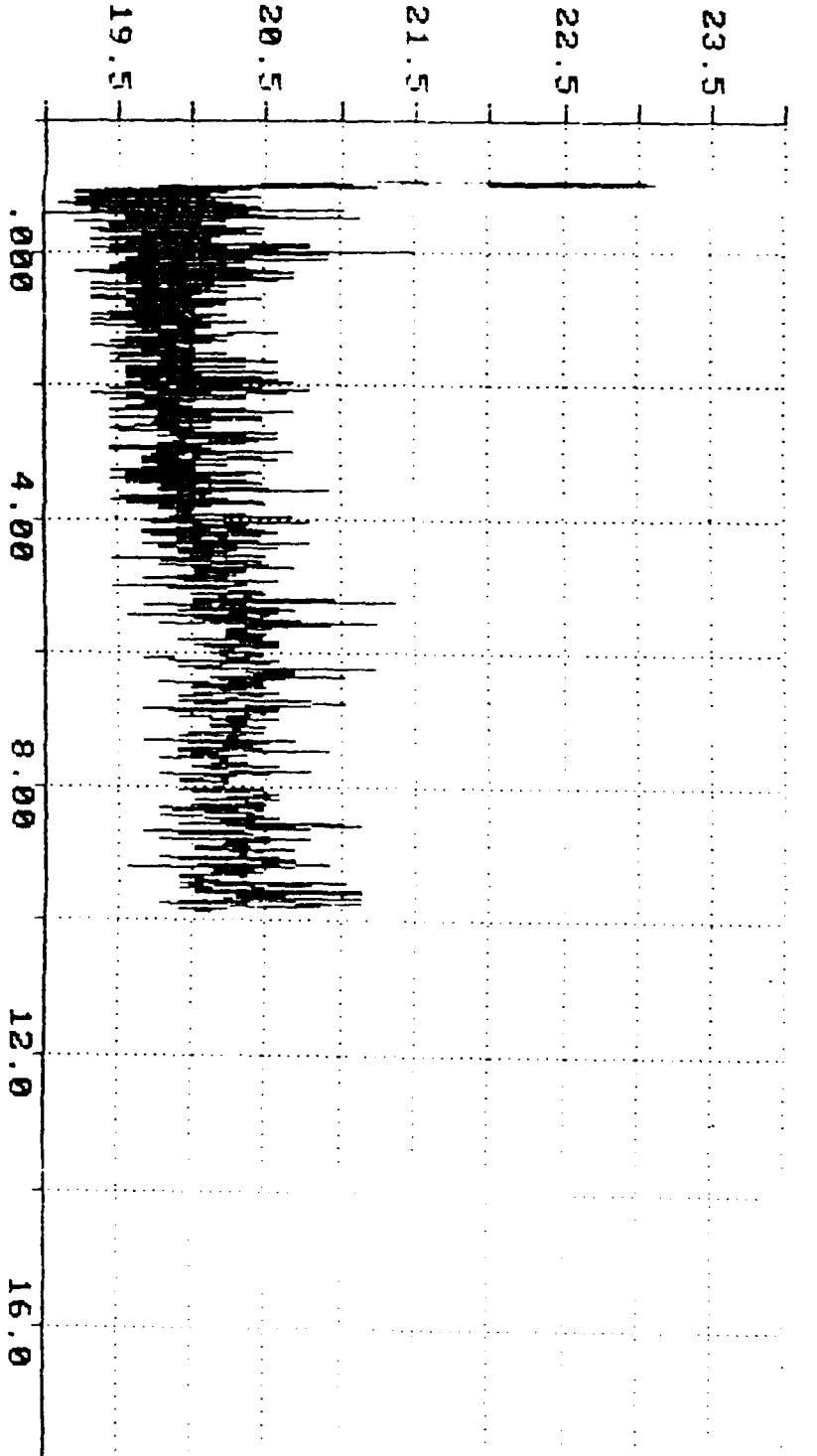
8 Comments

Subfiles (Total #: 7)

- 1> FERRONYL, TEMP SET AND CONTROLLED AT 80 D: Start# 1 Shape 2 x 256 #Repts 7
- 2> GES
- 3> LOOKED STRONGER THAN THE 70 DEGREE AND ST:
- 4> WELDS FROM THIS MORNING.

AUG 28 4

Fresh Panel
Ferronyl Temp = 80°



Quit/Continue: *

8 Comments

Subfiles (Total #: 7)

8 Comments

```

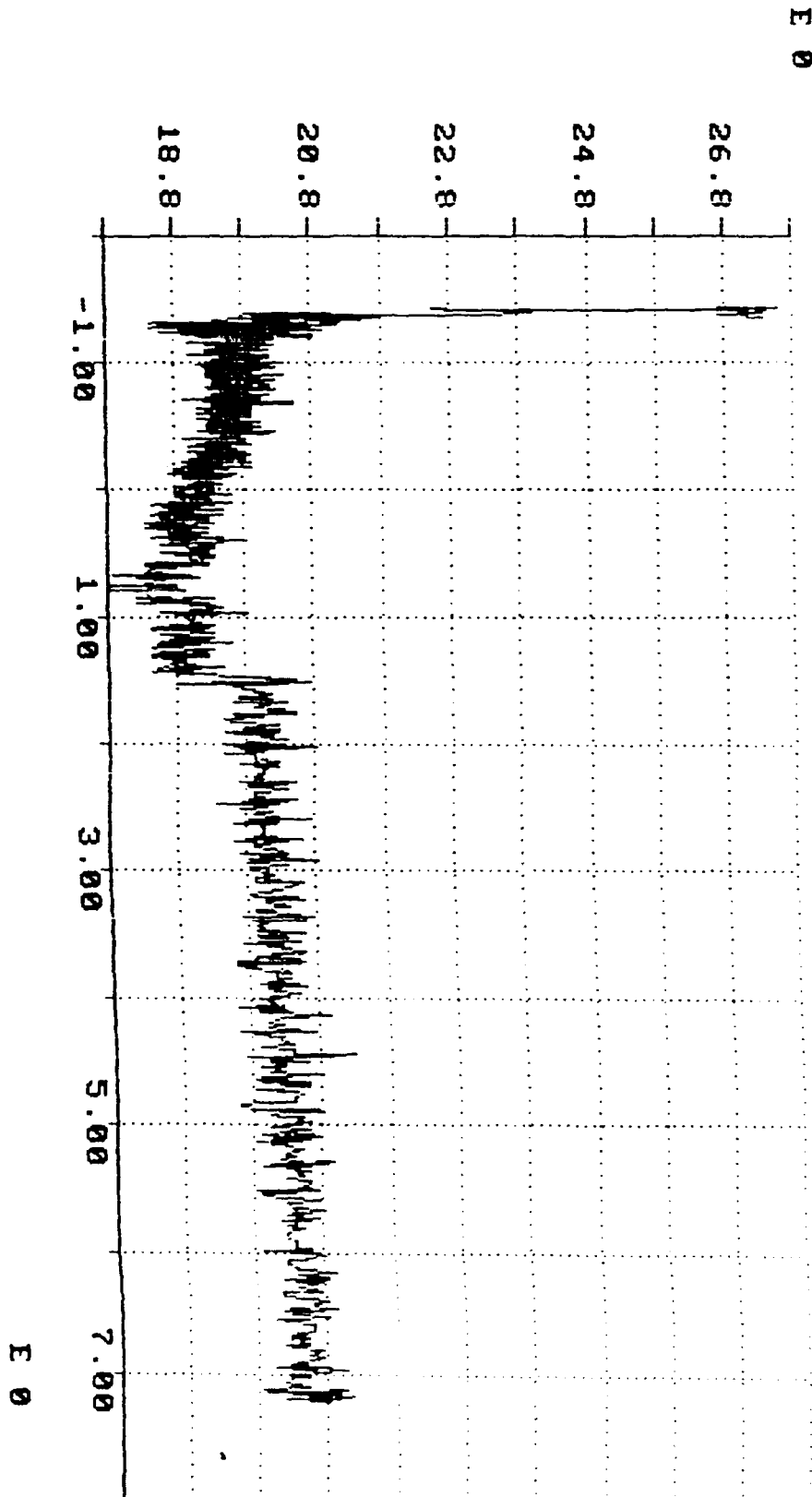
: 1> INDIA INK, 70 DEGREES (NOT REACHED) SOME : Start#          Shape          #Repts :
          2 x 256          7

```

2> WELDED, BROKE APART AT SEROSAL SURFACE. : 1 2 x 256 7

3> WELD SEEMED TO EXTEND THROUGHOUT TISSUE :

AUG 28 k



India and Temp - 20

ES

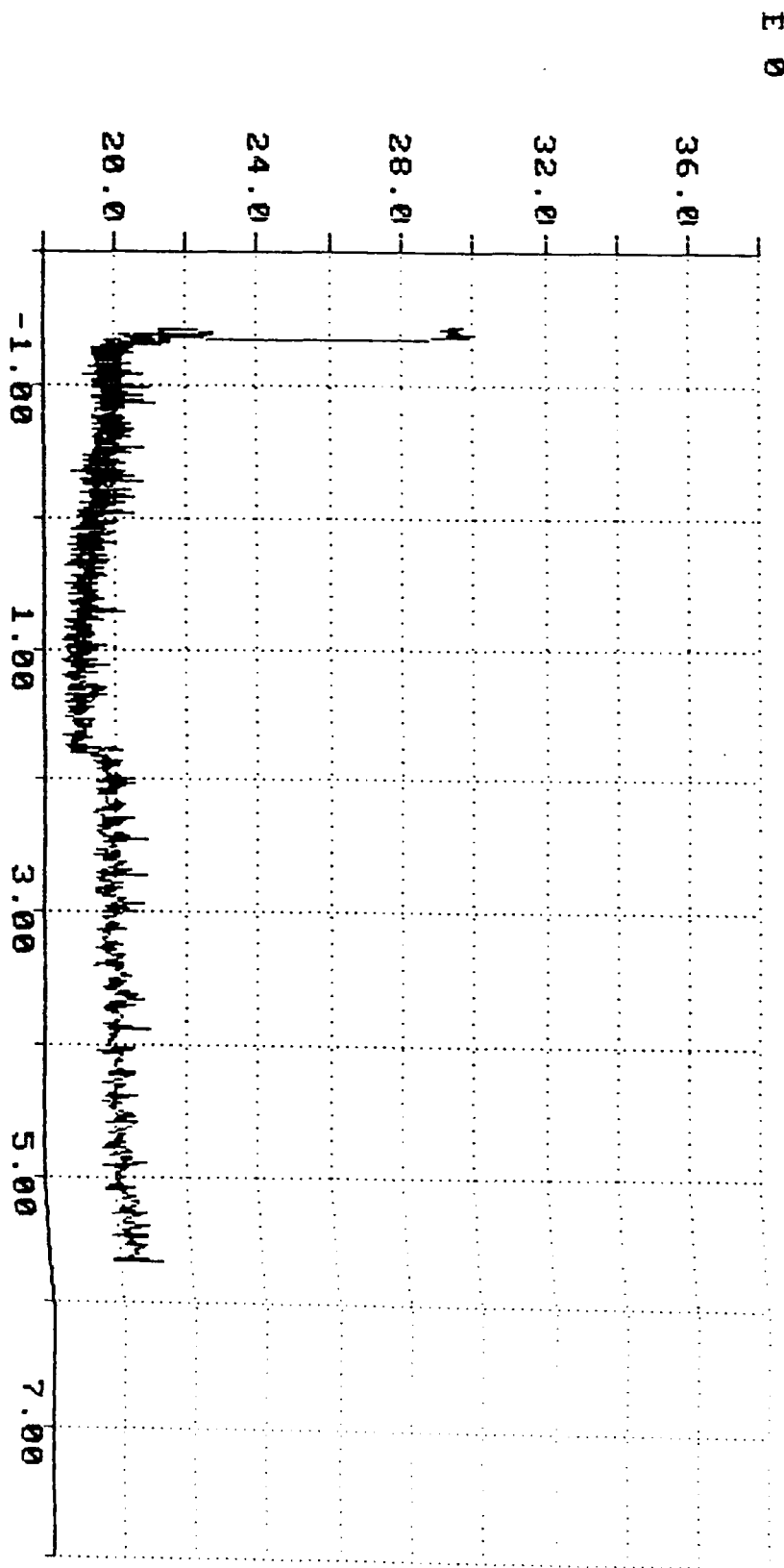
File Name: <B:AUG28M.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 7)

1> INDIA INK, TEMPERATURE SET AT 100 AND CON: Start# Shape #Repts :
 2> LOOKED LIKE A GOOD WELD : 1 2 x 256 7



AUG28M

India Ink Temp = 100

II File Input/Output

File Name: <B:AUG28N.USR>

Quit/Continue: *

Subfiles (Total #: 7)

8 Comments

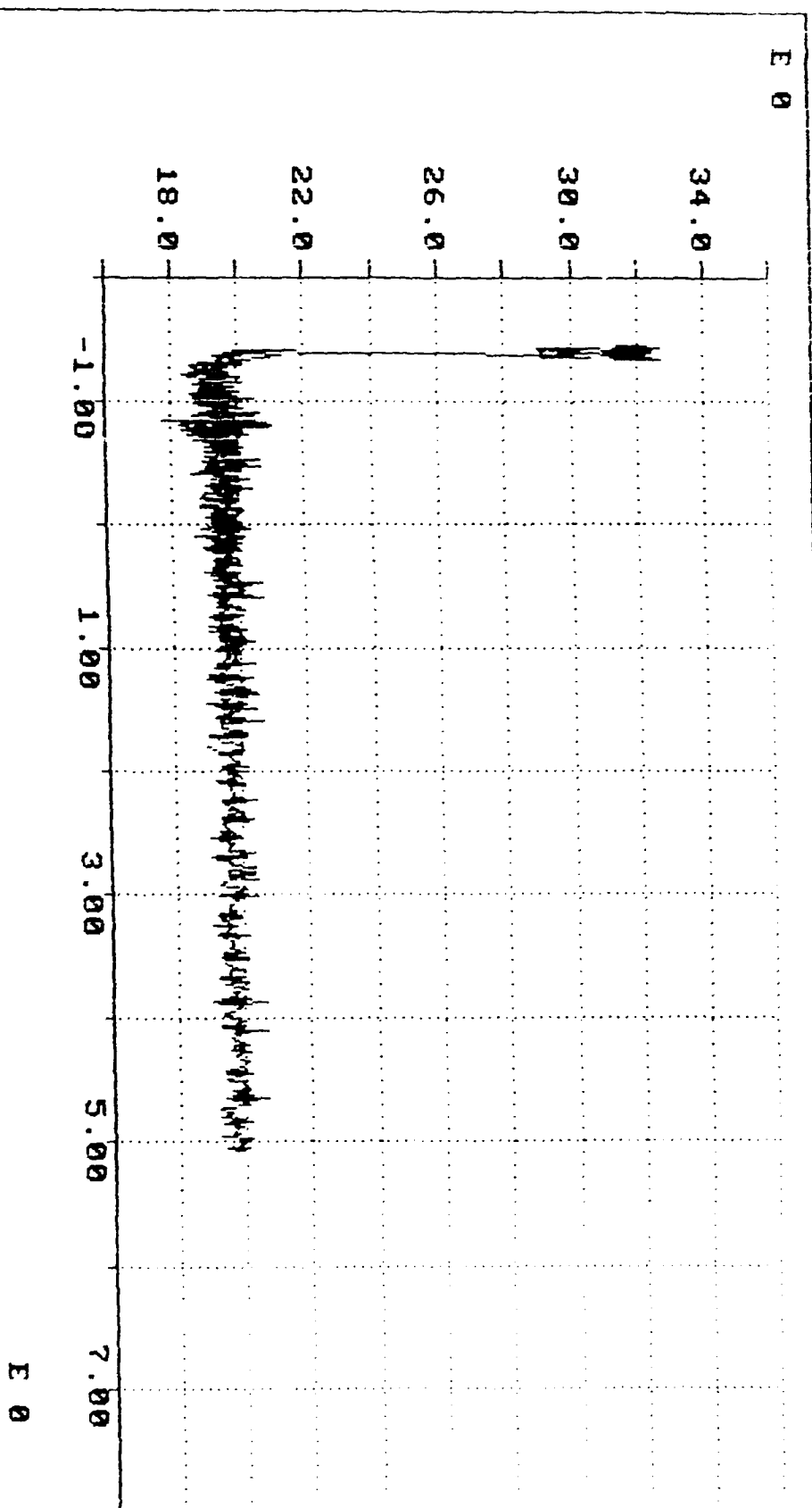
```

: 1> FERRONYL TEMP = 50 CONTROLLED AT 41 DEGRE: Start#
: 2> SOME BLANCHING LOOKS LIKE A WELD                : 1

```

Shape
2 x 256

```
#Repts :
7 :
```



Temp = 50°C

Temp = 60
Fe / only

Quit/Continue: *

8 Comments

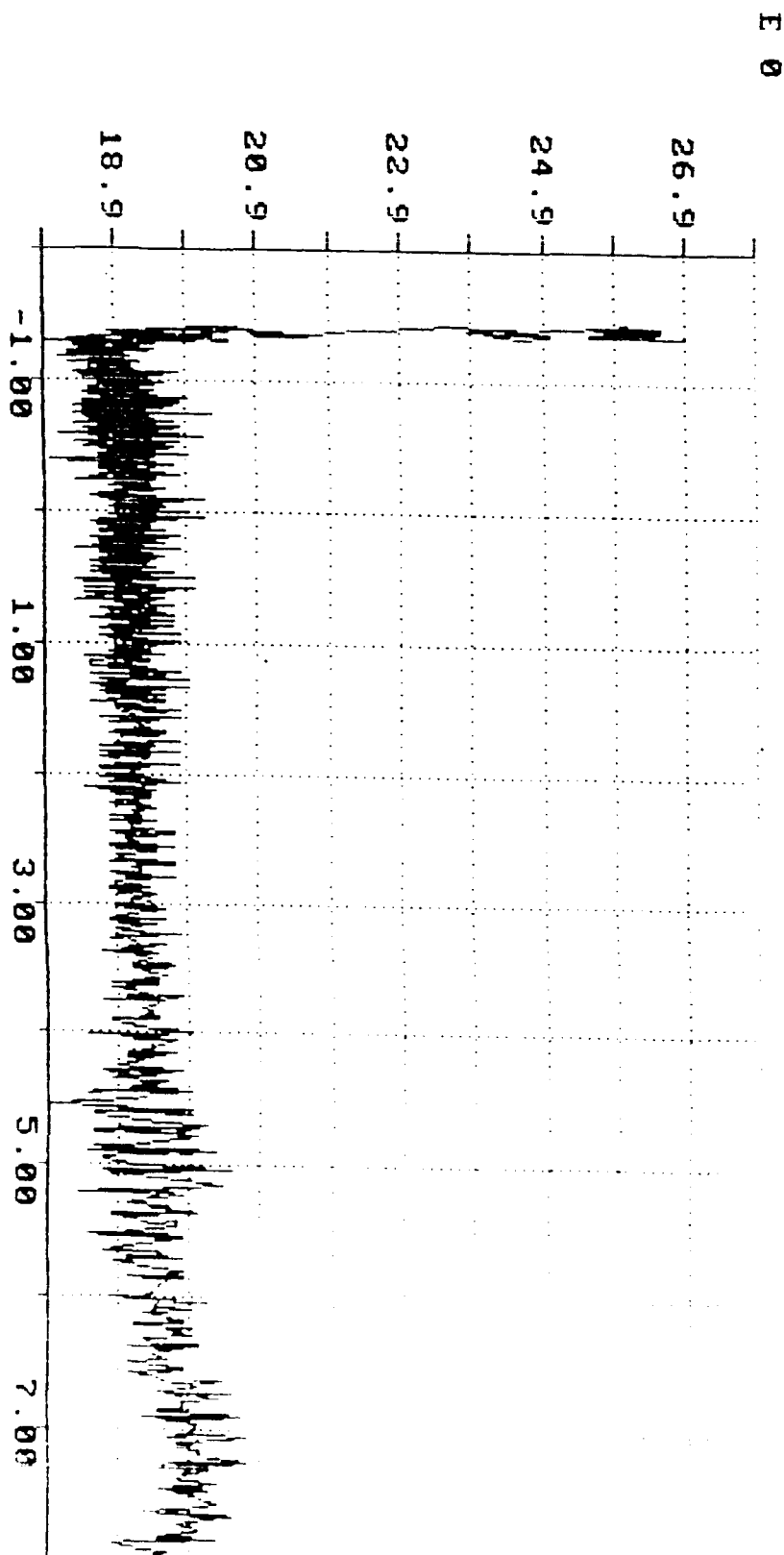
Subfiles (Total #: 8)

[illegible]

```

1> FERRONYL 70 DEGREES LITTLE DESSICATION AN: Start#           Shape           #Repts :
2> A WELD, STRONGER THAN 60 DEGRES, BUT NOT :           1           2 x 256           8           :
3> FERRONYL BARELY VISIBLE :                                     :

```



Review

$$T_{\text{emp}} = 70^\circ$$

File Name: <B:AUG28E.USR>

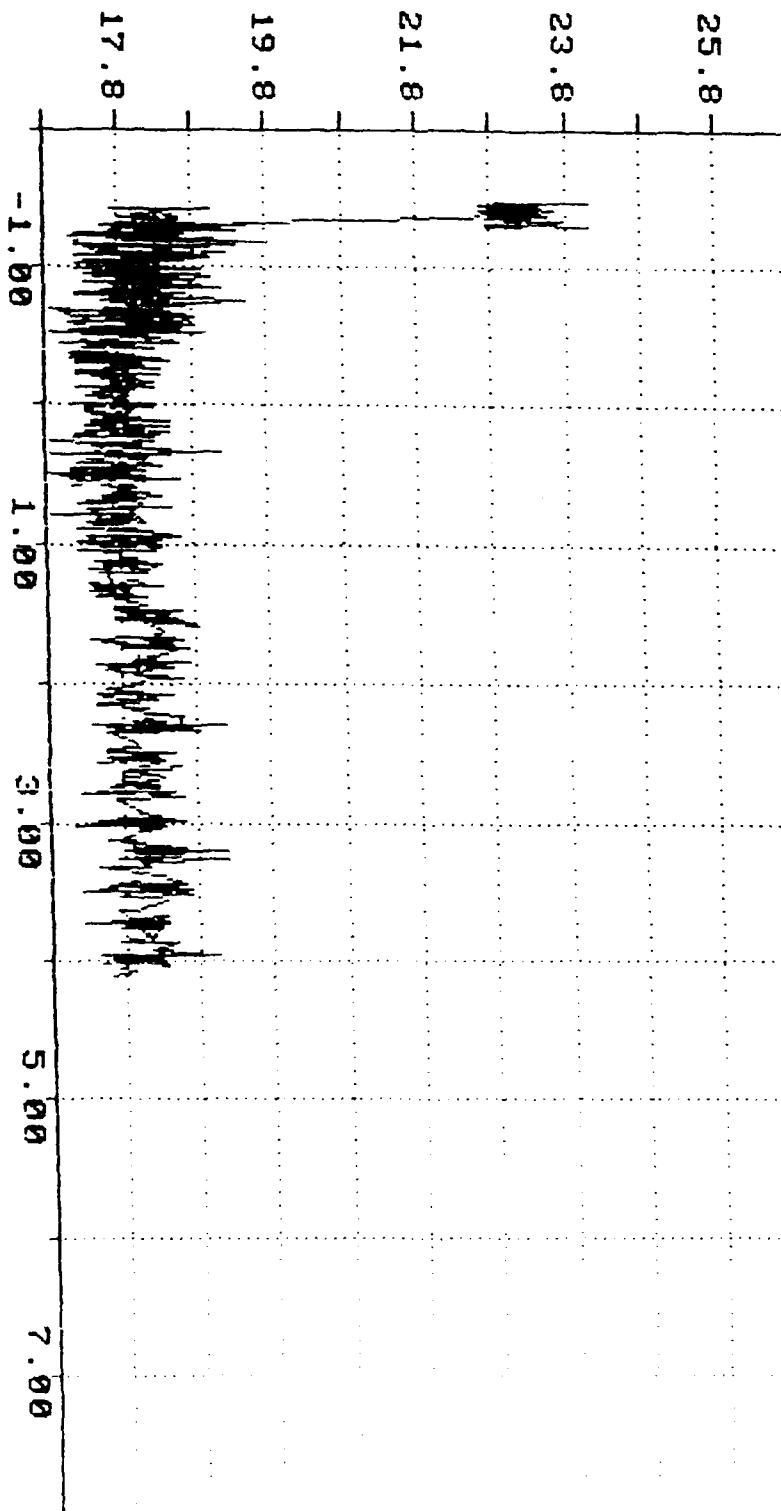
Quit/Continue: *

Subfiles (Total #: 5)

8 Comments

- 1> FERRONYL COMPOUND
- 2> 18 SECONDS
- 3> SMOKED
- 4> WELDED OR STUCK TOGETHER

Start#	Shape	#Repts
1	2 x 256	5



AUG 28 E

Ferronyl

E 0

File Name: <B:AUG28F.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 4)

- 1> LIGHT INDIA INK, DRIED TISSUE, CONTROLLED: Start#
- 2> NOT MUCH OF A WELD

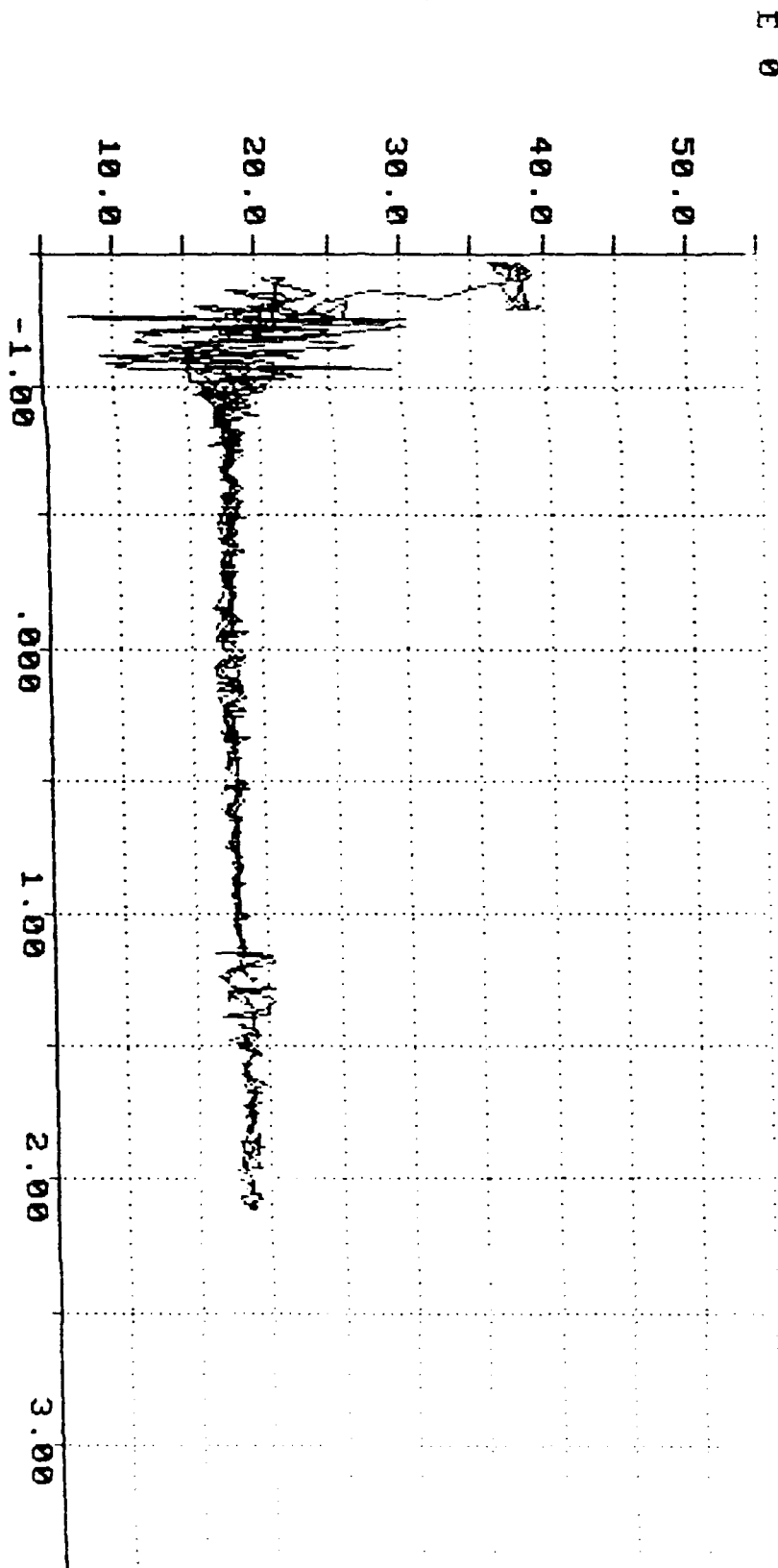
Shape

#Repts :

: 1

2 x 256

4



AUG 28 F

light india ink
dried tissue

red pine
no camp

File Name: <B:AUG28H.USR>

Quit/Continue: *

8 Comments

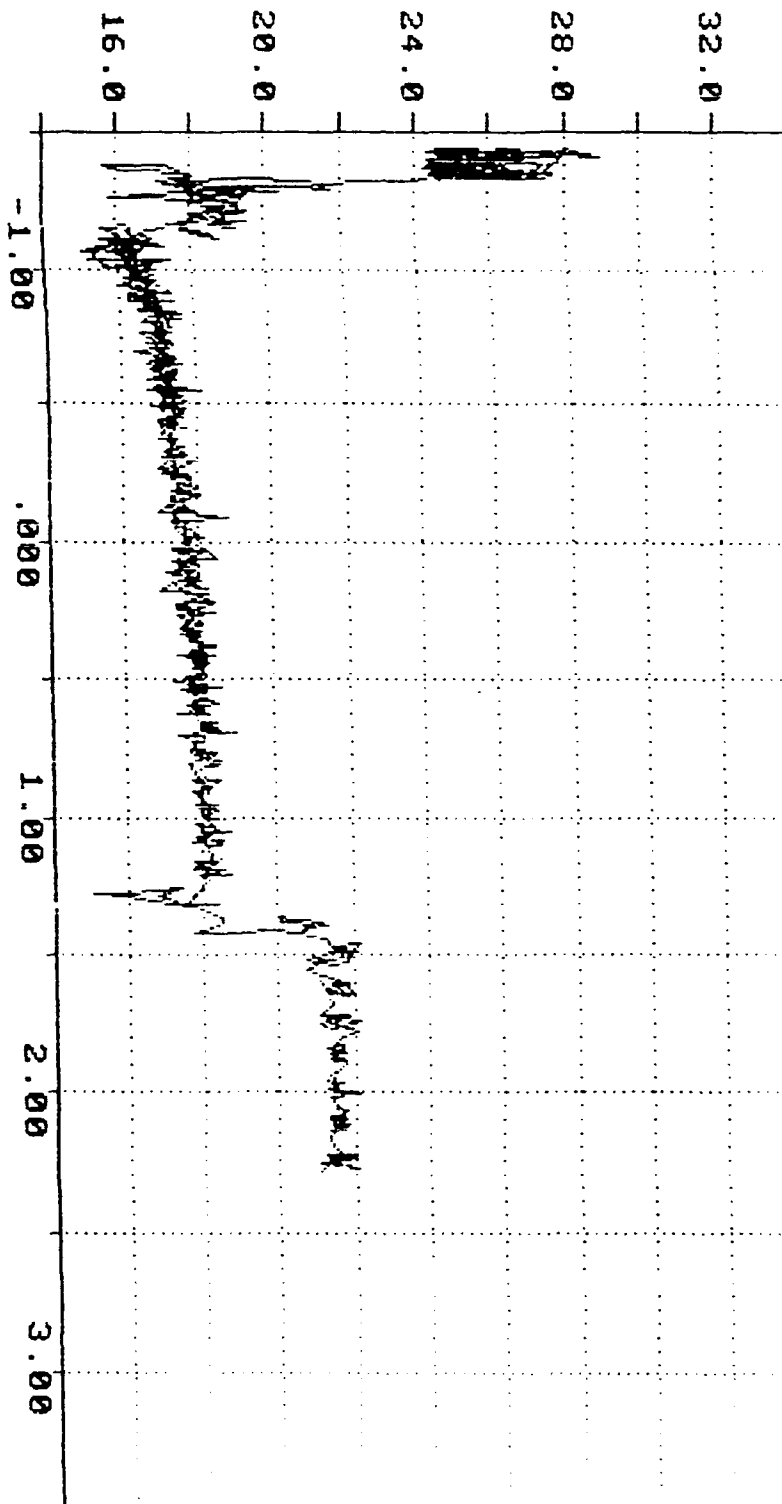
Subfiles (Total #: 5)

- 1> NEW BOWEL WITH CLAMPS, LIGHT INDIA INK, D: Start# Shape #Repts :
2> THERMOCOUPLE PLACEMENT NOT CORRECT-ALIGNED: 1 2 x 256 5 :
3> CLAMPS ARE INTERFERING WITH EXPI. :

AUG 28 H

high
pressure
new bowel
with clamp

E 0



File Name: <B:AUG28J.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 6)

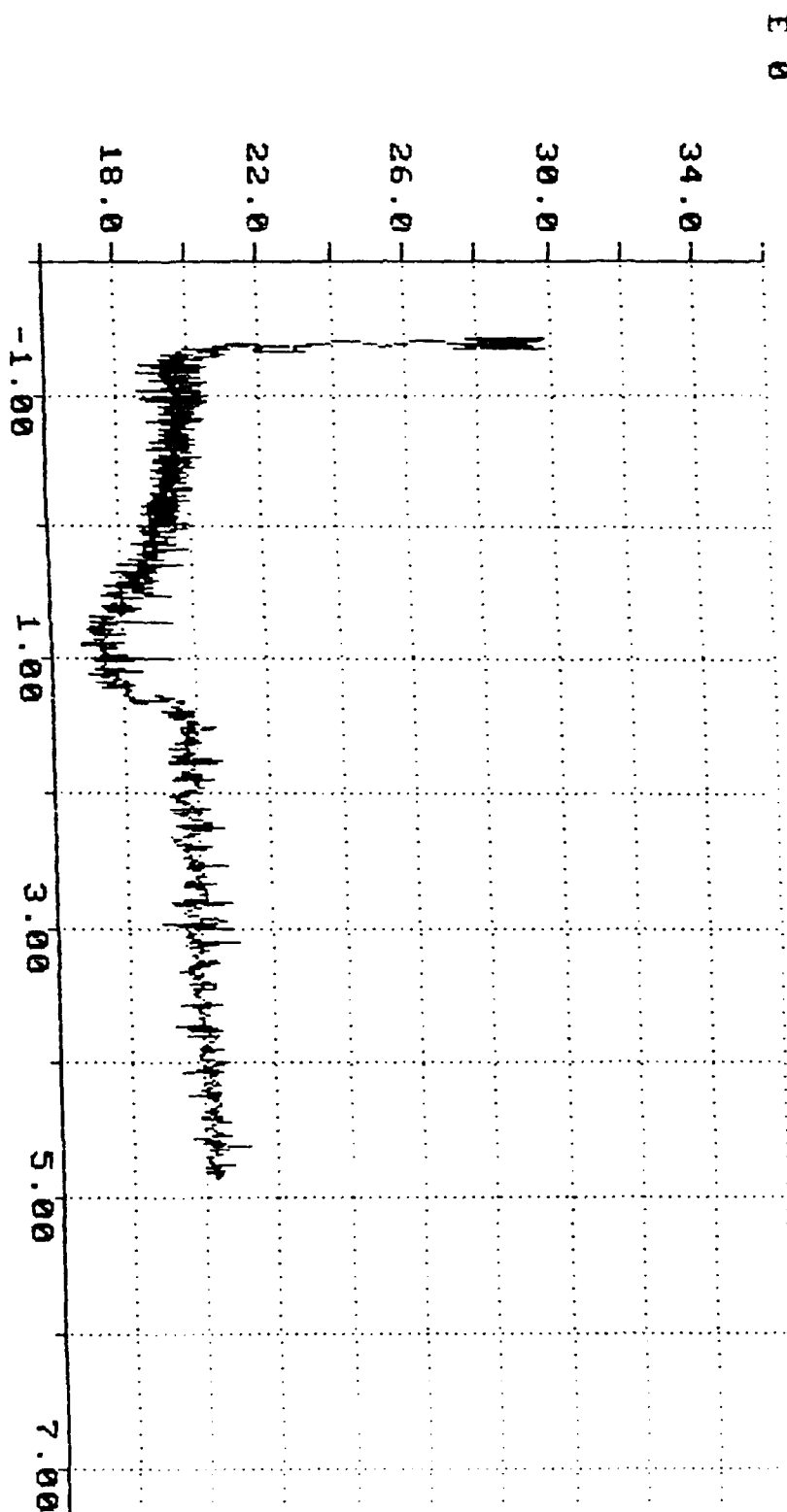
```

: 1> INDIA INK. TEMP = 60 DEGREES, SLIGHT DESS: Start#
: 2> LOOKS LIKE A WELD, TORE AT SEROSAL SURFACE: 1

```

Shape
2 x 256

```
#Repts :
      6
```



AUC 285

Andrea McK
Temp = 600

File Name: <B:AUG28B.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 5)

> TWO STRIP CONTROL

: Start#

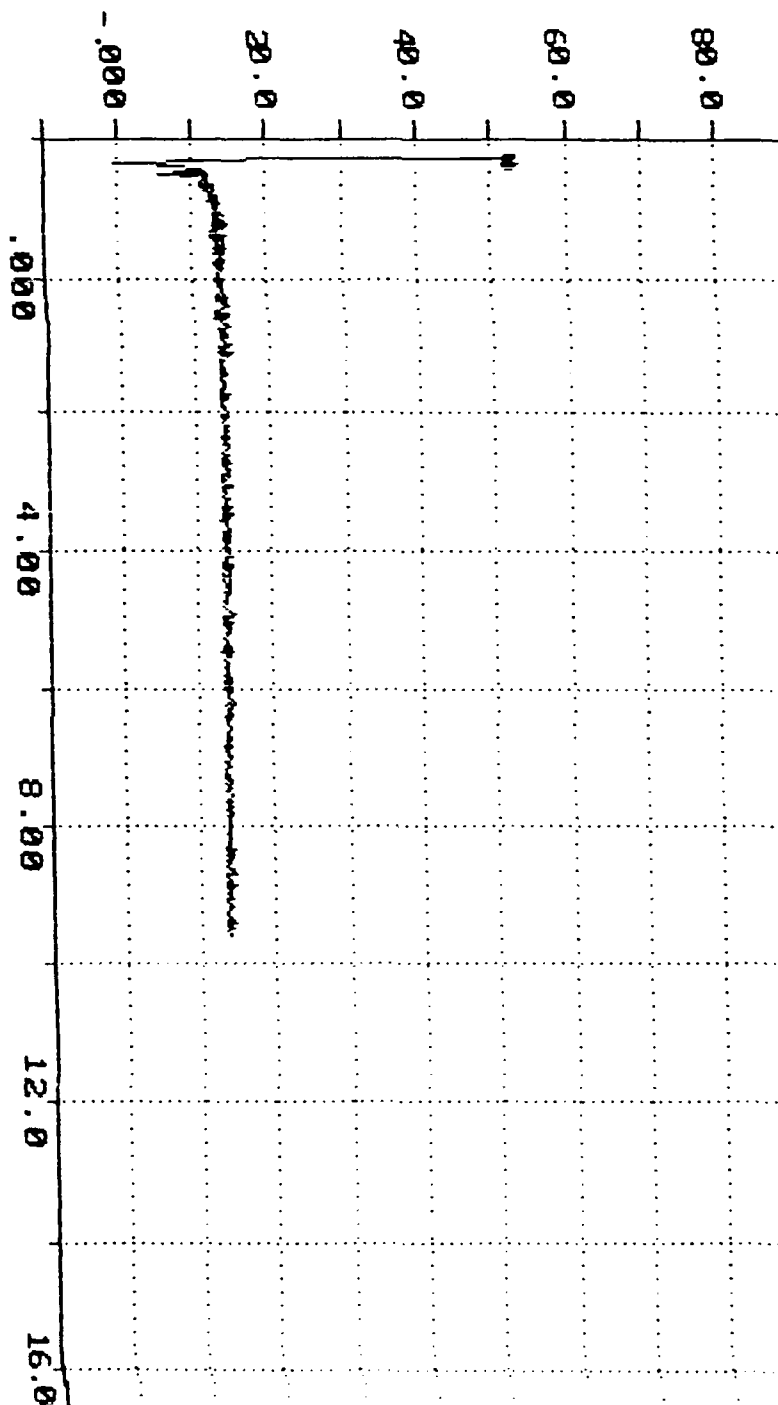
Shape

#Repts :

: 1

2 x 256

5



2 strip control

File Name: <B:AUG28C.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 4)

LASER CONTROL

: Start#

Shape

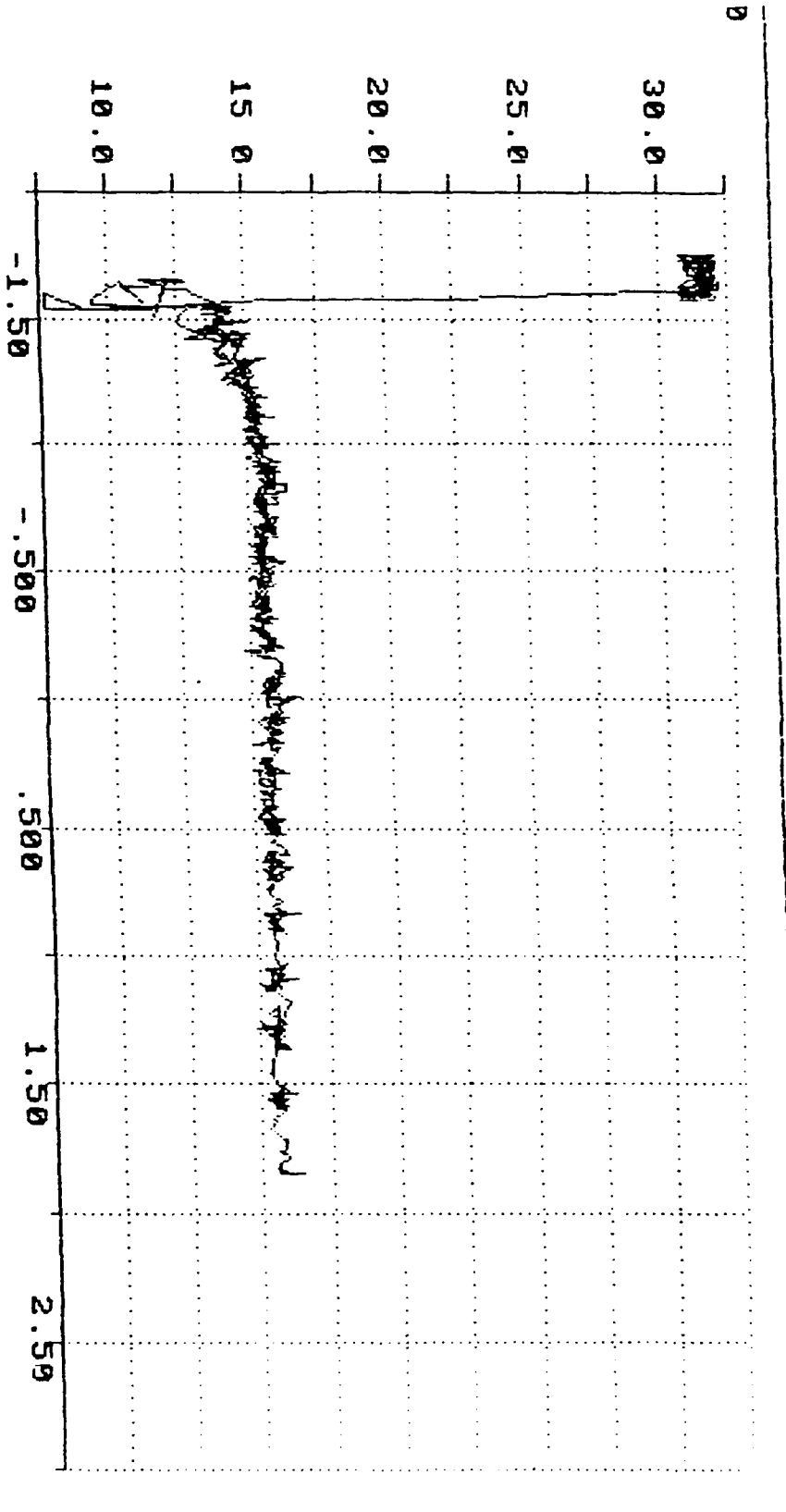
#Repts :

2> DID NOT LOOK LIKE MUCH OF A WELD

: 1

2 x 256

4



laser control - 2 strips

File Name: <B:AUG28D.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 4)

INDIA INK LIGHT

NOT A GOOD WELD

: Start#

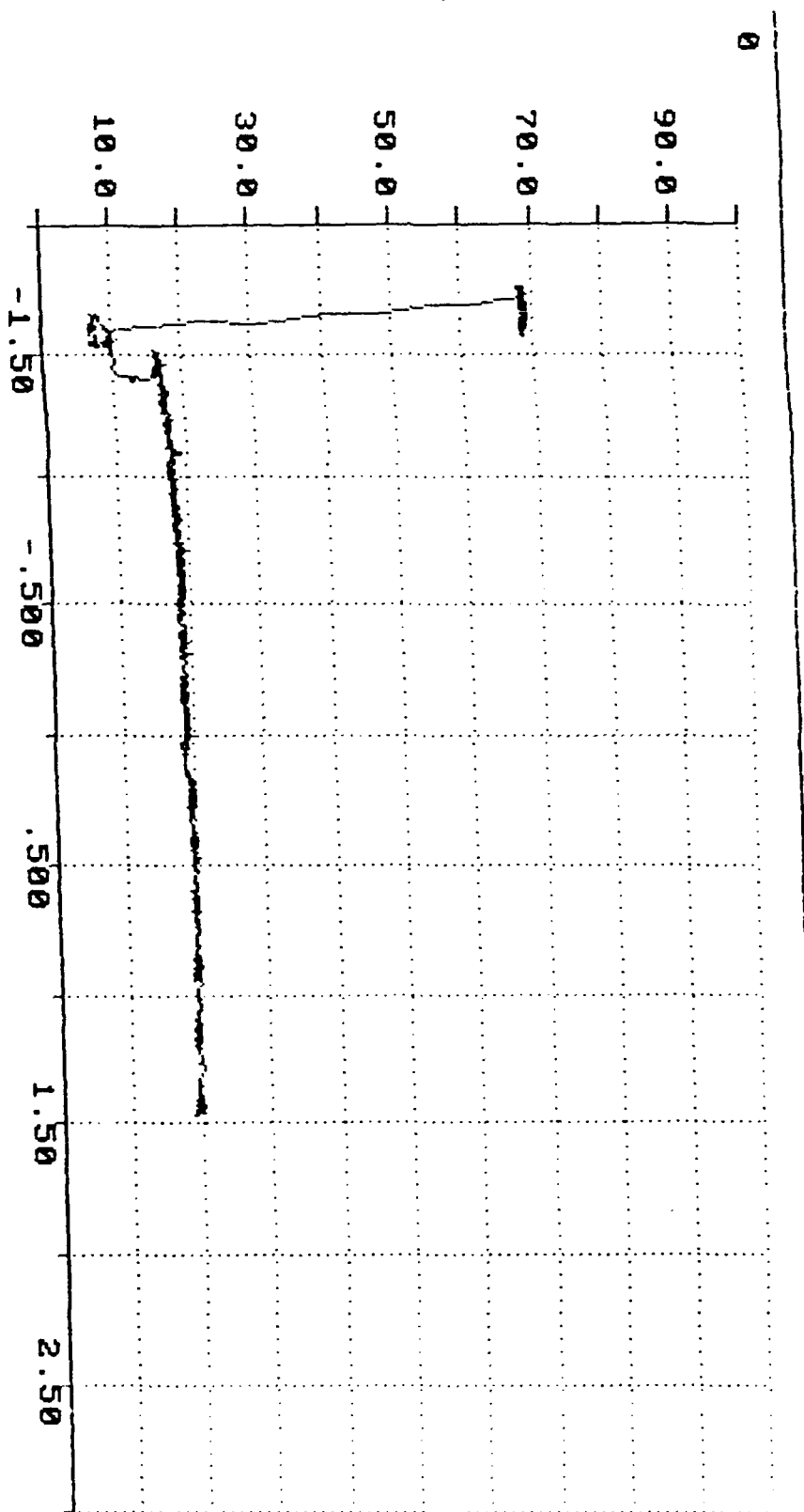
Shape

#Repts :

: 1

$$2 \times 256$$

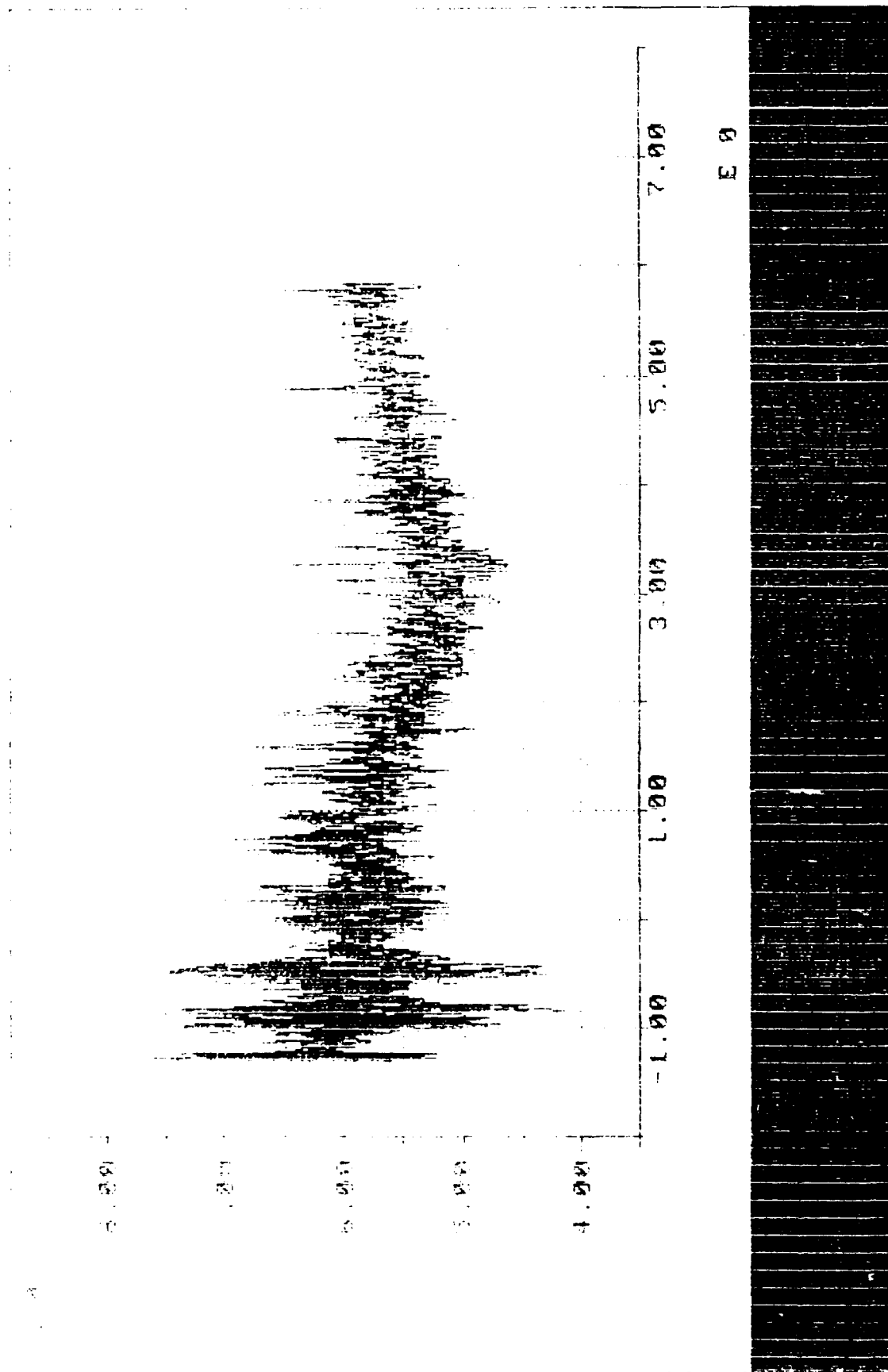
4



AUG 20

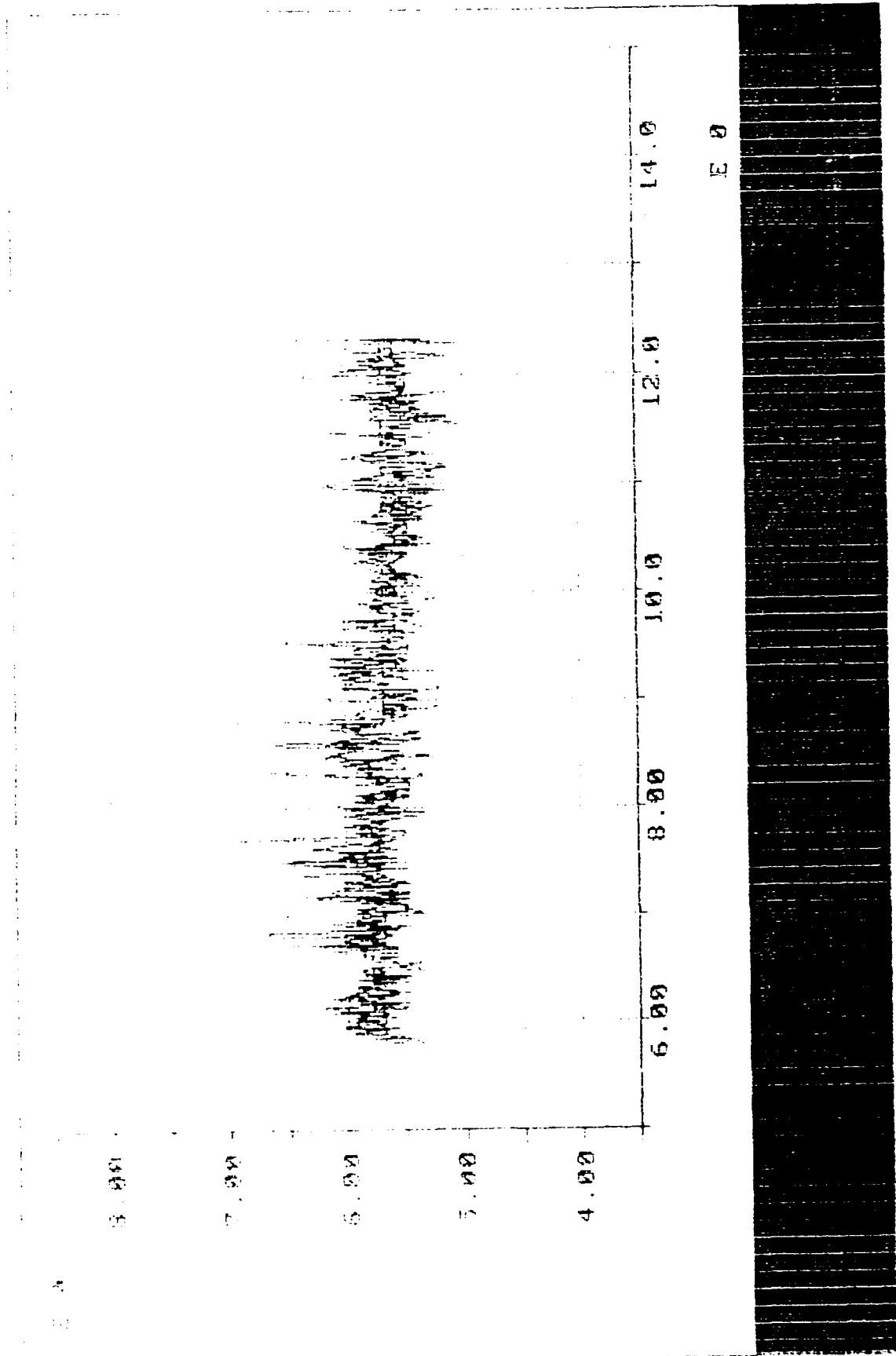
India inc (light)

HS



10-10-1964

20-10-1964

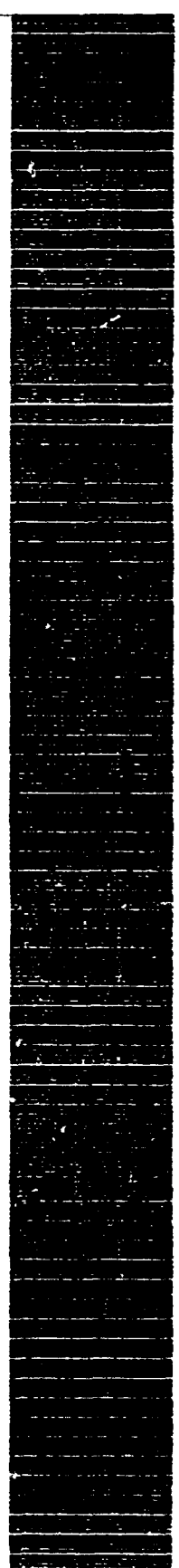
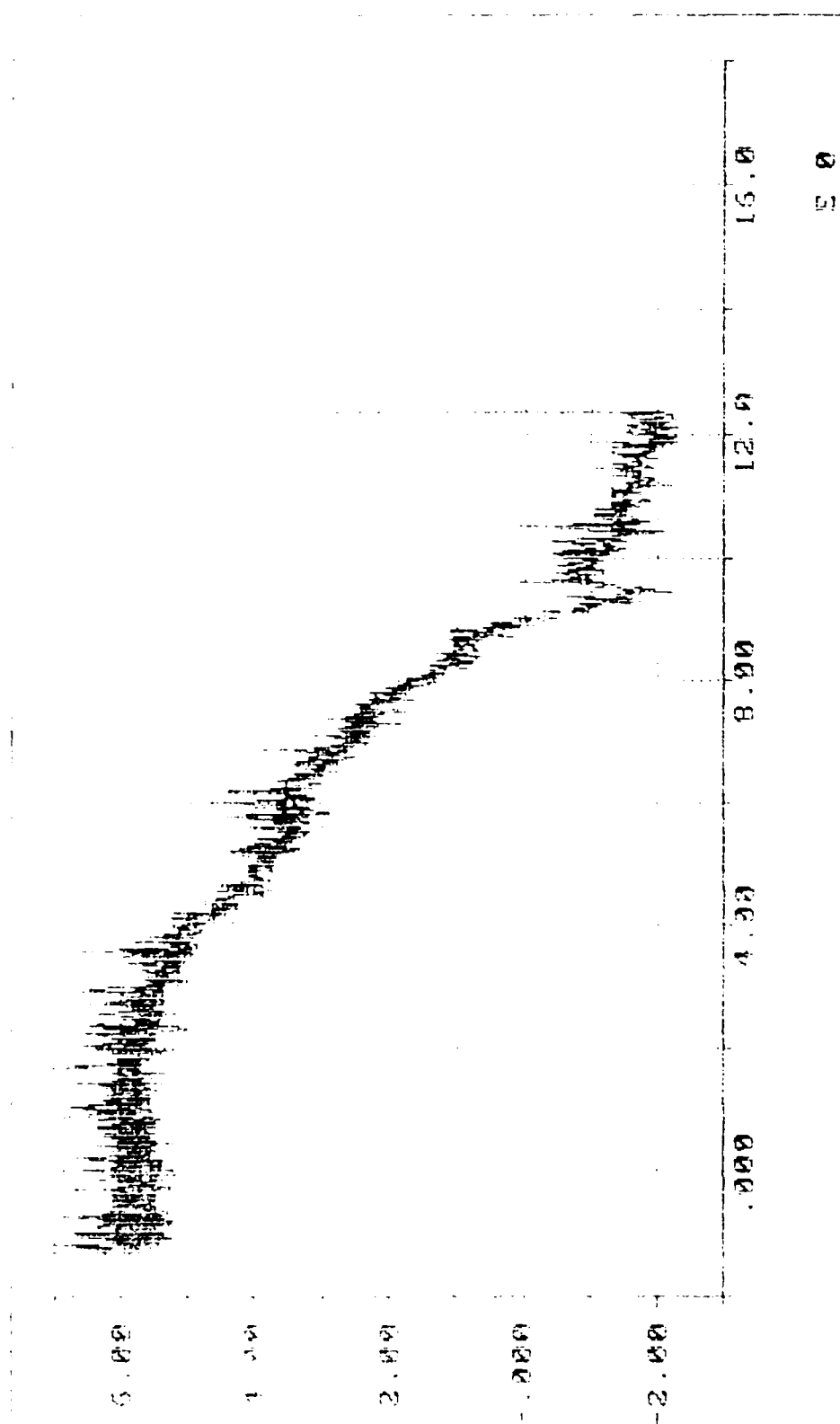


Handwritten notes:

1. 100

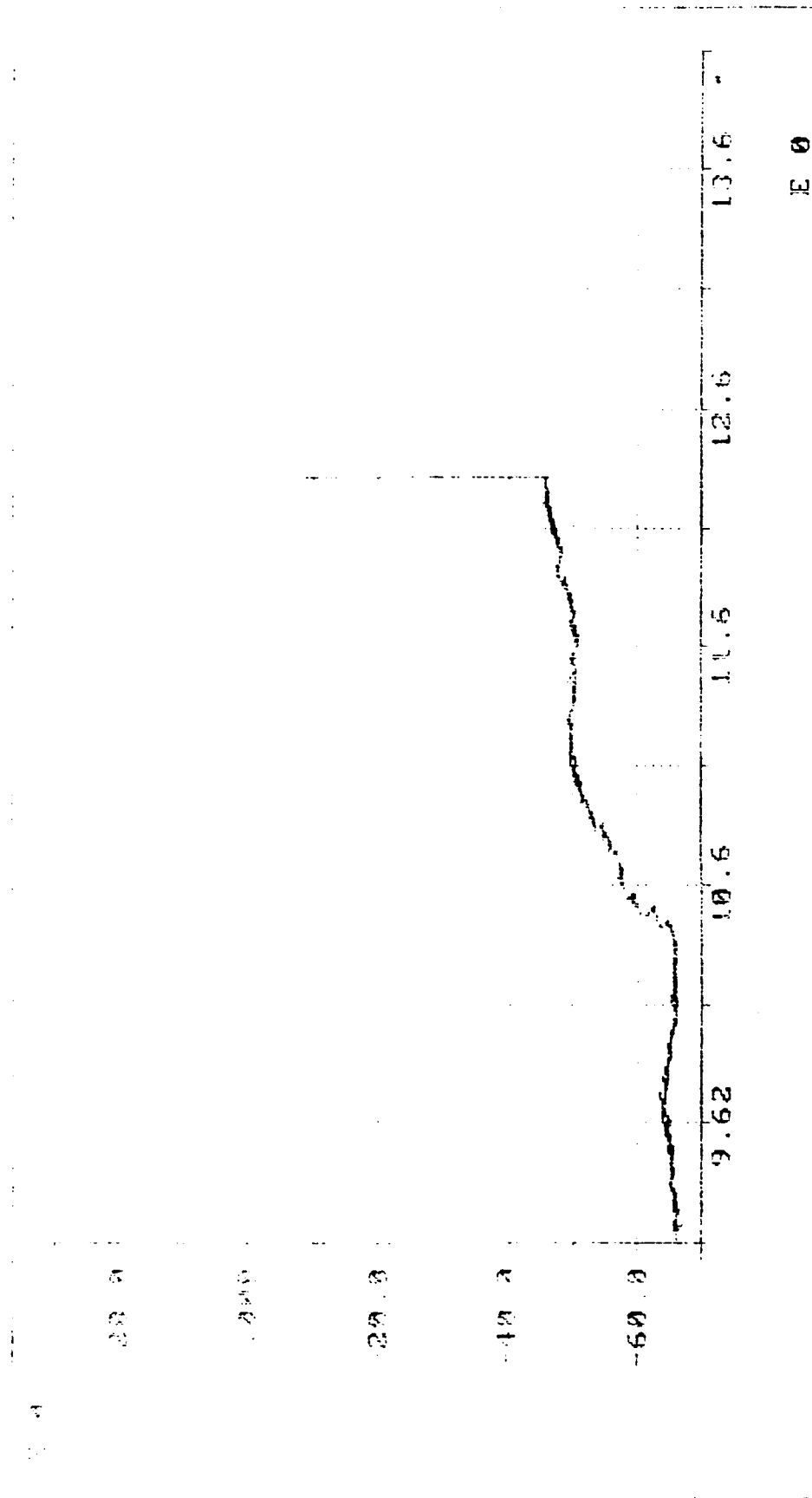
2. 100

3. 100

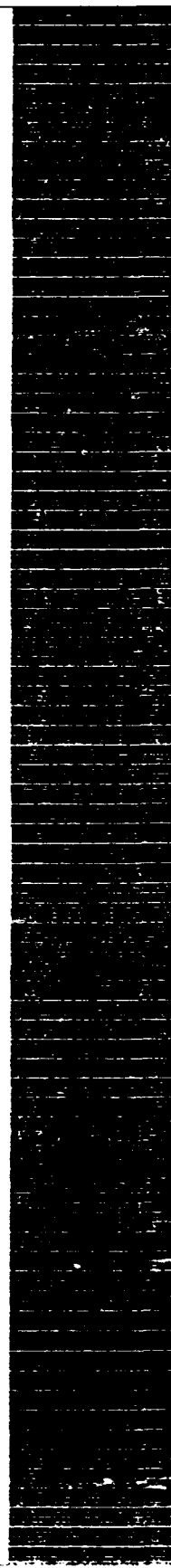
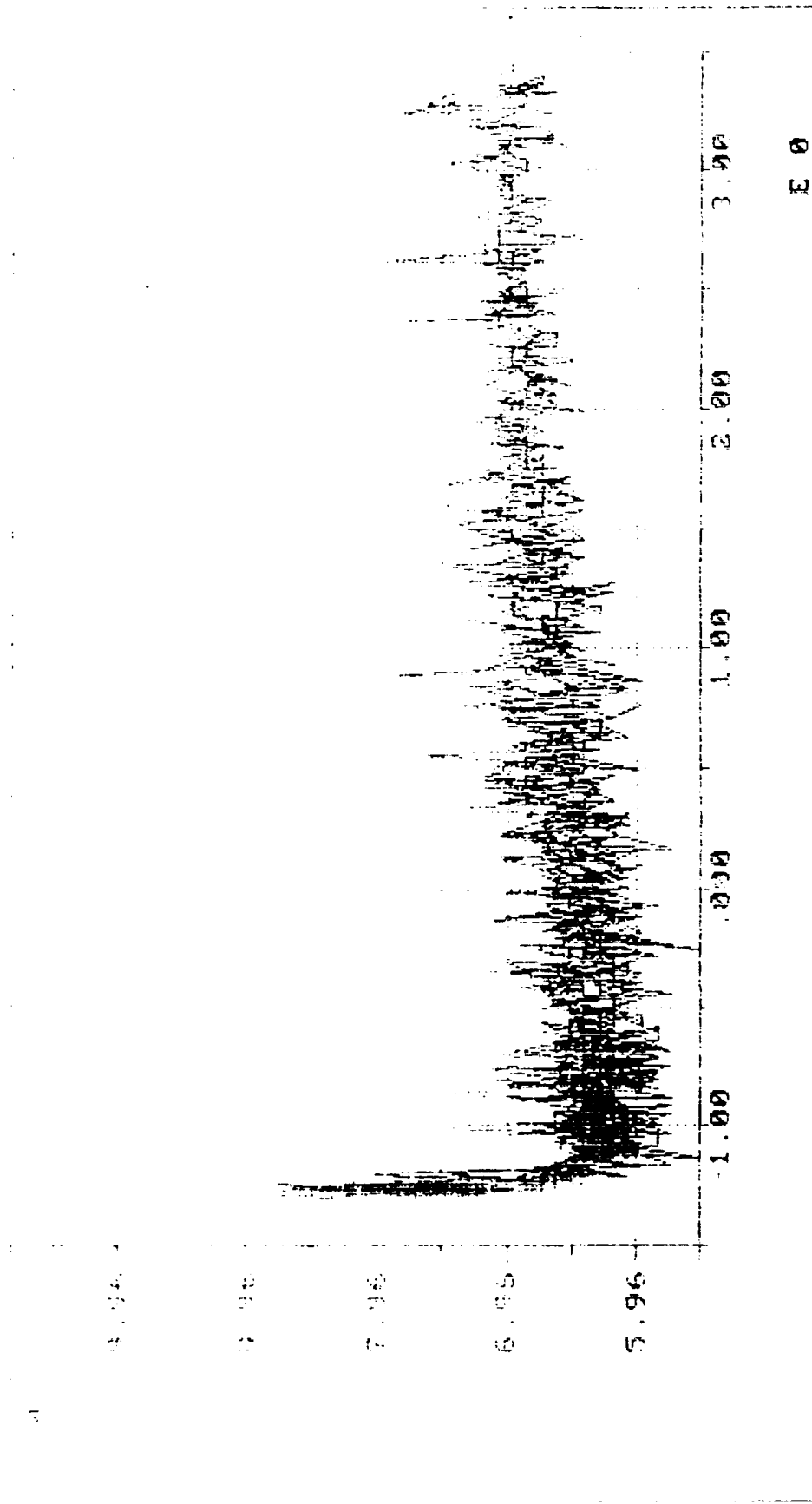


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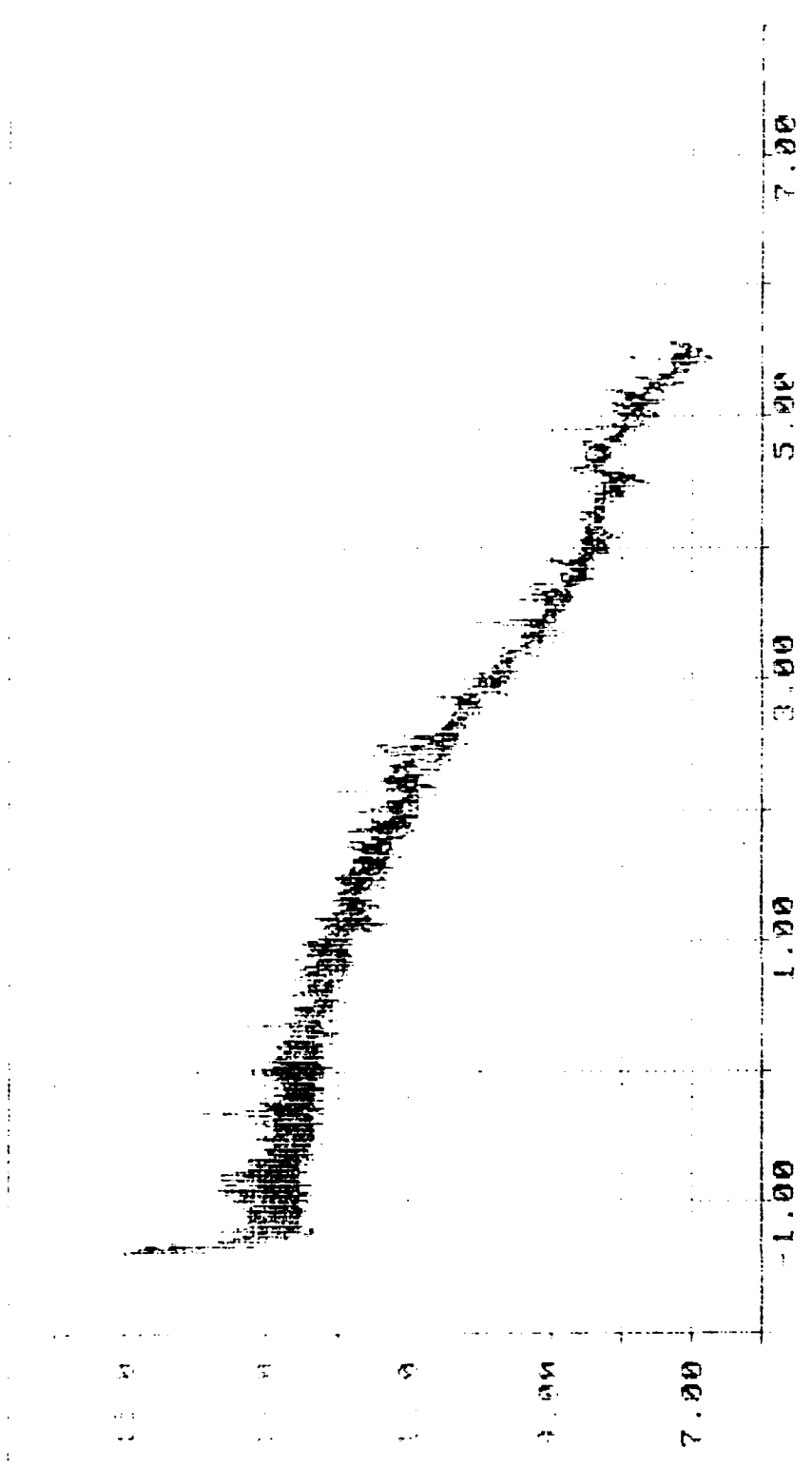
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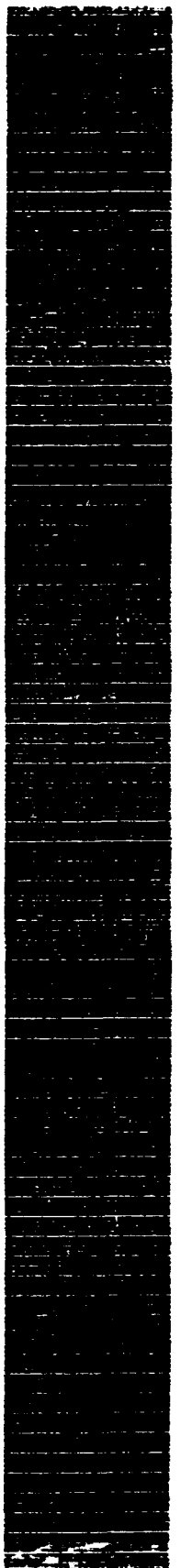
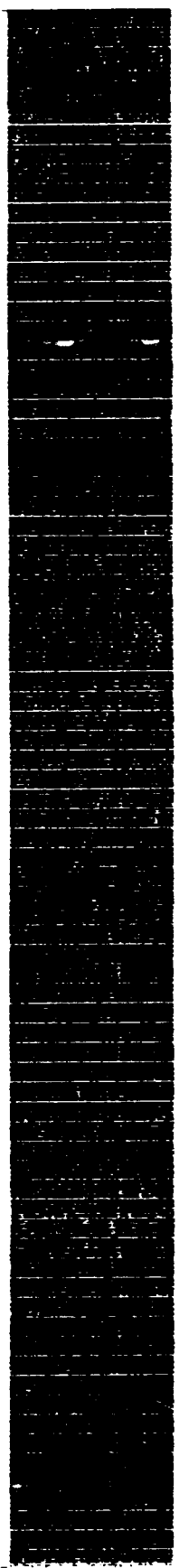
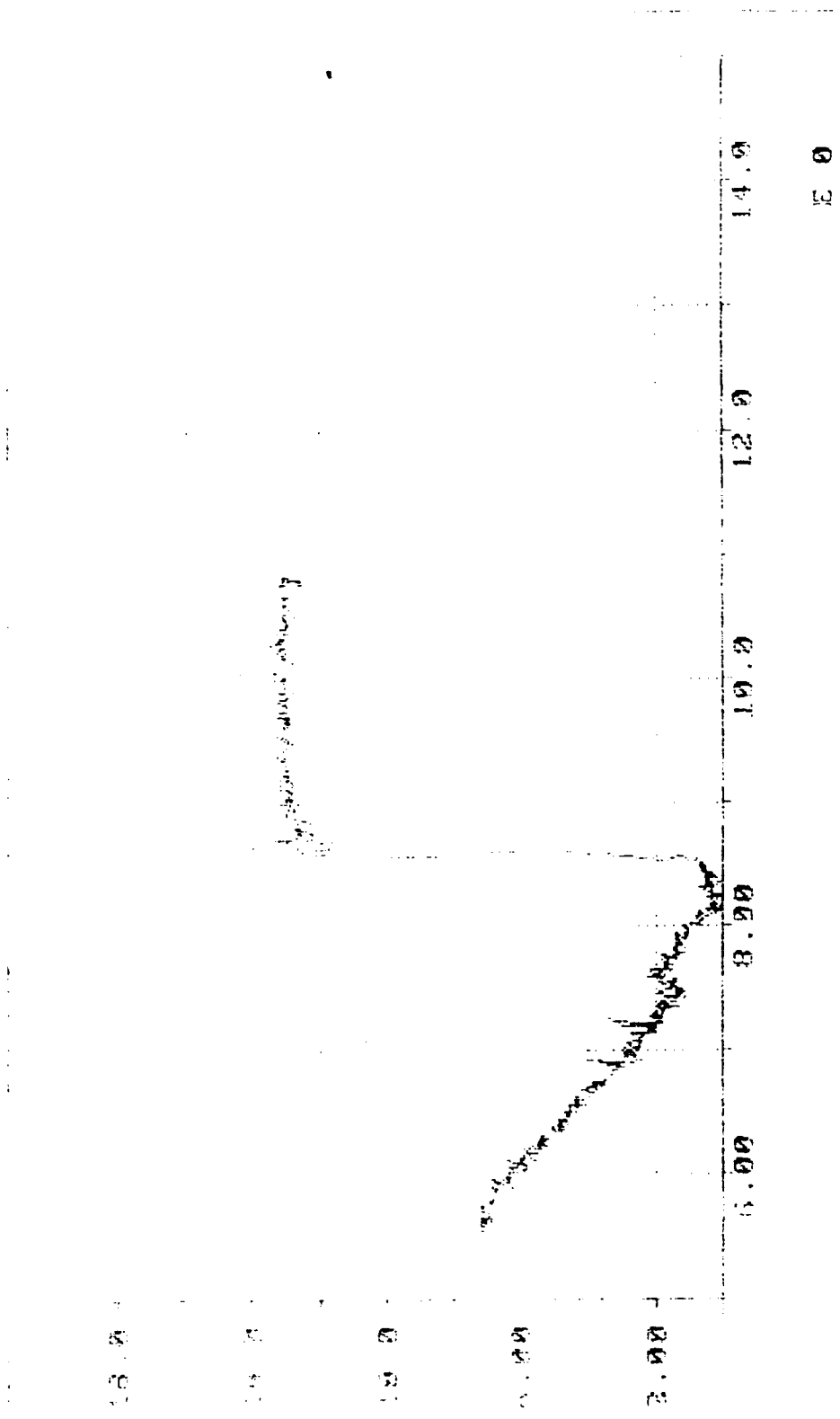
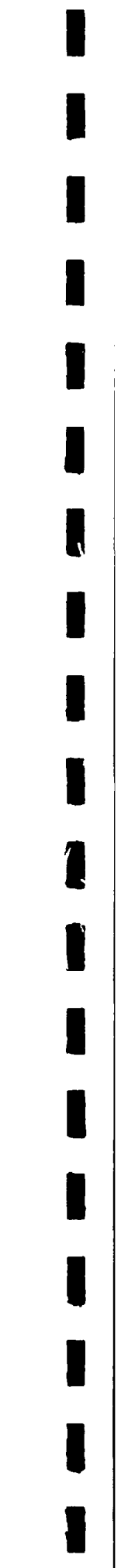
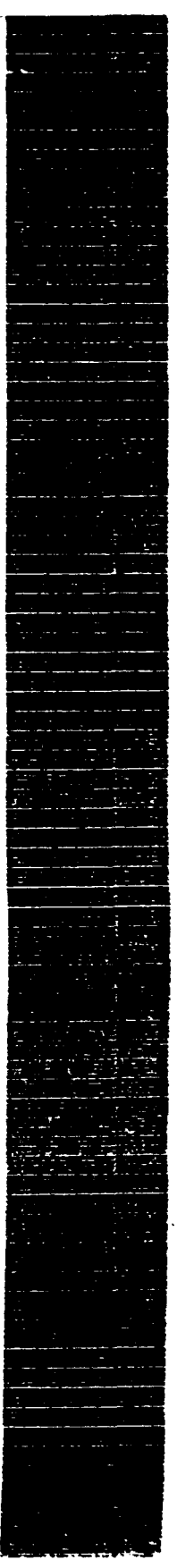
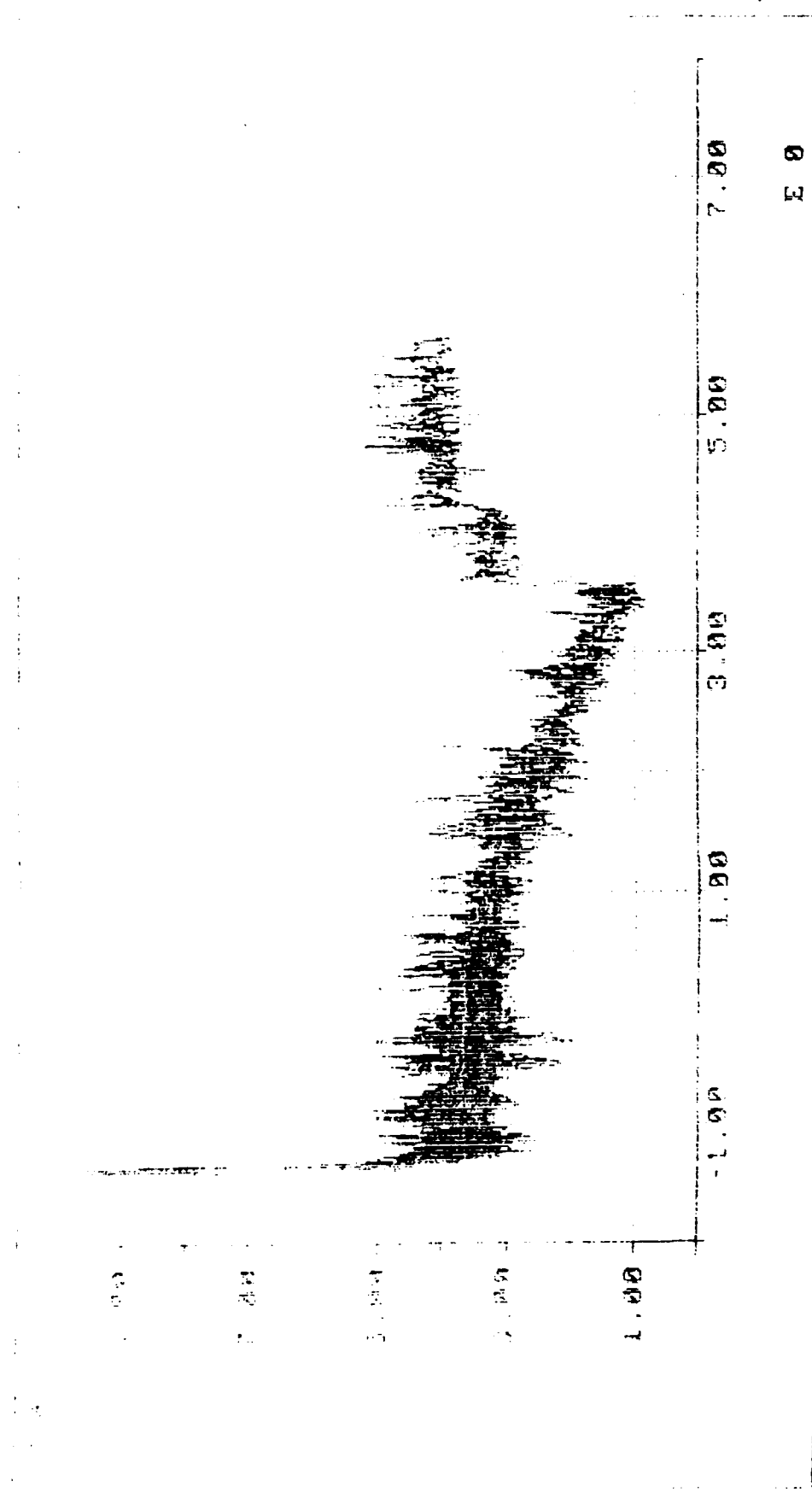


Fig. 10

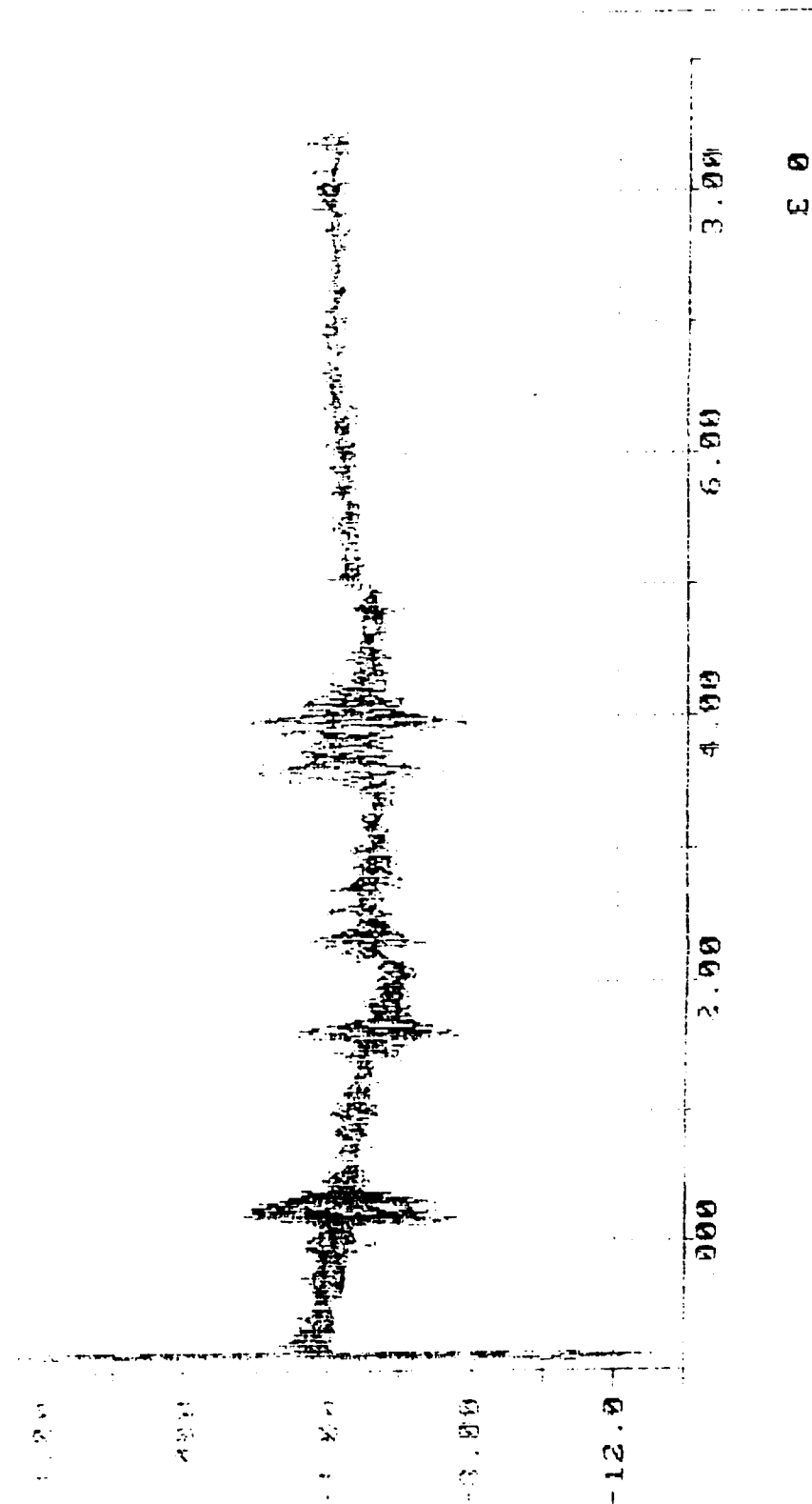


1. The first part of the document is a list of names and addresses. The names are: John Doe, Jane Doe, and John Doe. The addresses are: 123 Main St, 456 Main St, and 789 Main St.



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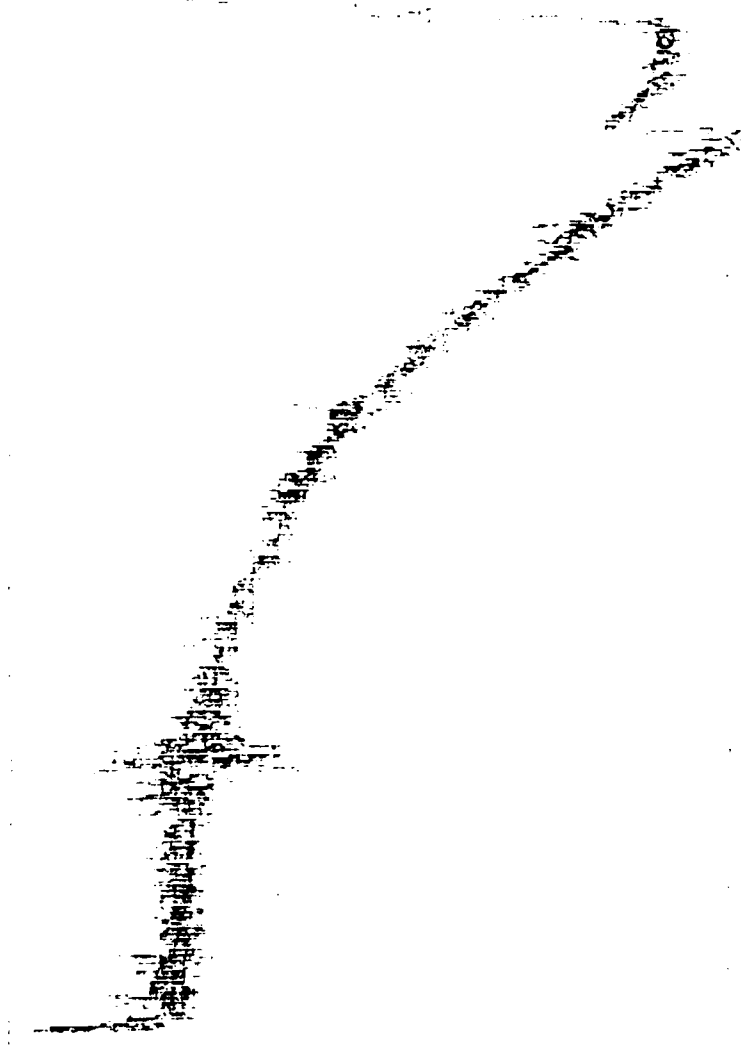
-11.00

-13.00

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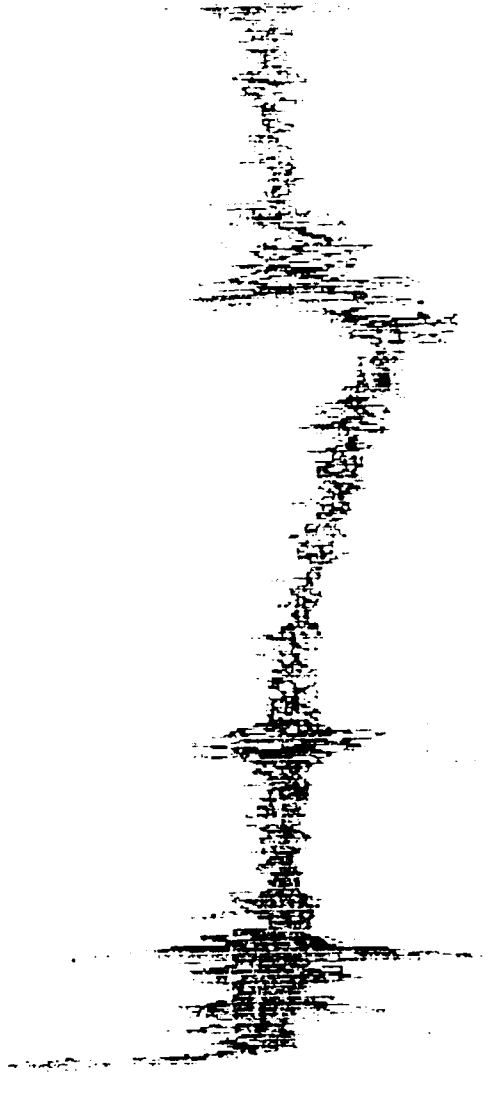
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-19.00



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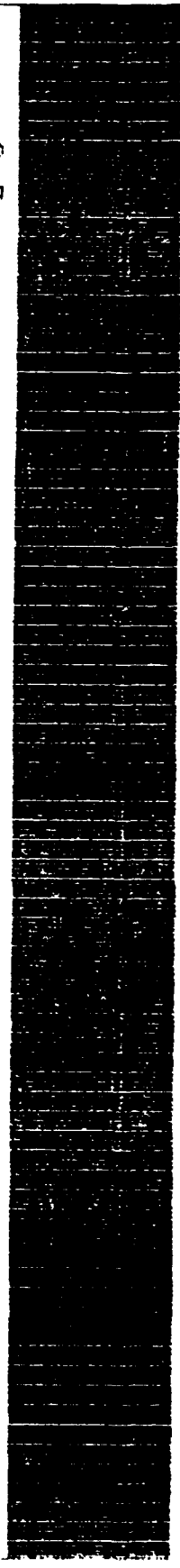
Handwritten notes in the bottom left corner, including the word "RECEIVED" and other illegible markings.

Handwritten notes in the top left corner, including a date and some illegible text.

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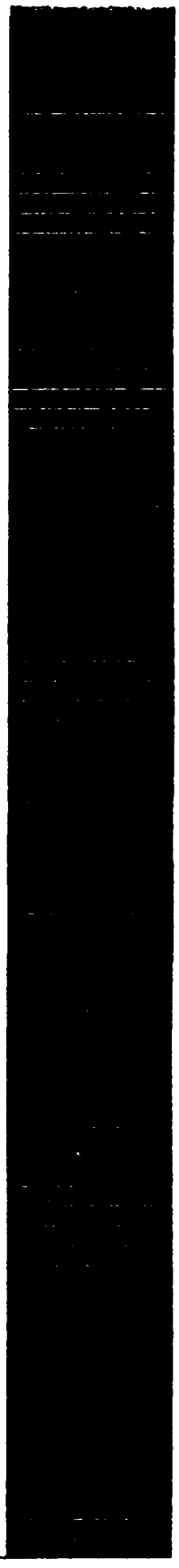
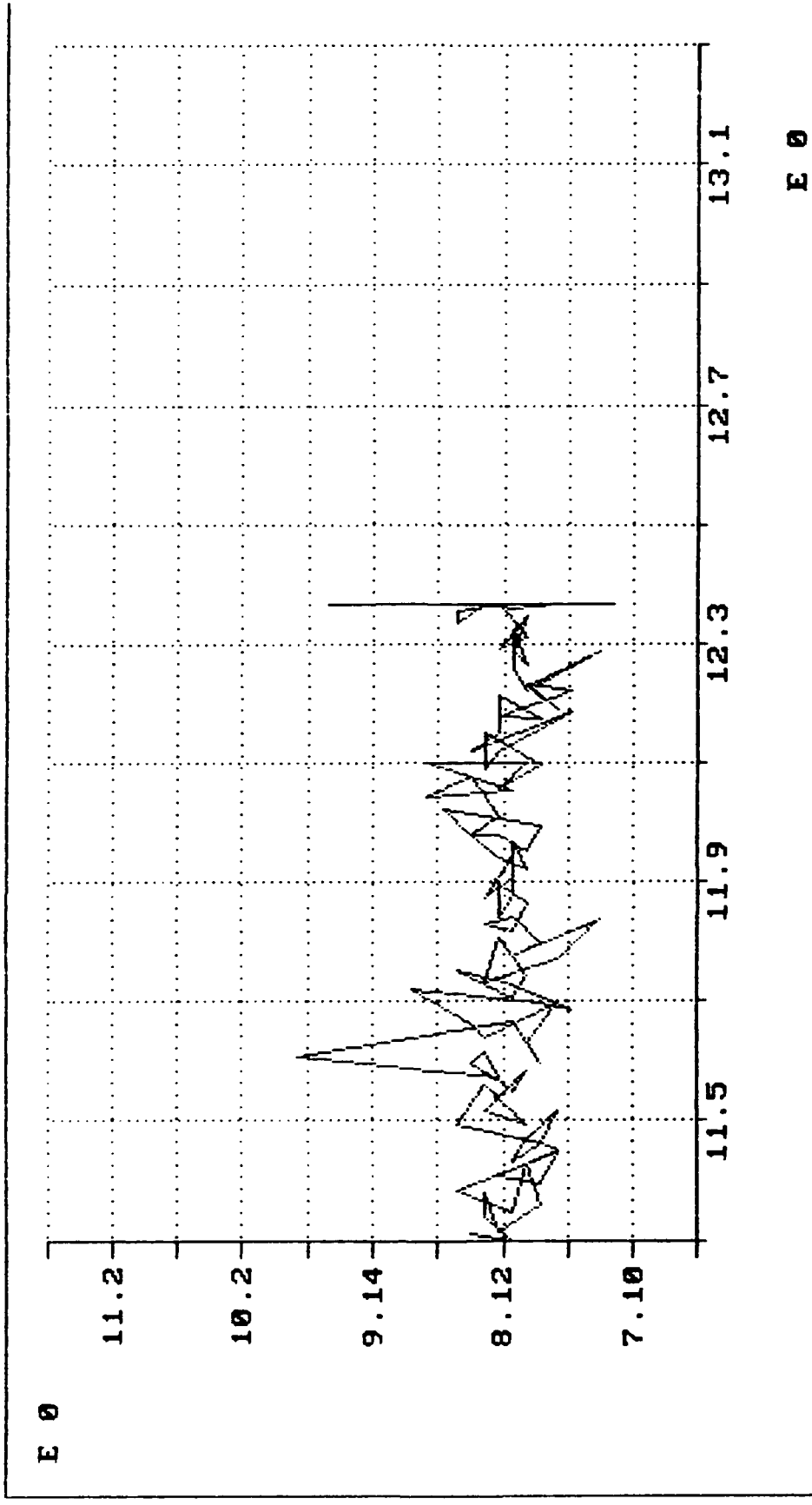


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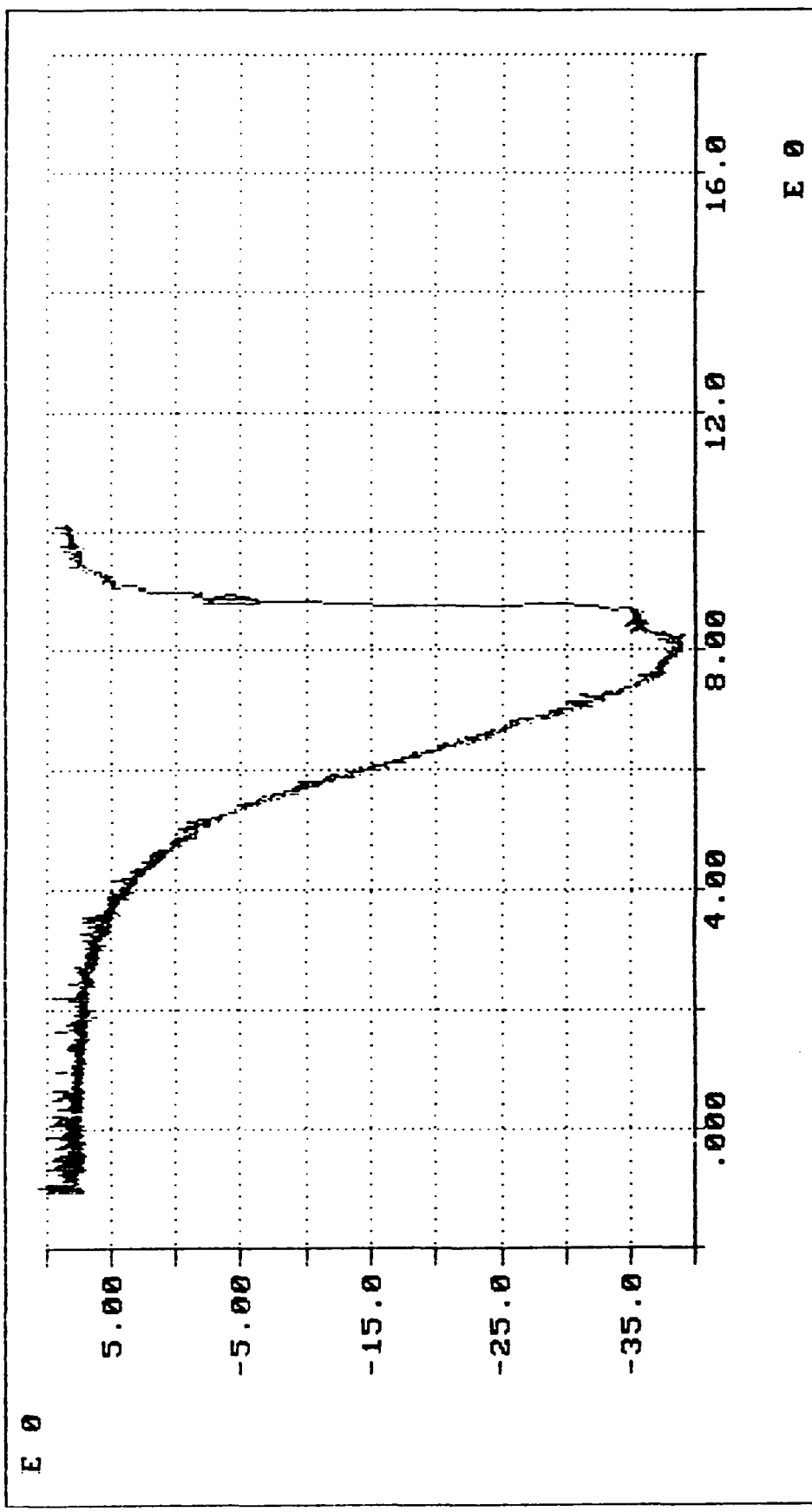


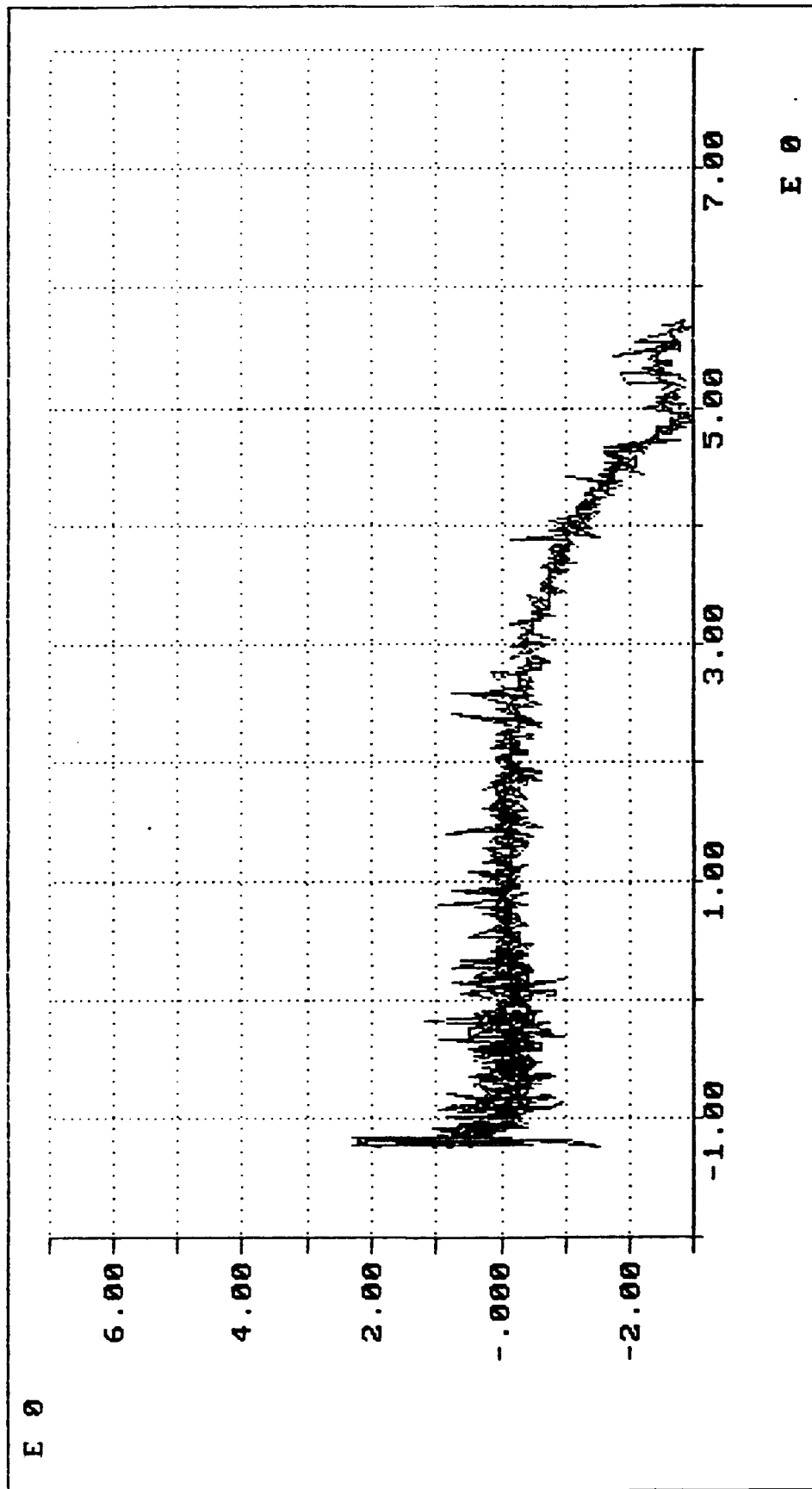
(2500 = end)

SEP 54



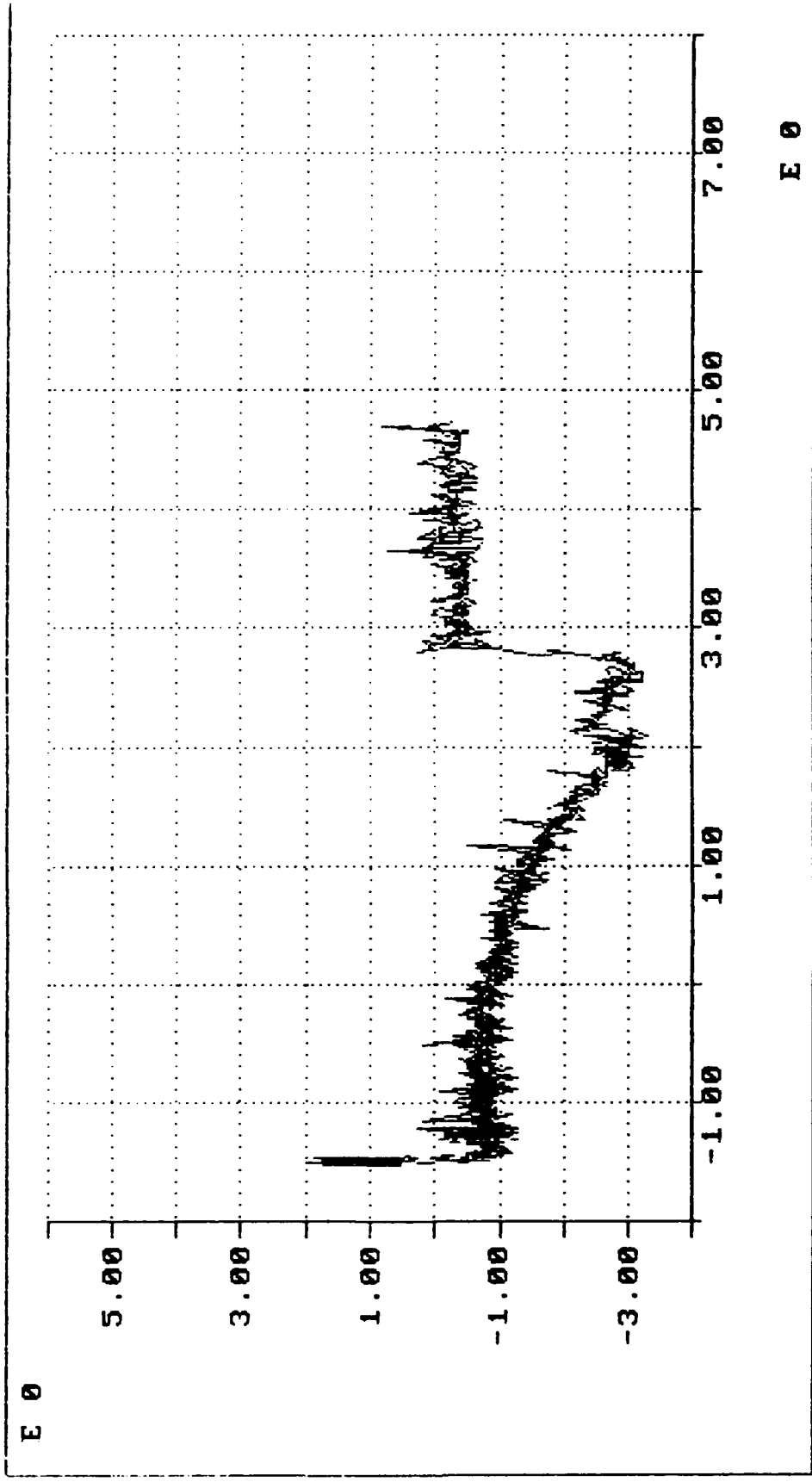
slimy
cold saline control
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Sep 5 N

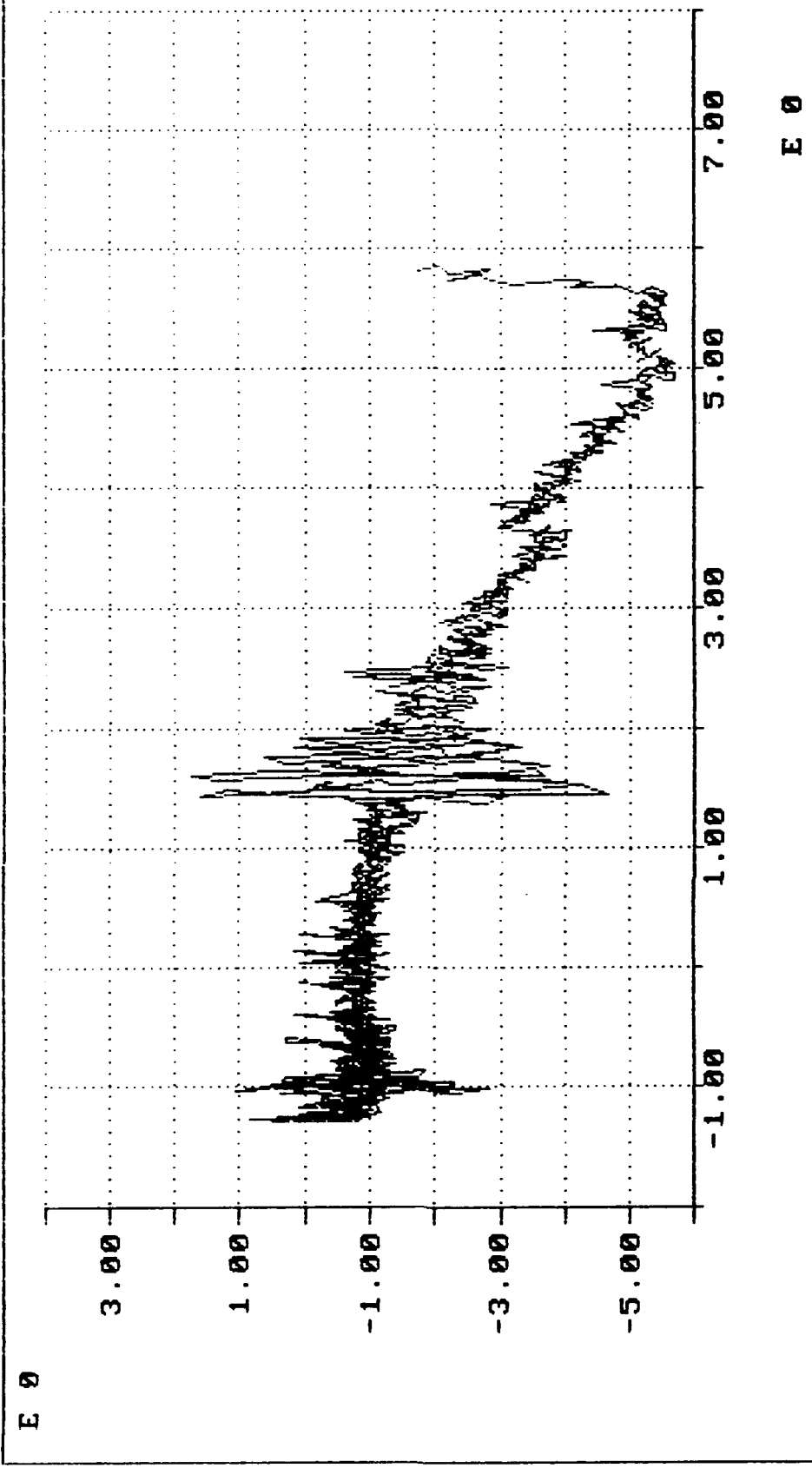




SEP 50
India Air controlled at 50
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strong

SEPSP
 Endian and set=60
 T max=55
 Norme Maudling, deslucatus
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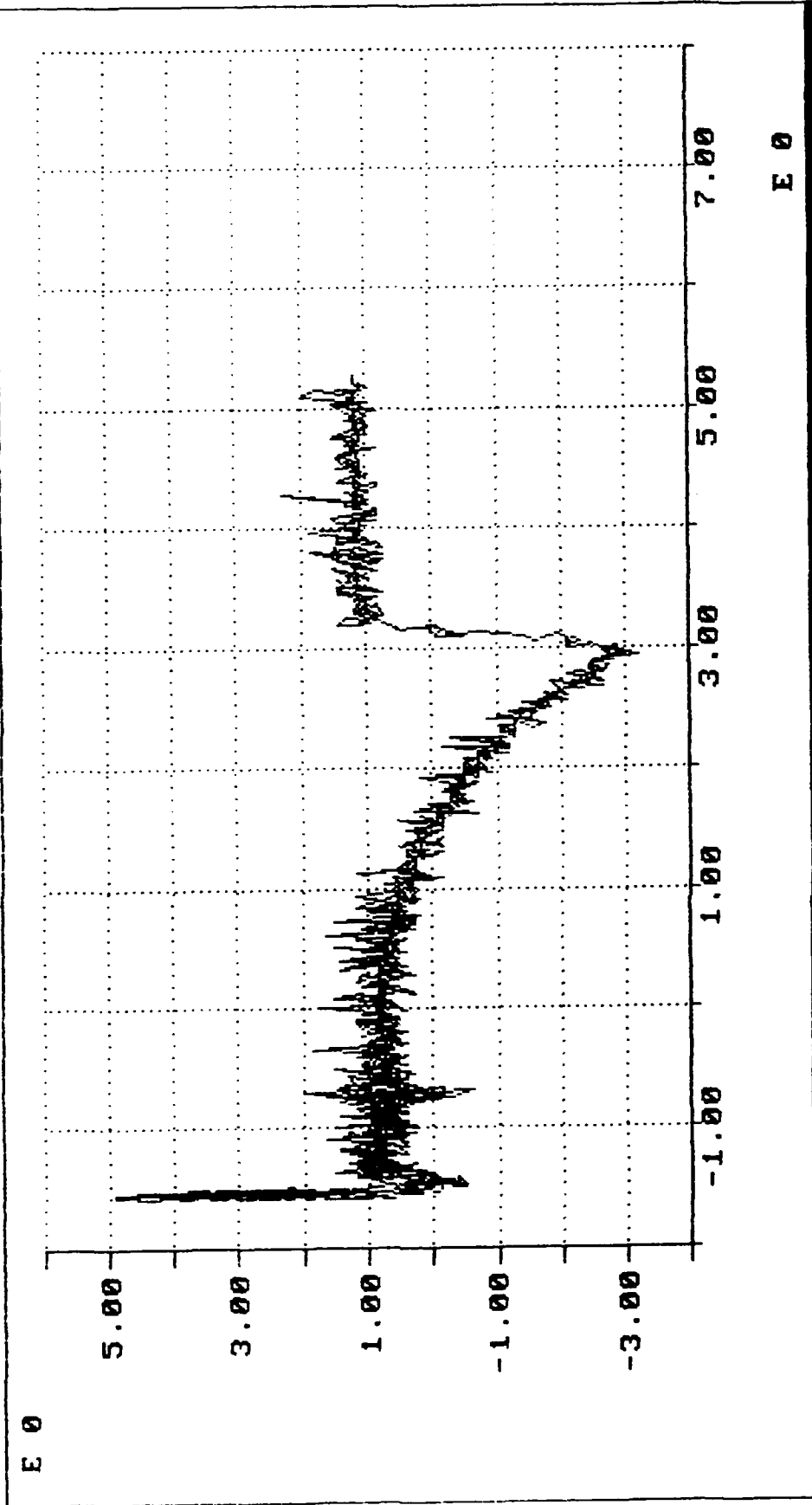
SEP 50
 India and controlled at 70
 blanding, deslitation
 moderate noise
 used with

100' visible changes

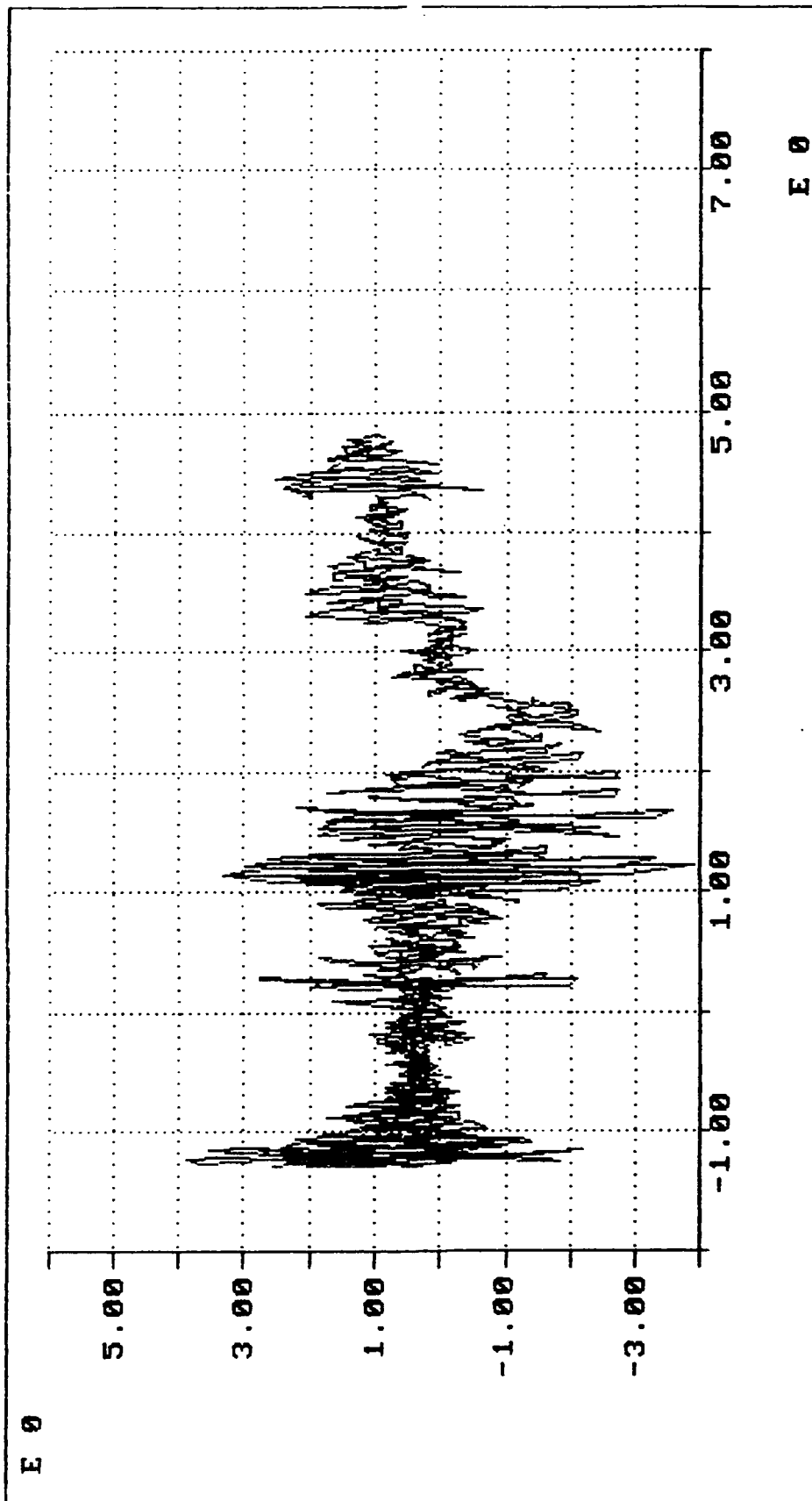
Tc max = 60

Endline gnd set = 80'

SEP 5R

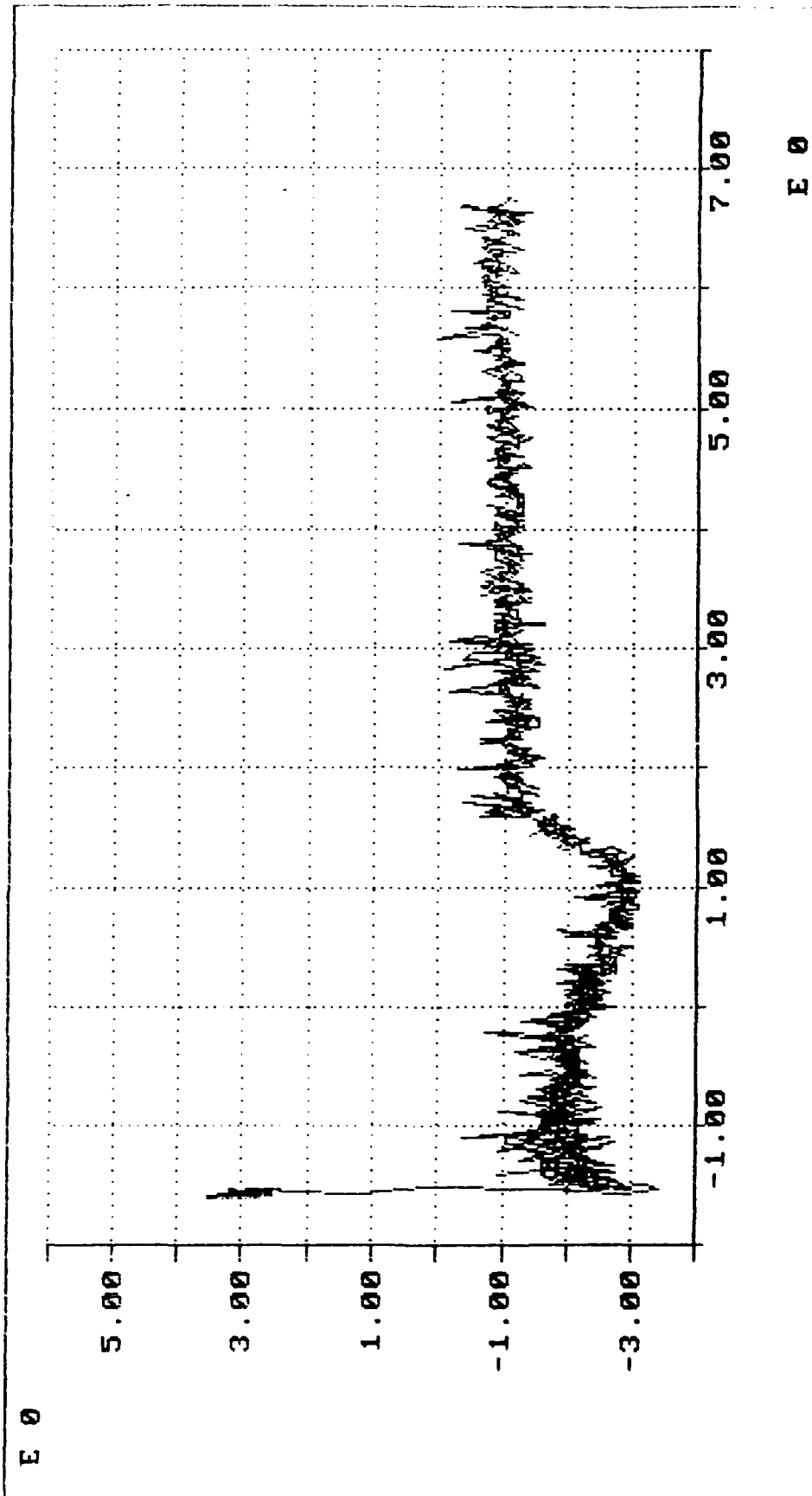


JE-P 55
India ink controlled at 80°
No visible change
very weak well

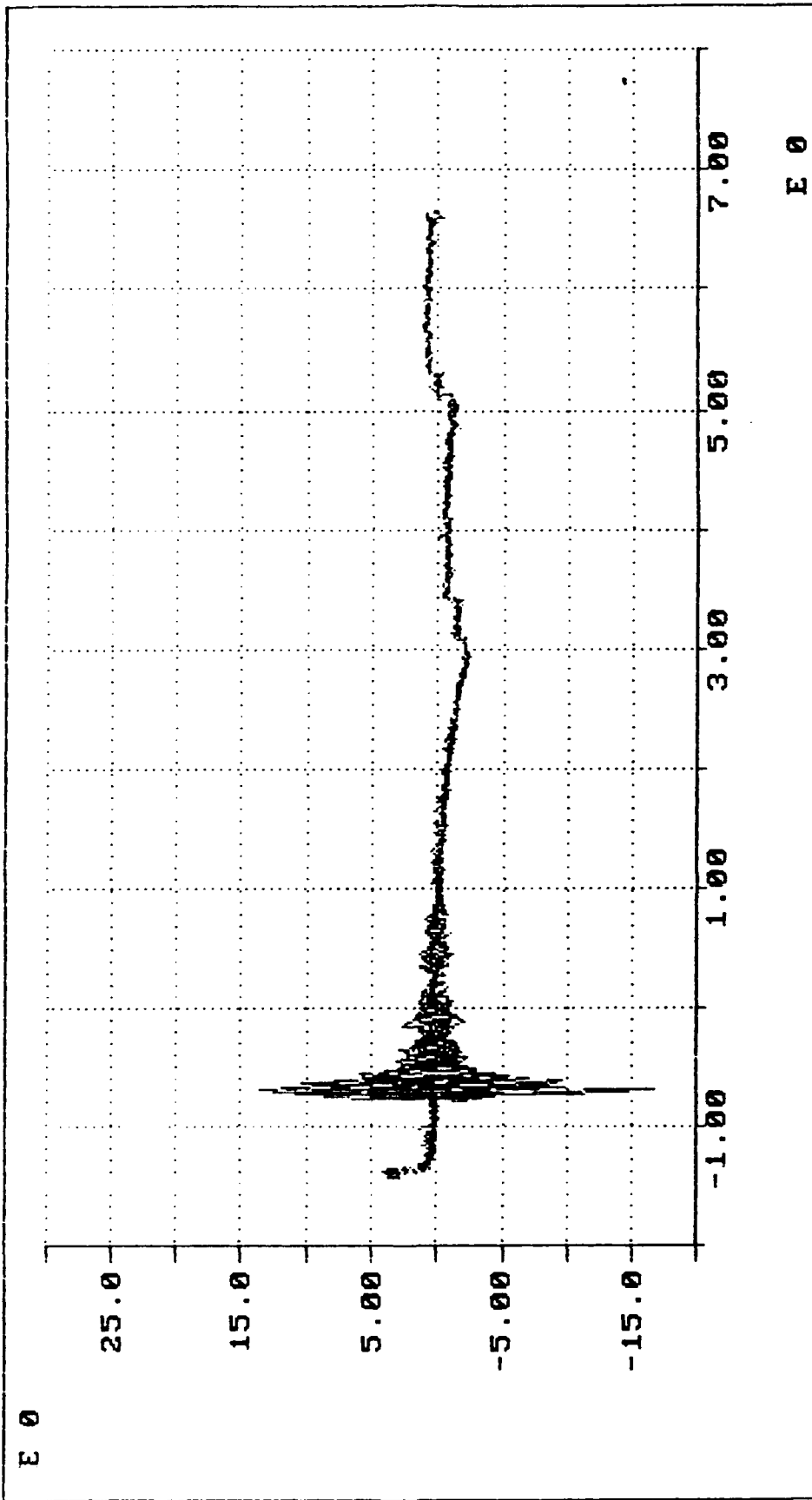


blanching, desiccation, smoke
weak weld
tissue didn't look welded

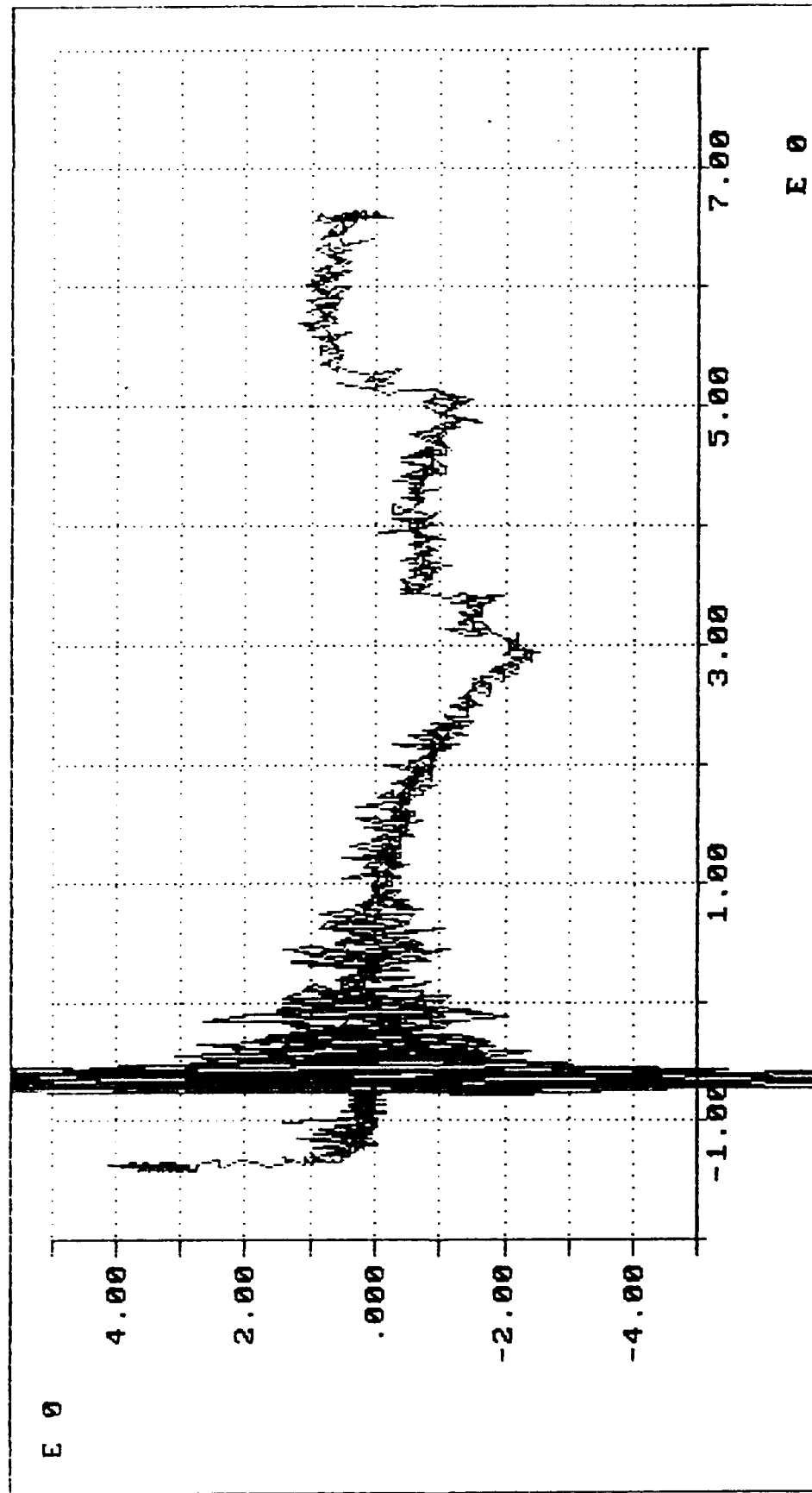
SEPST
Ania 9m set=100
T max=55°



SEP 54
 Under the
 Controlled at 1000
 Basic and standard
 were used



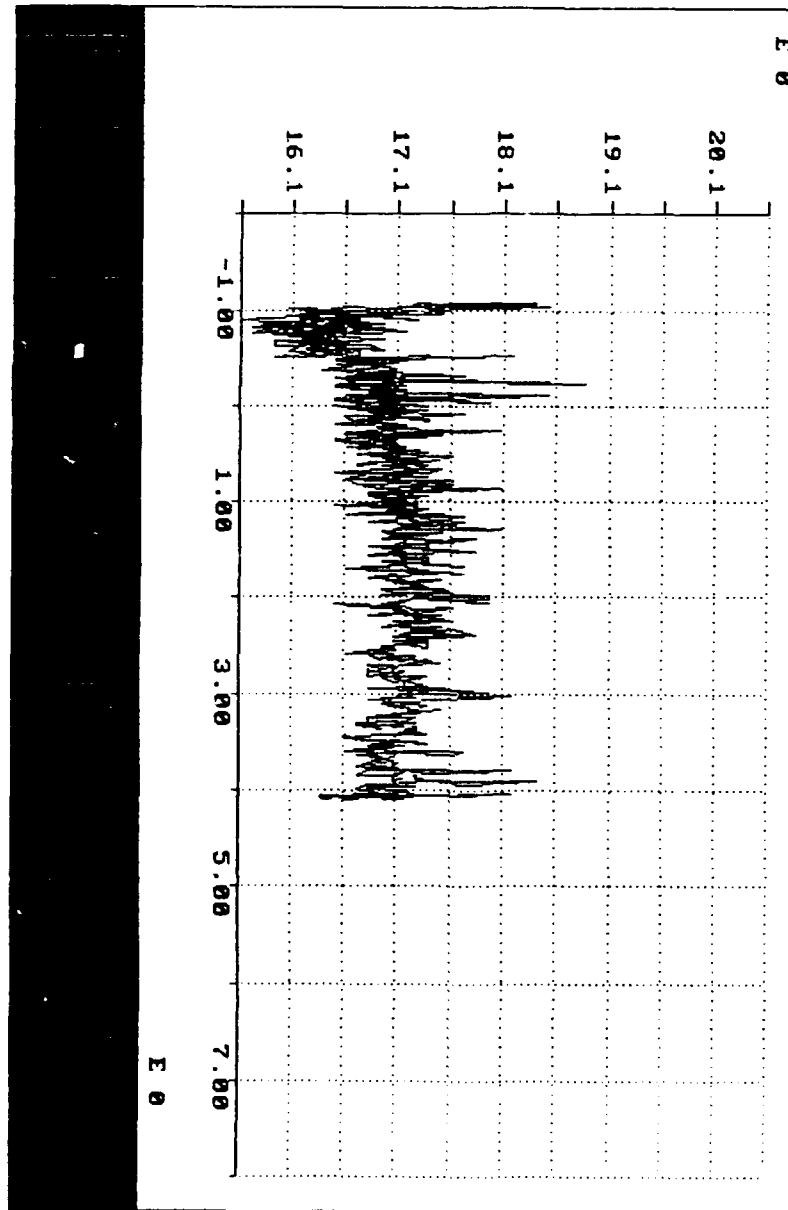
SEP54
(replotted)




```

##### File Input/Output #####
:
:   File Name: C:\SEP7W\USR                               Out/Continue: *
:
:   8 Comments                                             Subfiles (Total #: 3)
: 1) INDIA INK CONTROLLED AT 80                          : Start#      Shape      #Repts :
: 2) SLIGHT DESSICATION                                  :      1      2 x 256      -    :
: 3) DID NOT LOOK VERY STRONG WHEN TEARING OFF:
: 4
: 5
: 6
: 7
: 8
:
#####
: I/O Variable ( R - Z ):                               512 REAL
:
: Subfile:      < 1 >                                2 x 256 (Max Length: 768 )
: Row (0=all): < 0 >
: Start Column: < 1 >
: # of Columns: < 256 >
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
#####

```

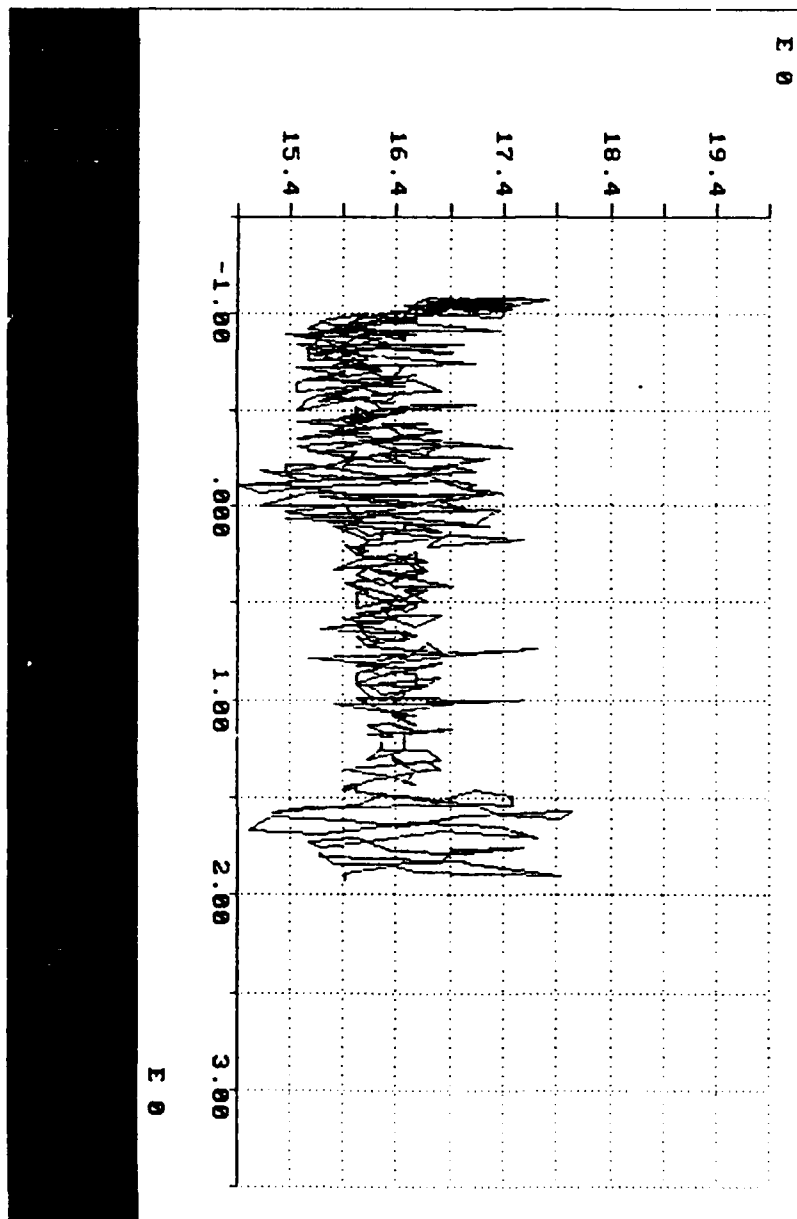


MT 235
SEP 7

```

##### File Input/Output #####
:
:   File Name: C:\SEP7X.USR                               Quit/Continue: *
:
:   8 Comments                                           Subfiles (Total #: 2)
#####
: 1> INDIA INK LONGITUDINAL SECTION                     : Start#      Shape      #Reps :
: 2> CONTROLLED AT 70                                     : 1           256        2    :
: 3> NO VISUAL CHANGES                                   :                               :
: 4> BROKE QUICKLY-DID NOT SEE A WELD                   :                               :
: 5>                                                       :                               :
: 6>                                                       :                               :
: 7>                                                       :                               :
: 8>                                                       :                               :
#####
: I/O Variable ( R = 2 ):                               768 REAL
:
: Subfile: < 1>                                           2 = 256 (New Length: 512)
: Row (0=all): < 0>
: Start Column: < 1>
: # of Columns: < 256>
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
#####

```

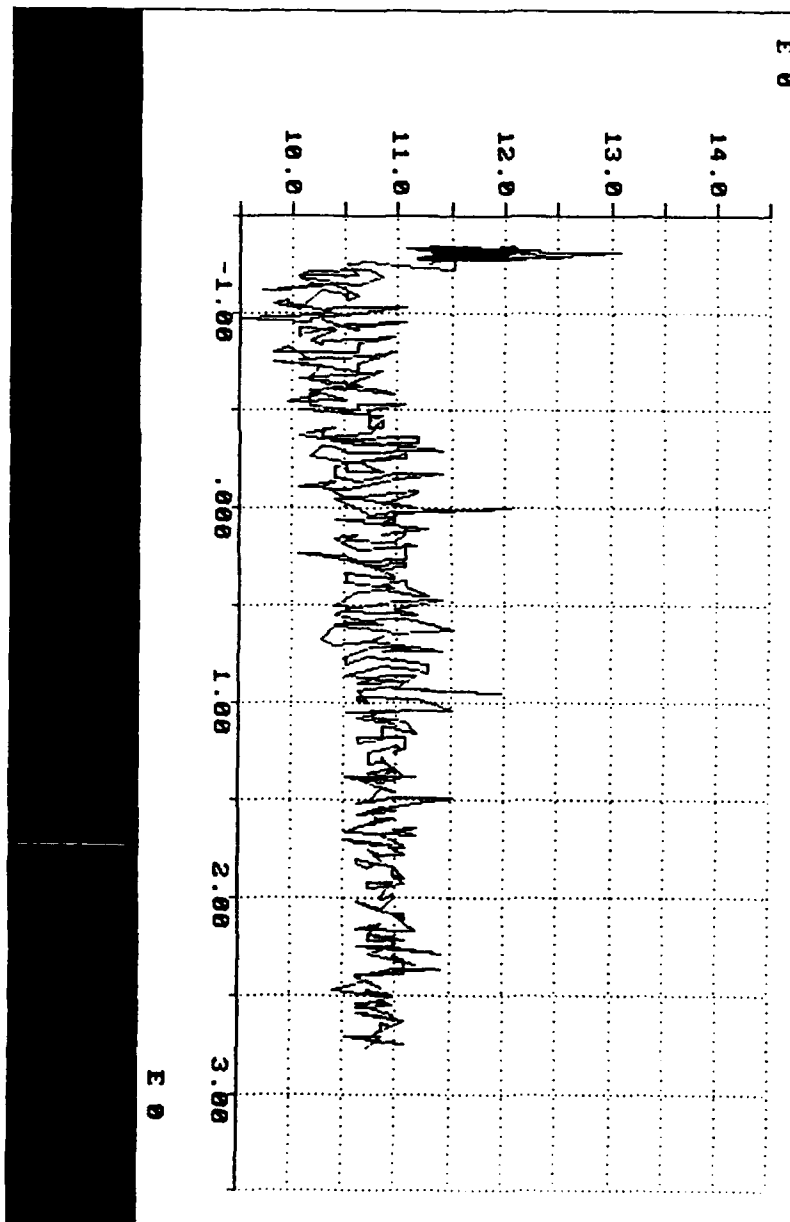


XtDAS


```

##### File Input/Output #####
:
:   File Name: <B:SEP12D.USR>           Quit/Continue: *
:
:   8 Comments                           Subfiles (total #: 2)
#####
: 1> INDIA INK CONTROLLED AT 50          : Start#      Shape      #kepts :
: 2> LOOKS LIKE A WELD                  :      1        2 x 256      2   :
: 3> NO SMOKE                           :      :      :      :
: 4> NO BLANCHING                       :      :      :      :
: 5> WEAK WELD                          :      :      :      :
: 6> Small Aperture                   :      :      :      :
: 7> SW                               :      :      :      :
: 8>                                     :      :      :      :
#####
: I/O Variable ( R = 1 ) :          256 REAL
:
: Subfile:      < 1 >           2 x 256 (Max Length: 512 )
: Row (0=all): < 0 >
: Start Column: < 1 >
: # of Columns: < 256 >
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
#####

```



File Input/Output

File Name: <B:SEP12H.USR>

Quit/Continue: *

8 Comments

Subfiles (Total #: 1)

1> INDIA INK CONTROLLED AT 100
2> VERY MINIMAL DESSICATION
3> SMALL APERTURE
4> DID NOT APPEAR TO BE WELDED
5> SW
6>
7>
8>

Start# Shape #Repts
1 2 x 256

I/O Variable (R - Z):

768 REAL

Subfile: < 1 >

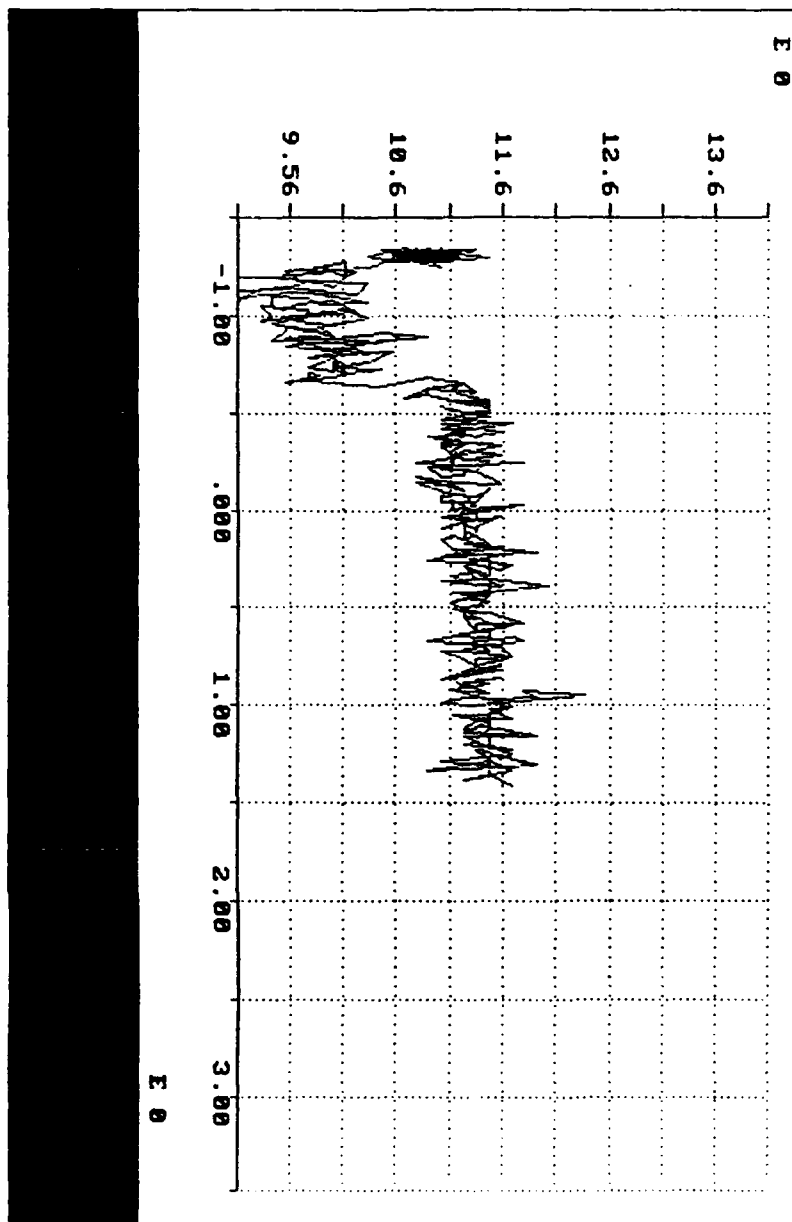
2 x 256 (Max Length: 512)

Row (0=all): < 0

Start Column: < 1

of Columns: < 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



File Input/Output

File Name: <B:SEP12I.USR

Quit/Continue: *

8 Comments

Subfiles Total #: 1

1> INDIA INK CONTROLLED AT 100

Start#

Shape

#Repts :

2> TC PLACED DEEPER THAN PREVIOUS RUN

1

2 x 256

3> DESSICATION. SMELLS COBLED

4> STILL LOOKS WEAT

5> Small Aperture

6> SW

7>

8>

I/O Variable (R - Z) :

512 REAL

Subfile: < 1

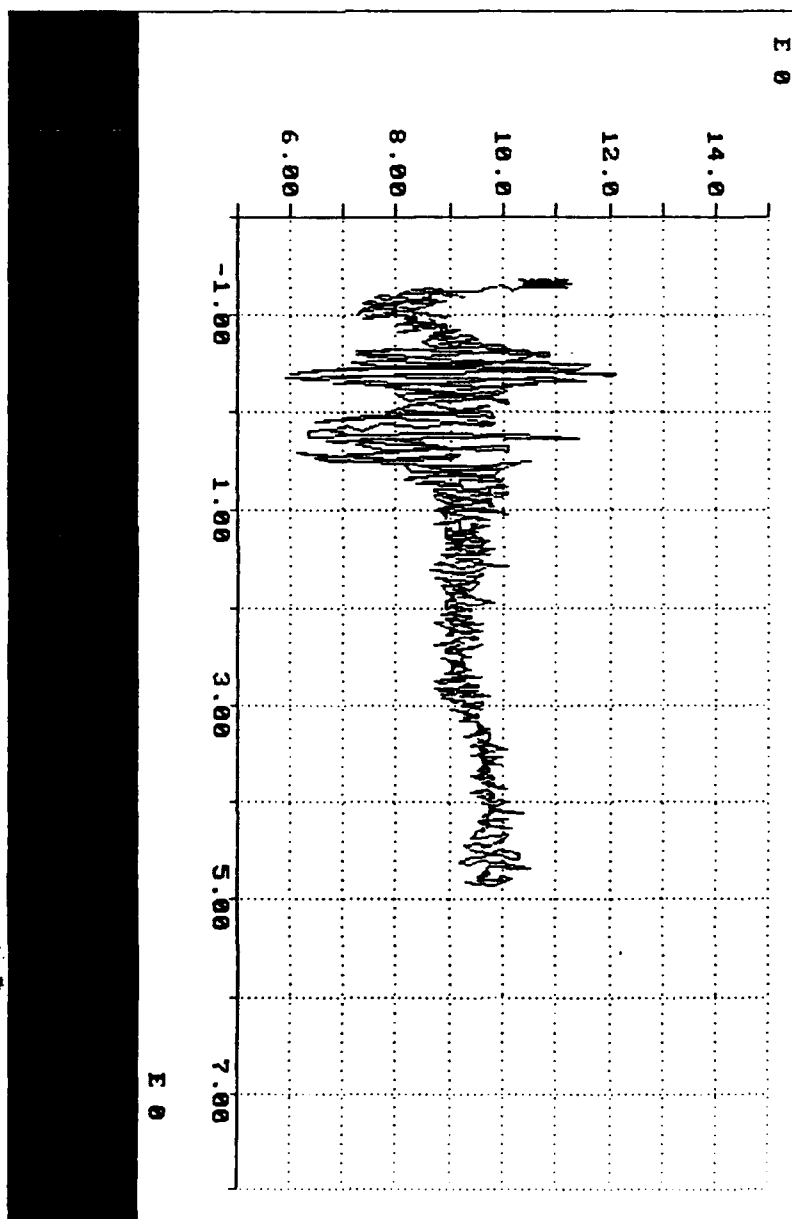
2 x 256 (Max Length: 768)

Row (0=all): 0

Start Column: 1

of Columns: < 256

Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



File Input/Output

File Name: <2:SEP12L.USR

Quit/Continue: *

B Comments

Subfiles (Total #: 1)

1) INDIA INK CONTROLLED AT 8"

Start#

Shape

#Repts

2) NOT MUCH OF A VISUAL CHANGE

1

256

3) SMALL APERTURE

4) WEAK WELD

5) 5W

6)

7)

8)

I/O Variable (R - Z):

768 REAL

Subfile: <1>

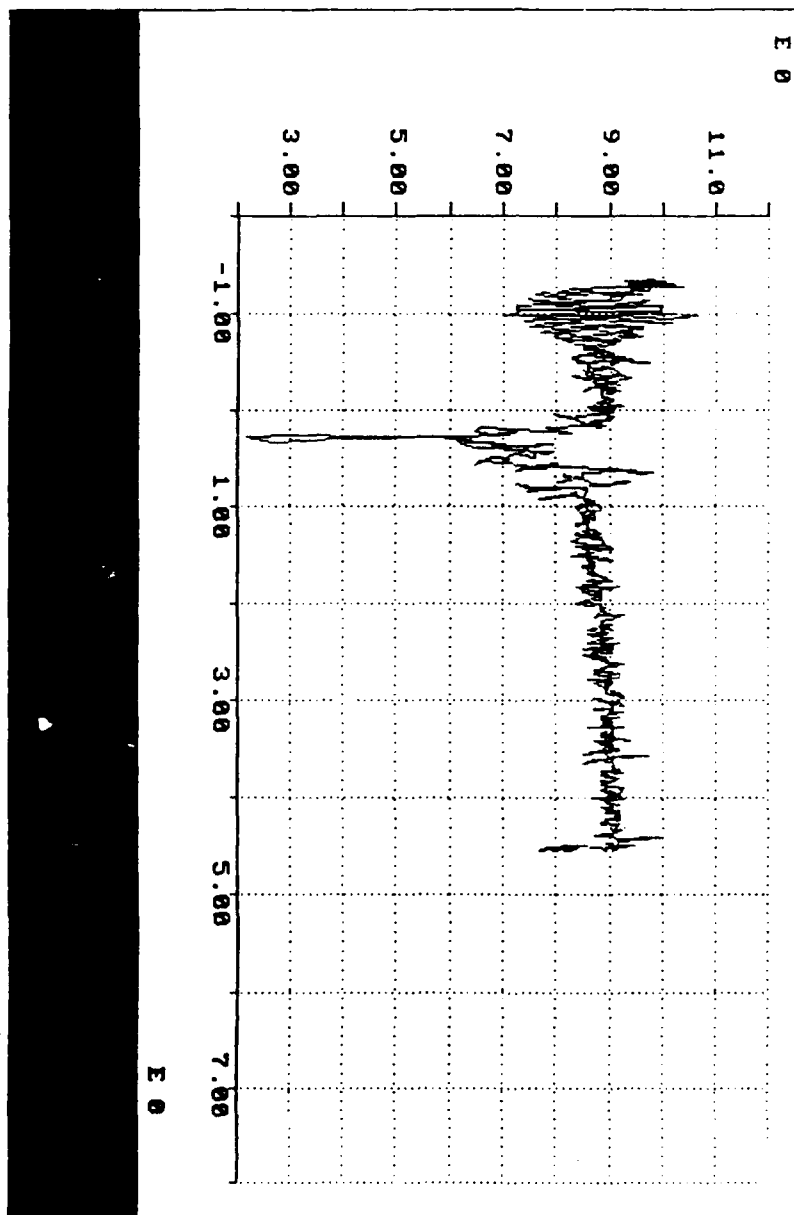
2 x 256 (Max Length: 768)

Row (0=all): <0>

Start Column: <1>

of Columns: <256>

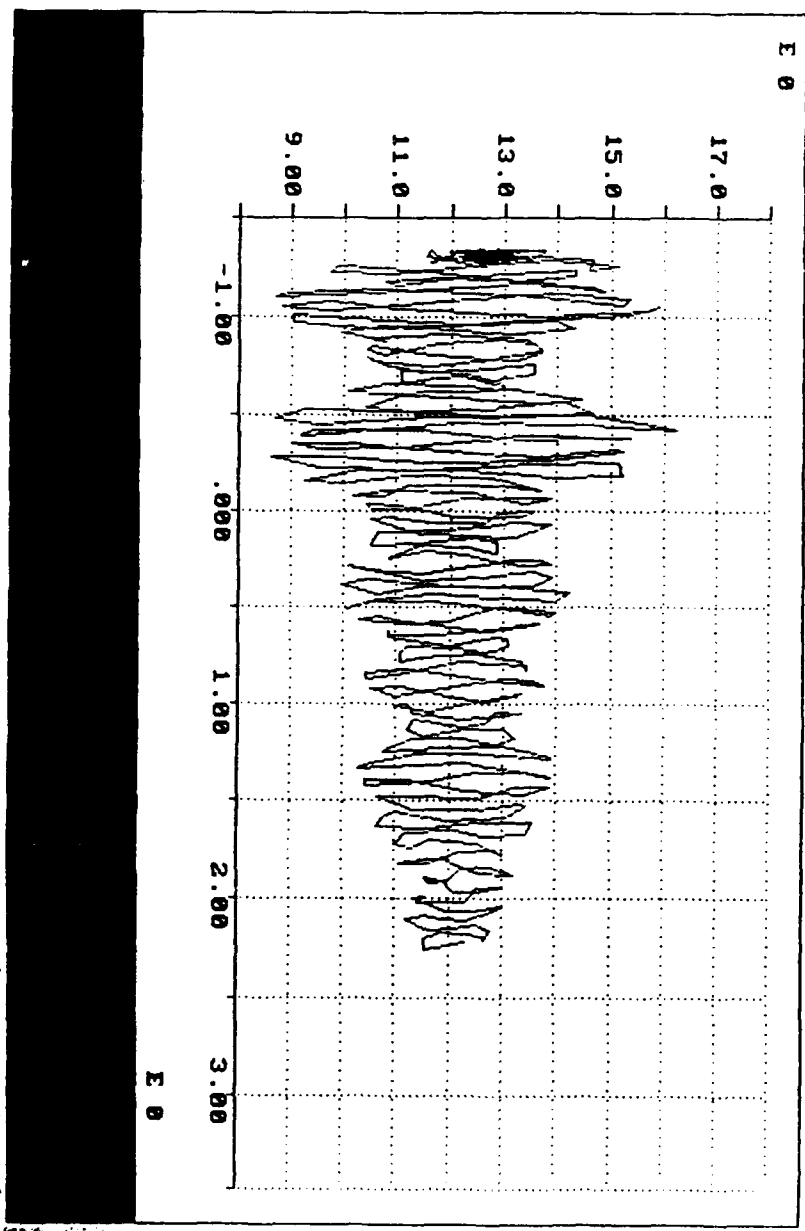
Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *




```

##### File Input/Output #####
:
:   File Name: <B:SECTION.USK>                               Quit/Continue: *
:
:   8 Comments                                                Subfiles (Total #: 2)
: #####
: 1 TWO STRIP CONTROL UNWELDED                               : Start#      Shape      #Lepts :
: 2 LARGE APERTURE                                           :      1      1000000    1000000 :
: 3 SW                                                         :      :      :      :
: 4 :                                                         :      :      :      :
: 5 :                                                         :      :      :      :
: 6 :                                                         :      :      :      :
: 7 :                                                         :      :      :      :
: 8 :                                                         :      :      :      :
: #####
: I/O Variable ( R - Z ):                                     1024 REAL
:
: Subfile: < 1 >                                             Z #: 256 (Max Length: 512 )
: Row (0=all): < 0 >
: Start Column: < 1 >
: # of Columns: < 256 >
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
#####

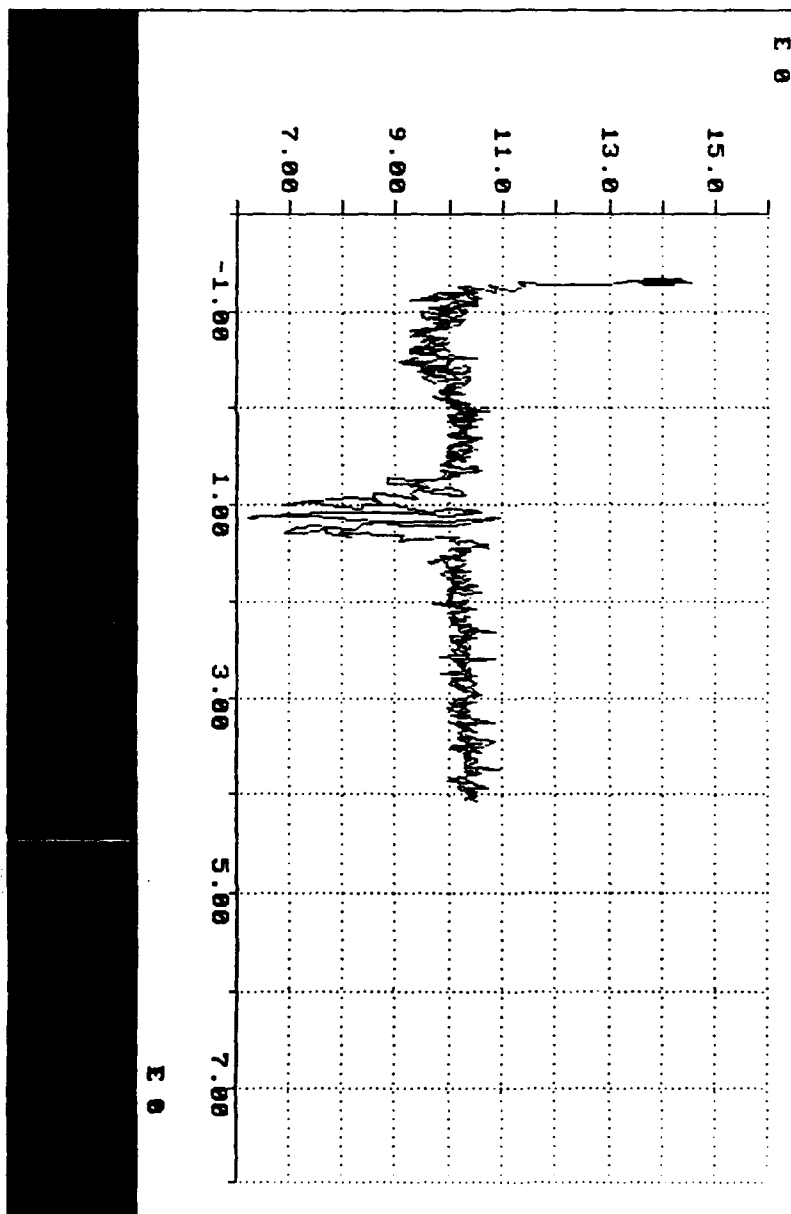
```




```

##### File Input/Output #####
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:   File Name: <B:SEP12P.USR>           Quit/Continue: *
:
:   8 Comments                           Subfiles (Total #: 1)
#####
: 1> INDIA INK CONTROLLED AT 50           : Start#      Shape      #Repts :
: 2> LARGE APERTURE                       :      1      2 x 256    :
: 3> NO VISUAL CHANGES                   :              :
: 4> DID NOT LOOK WELDED                  :              :
: 5> SW                                   :              :
: 6>                                       :              :
: 7>                                       :              :
: 8>                                       :              :
#####
: I/O Variable ( R - Z ):                512 REAL
:
: Subfile:      1      2 x 256 (Max Length: 768)
: Row (0=all): < 0 >
: Start Column: < 1
: # of Columns: < 256
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
#####

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***** File Input/Output *****

: File Name: <B:SEP120.JSR>

: Quit/Continue: *

: 8 Comments

: Subfiles (Total #: 4)

: 1> INDIA INK CONTROLLED AT 4.0 : Start# : Shape :
: 2> LARGE APERTURE : : :
: 3> SMOKING,DESSICATION : : :
: 4> TC MAY BE A LITTLE TOO DEEP : : :
: 5> BETTER, BUT STILL A WIDE FIELD : : :
: 6> SW : : :
: 7> : : :
: 8> : : :

: I/O Variable (R - Z): 778 REAL

: Subfile: < 1 >

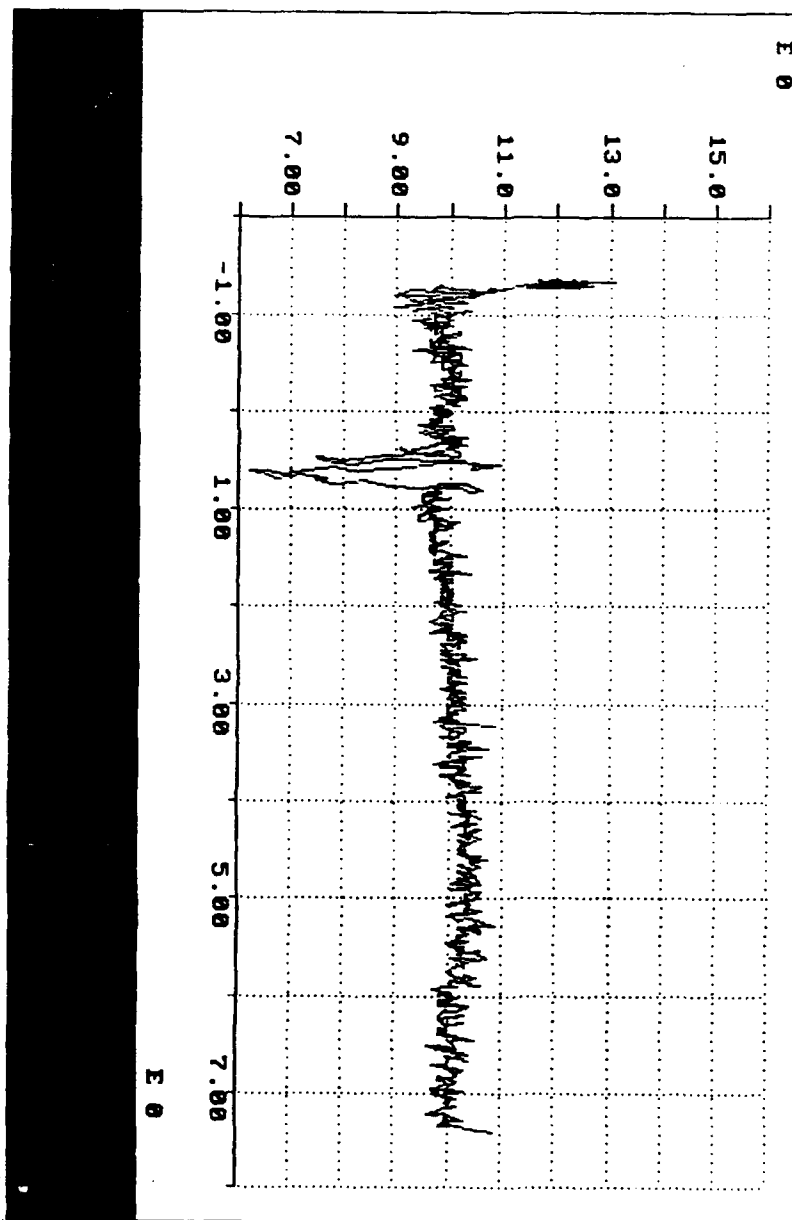
: 2 : 256 (Max Length: 1024)

: Row (0=all): < 0 >

: Start Column: < 1 >

: # of Columns: < 256 >

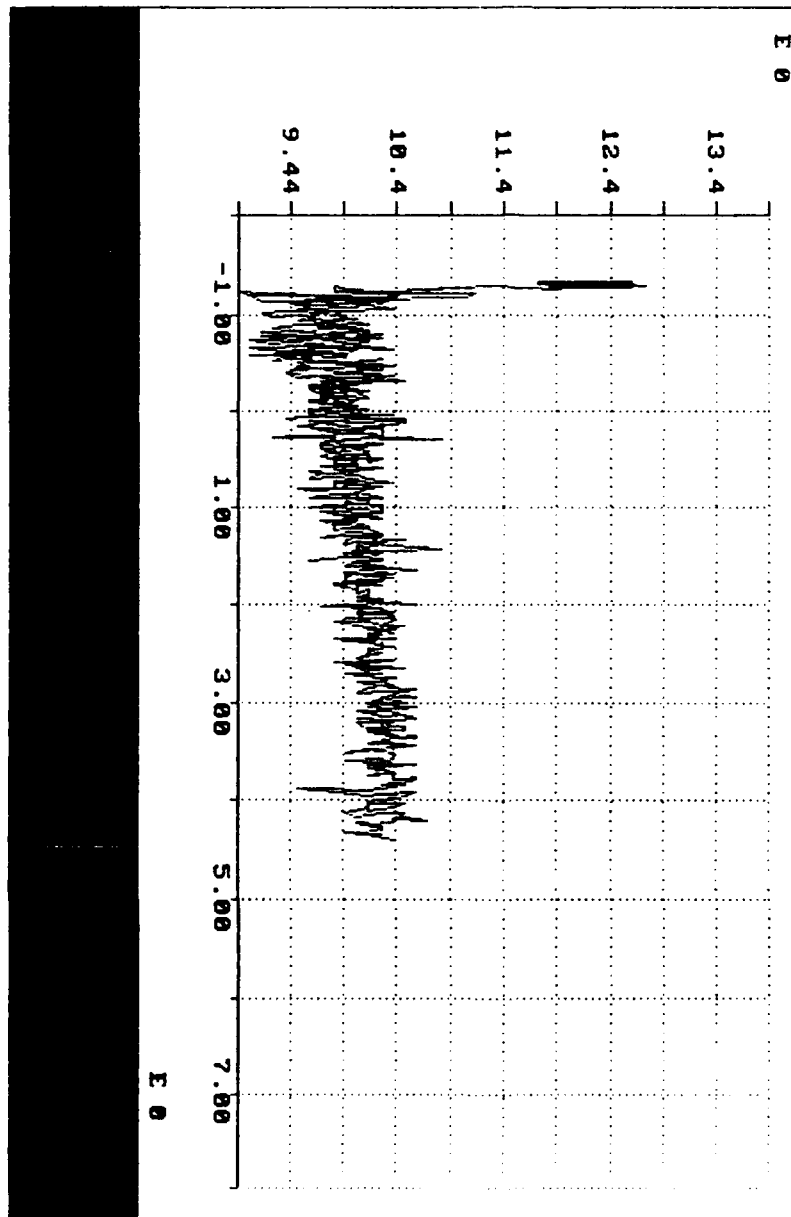
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *




```

#####
: File Name: <B:SEP121.USR                               Quit/Continue: *
:
: 8 Comments                                              Subfiles (Total #: 3)
#####
: 1> INDIA INK CONTROLLED AT 80                          : Start#      Shape      #Repts :
: 2> LARGE APERTURE                                       :      1      2 x 256    1       :
: 3> SLIGHT DESSICATION                                   :          :          :
: 4> WELDED, BUT NOT IMPERMEABLE                         :          :          :
: 5> WEAK WELD                                           :          :          :
: 6> SW                                                  :          :          :
: 7>                                                     :          :          :
: 8>                                                     :          :          :
#####
: I/O Variable ( R = 2 )                                400 1.00
:
: Subfile:      1                                         2 x 256 (No. of Repts: 1)
: Row (0=all): < 0
: Start Column: < 1
: # of Columns: 256
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
#####

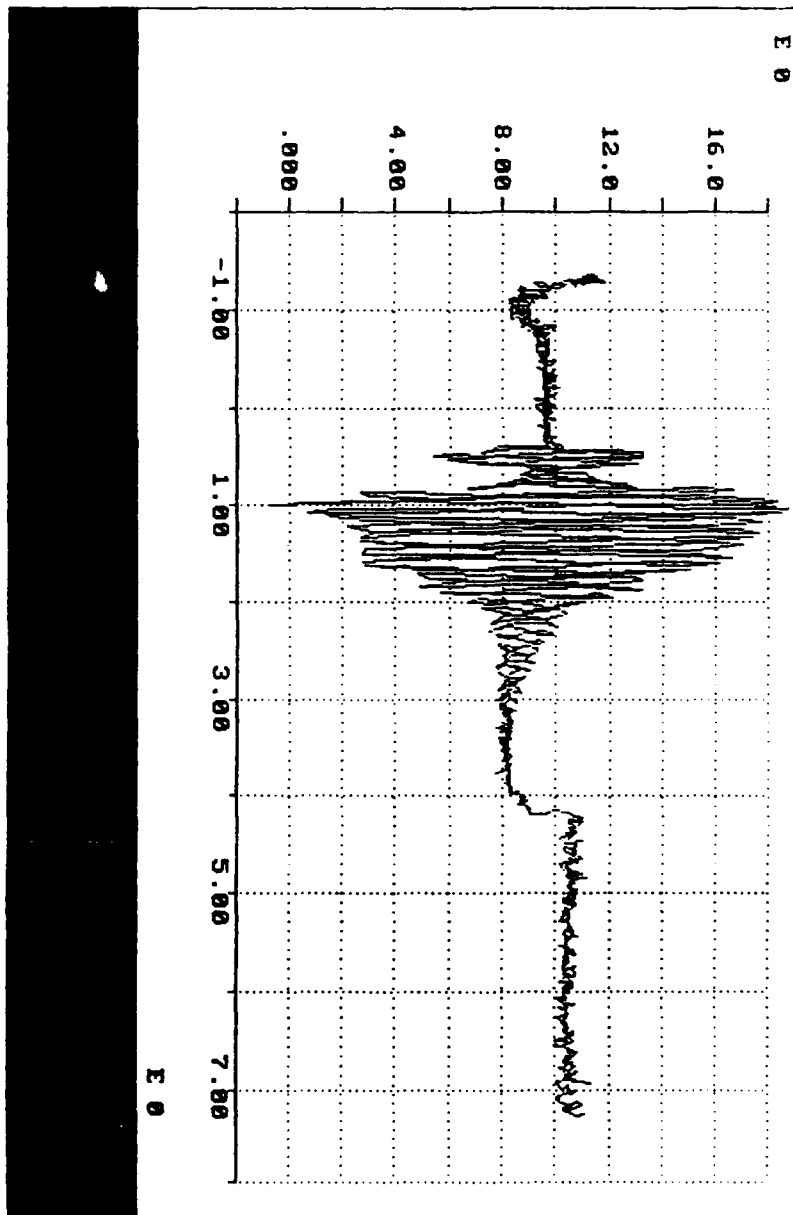
```




```

##### File: Input/Output #####
:
:   File Name: <B:SER12V.USR>                               Quit/Continue: *
:
:   8 Comments                                              Subfiles (Total: 4)
#####
: 1> INDIA INK SET=100, IC MAX=70                          : Start#      Shape      Widths :
: 2> LARGE APERTURE                                         :      1      2 x 256      4      :
: 3> SLIGHT DESSICATION, SMOKE RING                        :      :      :      :
: 4> A WELD                                                 :      :      :      :
: 5> RD MOVED APPARATUS DURING FULL START                 :      :      :      :
: 6> 5W                                                     :      :      :      :
: 7>                                                         :      :      :      :
: 8>                                                         :      :      :      :
#####
: I/O Variable ( R - Z ):                                769 REAL
:
: Subfile:      < 1 >                                2 x 256 (Max Length: 1000)
: Row (0=all):  < 0 >
: Start Column: < 1 >
: # of Columns: < 256 >
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
#####

```

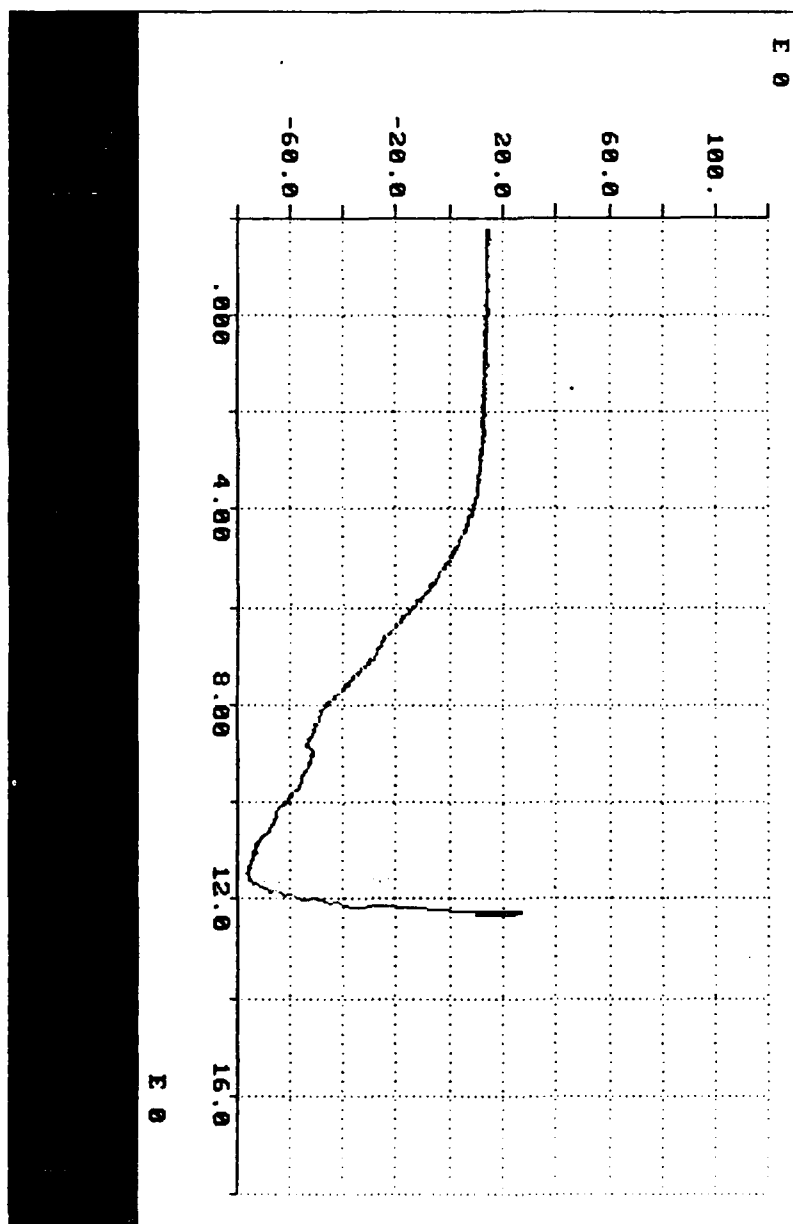


[illegible]

```

***** File Input/Output *****
:
:   File Name: <C:\SEP14A.USR>                               Quit/Continue: *
:
:   8 Comments                                         Subfiles (Total #: 3)
*****
: 1> ONE STRIP UNWELDED CONTROL           : Start#      Shape      #Repts :
: 2> BROKE AT THE CLAMP                   :      1      2 x 256      :
: 3> NO SLIFFAGE                           :      :      :
: 4                                         :      :      :
: 5                                         :      :      :
: 6                                         :      :      :
: 7                                         :      :      :
: 8                                         :      :      :
*****
: I/O Variable ( R - Z ) :                               768 REAL
:
: Subfile:      < 1 >                               2 x 256 (Max Length: 768)
: Row (0=all):  < 2 >
: Start Column:  < 1 >
: # of Columns: < 768 >
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
*****

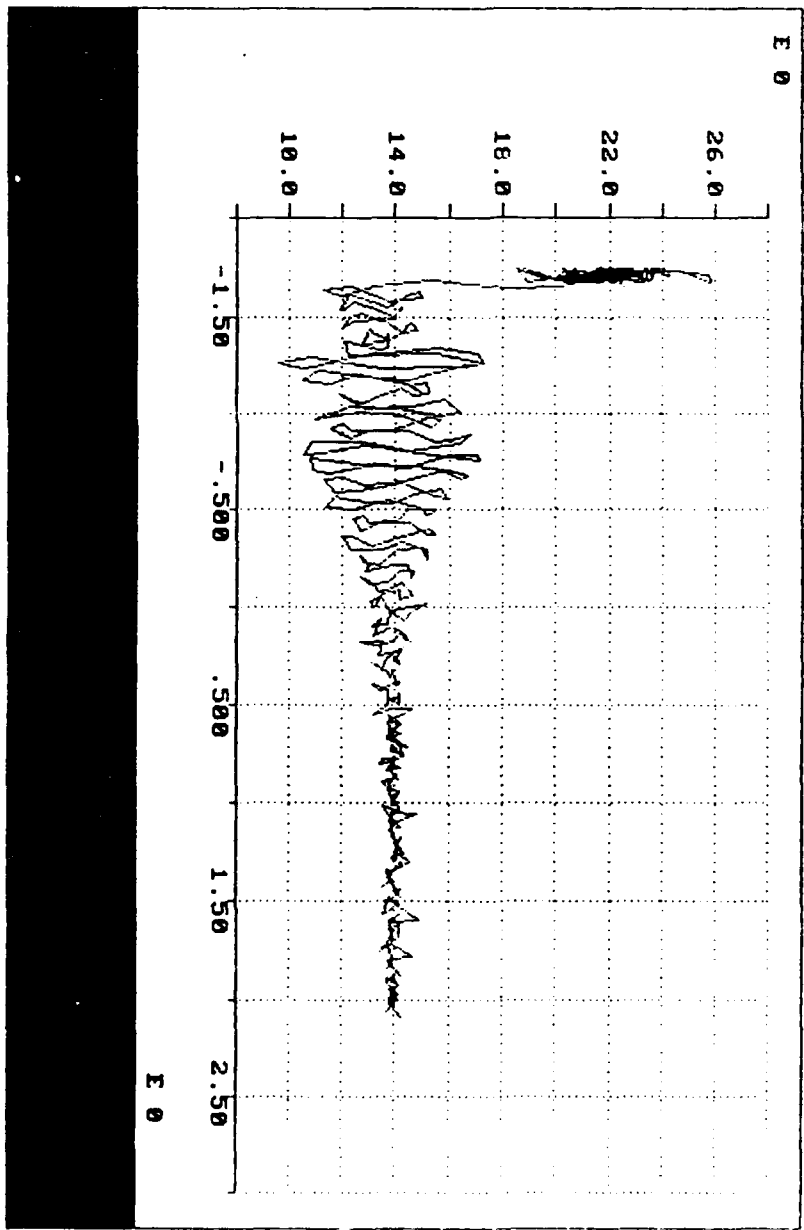
```




```

##### File Input/Output #####
:
:   File Name: <C:SEF140.UT#   Quit/Continue: *
:
:   8 Comments                               Subfiles (Total #):
#####
: 1: INDIA INK UNWELDED                      : Start#      Shape      Plot#
: 2: BD LEANED ON TABLE AT RECORDING        :             2 = 254
: 3:
: 4:
: 5:
: 6:
: 7:
: 8:
#####
: I/O Variable ( R - Z ):                   768 RIAL
:
: Subfile: < 1                               2 = 255 (Max Length: 512)
: Row (0=all): < 0
: Start Column: 1
: # of Columns: < 256
:
: Read/Write/Append/Scroll/Int/Edi/1st/Show File Quit: *
:
#####

```



***** File Input/Output *****

File Name: <C:\SEF14E.USR>

Quit/Continue: *

8 Comments

Subfiles (total #: 1)

1 INDIA INK CONTROLLED AT 50

Start#

Shape

Steps

2 NO VISUAL CHANGES

1

2 * 100

3 NO SMOKE

4

5 DEAF WELD

6 BROKE FROM SEPTOR (20000)

7

8

I/O Variable (R = Z)

768 Rows

Subfile: < 1

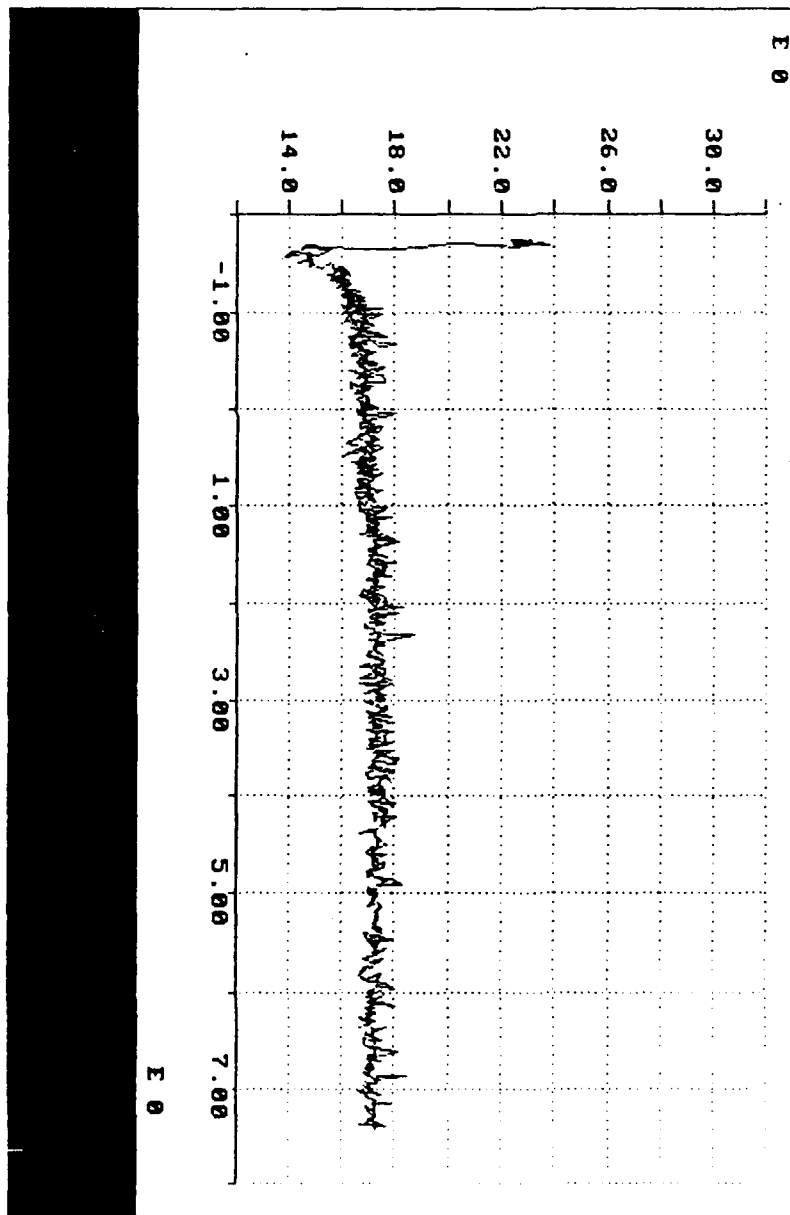
2 = 256 (Max Length: 768)

Row (0=all): < 0

Start Column: < 1

of Columns: < 256

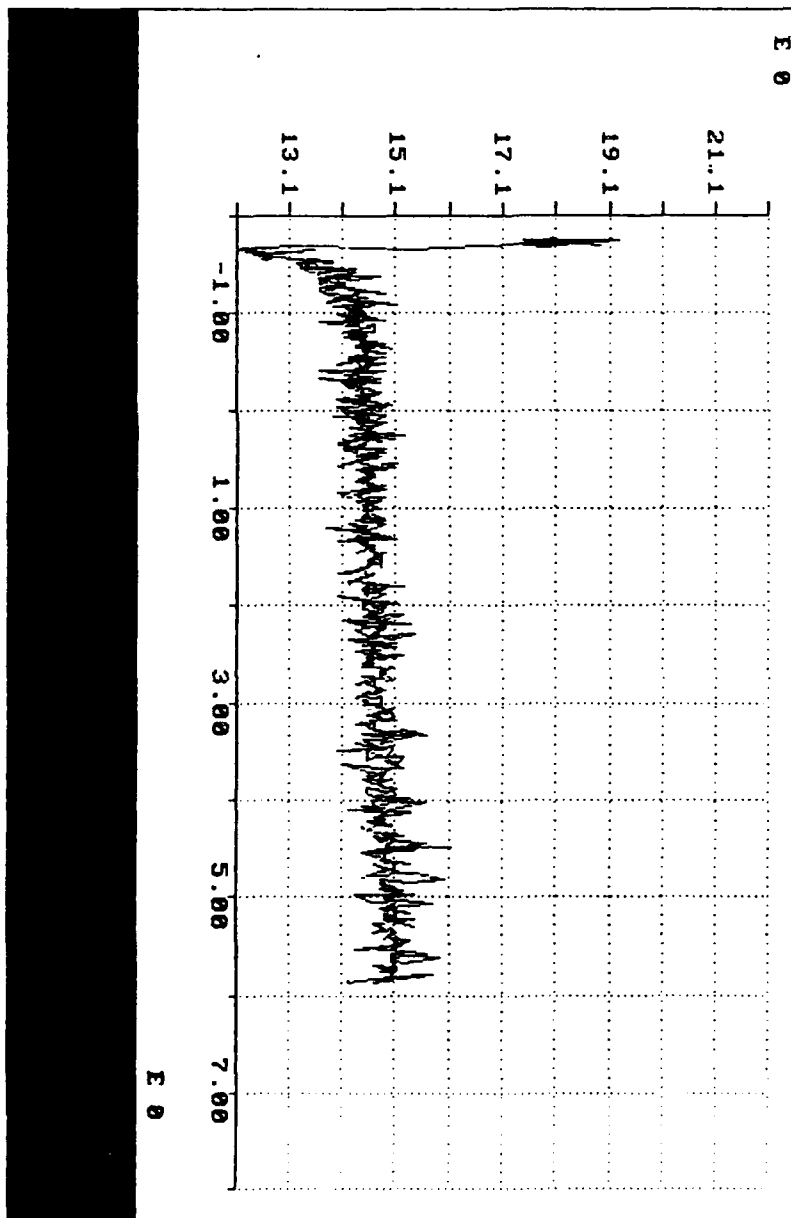
Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *



```

##### File Input/Output #####
:
:   File Name: C:\SEP14\JUS6          Quit/Continue: *
:
:   9 Comments                      Subfile: Total #: 1
#####
: 1 INDIA INK CONTROLLED AT 20      : Start#      Shape      #Feats :
: 2 SLIGHT DESSICATION              : 1          256        0       :
: 3 MINIMAL BLANCHING               :             :         :
: 4                                  :             :         :
: 5 LOOKED LIKE A WELD               :             :         :
: 6 NO SMOKE                        :             :         :
: 7                                  :             :         :
: 8                                  :             :         :
#####
: I/O Variable ( R - Z ):          768 REAL
:
: Subfile: < 1 >                  2 x 256 (Max Length: 768 )
: Row (0=all): < 0 >
: Start Column: < 1 >
: # of Columns: < 256 >
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
#####

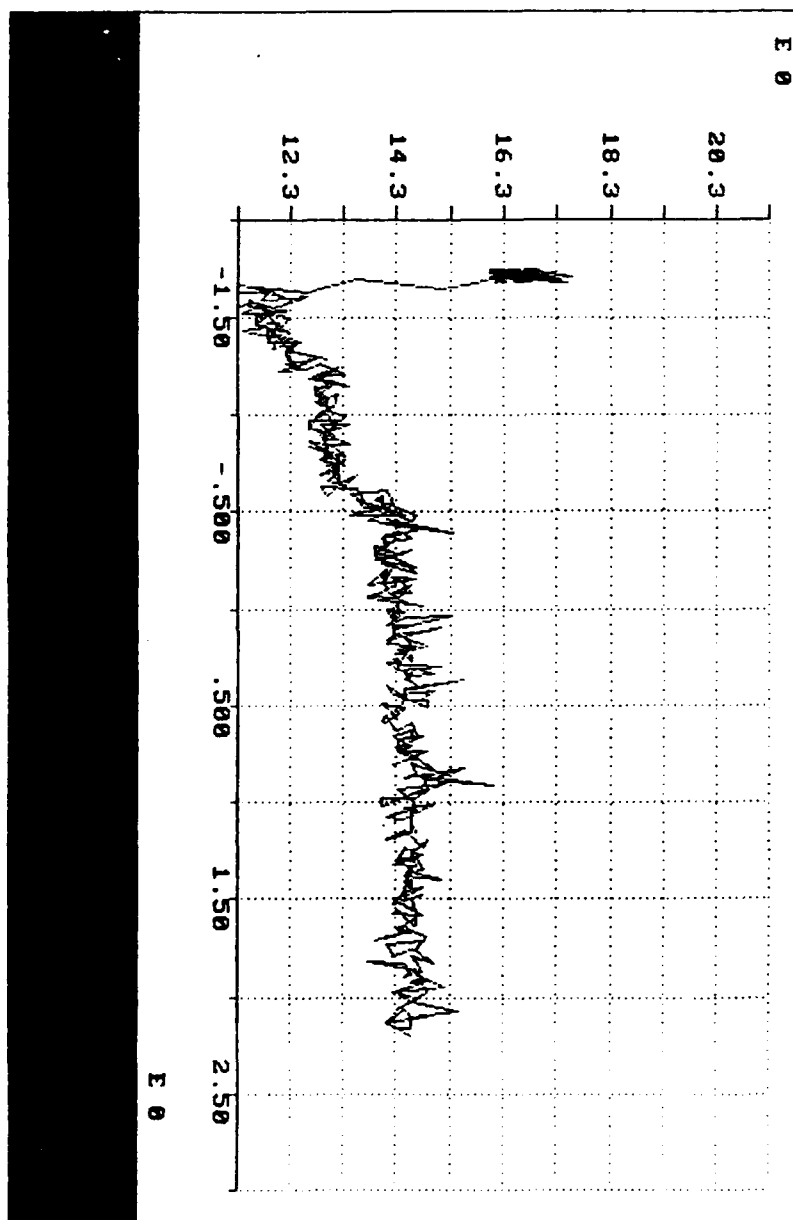
```



```

##### File Input/Output #####
:
:   File Name: <C:SER146.USR>           Out/Continue: *
:
:   B Comments                           Subfiles (Total #: 0)
#####
: 1> INDIA INK CONTROLLED AT 80          Start#      Shape      #Steps :
: 2> SOME BLANCHING                      :             :
: 3> NO SMOKE                            :             :
: 4> LITTLE DESSICATION                  :             :
: 5>                                     :             :
: 6> NO WELD SEEN                        :             :
: 7>                                     :             :
: 8>                                     :             :
#####
: I/O Variable ( Row = 1 ) :           768 REAL
:
: Subfile: < 1           0 x 256 (Max Length: 512)
: Row (0=all): < 0
: Start Column: < 1
: # of Columns: < 256
:
: Read/Write/Append/Scroll/Find/Edit/List/New File/Quit: *
:
#####

```

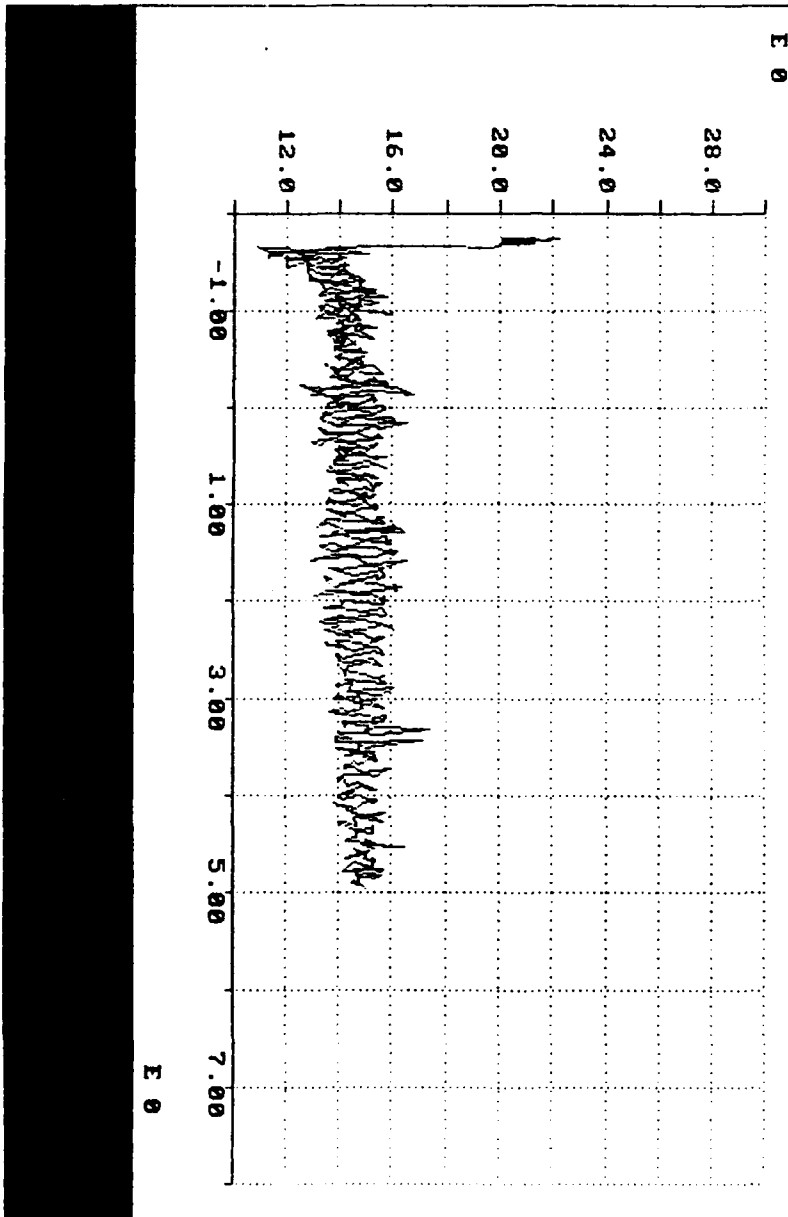


***** File Input/Output *****

: File Name: <C:\SEF14H.USB> Quit/Continue: *
: 8 Comments Subfile: Total #: 1

: 1) INDIA INK SET=80 TO MAX=65 : Start# : : :
: 2) SLIGHT DESSICATION : : : :
: 3) NO CARBONIZATION : : : :
: 4) SLIGHT BLANCHING : : : :
: 5) NO SMOKE : : : :
: 6) : : : :
: 7) BD LEANED ON TABLE : : : :
: 8) NO EVIDENCE OF A WELD : : : :

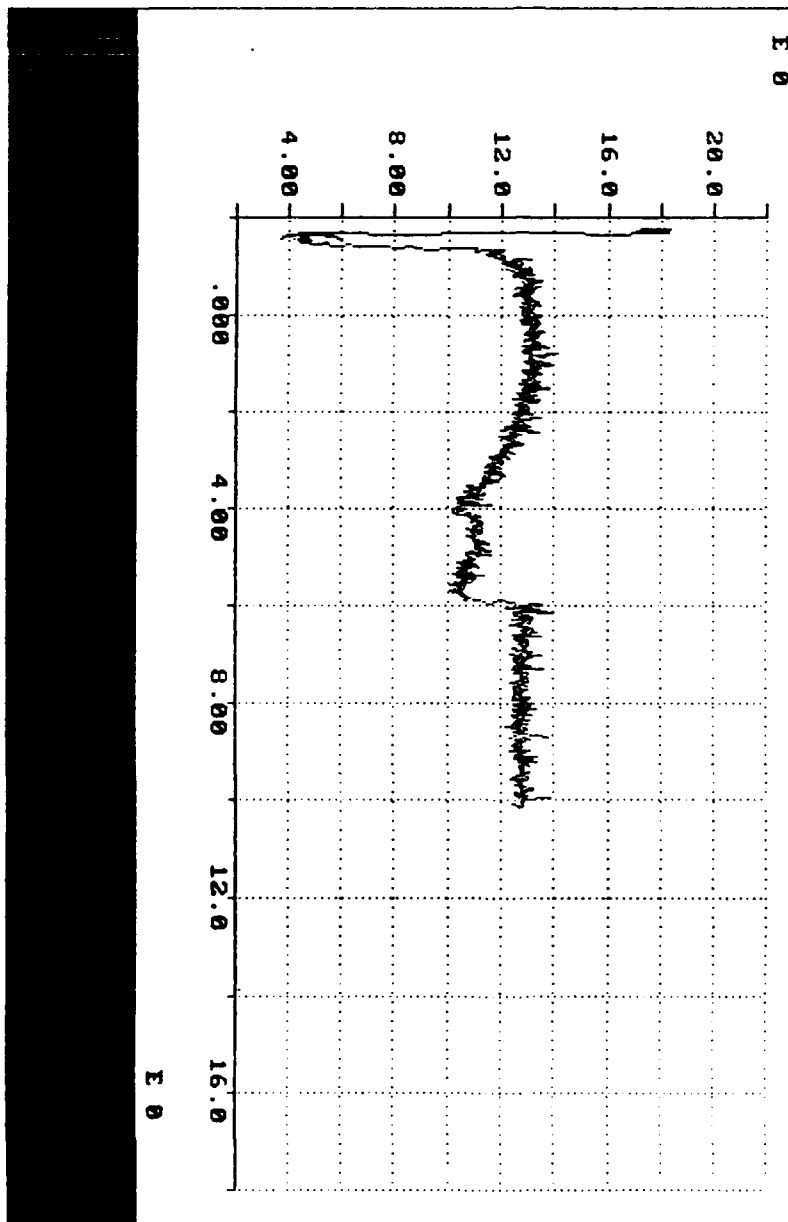
: I/O Variable (R = 2) : : : :
: Subfile: 1 2 x 256 (Max Length: 768)
: Row (0=all): < 0
: Start Column: 1
: # of Columns: < 256
: Read/Write/Append/Scroll/Plot/Edit/List/Now file.Quit: *

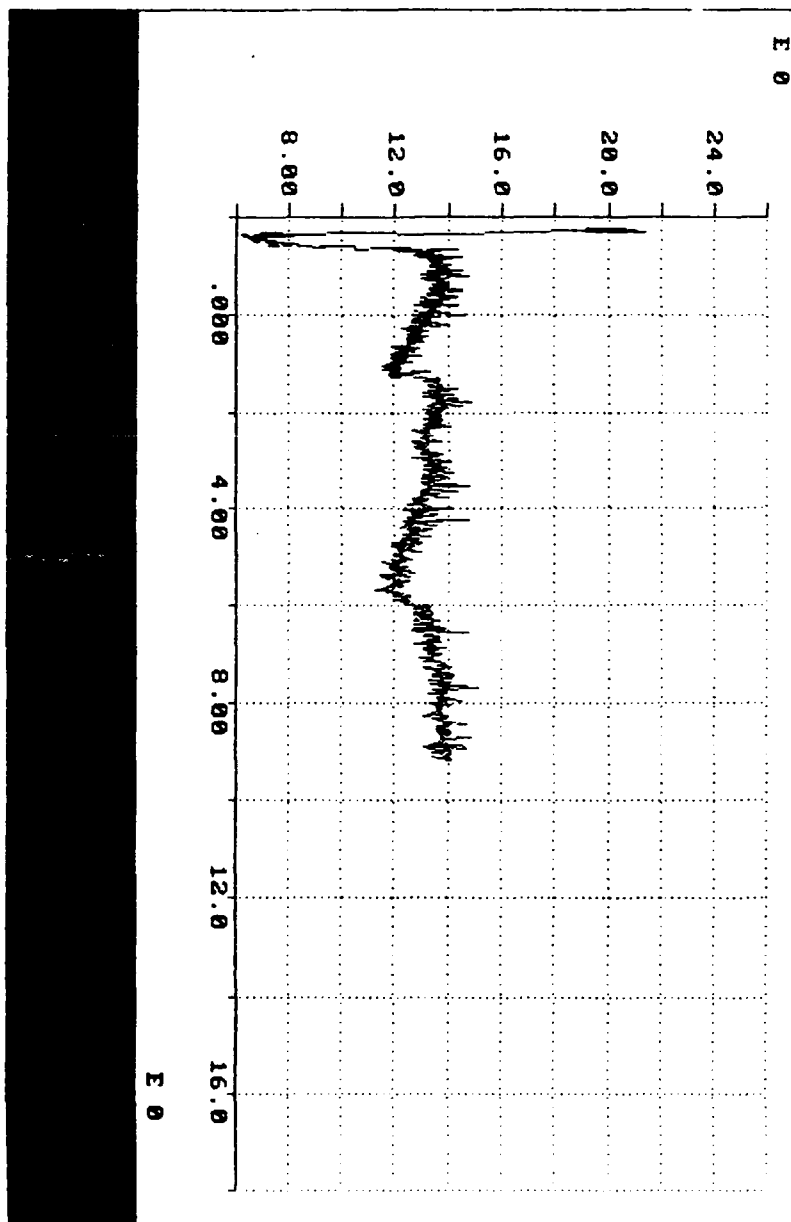


```

##### File Input/Output #####
:
:   File Name: <C:\SEI141.USR          Quit/Continue: *
:
:   8 Comments                          Subfiles (Total #: 4)
#####
: 1> INDIA INK SET=100, TC MAX=94      : Start#      Shape      #Repts :
: 2> TOTAL TIME=255                    :      1      2 x 255    4      :
: 3> DESSICATION AND BLANCHING        :
: 4> NO SMOKE                         :
: 5>                                  :
: 6> STRONGEST AT THE PERSONAL SURFACE :
: 7> BEST WELD SO FAR TODAY          :
: 8>                                  :
#####
: 10 Variable ( R = 7 ) : 76P REAL
:
: Subfile:      1      2 x 256 (Max Length: 1024)
: Row (0=all):  0
: Start Column:  1
: # of Columns: 256
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
#####

```

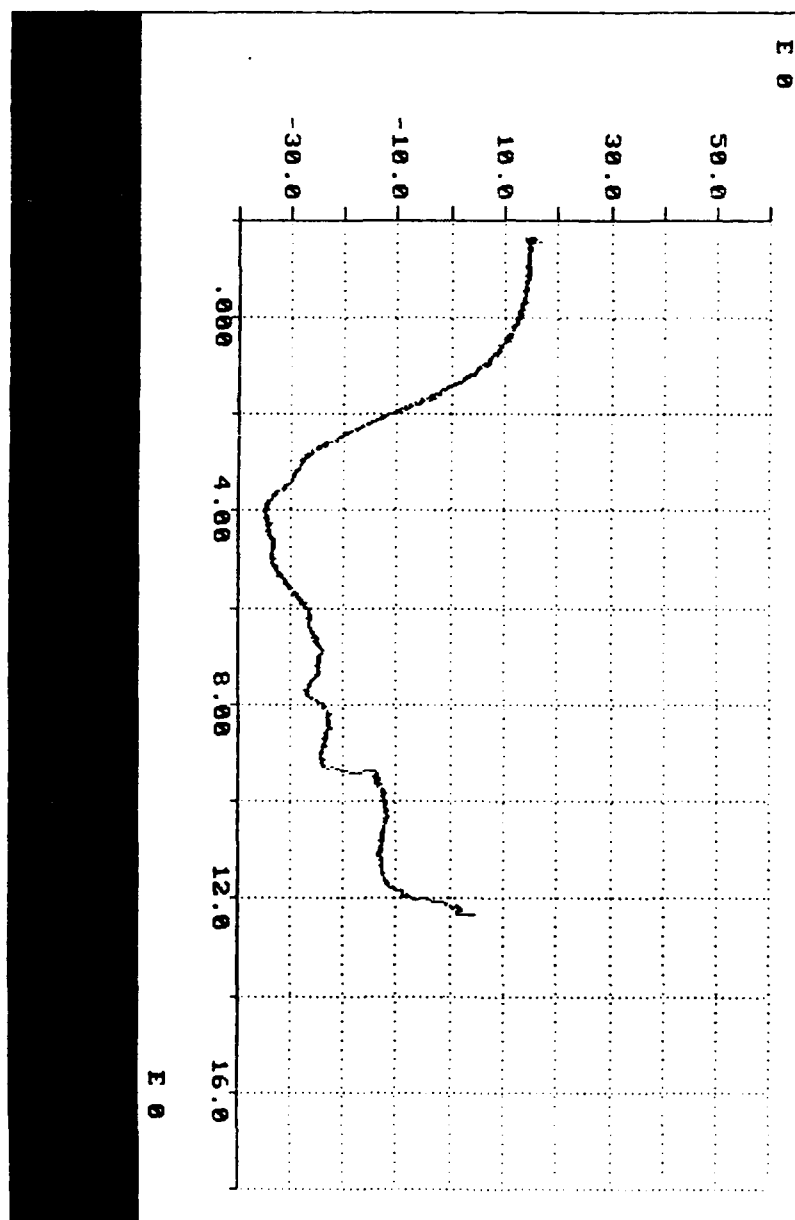


[illegible]

```

##### File Input/Output #####
:
:   File Name: 10:58:14SL001
:   Date/Time: 10/10/81
:
:   8 Comments
:   Subfiles: 100
:
: 1 ONE STRIP CONTROL
: 2 SMALL APERTURE
: 3 BROKE BY THE CLAMP
: 4 (AT THE MOVING STAGE)
: 5
: 6
: 7
: 8
:
: 10 Variable (100)
:
: Subfiles: 100
: Row (0=100): 100
: Start Column: 1
: # of Columns: 256
:
: Read/Write/Append/Scroll/Plot/Edit/List/New File/Quit:
:
#####

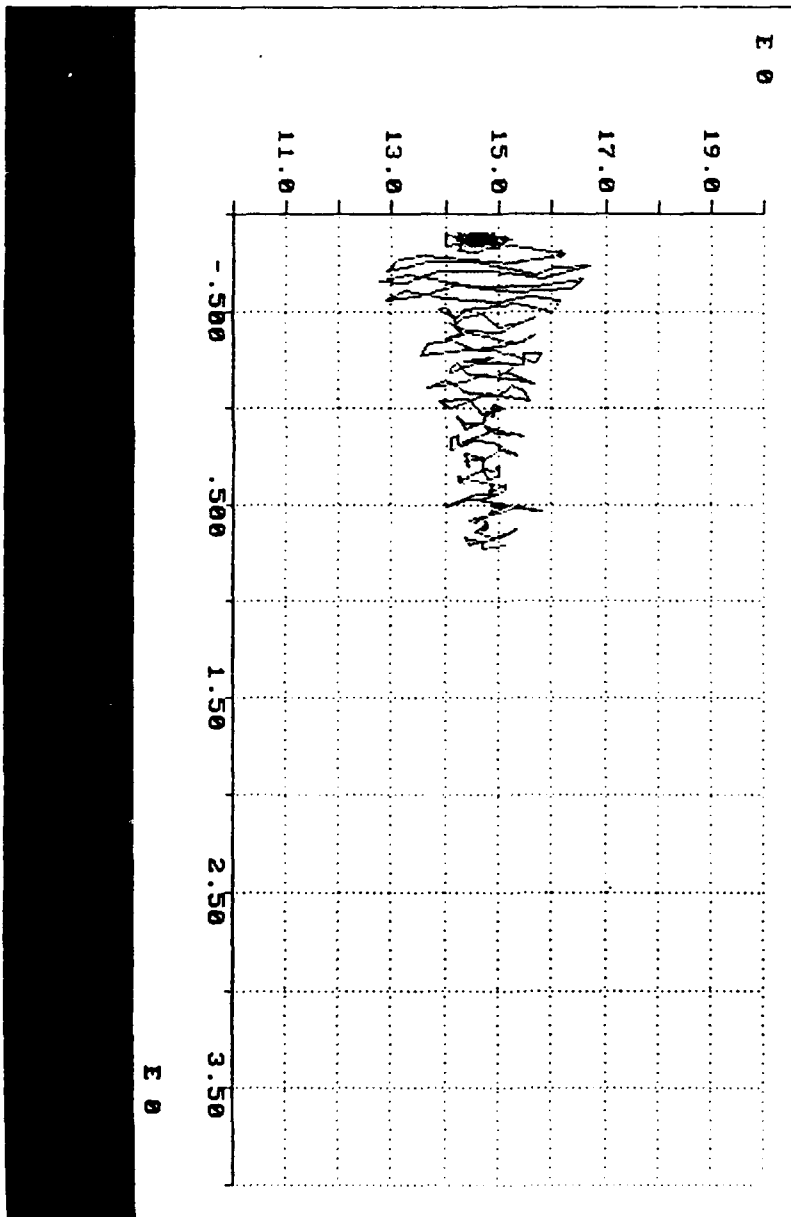
```




```

*****
File Name: LCISEP1400000      Units/Conversion: 4
      8 Comments      Subfile: 1 Total W: 1
*****
1: TWO STRIP INDIA IN ORDER 050 CONTROL      Length      Range      #Records
2:      :      :      :      :      :      :
3:      :      :      :      :      :      :
4:      :      :      :      :      :      :
5:      :      :      :      :      :      :
6:      :      :      :      :      :      :
7:      :      :      :      :      :      :
8:      :      :      :      :      :      :
*****
I/O Variable ( R = Z ):      NO DEAL
Subfile:      1      2 = Data Strip Length: 1000
Row (0=all): 0
Start Column: 1
# of Columns: 256
Read/Write/Append/Scroll/Print/Strip/List/New: 1
*****

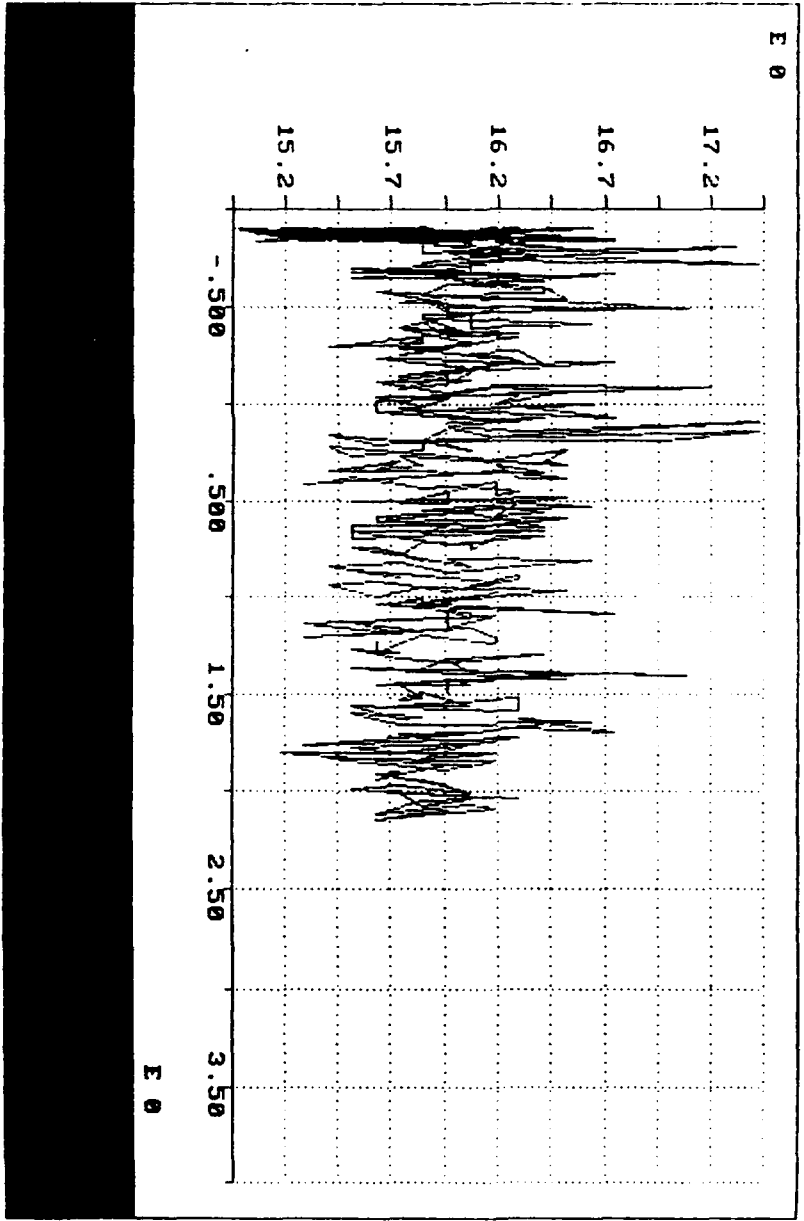
```




```

##### File: Input (Data) #####
: File Name: C:\SET14.JUNK Outfile:
:
: 8 Comments Subfiles (Total #: 1)
#####
: 1 INDIA INK CONTROLLED AT 50 : Start# : Check : #Reps :
: 2 SLIGHT SMOKING : : : :
: 3 SLIGHT BLANCHING : : : :
: 4 NO DESSICATION : : : :
: 5 : : : :
: 6 WEAK WELD : : : :
: 7 TORE AT SEROSA : : : :
: 8 : : : :
#####
: I/O Variable (F = 2): 512 DEAL
:
: Subfile: 1 C = 256 (No. Length: 512)
: Row (0=all): 0
: Start Column: 1
: # of Columns: 256
:
: Read/Write/Append/Scroll: Total data list New File Ports:
#####

```



File Name: TCSETHX.DAT

2 Comments

Subfile: 1

1 INDIA INK CONTAINER

2

2 SMALL APERTURE

3 BLANCHING AND TONING

4 NO SNIDE

5 DID NOT LOSE LITHO

6

1/0 Variable (k = 2)

Subfile: 1

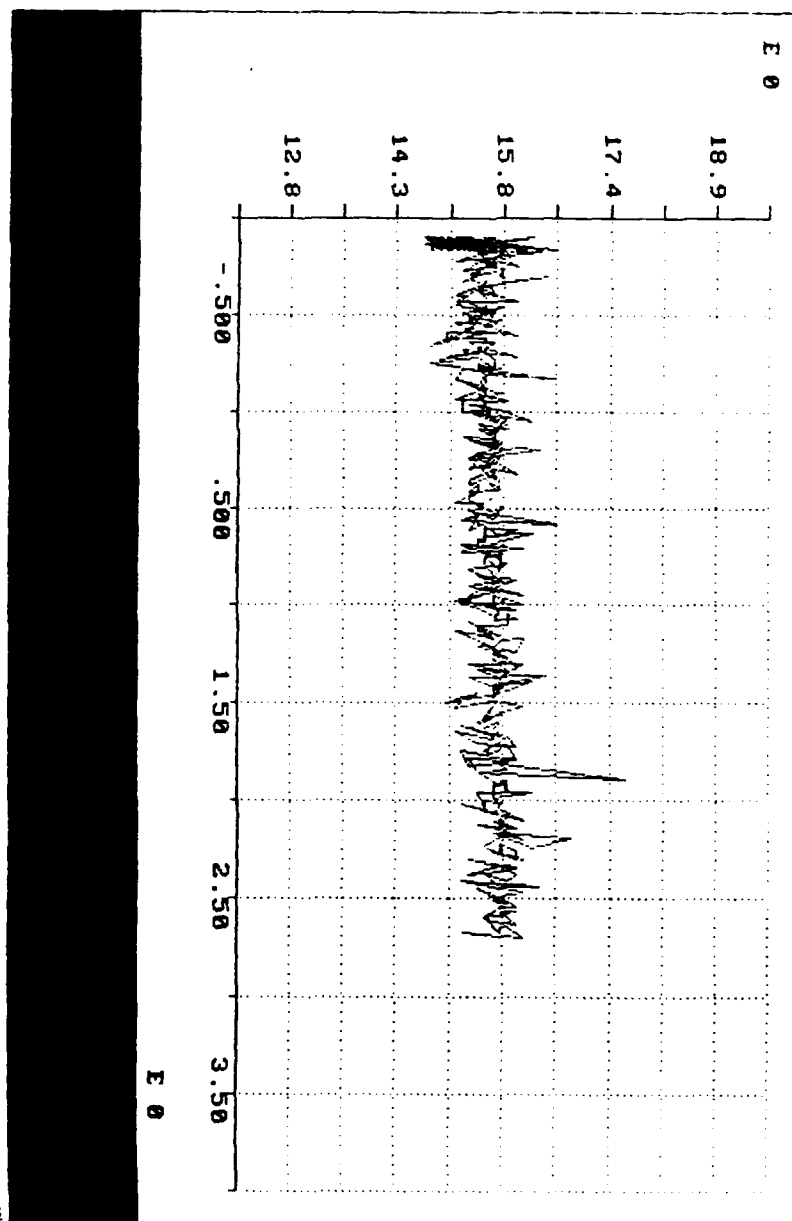
2 256 col Length: 256

Row (0=all): 0

Start Column: 1

of Columns: 256

Read/Write/Append/Sort/Find/Print/Plot/Exit



File Name: C:\SEF141200

Quit: 2000-01-15

0 Comments

Total #:

1 INDIA IN CONTINENT

Start: 2000-01-15

2 SMALL APERTURE

3 LARGE APERTURE

4 15000

5 15000

6 MEDIUM WELD

7 15000

8 15000

I/O Variable (R = 1)

15000

9 Subfile:

15000-15000-15000

10 Row (0=all): 10

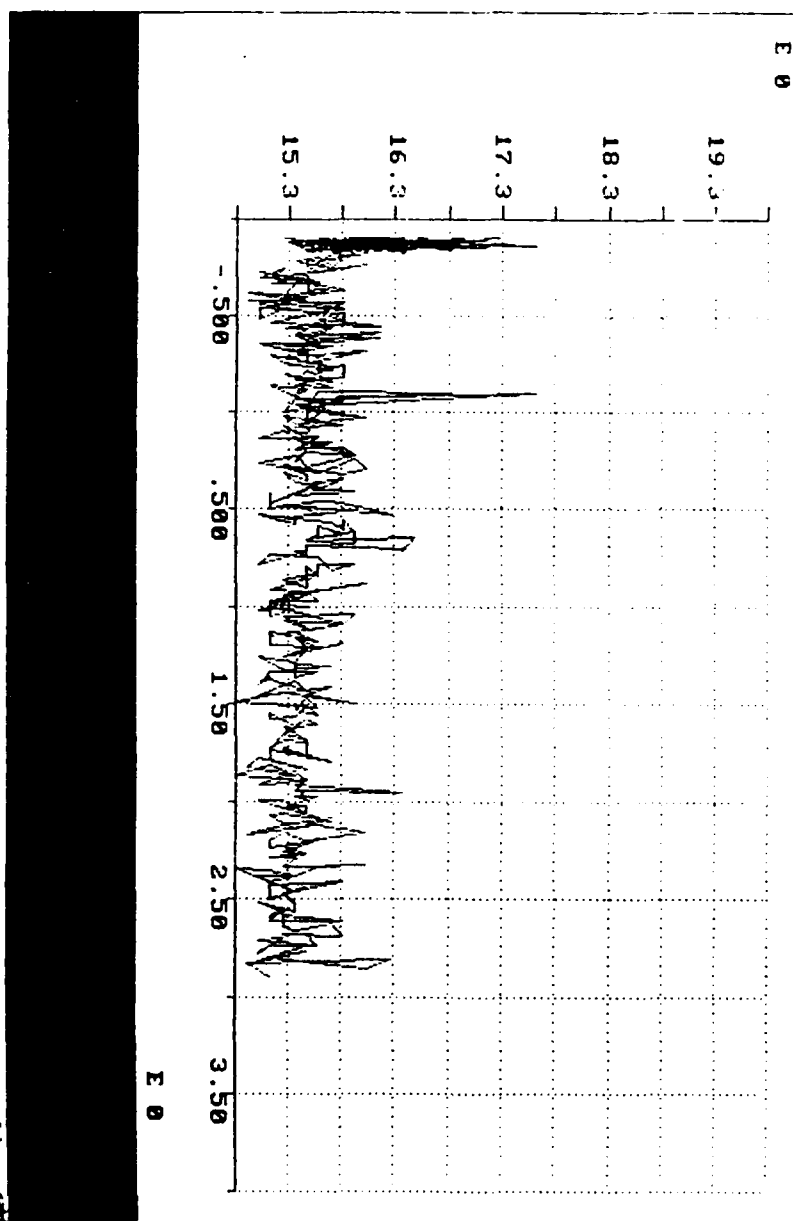
11 Start Column: 1

12 # of Columns: 256

13

14 Read/Write/Append: Read/Write/Append

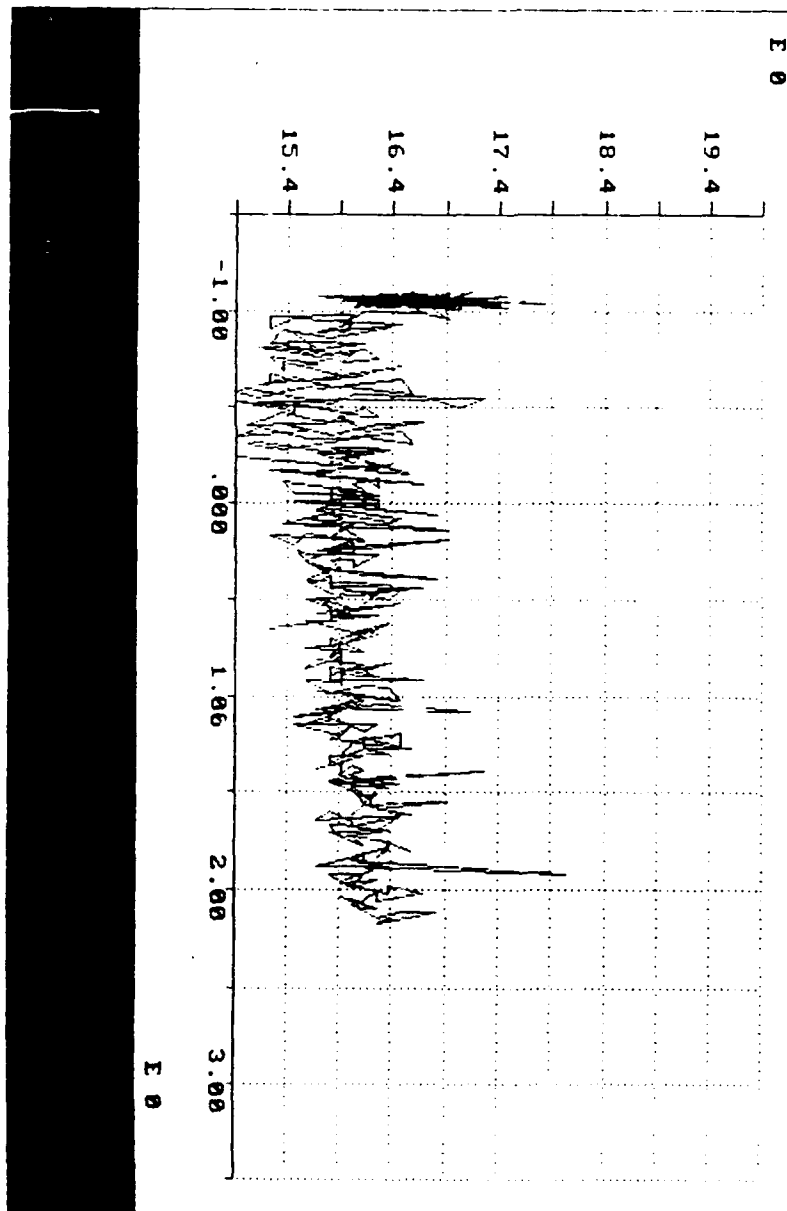
15



```

*****
:
:   File Name:  C:\...
:
:   E Comments
*****
: 1  INDIA IN CONTAINER
: 2  SMALL AIRCRAFT
: 3  SEARCHING AND
: 4  IN STATE
:
: 5  REPT. 10. 10
:
: *****
: 100 Variable (1)
:
: Profile:
: Row (Cell):
: Start Column:
: # of Columns:
:
: Read/Write/Append:
:
*****

```



File Name: [REDACTED]

1. [REDACTED]

2. [REDACTED]

3. [REDACTED]

4. [REDACTED]

5. [REDACTED]

6. [REDACTED]

7. [REDACTED]

8. [REDACTED]

9. [REDACTED]

10. [REDACTED]

11. [REDACTED]

12. [REDACTED]

13. [REDACTED]

14. [REDACTED]

15. [REDACTED]

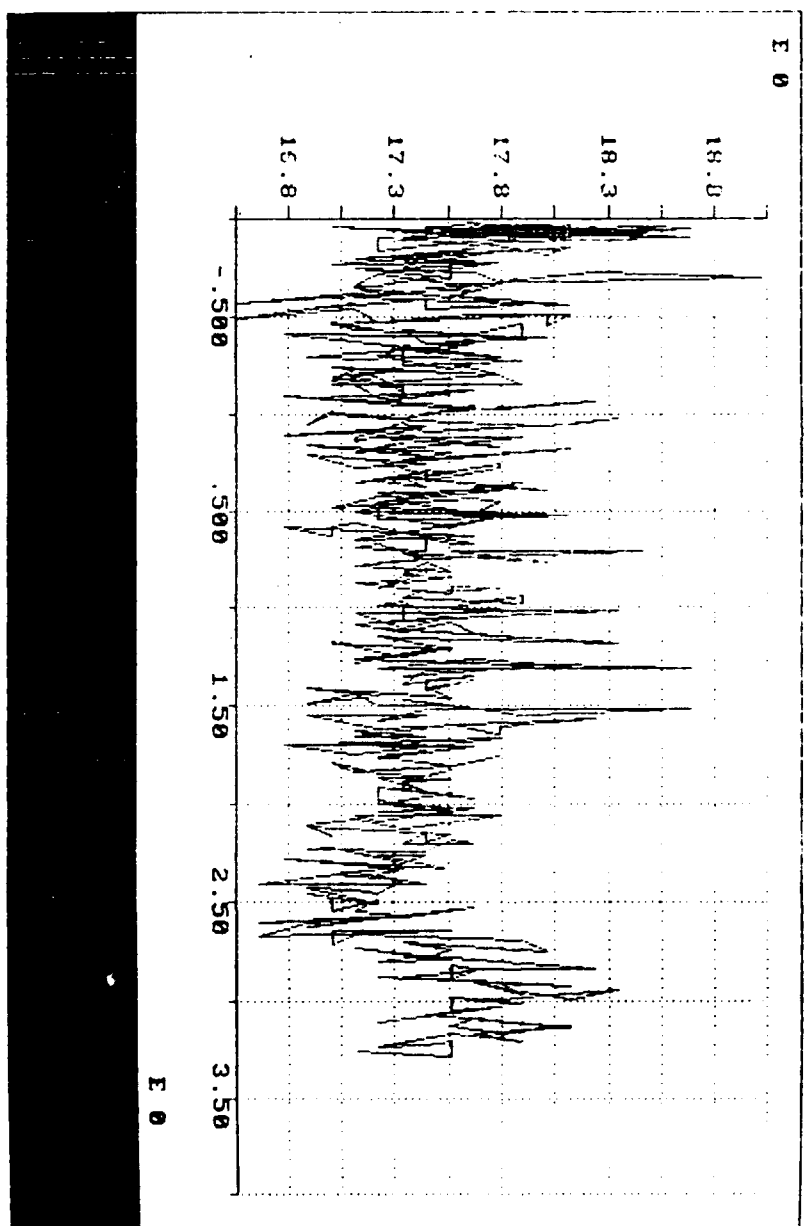
16. [REDACTED]

17. [REDACTED]

18. [REDACTED]

19. [REDACTED]

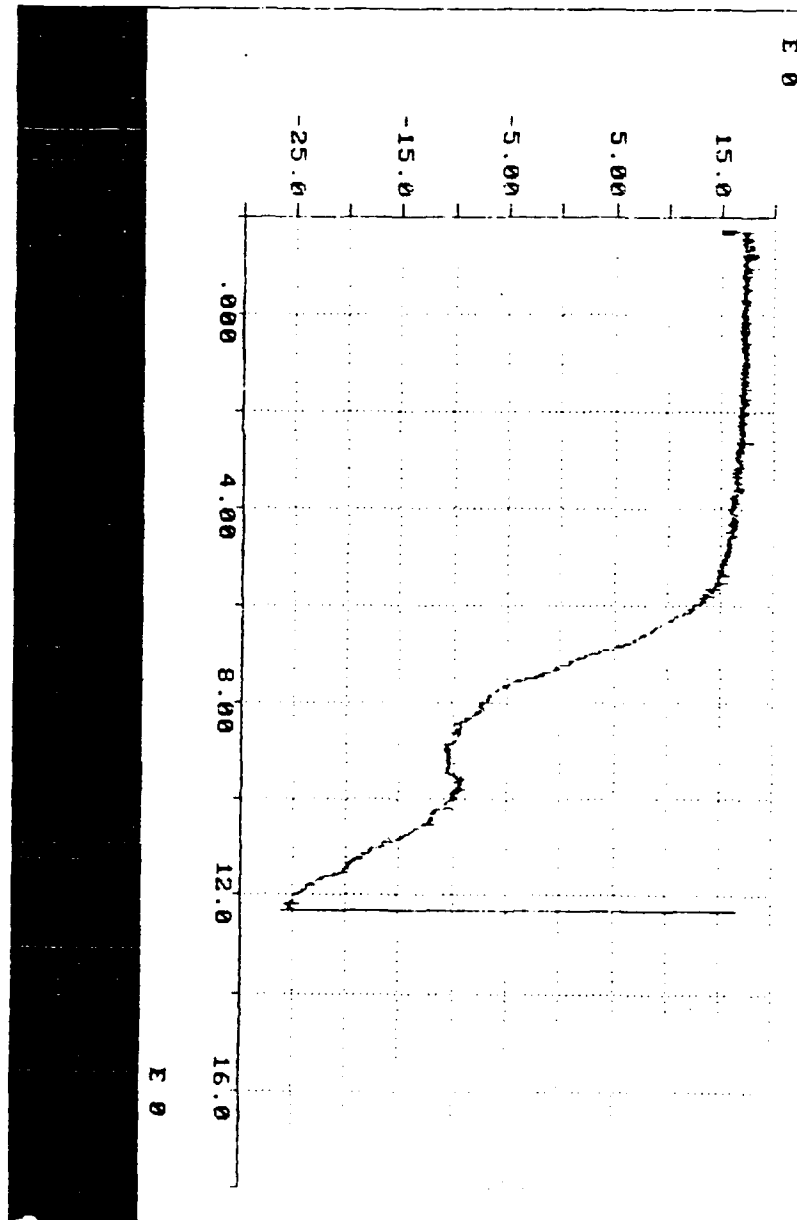
20. [REDACTED]



```

: *****
: File Name: 001.DAT
:
: 1.0 Variable (1.000000)
: Subfile:
: Row (0001):
: Start Column:
: # of Columns:
: Read/Write Append/Full:
: *****

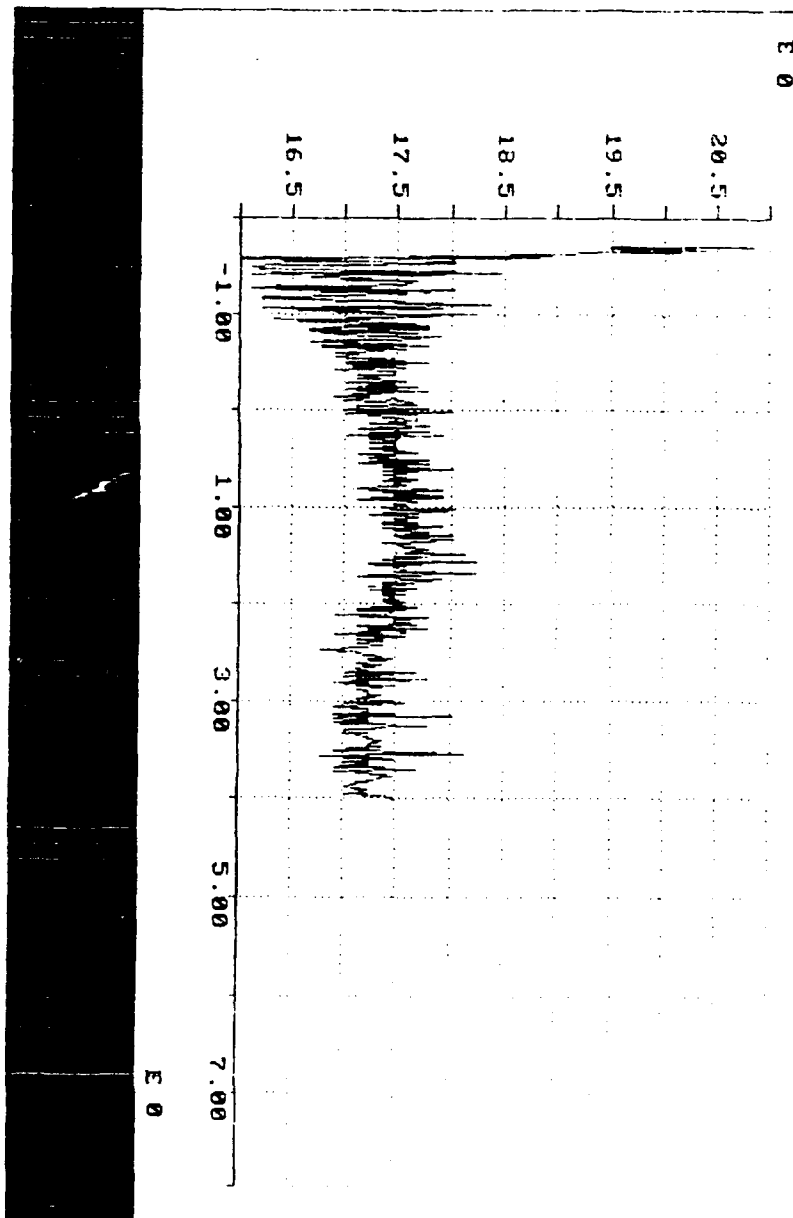
```

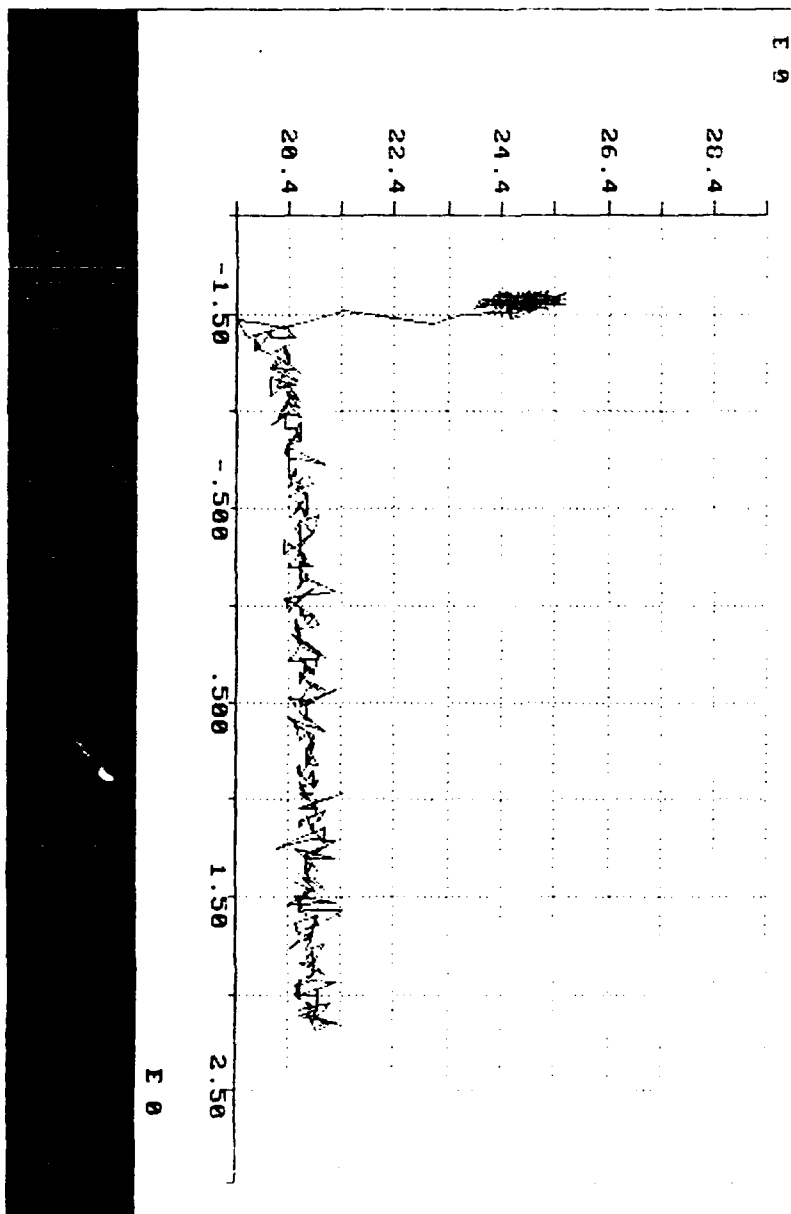


```

: *****
: File Name: C:\BPRM1.DAT
:
: R Comments
: *****
: 1 TWO STRIP UNWEIGHTED
:
:
:
:
:
: 170 Variable 1
:
:
: Stripfile:
: Row (0=All):
: Start Column: 1
: # of Columns: 254
:
: Read/Write/Append/Print/Plot/Quit/Help/Exit/
:
: *****

```





File Name: C:\PLOT\101

9 Comments

1 2X ICG CONTROLLED AT 10

2 NO VISIBLE THREATS

3 NO SHORE

4

5

6

7

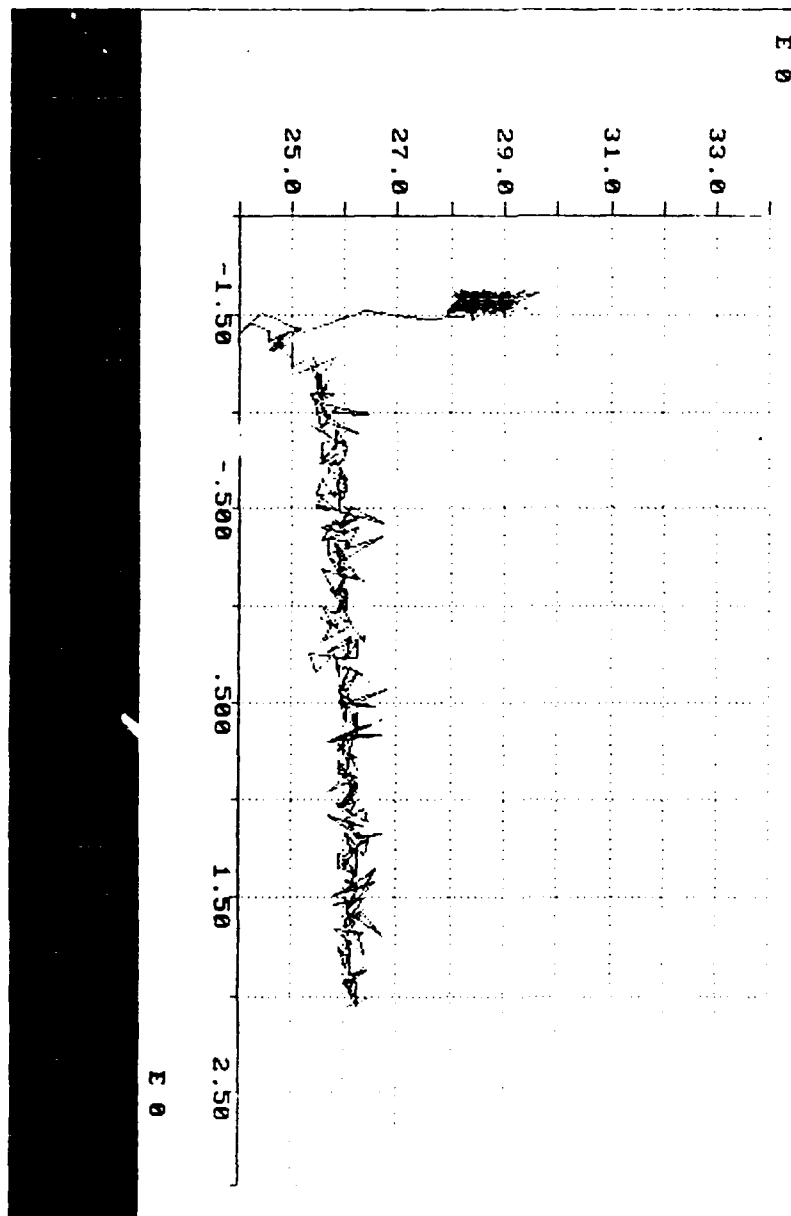
8

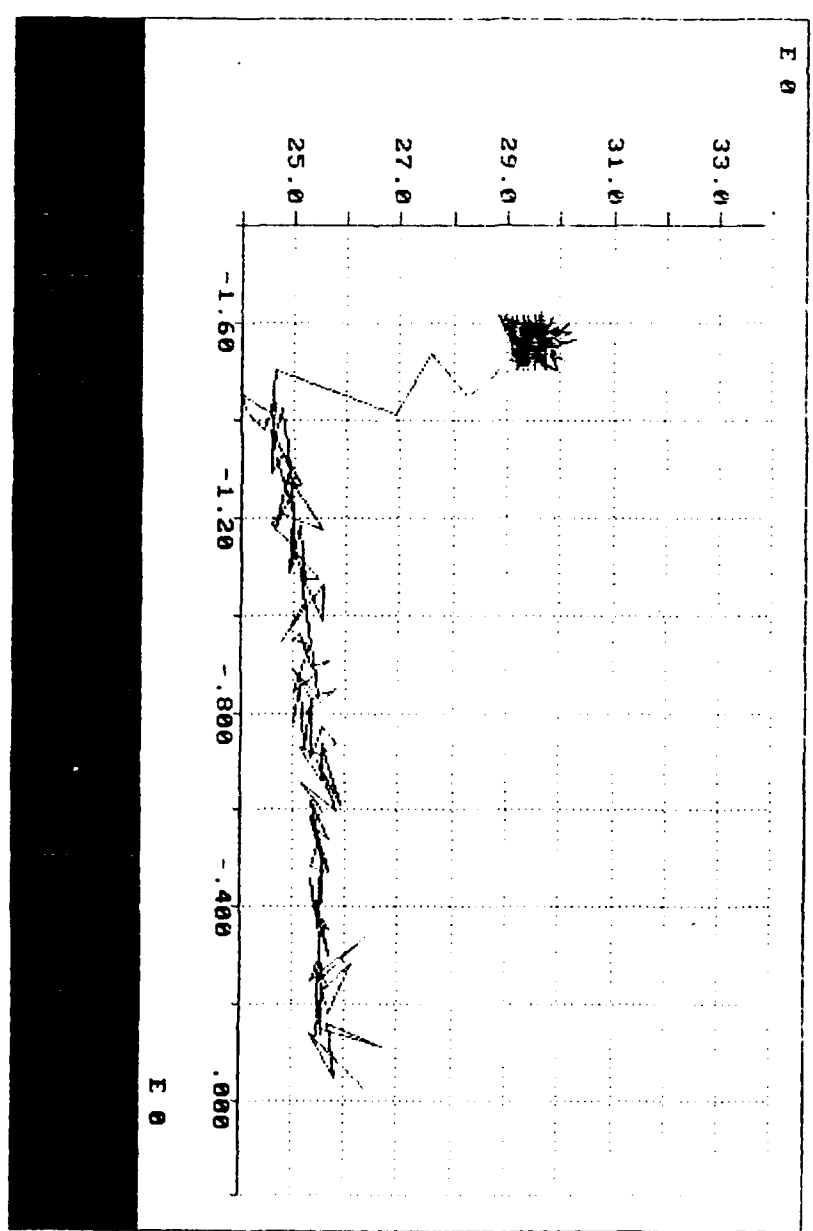
9

10

11

12



[illegible]

10/10/1998 10:00:00

10/10/1998 10:00:00

10/10/1998 10:00:00

10/10/1998 10:00:00

10/10/1998 10:00:00

10/10/1998

10/10/1998

10/10/1998

10/10/1998 10:00:00

10/10/1998 10:00:00

10/10/1998

10/10/1998

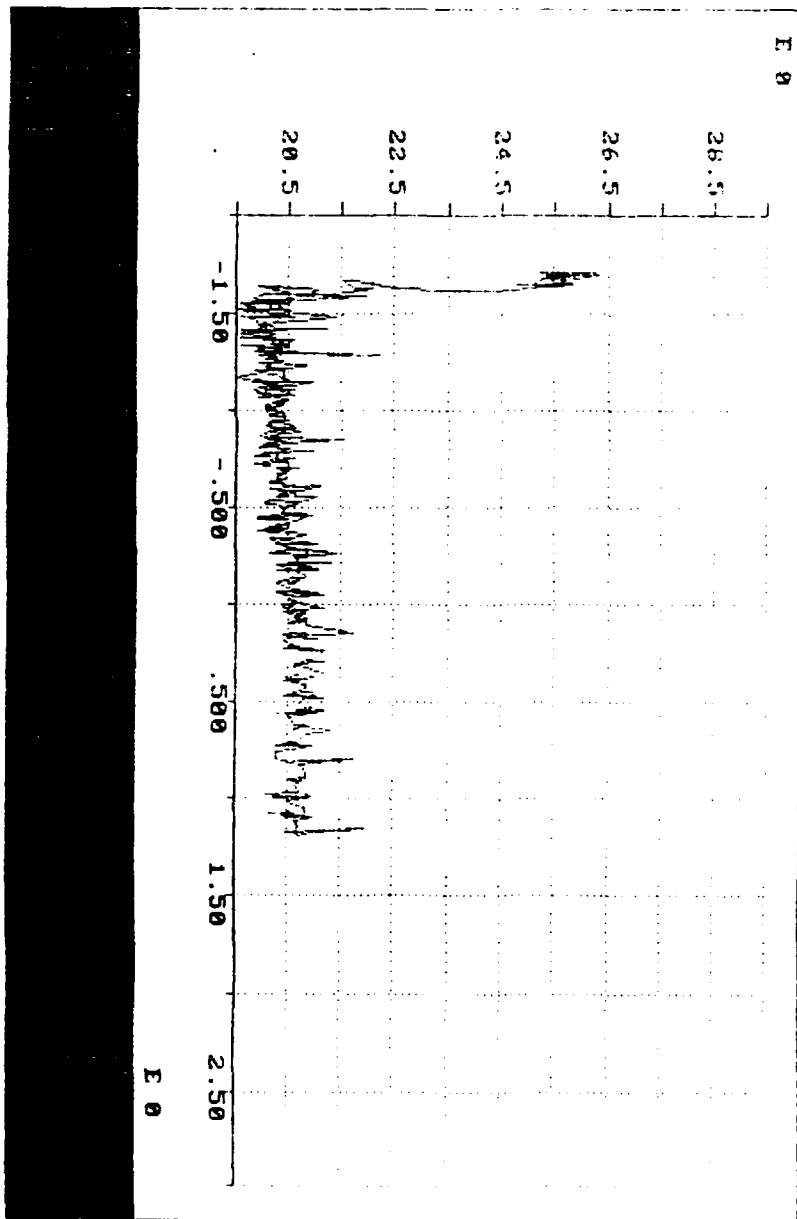
10/10/1998

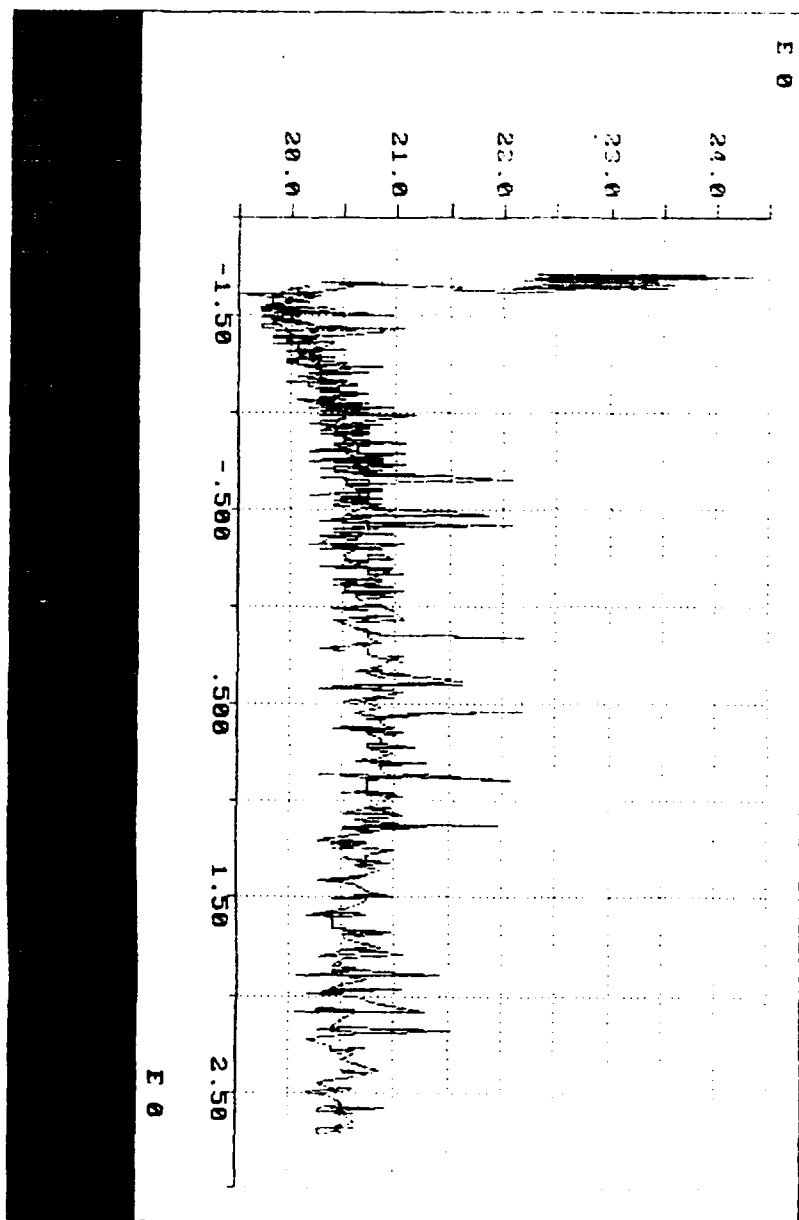
10/10/1998

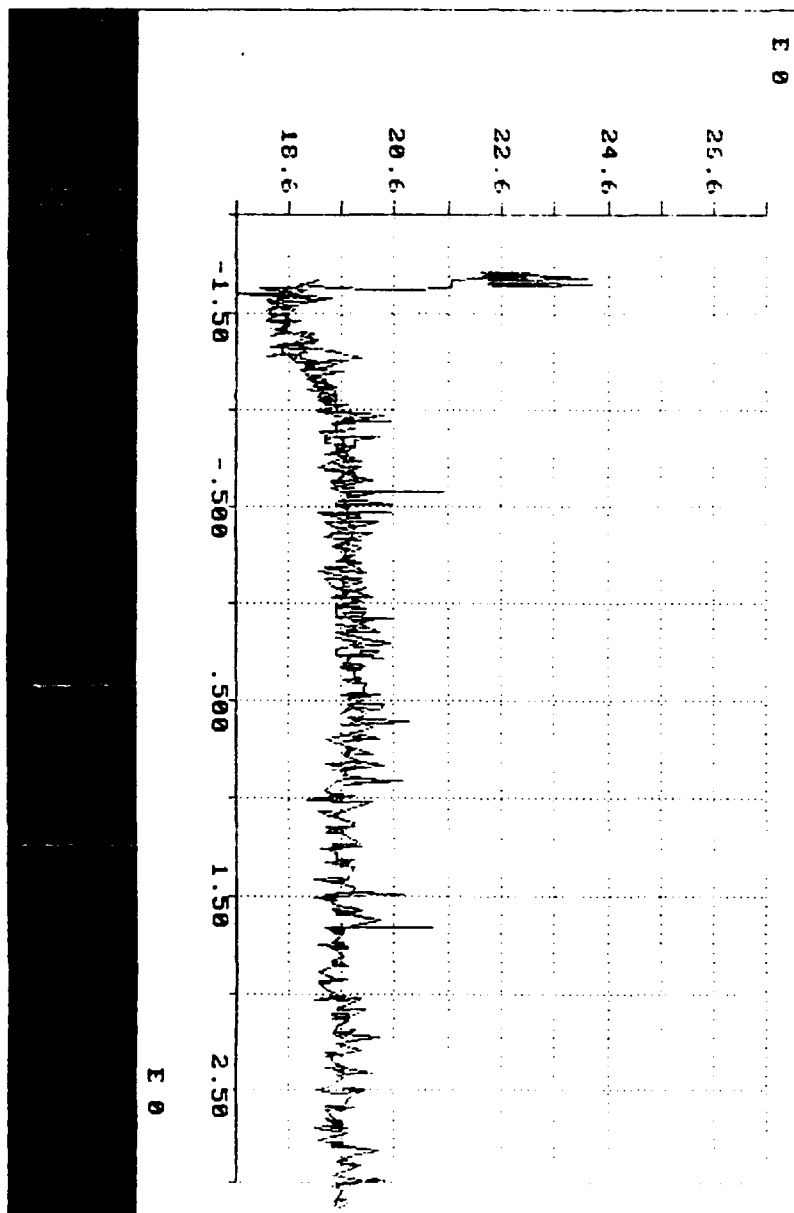
10/10/1998

10/10/1998

10/10/1998





[illegible]

No Name: 121 121

Comments

1. BLOOD ALONE CONTROL

2. BARELY PERCEPTIBLE

3. NO SHOW

4. NO SHOW

5. NO WILD

6. NO WILD

7. Variable

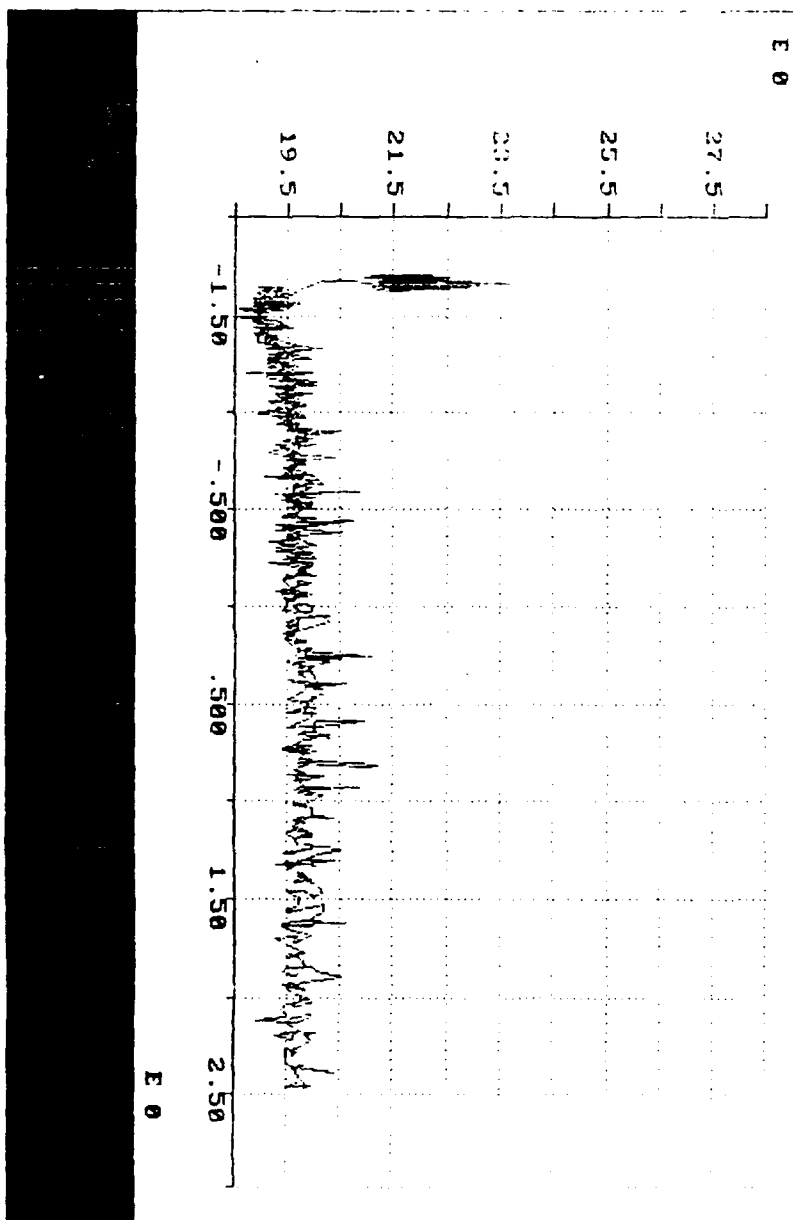
Subfile:

Row (total):

Start Column:

of Columns: 256

Read/Write/Append

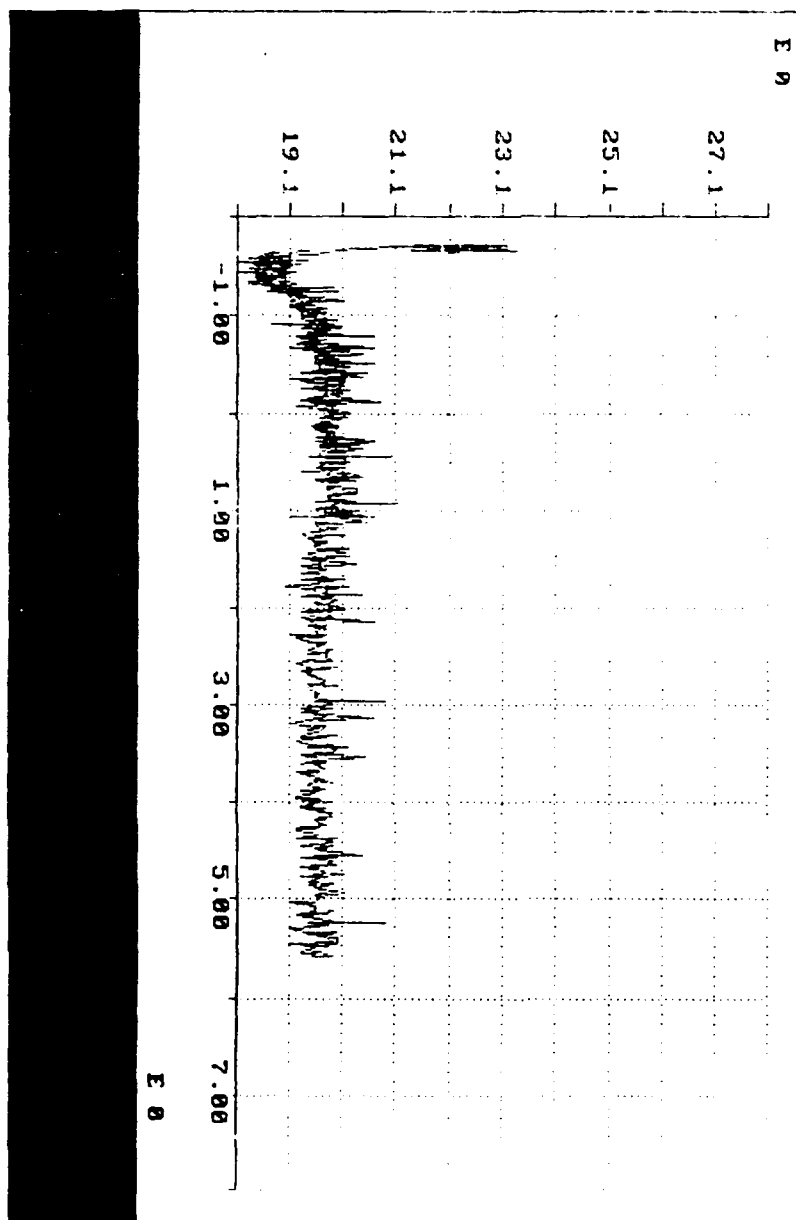


File Name: C:\STI\101115
Comments:
1. FLOOD ALONG SE
2. TOTAL EXPOSURE
3. IS ONLY VISIBLE
4. NO IDENTIFIED
NO SNIP

2. 30 WFLD
3.

Scanner:
Serial (WFLD):
+ Column:
of Columns: 10

Speed/White/Appendix: 100/100/100/100/100/100/100/100/100/100



File Name: 01010101

0 Comments

1. BLOOD ALONE 5000000000

File: 01010101

File: 01010101

File: 01010101

File: 01010101

File: 01010101

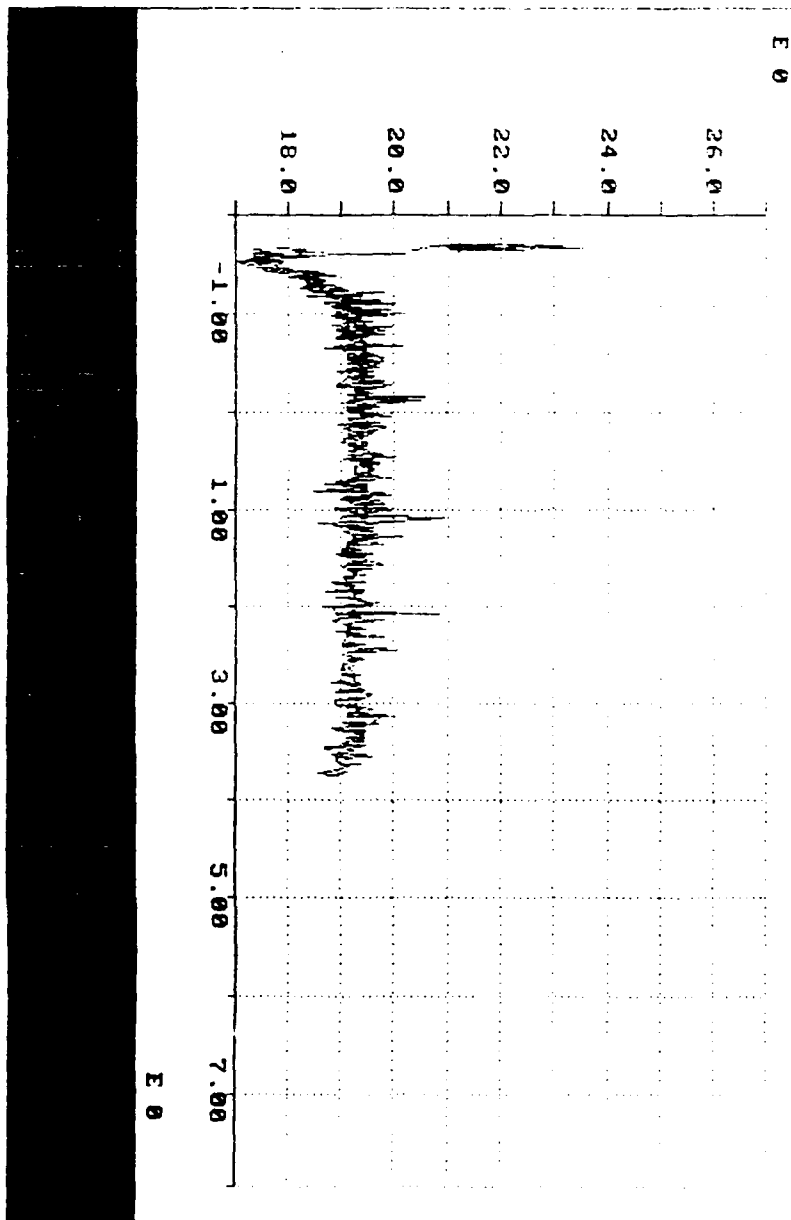
File: 01010101

File: 01010101

File: 01010101

File: 01010101

File: 01010101



Source: [illegible]

File Name: [illegible]

File Path: [illegible]

File Size: [illegible]

File Date: [illegible]

File Time: [illegible]

File Type: [illegible]

File Owner: [illegible]

File Group: [illegible]

File Access: [illegible]

File Status: [illegible]

File Content: [illegible]

File Location: [illegible]

File Name: [illegible]

File Path: [illegible]

File Size: [illegible]

File Date: [illegible]

File Time: [illegible]

File Type: [illegible]

File Owner: [illegible]

File Group: [illegible]

File Access: [illegible]

File Status: [illegible]

File Content: [illegible]

File Location: [illegible]

File Name: [illegible]

File Path: [illegible]

File Size: [illegible]

File Date: [illegible]

File Time: [illegible]

File Type: [illegible]

File Owner: [illegible]

File Group: [illegible]

File Access: [illegible]

File Status: [illegible]

File Content: [illegible]

File Location: [illegible]

File Name: [illegible]

File Path: [illegible]

File Size: [illegible]

File Date: [illegible]

File Time: [illegible]

File Type: [illegible]

File Owner: [illegible]

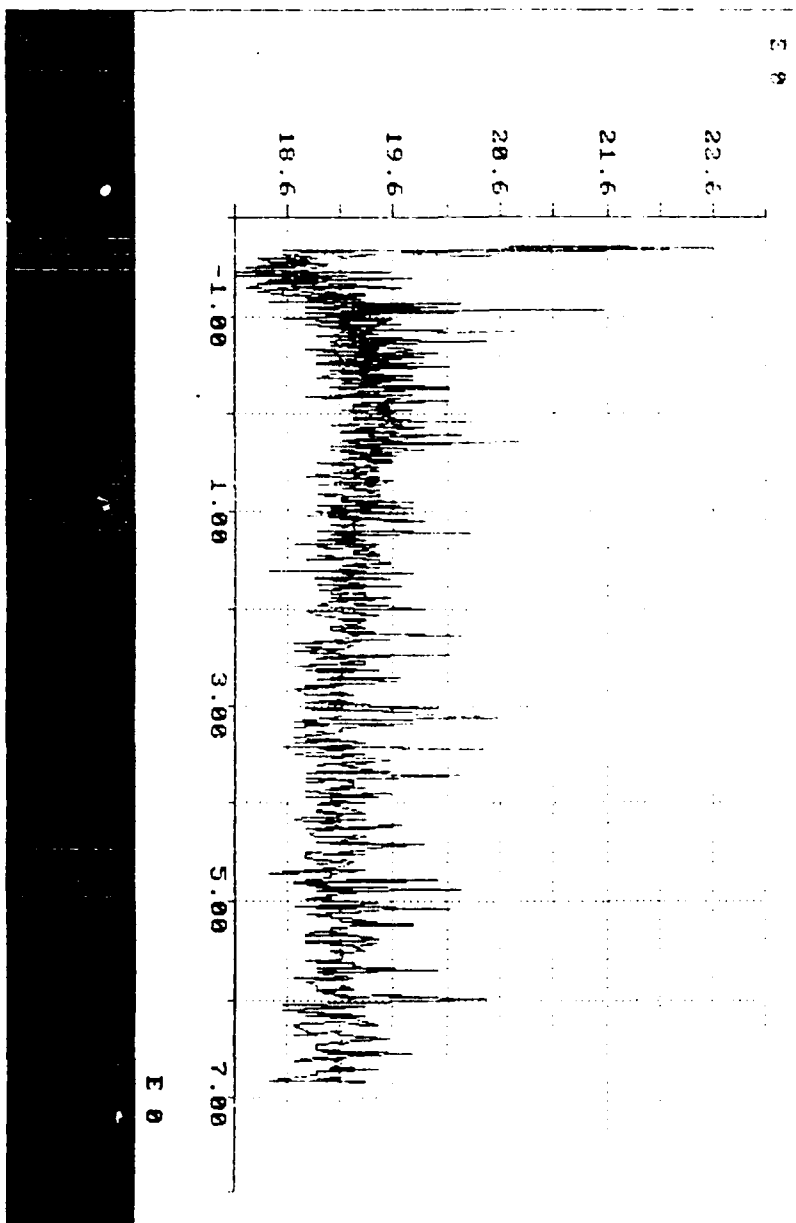
File Group: [illegible]

File Access: [illegible]

File Status: [illegible]

File Content: [illegible]

File Location: [illegible]



10-10-1964

10-10-1964

10-10-1964

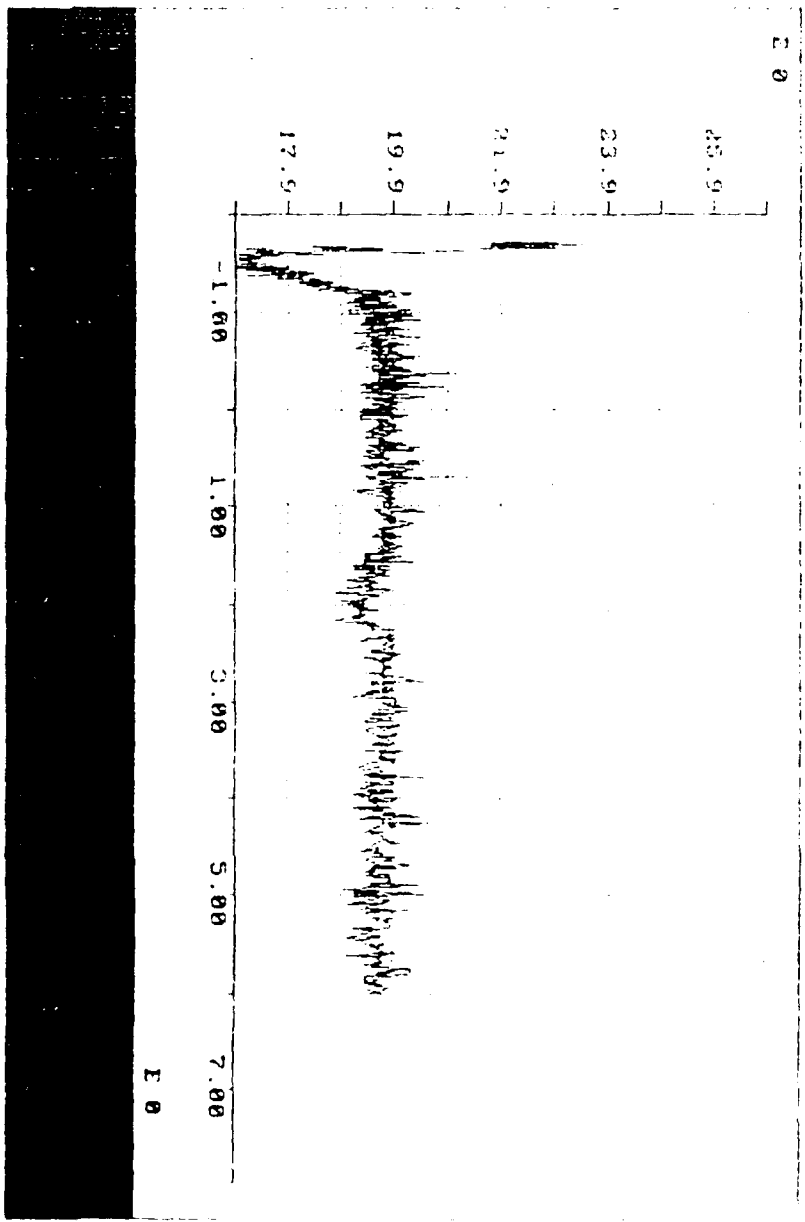
10-10-1964

10-10-1964

10-10-1964

10-10-1964

10-10-1964



1. TITLE: [Illegible]

2. DATE: [Illegible]

3. LOCATION: [Illegible]

4. PROJECT: [Illegible]

5. DRAWING NO.: [Illegible]

6. SCALE: [Illegible]

7. [Illegible]

8. [Illegible]

9. [Illegible]

10. [Illegible]

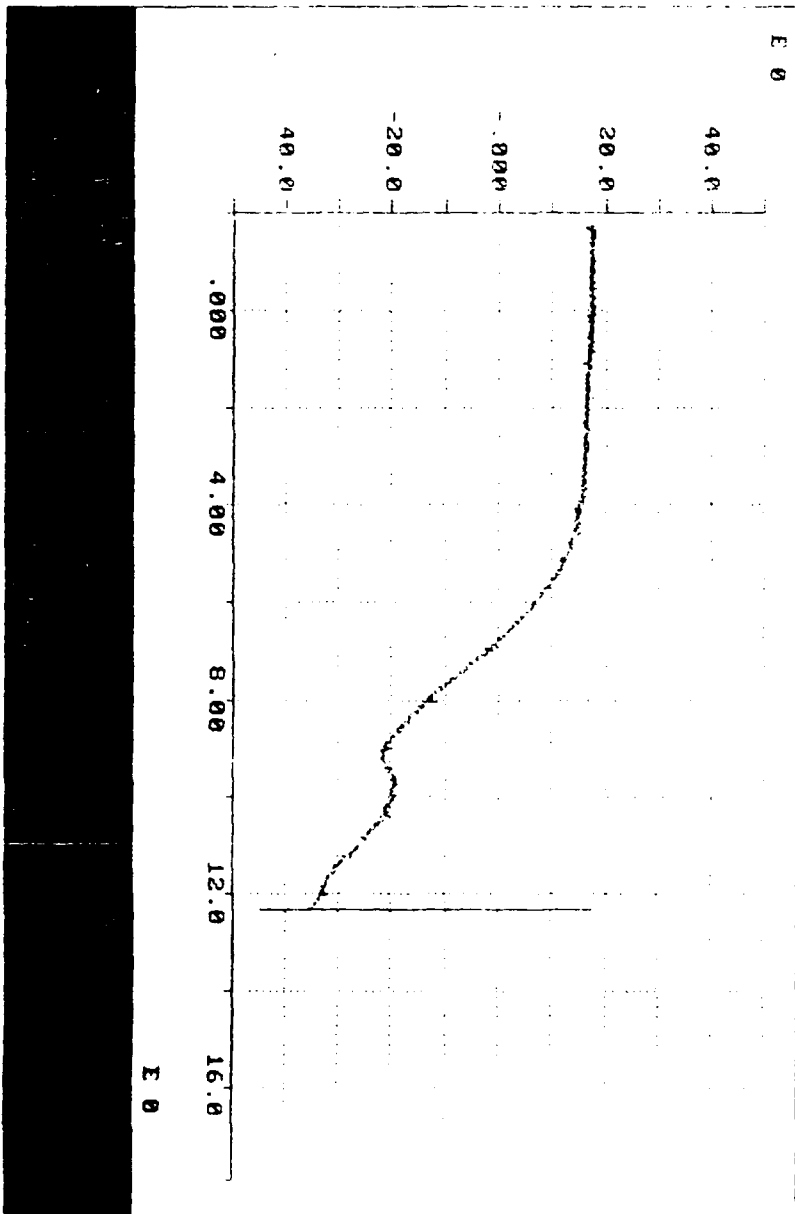
11. [Illegible]

12. [Illegible]

13. [Illegible]

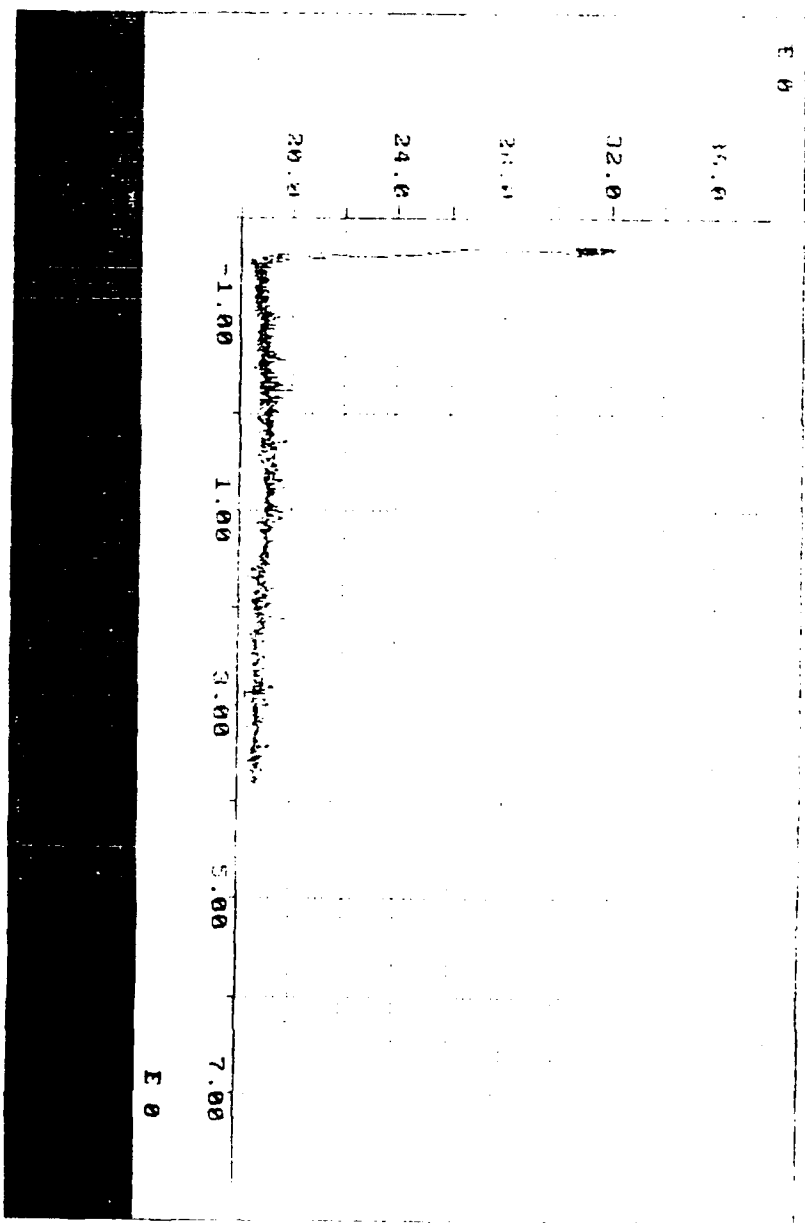
14. [Illegible]

15. [Illegible]



1. 1970-1971 1972-1973 1974-1975 1976-1977 1978-1979 1980-1981 1982-1983 1984-1985 1986-1987 1988-1989 1990-1991 1992-1993 1994-1995 1996-1997 1998-1999 2000-2001 2002-2003 2004-2005 2006-2007 2008-2009 2010-2011 2012-2013 2014-2015 2016-2017 2018-2019 2020-2021 2022-2023 2024-2025 2026-2027 2028-2029 2030-2031 2032-2033 2034-2035 2036-2037 2038-2039 2040-2041 2042-2043 2044-2045 2046-2047 2048-2049 2050-2051 2052-2053 2054-2055 2056-2057 2058-2059 2060-2061 2062-2063 2064-2065 2066-2067 2068-2069 2070-2071 2072-2073 2074-2075 2076-2077 2078-2079 2080-2081 2082-2083 2084-2085 2086-2087 2088-2089 2090-2091 2092-2093 2094-2095 2096-2097 2098-2099 2100-2101 2102-2103 2104-2105 2106-2107 2108-2109 2110-2111 2112-2113 2114-2115 2116-2117 2118-2119 2120-2121 2122-2123 2124-2125 2126-2127 2128-2129 2130-2131 2132-2133 2134-2135 2136-2137 2138-2139 2140-2141 2142-2143 2144-2145 2146-2147 2148-2149 2150-2151 2152-2153 2154-2155 2156-2157 2158-2159 2160-2161 2162-2163 2164-2165 2166-2167 2168-2169 2170-2171 2172-2173 2174-2175 2176-2177 2178-2179 2180-2181 2182-2183 2184-2185 2186-2187 2188-2189 2190-2191 2192-2193 2194-2195 2196-2197 2198-2199 2200-2201 2202-2203 2204-2205 2206-2207 2208-2209 2210-2211 2212-2213 2214-2215 2216-2217 2218-2219 2220-2221 2222-2223 2224-2225 2226-2227 2228-2229 2230-2231 2232-2233 2234-2235 2236-2237 2238-2239 2240-2241 2242-2243 2244-2245 2246-2247 2248-2249 2250-2251 2252-2253 2254-2255 2256-2257 2258-2259 2260-2261 2262-2263 2264-2265 2266-2267 2268-2269 2270-2271 2272-2273 2274-2275 2276-2277 2278-2279 2280-2281 2282-2283 2284-2285 2286-2287 2288-2289 2290-2291 2292-2293 2294-2295 2296-2297 2298-2299 2300-2301 2302-2303 2304-2305 2306-2307 2308-2309 2310-2311 2312-2313 2314-2315 2316-2317 2318-2319 2320-2321 2322-2323 2324-2325 2326-2327 2328-2329 2330-2331 2332-2333 2334-2335 2336-2337 2338-2339 2340-2341 2342-2343 2344-2345 2346-2347 2348-2349 2350-2351 2352-2353 2354-2355 2356-2357 2358-2359 2360-2361 2362-2363 2364-2365 2366-2367 2368-2369 2370-2371 2372-2373 2374-2375 2376-2377 2378-2379 2380-2381 2382-2383 2384-2385 2386-2387 2388-2389 2390-2391 2392-2393 2394-2395 2396-2397 2398-2399 2400-2401 2402-2403 2404-2405 2406-2407 2408-2409 2410-2411 2412-2413 2414-2415 2416-2417 2418-2419 2420-2421 2422-2423 2424-2425 2426-2427 2428-2429 2430-2431 2432-2433 2434-2435 2436-2437 2438-2439 2440-2441 2442-2443 2444-2445 2446-2447 2448-2449 2450-2451 2452-2453 2454-2455 2456-2457 2458-2459 2460-2461 2462-2463 2464-2465 2466-2467 2468-2469 2470-2471 2472-2473 2474-2475 2476-2477 2478-2479 2480-2481 2482-2483 2484-2485 2486-2487 2488-2489 2490-2491 2492-2493 2494-2495 2496-2497 2498-2499 2500-2501 2502-2503 2504-2505 2506-2507 2508-2509 2510-2511 2512-2513 2514-2515

115



1. The first part of the report is a summary of the work done during the year. It includes a list of the projects completed, a description of the work done on each project, and a summary of the results of the work.

2. The second part of the report is a detailed description of the work done on each project. It includes a list of the tasks completed, a description of the work done on each task, and a summary of the results of the work.

3. The third part of the report is a summary of the work done during the year. It includes a list of the projects completed, a description of the work done on each project, and a summary of the results of the work.

4. The fourth part of the report is a detailed description of the work done on each project. It includes a list of the tasks completed, a description of the work done on each task, and a summary of the results of the work.

5. The fifth part of the report is a summary of the work done during the year. It includes a list of the projects completed, a description of the work done on each project, and a summary of the results of the work.

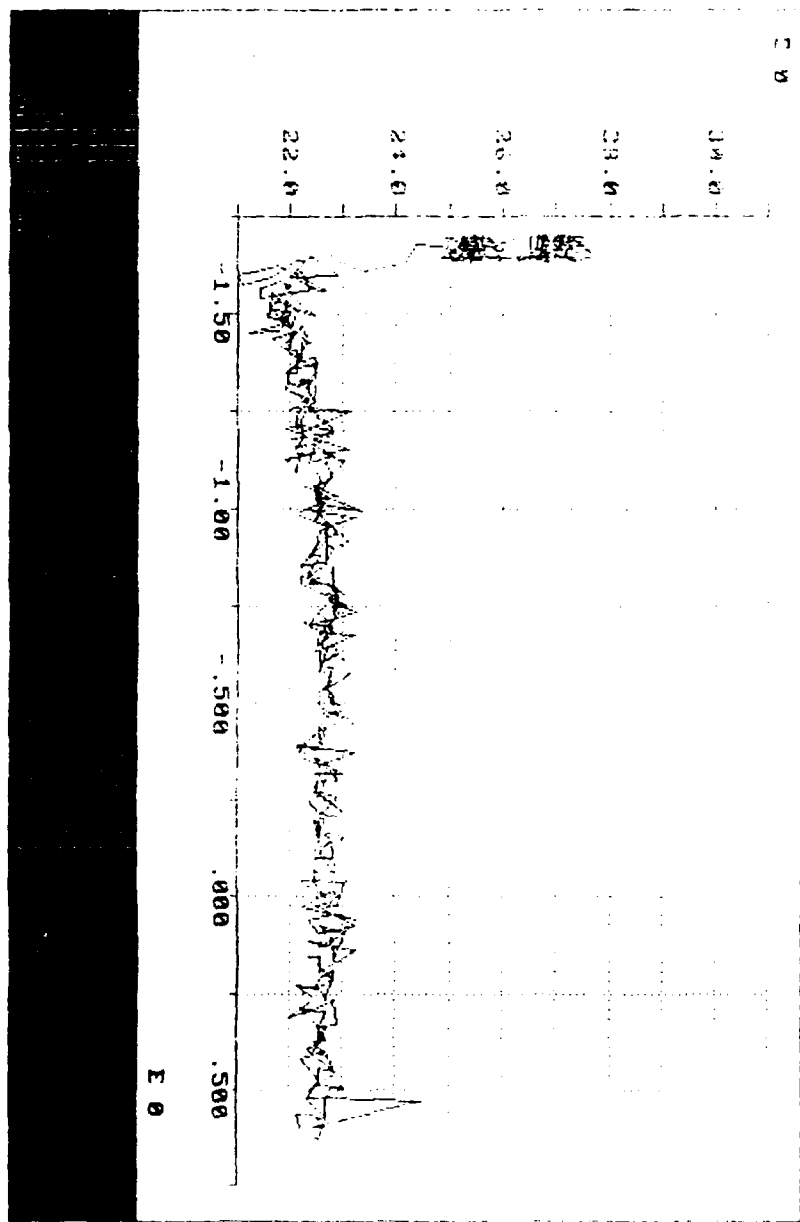
6. The sixth part of the report is a detailed description of the work done on each project. It includes a list of the tasks completed, a description of the work done on each task, and a summary of the results of the work.

7. The seventh part of the report is a summary of the work done during the year. It includes a list of the projects completed, a description of the work done on each project, and a summary of the results of the work.

8. The eighth part of the report is a detailed description of the work done on each project. It includes a list of the tasks completed, a description of the work done on each task, and a summary of the results of the work.

9. The ninth part of the report is a summary of the work done during the year. It includes a list of the projects completed, a description of the work done on each project, and a summary of the results of the work.

10. The tenth part of the report is a detailed description of the work done on each project. It includes a list of the tasks completed, a description of the work done on each task, and a summary of the results of the work.

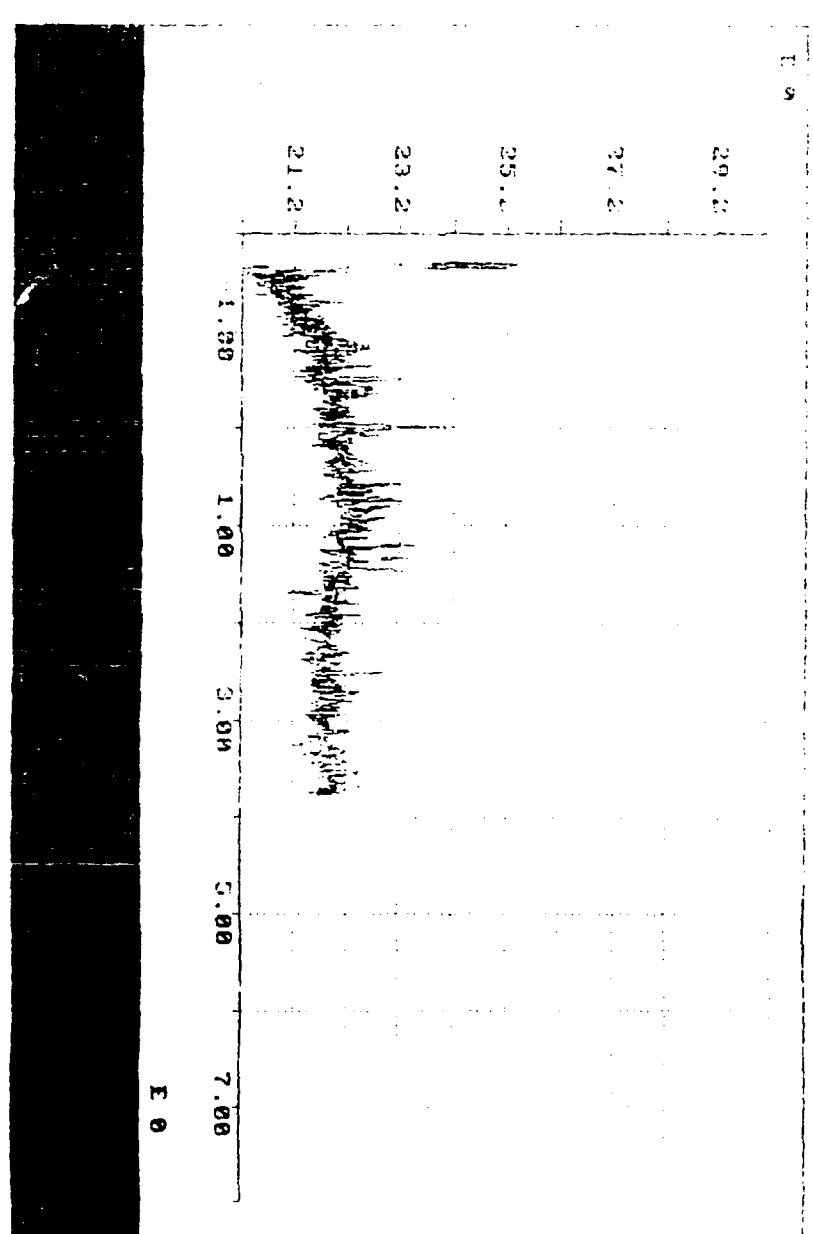


1. Title
 2. Author
 3. Subject
 4. Date

5. Summary
 6. Notes

7. References
 8. Index

9. Appendix
 10. Bibliography



1. 100% 100% 100%

2. 100% 100% 100%

3. 100% 100% 100%

4. 100% 100% 100%

5. 100% 100% 100%

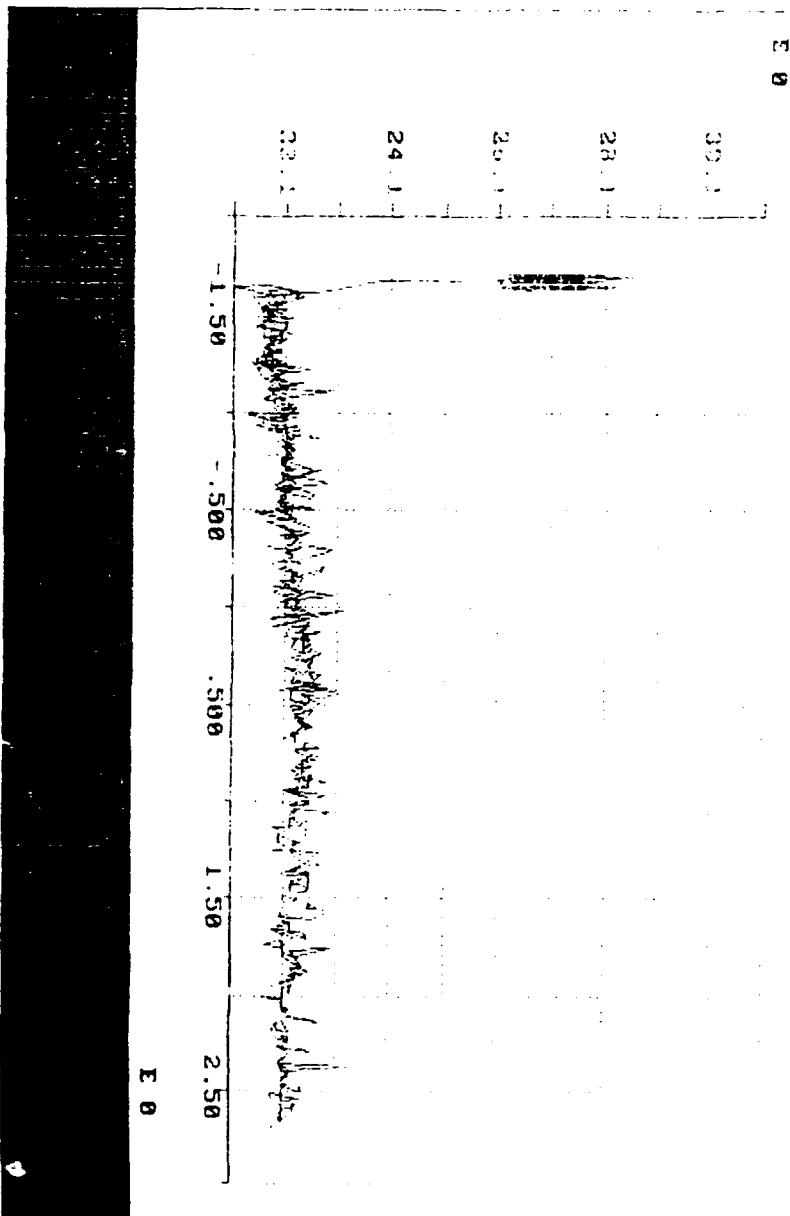
6. 100% 100% 100%

7. 100% 100% 100%

8. 100% 100% 100%

9. 100% 100% 100%

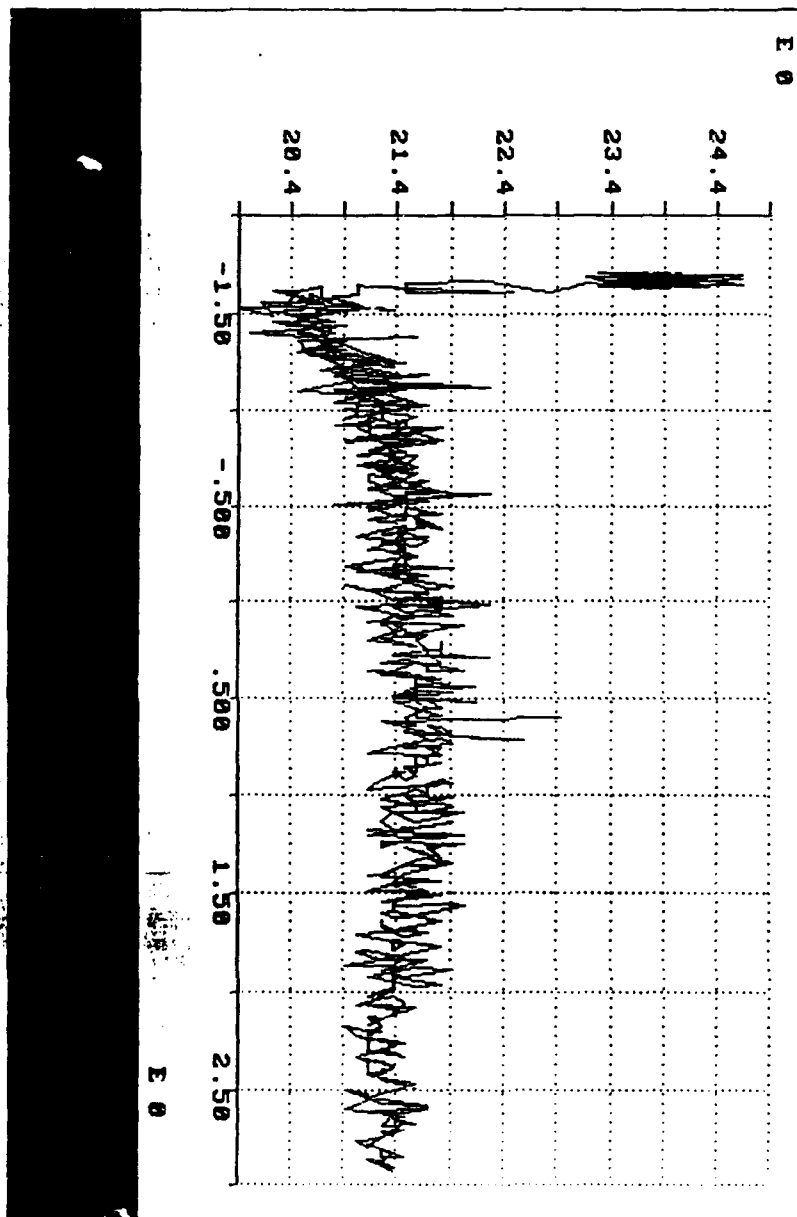
10. 100% 100% 100%

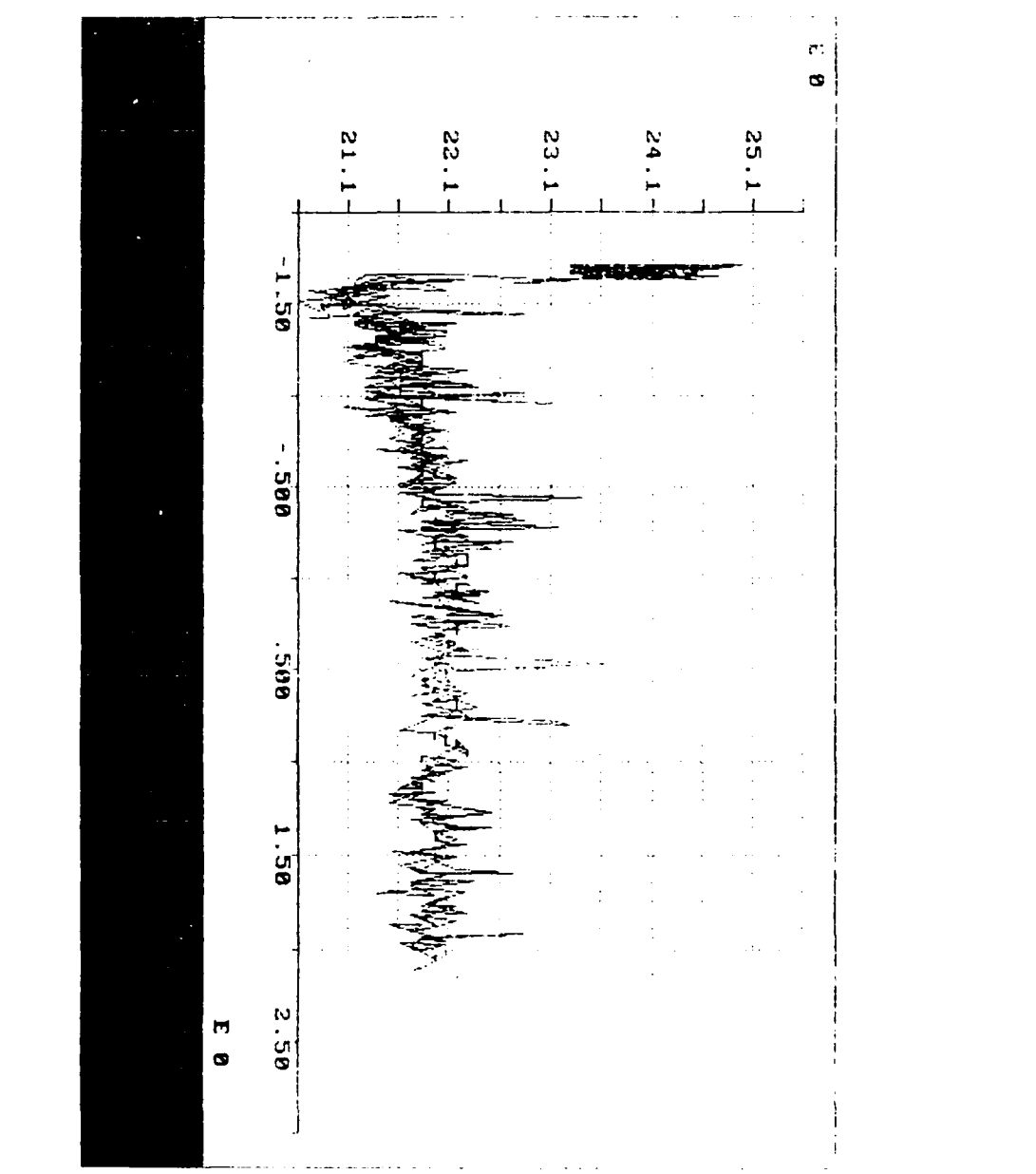


```

##### File Input/Output #####
:
:   File Name: <C:\SEF18AE.USR>                               Quit/Continue: *
:
:   8 Comments                                                    Subfiles (Total #: 3)
#####
: 1> BLOOD SET=80 TC MAX=40                                     : Start#      Shape      #Repts :
: 2> TOTAL EXPOSURE =30 S                                       :      1        2 x 256      3   :
: 3> NO VISIBLE CHANGES                                         :                                     :
: 4> NO SMOKE                                                    :                                     :
: 5>                                                              :                                     :
: 6> NO WELD                                                      :                                     :
: 7>                                                              :                                     :
: 8>                                                              :                                     :
#####
: I/O Variable ( R - Z ):                                     1024 REAL
:
: Subfile:      < 1 >                                     2 x 256 (Max Length: 768 )
: Row (0=all): < 0 >
: Start Column: < 1 >
: # of Columns: < 256 >
:
: Read/Write/Append/Scroll/Plot/Edit/List/New file/Quit: *
:
#####

```





1. Subprogram: PLOT (Plotting) - This subprogram is used to plot the data from the file.

2. File Name: PLOT.DAT - This is the name of the file to be plotted.

3. Comments:

4. The following data was plotted from the file PLOT.DAT:

- 1. ONE STRIP UNW LMS (1000000)
- 2. BROKE AT THE END OF THE STRIP

5. The following data was plotted from the file PLOT.DAT:

6. The following data was plotted from the file PLOT.DAT:

7. The following data was plotted from the file PLOT.DAT:

8. The following data was plotted from the file PLOT.DAT:

9. The following data was plotted from the file PLOT.DAT:

10. The following data was plotted from the file PLOT.DAT:

11. The following data was plotted from the file PLOT.DAT:

12. The following data was plotted from the file PLOT.DAT:

13. The following data was plotted from the file PLOT.DAT:

14. The following data was plotted from the file PLOT.DAT:

15. The following data was plotted from the file PLOT.DAT:

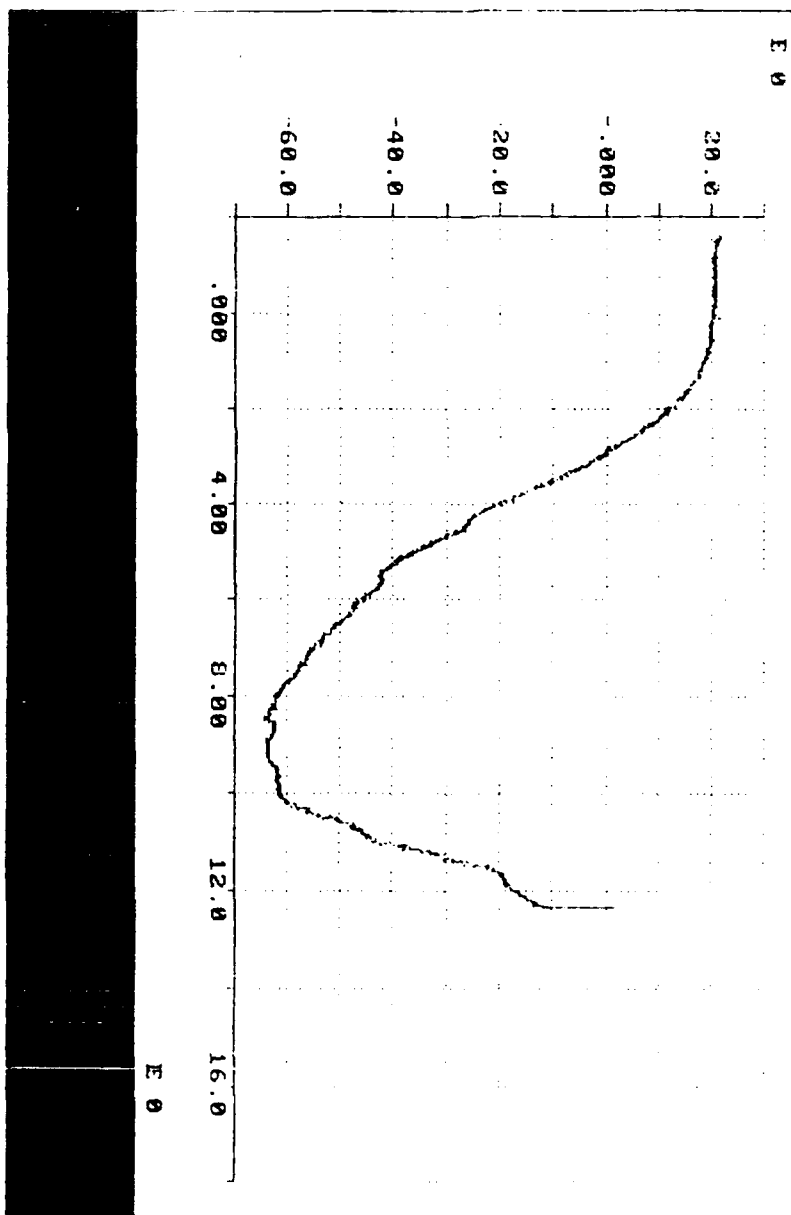
16. The following data was plotted from the file PLOT.DAT:

17. The following data was plotted from the file PLOT.DAT:

18. The following data was plotted from the file PLOT.DAT:

19. The following data was plotted from the file PLOT.DAT:

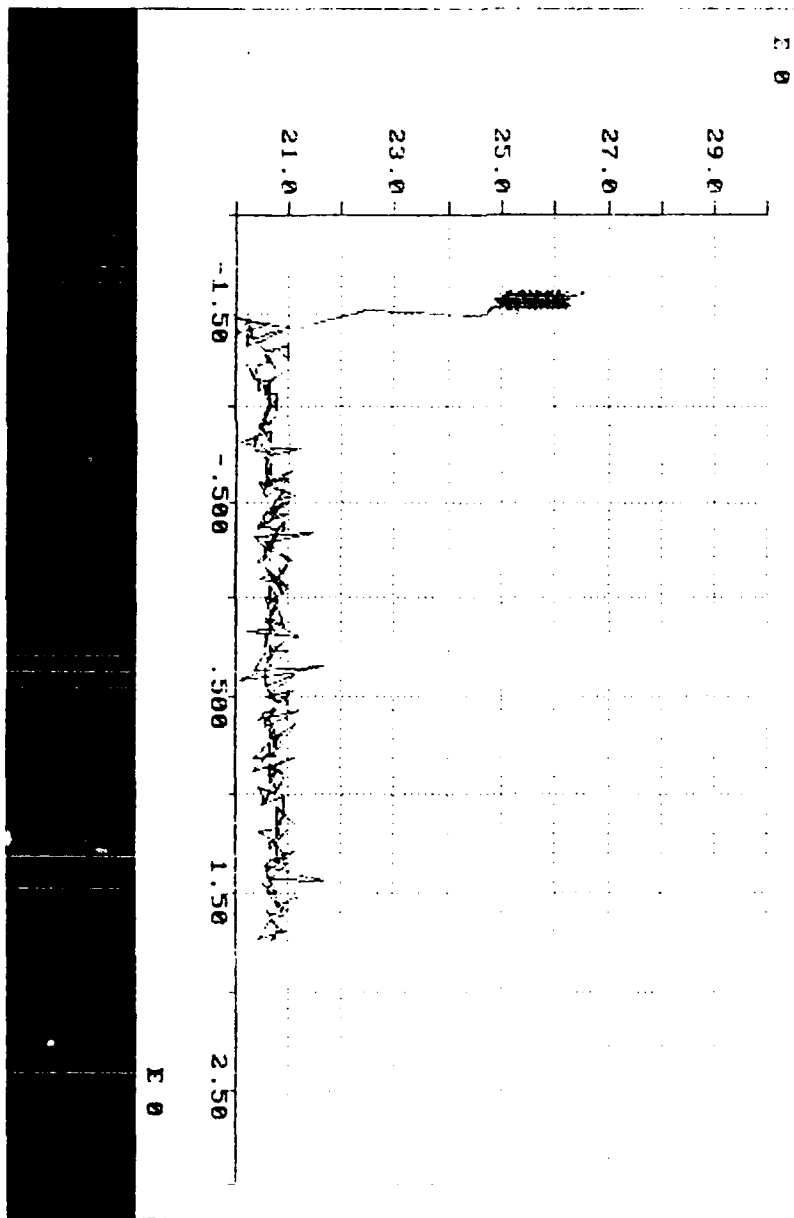
20. The following data was plotted from the file PLOT.DAT:



```

File Name: C:\SE-1.1
...
1. NO Error (low level)
...
1.0 Variable (1)
...
Subfile: 1
Low (up all): 0
Start Column: 1
# of Columns: 255
Lead Write/Append File: 1

```



File Name: 02111001

Comments:

IO Variable: 0

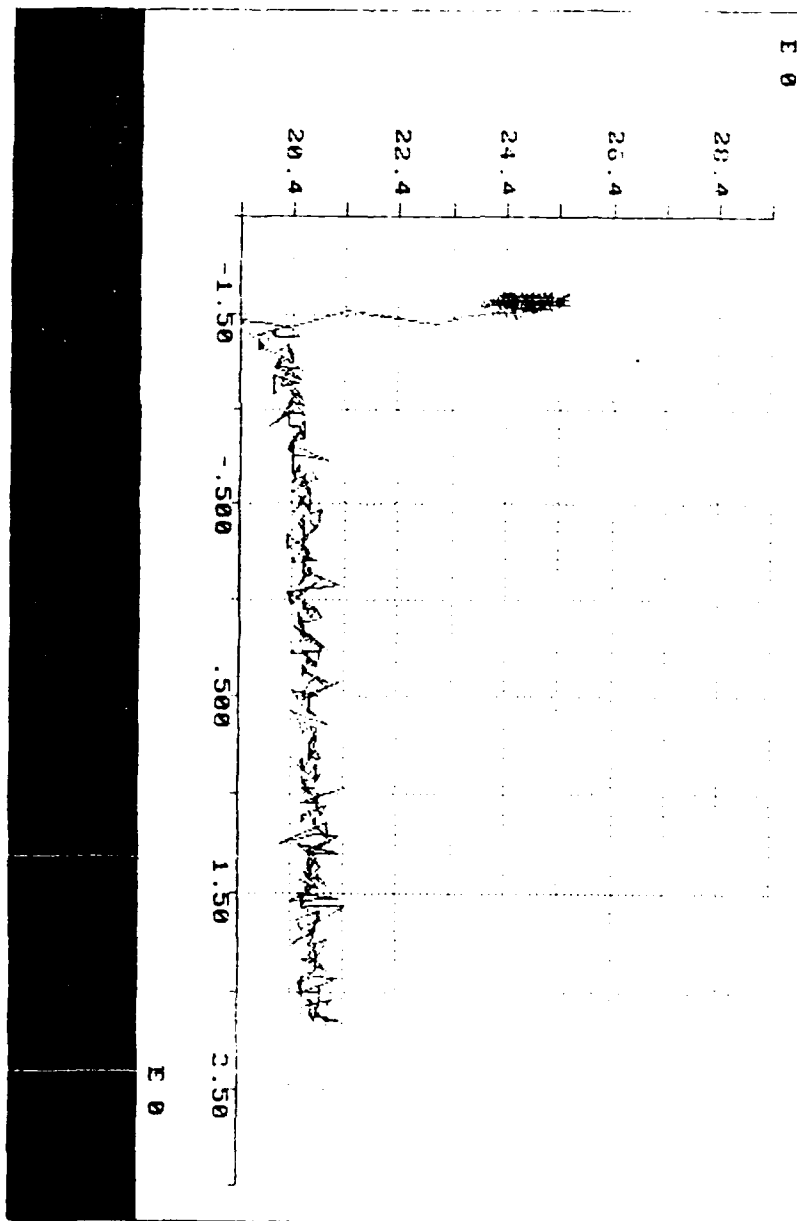
Subfile:

Row (total): 0

Start Column: 1

of Columns: 256

Read/Write/Append/Scroll/Print/Exit/Quit/Help/Menu:



File Name: 1000000

Comments:

1000000 (Output)

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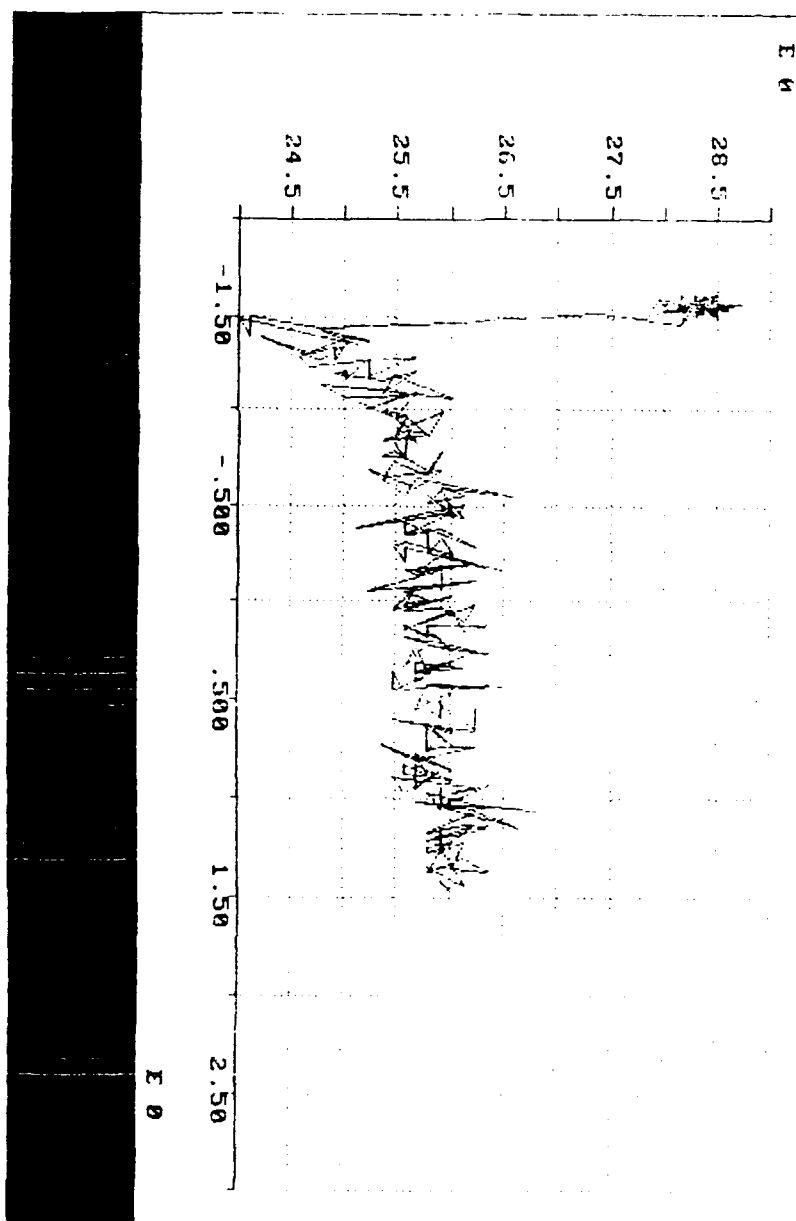
1000000 (Output)

1000000 (Output)

1000000 (Output)

1000000 (Output)

1000000 (Output)



File Name: C:\PLOT\101

Plot

Plot Title: CUS

Plot Type: LINE

Plot ID: 101

Plot Variable: CUS

Plot Date: 10/1/80

Plot Time: 10:00

Plot Title: CUS

Plot Type: LINE

Plot ID: 101

Plot Variable: CUS

Plot Date: 10/1/80

Plot Time: 10:00

Plot Title: CUS

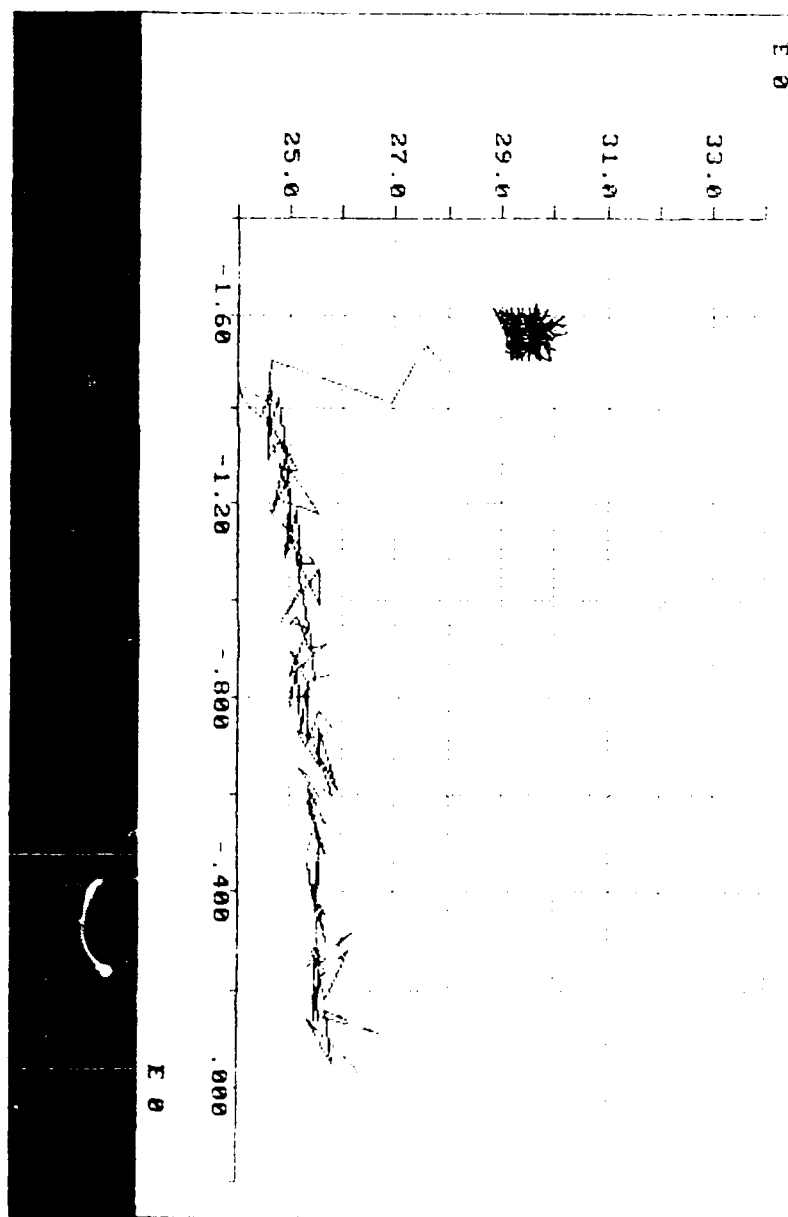
Plot Type: LINE

Plot ID: 101

Plot Variable: CUS

Plot Date: 10/1/80

Plot Time: 10:00



File Name: C:\13100

Device:

1. 100.0X SEI

2. NO VISUAL

3. NO SEI

4. SEI

1. 100.0X SEI

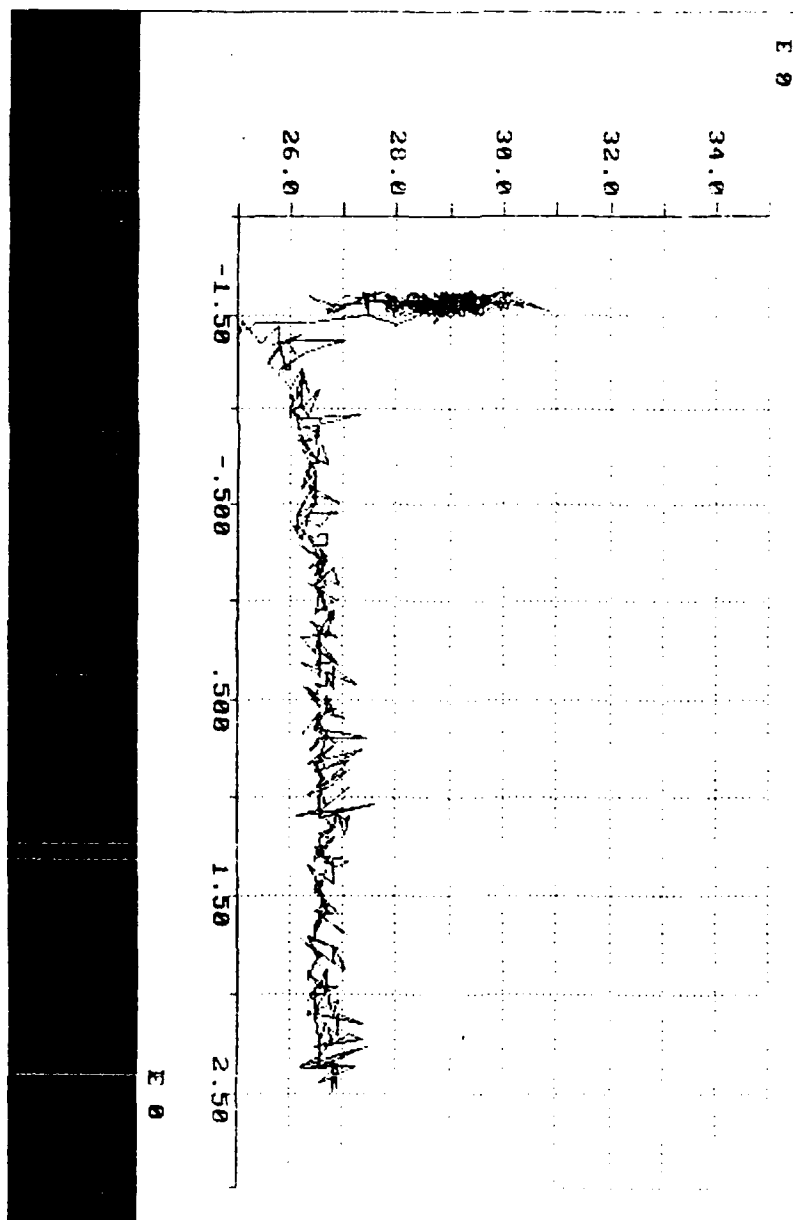
2. SEI

3. SEI

4. SEI

5. SEI

Read/Write/Append/Save/Exit/Quit/Help/About/...



File Name: 010011

Comments

1. ICG CY SE (100) 1000

2. 100 VISIBLE

3. 1000

4. 1000

5. 1000

6. 1000

7. 1000

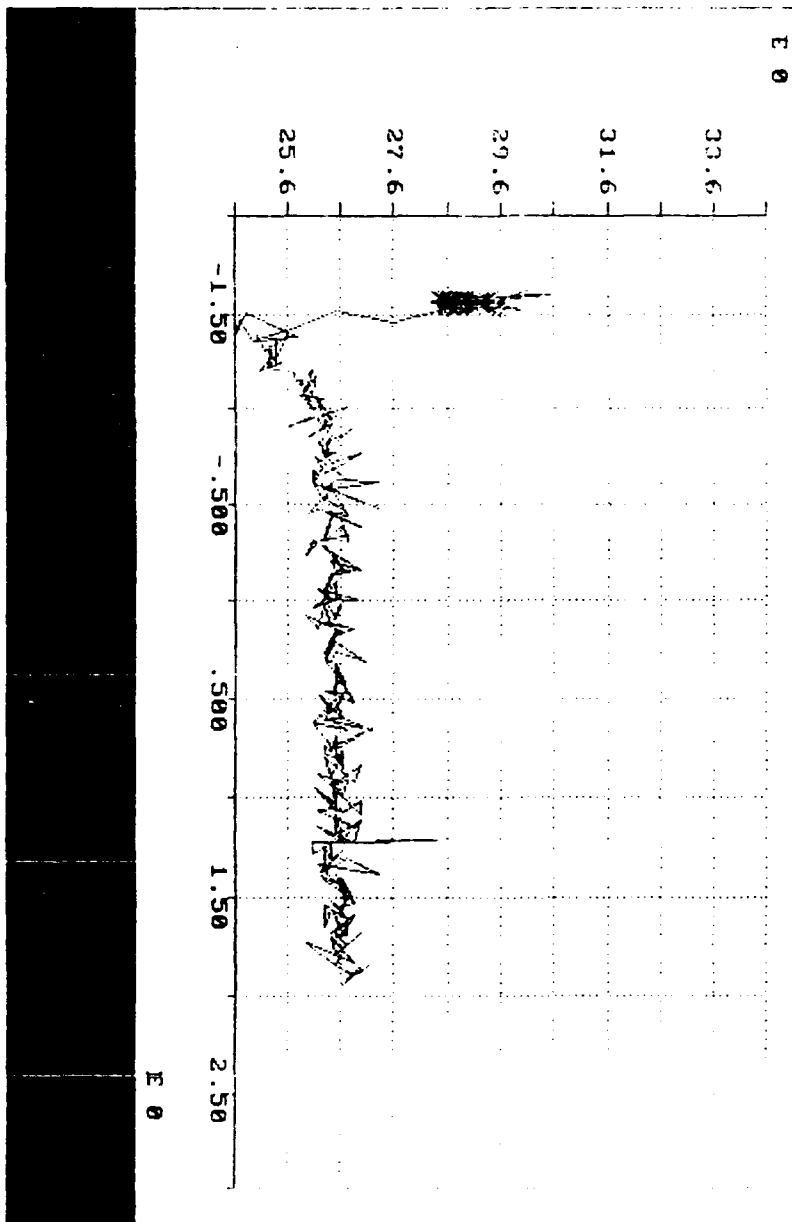
8. 1000

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12. 1000



XXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXX

1. Date: 10/10/68

2. Location:

3. Name of Project:

4. Name of Client:

5. Name of Contractor:

6. Name of Engineer:

7. Name of Designer:

8. Name of Checker:

9. Name of Approver:

10. Name of Reviewer:

11. Name of Auditor:

12. Name of Approver:

13. Name of Reviewer:

14. Name of Auditor:

15. Name of Approver:

16. Name of Reviewer:

17. Name of Auditor:

18. Name of Approver:

19. Name of Reviewer:

20. Name of Auditor:

21. Name of Approver:

22. Name of Reviewer:

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73. Name of Reviewer:

74. Name of Auditor:

75. Name of Approver:

76. Name of Reviewer:

77. Name of Auditor:

78. Name of Approver:

79. Name of Reviewer:

80. Name of Auditor:

81. Name of Approver:

82. Name of Reviewer:

83. Name of Auditor:

84. Name of Approver:

85. Name of Reviewer:

86. Name of Auditor:

87. Name of Approver:

88. Name of Reviewer:

89. Name of Auditor:

90. Name of Approver:

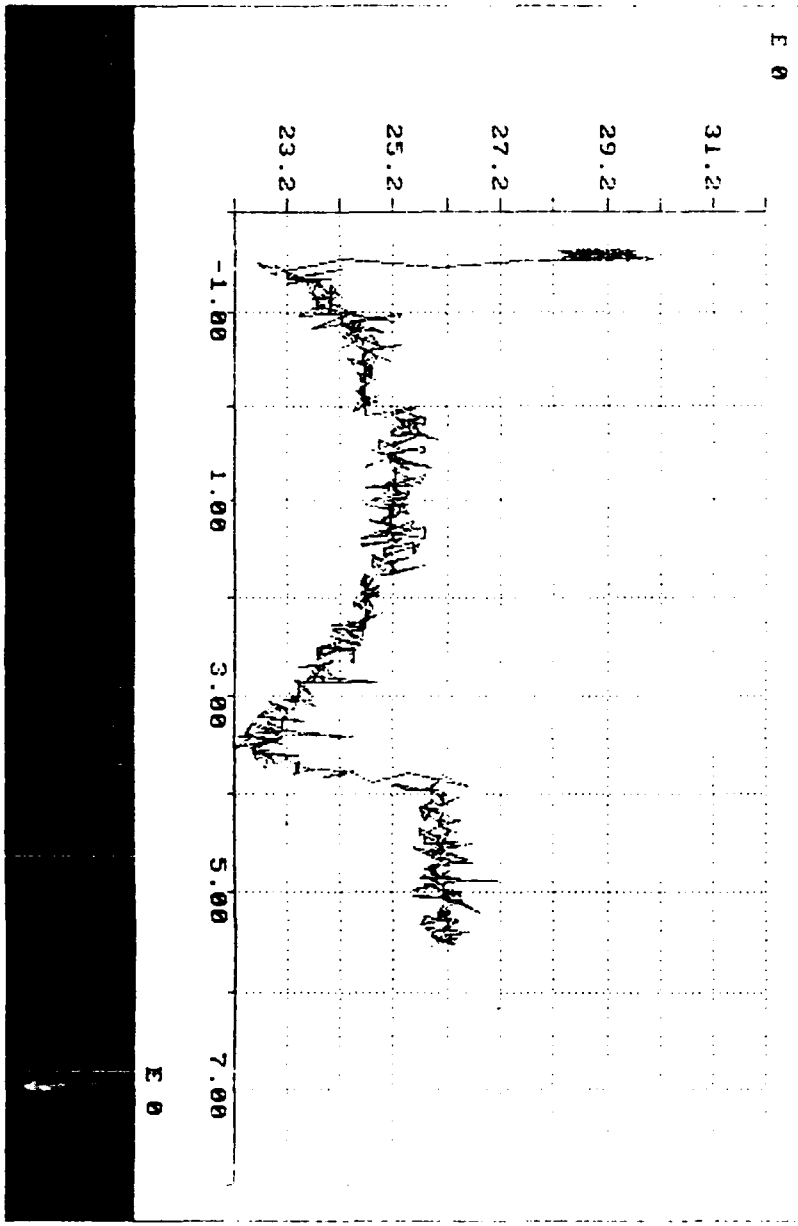
91. Name of Reviewer:

92. Name of Auditor:

93. Name of Approver:

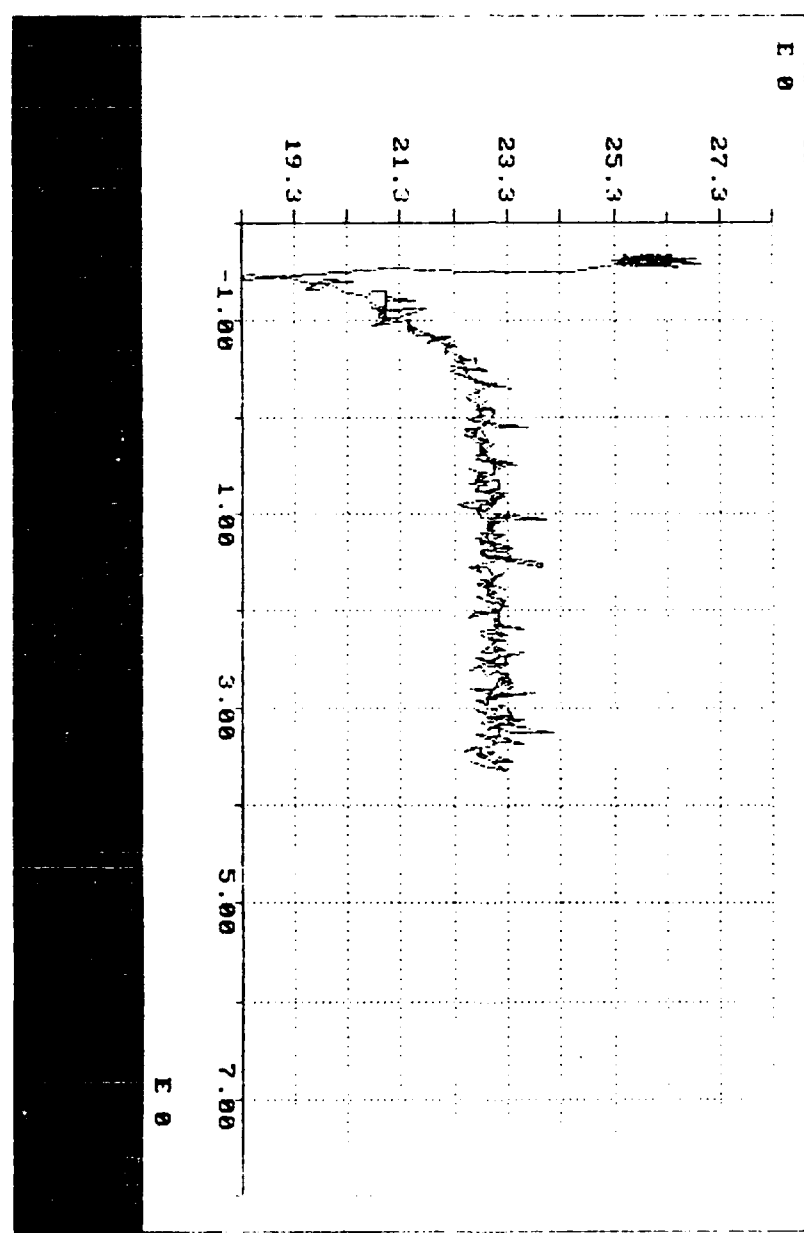
94. Name of Reviewer:

95. Name of Auditor:



: File Name: K045F0210.D
: 8 Comments
: 1) BLOOD CONTROLLED
: 2) NO VISIBLE CHANGES
: 3) NO SMOKE
: 4
: 5) NO WELD
: 6
: 7
: 8

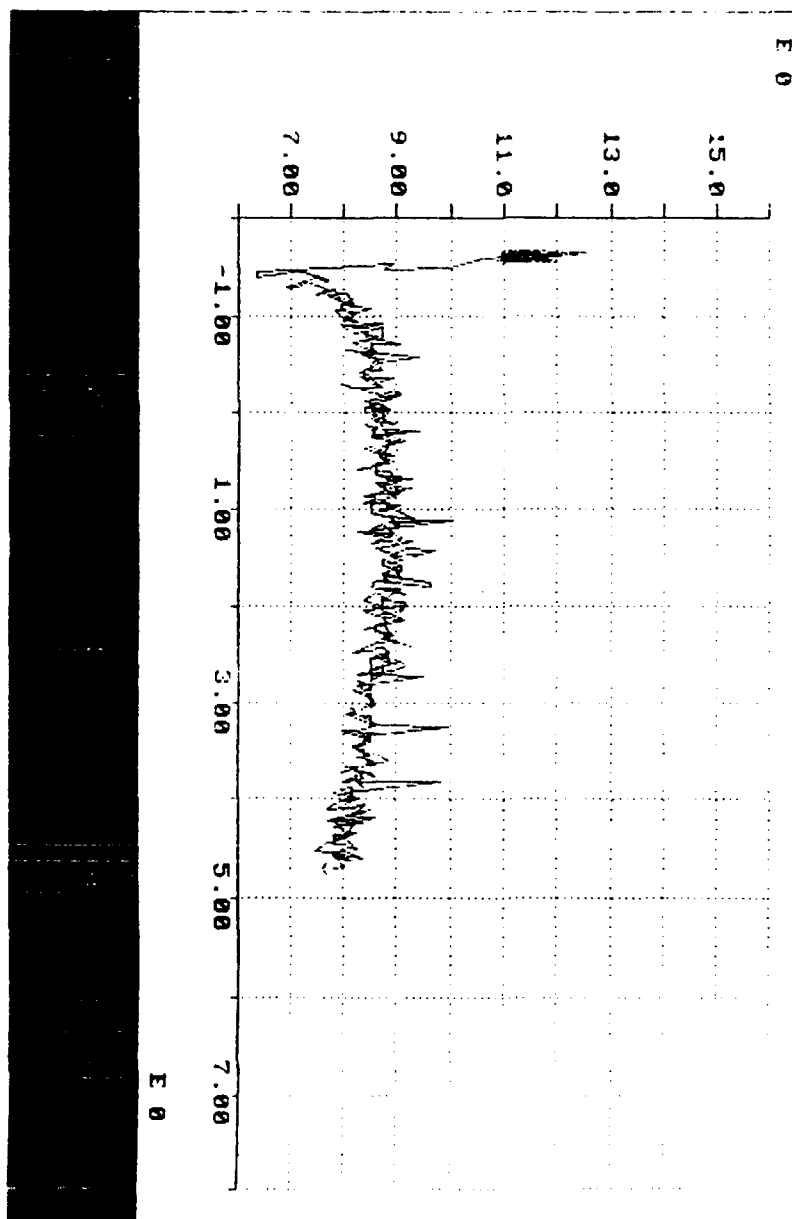
: I/O Variable ()
: Subfile: 1
: Row (0=all): 0
: Start Column:
: # of Columns:
: Read/Write/Append:



```

#####
: File Name: C:\B\1\B101
:
: 8 Comments
: 1 BLOOD CONTROLLED
: 2 BLANCHING AND BURNING
: 3 MIGHT BE A WEAR
: 4
: 5 A WEAR WELD
: 6
: 7
: 8
#####
: I/O Variable (F=1, B=0)
:
: Subfile:
: Row (0=all):
: Start Column:
: # of Columns:
:
: Read/Write/Append/Scroll/Exit/End/Quit/Help/Print/Quit: #
:
#####

```



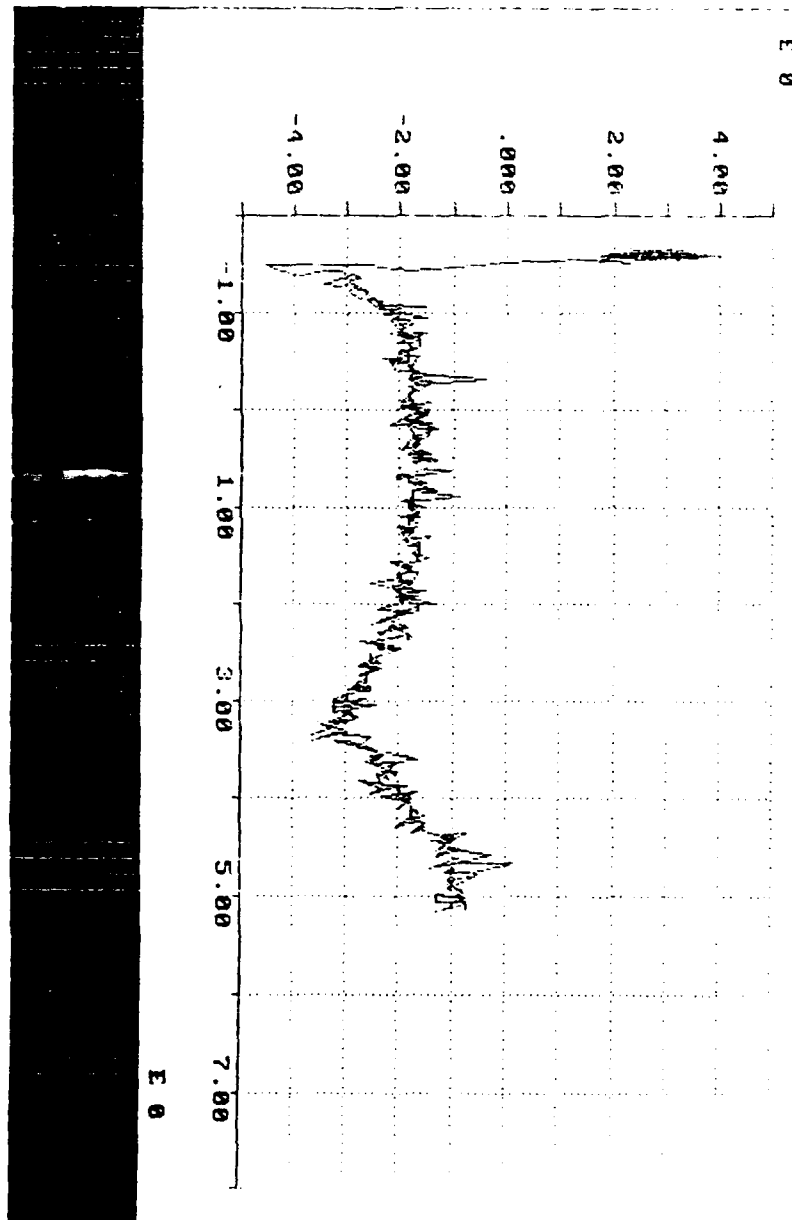
: File Name: :
: 8 Comments

: 1 BLOOD CONTROL
: 2 BLANCHING
: 3 NO SMOKE
: 4 LOOKS LIKE
: 5
: 6 MODERATE W
: 7 TORE AT SEEM
: 8

: I/O Variable (

: Subfile: :
: Row (0=all): :
: Start Column: :
: # of Columns: :

: Read/Write/Append :
:



: File Name: *****

: Comments

: 1. GOOD CONTINUED

: 2. BLANCHING (WATER)

: 3. SMALL AMOUNT OF

: 4. LOOKS LIKE A

: 5.

: 6. MODERATE WELD

: 7. TORE AT SEAM

: 8.

: I/O Variable (*****)

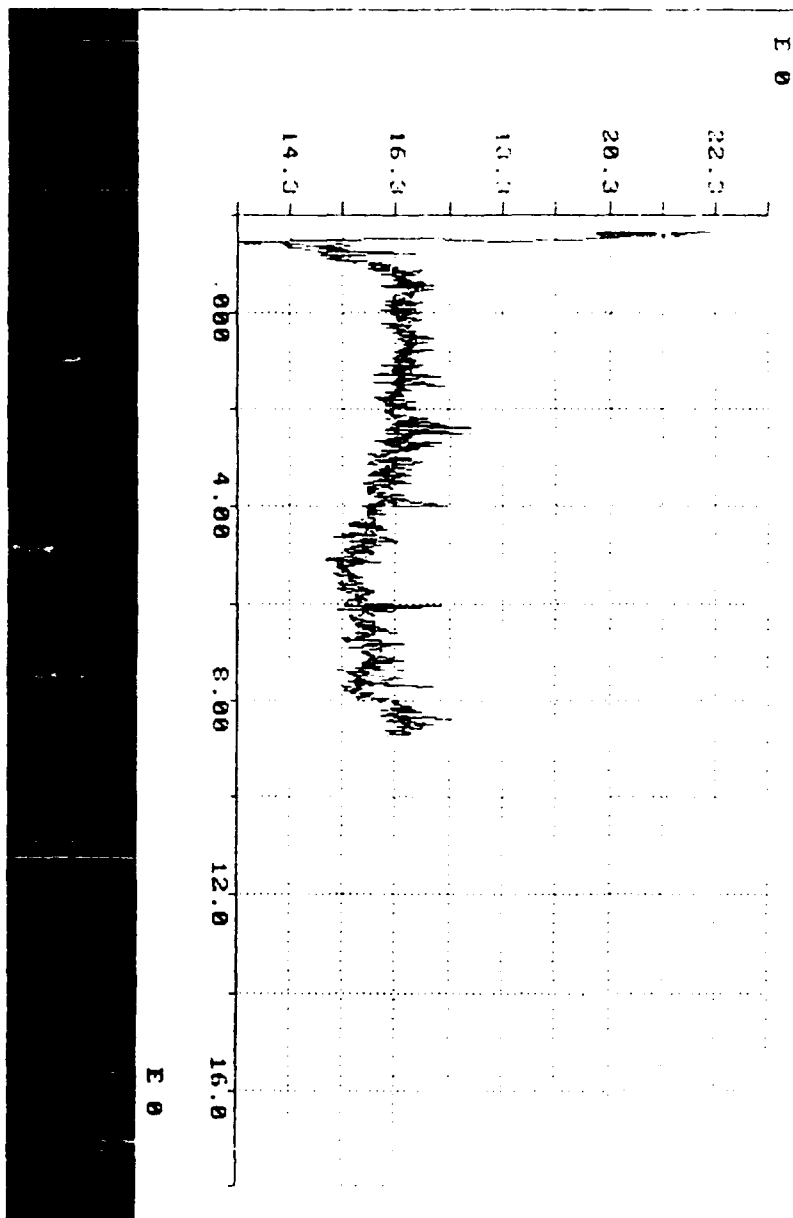
: Subfile: *****

: Row (0=all): *****

: Start Column: *****

: # of Columns: *****

: Read/Write/Append (r/w/a) List/No. File Data: *****



File Name: C:\Program Files\...

Comments:

1. ELOOD CONTROL

2. BLANCHING W/...

3. MODERATE CM...

4.

5. YEAR 2000

6.

7.

8.

I/O Variable (1=...

9.

Subfile:

Row (0=all):

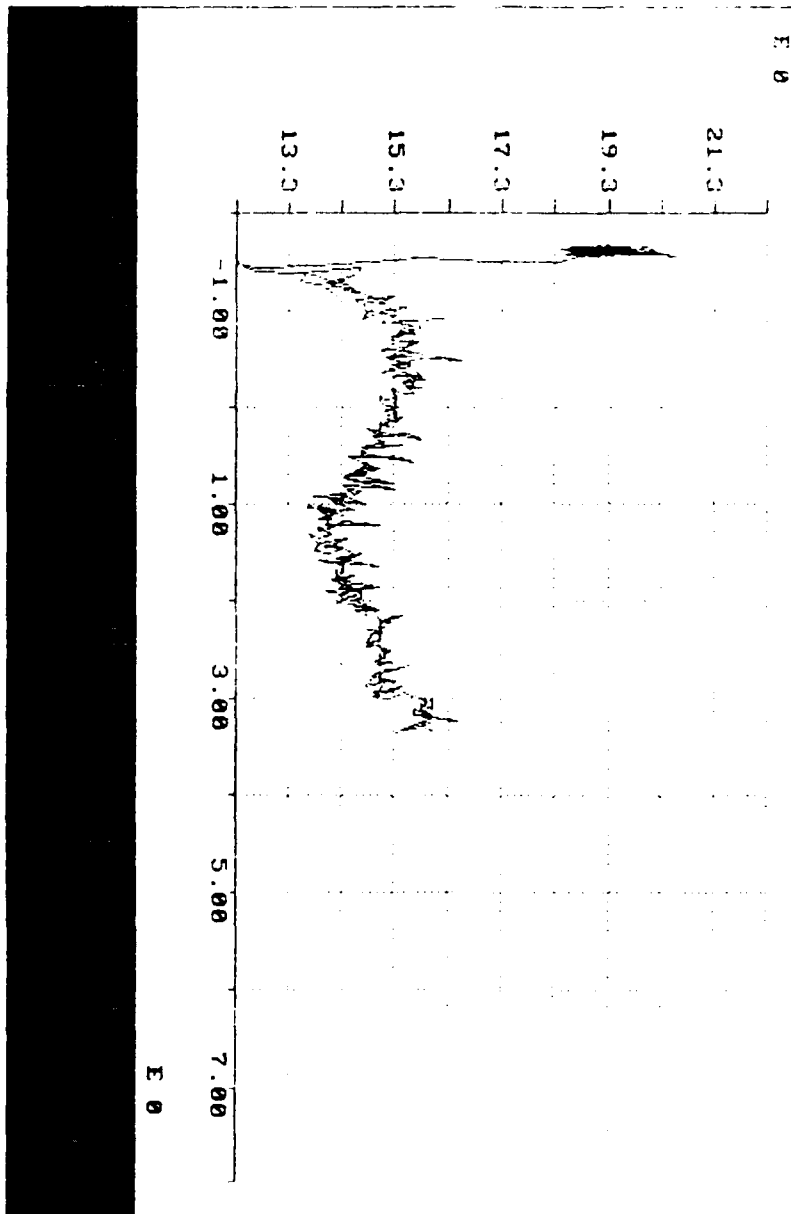
Start Column:

of Columns:

10.

Read/Write/Append (0=...

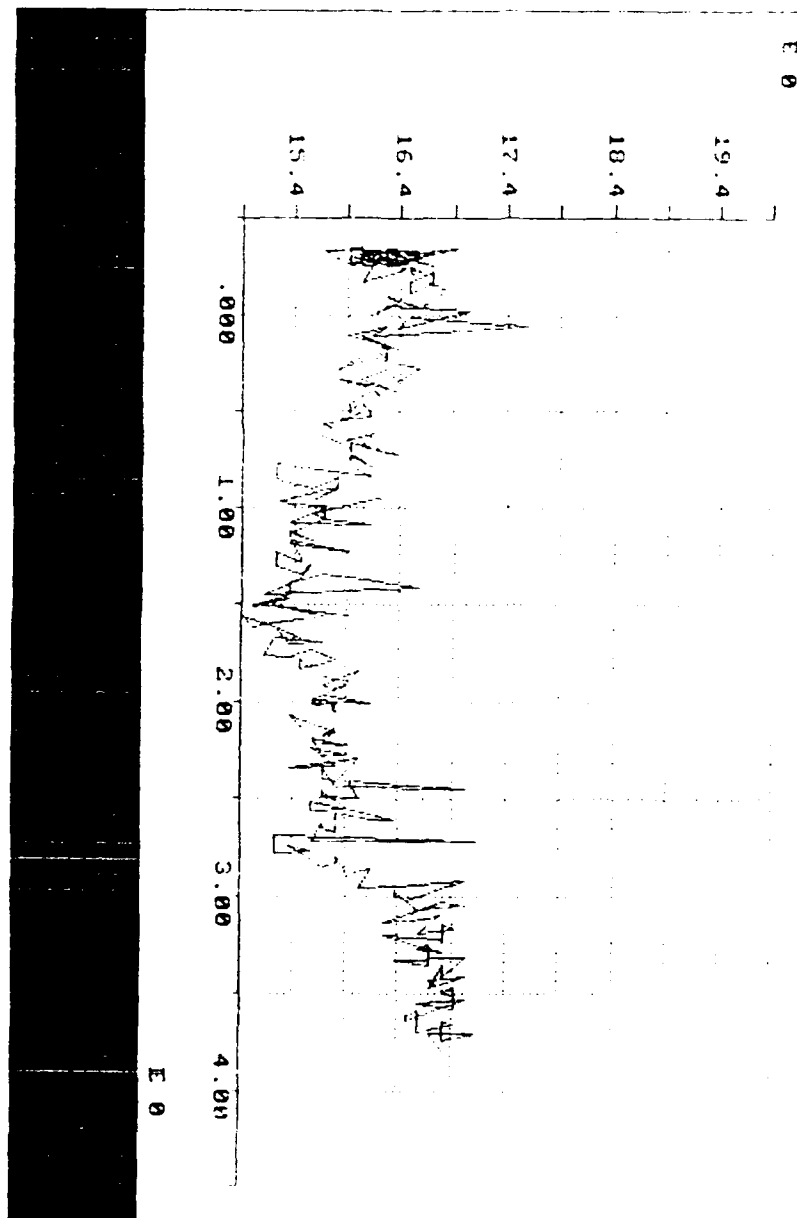
11.



```

#####
:
: File Name: C:\
:
: 9 Comments
#####
: 1 FLOOD CONTROL
: 2 REPEAT
: 3 BRANCHING
: 4 LIGHT CHAIR
:
: 5 OR STARTED
:
:
#####
: 10 Variable
:
: 11 file:
: 12 Row (0=all):
: 13 Start Column:
: 14 # of Columns:
:
: 15 Read/Write/Append:
:
#####

```

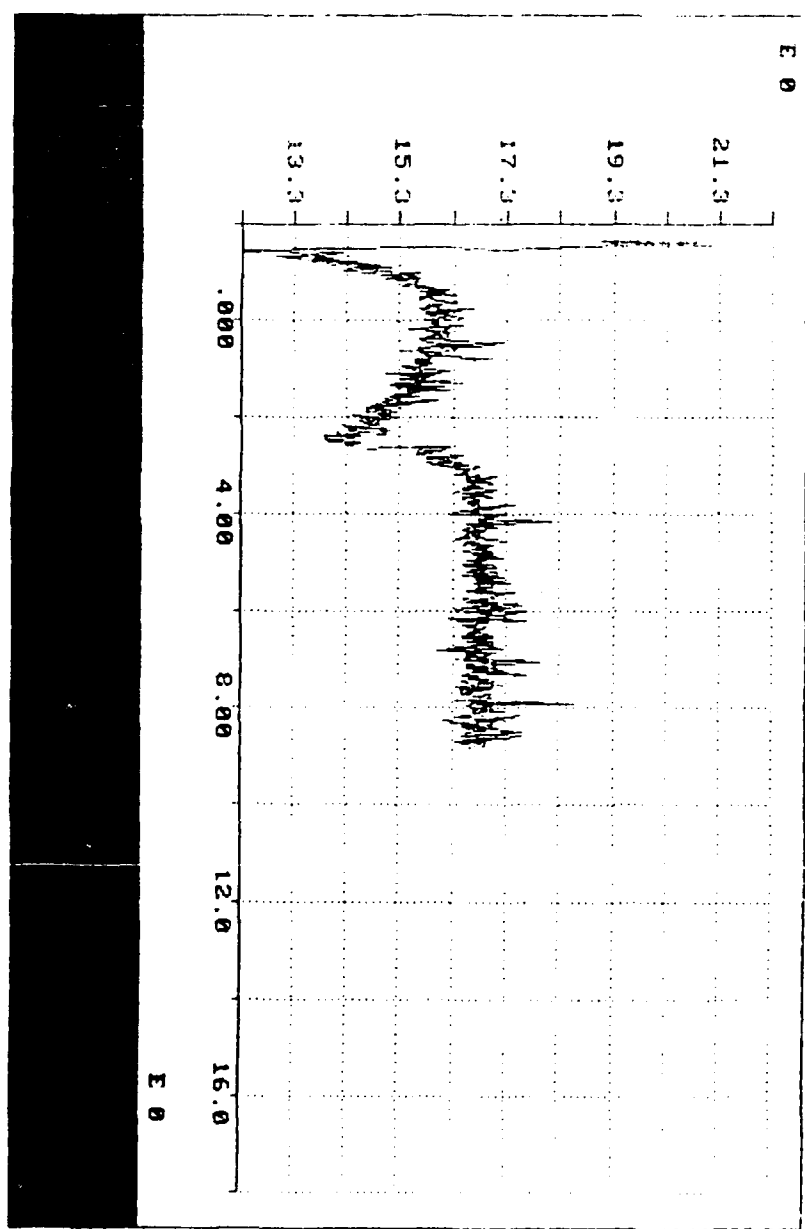


#####

: File Name:
:
: 8 Comments

: 1 BLOOD CONTRAST
: 2 BLANCHING
: 3 NO CHARGING
: 4 NO SMOKE
: 5 LOOKS WELDED
: 6 BLOTTED SEAM
: 7 BLOOD
: 8 PROBE AT SEAM

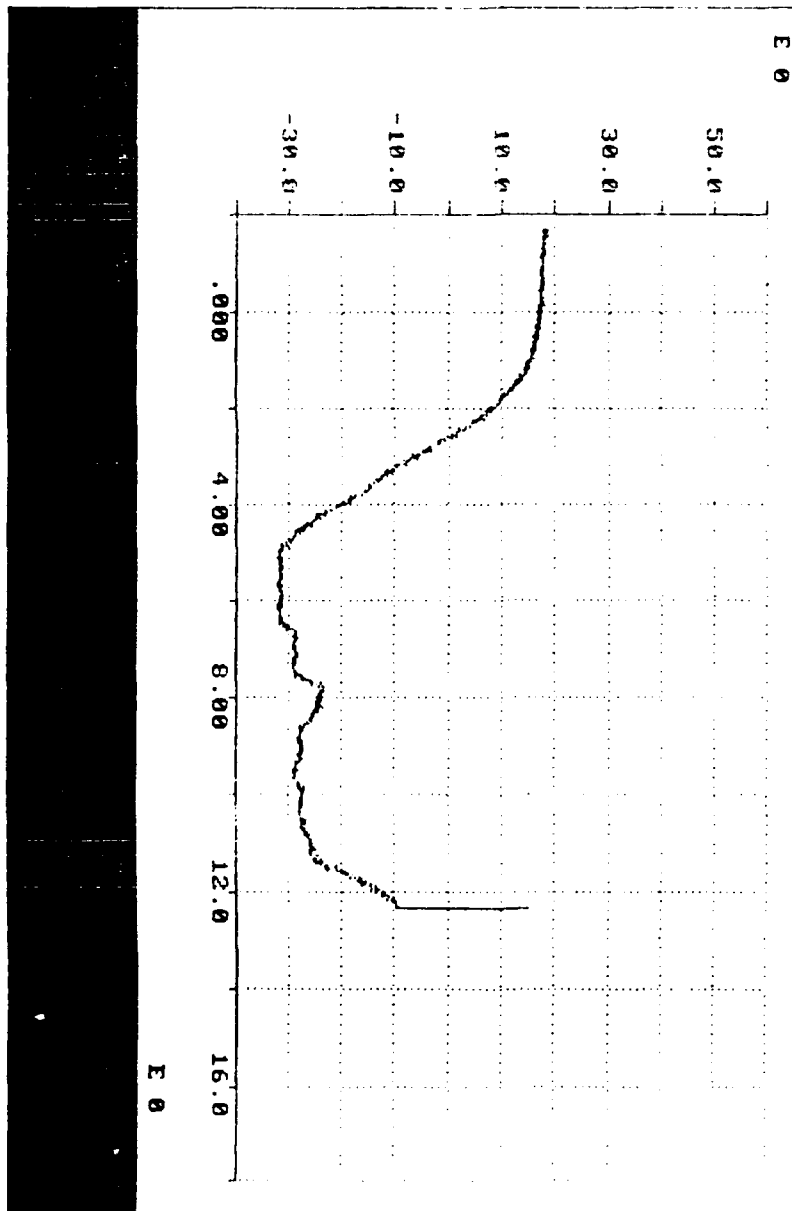
: I.O Variable (
:
: Subfile:
: Low (0=all):
: Start Column:
: # of Columns:
:
: Read/Write/Append
:
#####



```

#####
: File Name:
:
: B Comment:
#####
: 1 ONE STRIP
: 2
: 3
: 4
: 5
: 6
: 7
: 8
#####
: I/O Variable (R)
:
: Subfile:
: Row (0=all):
: Start Column:
: # of Columns:
:
: Read/Write/Append
:
#####

```



File Name: *****

9 Comments

1 TWO STRIP

1

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10 Variable

1

Subfile:

Row (0=all):

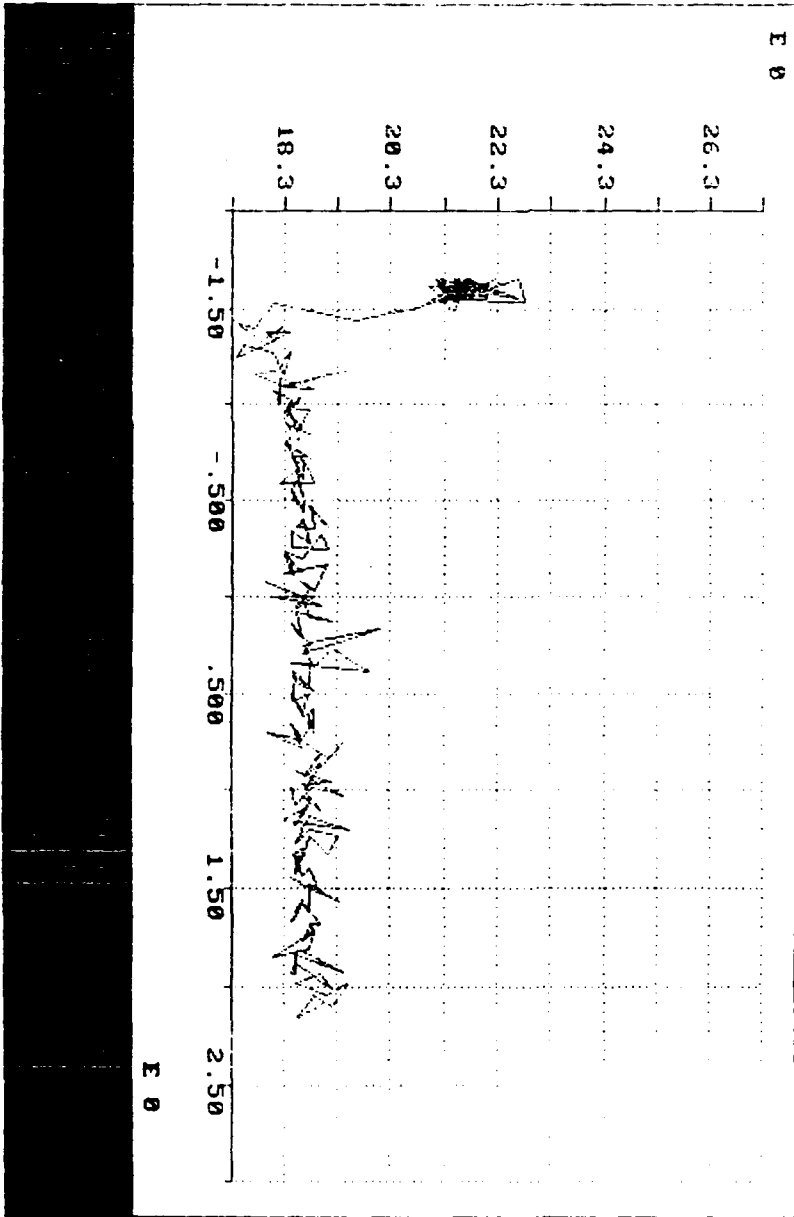
Start Column:

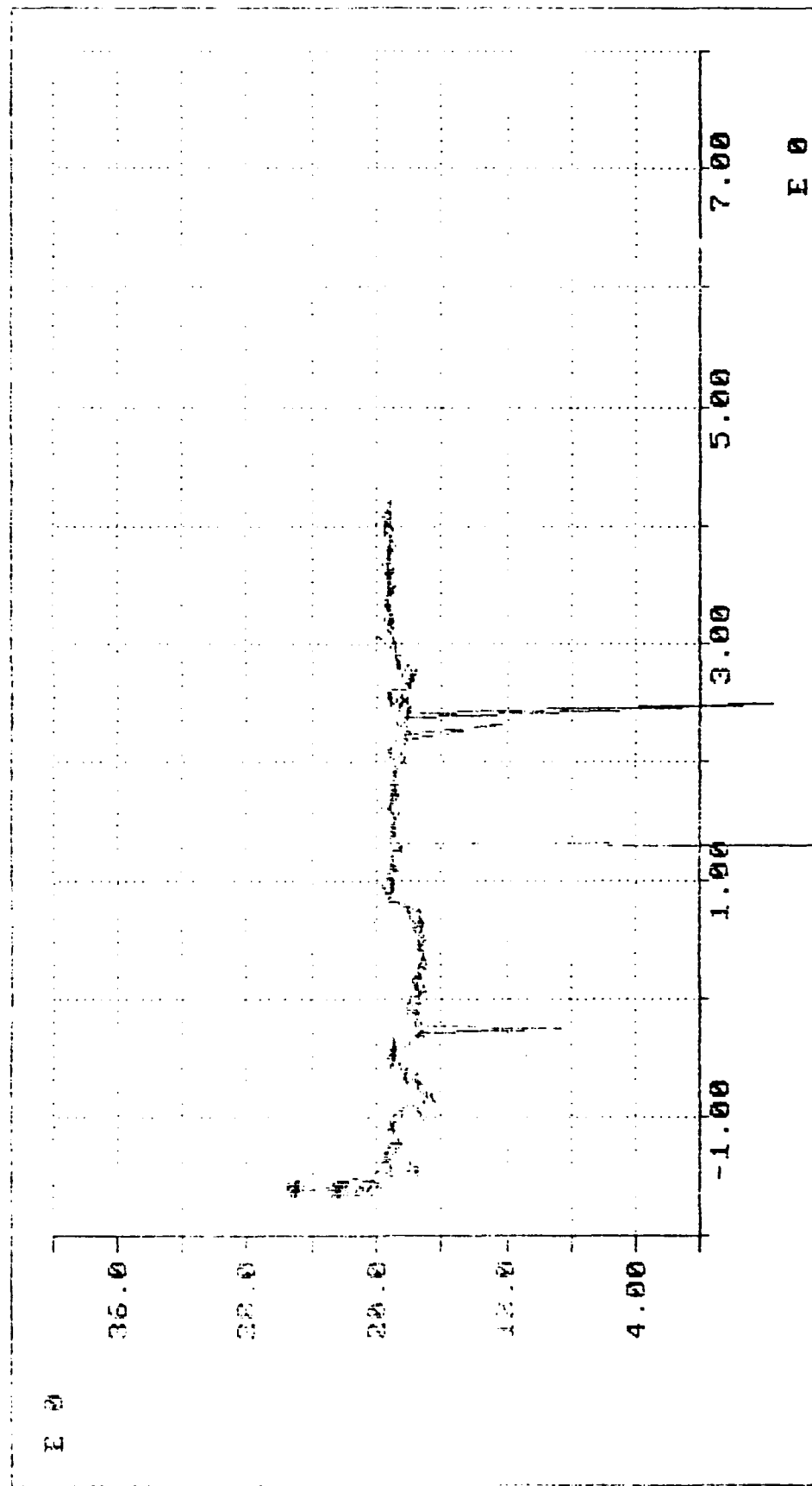
of Columns: 256

1

Read/Write/Append/Share/Print/Get/Variable/Get/Print/

1





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File Name: 0000

Comments:

=====

1. 10.0000000000000000

2. 10.0000000000000000

3. 10.0000000000000000

4. 10.0000000000000000

5. 10.0000000000000000

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Variable:

6. 10.0000000000000000

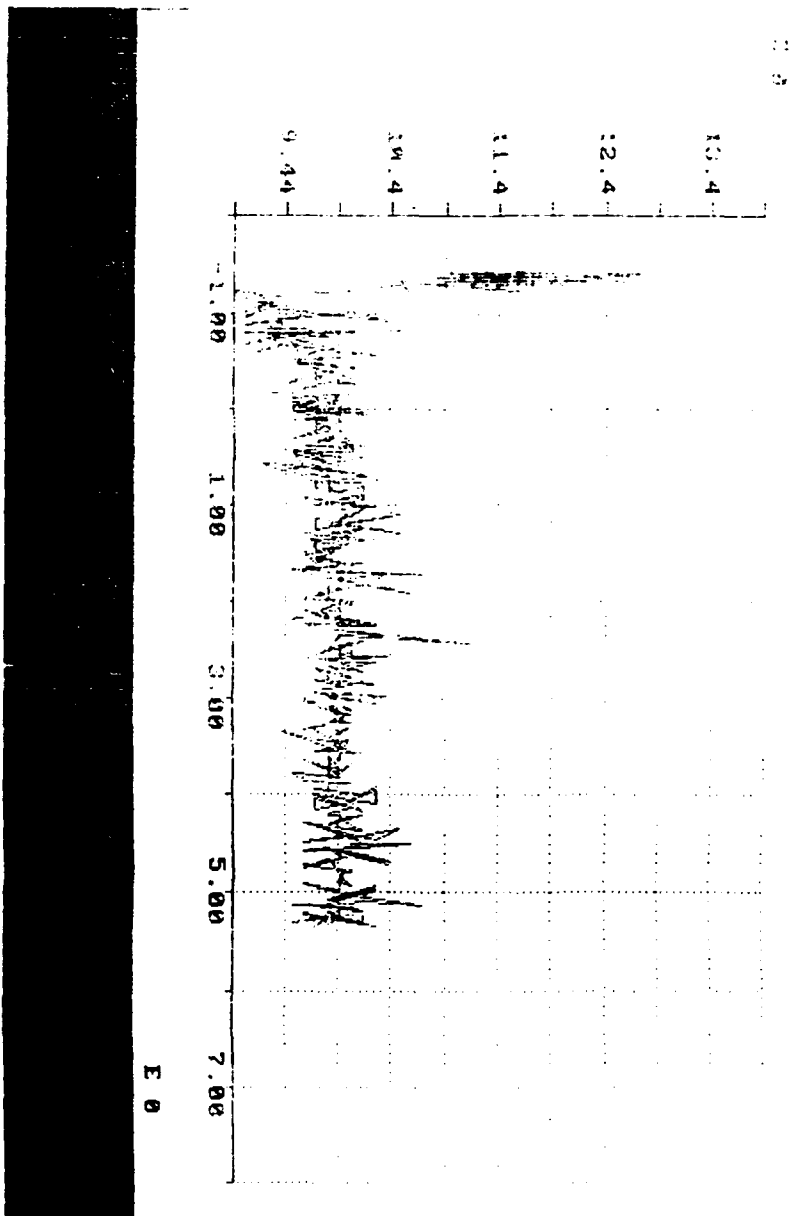
7. 10.0000000000000000

8. 10.0000000000000000

9. 10.0000000000000000

10. 10.0000000000000000

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File Name: C:\P\1001\1001.D

8 Comments

OR CONTROL

NO VISIBLE

NO SMOKE

NO WELD

8

170 Variable (100)

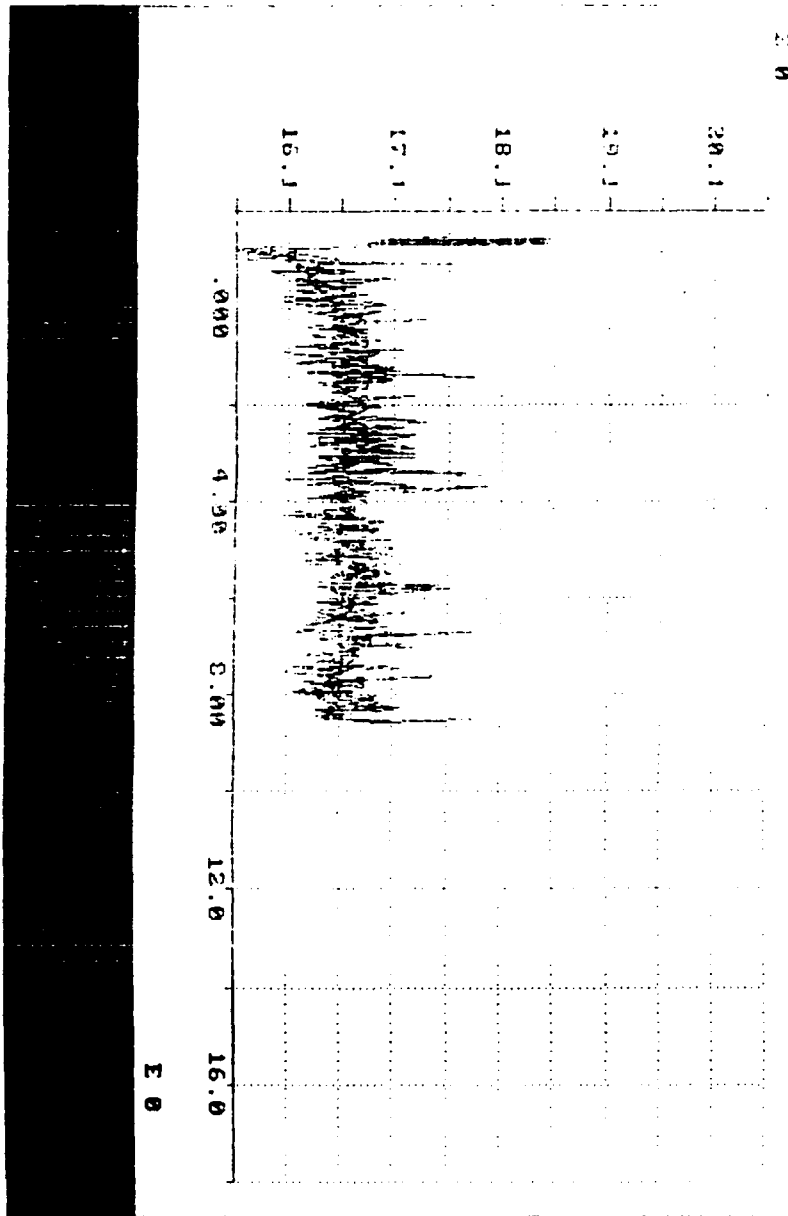
Subfile:

Row (0=All):

Start Column:

End Column:

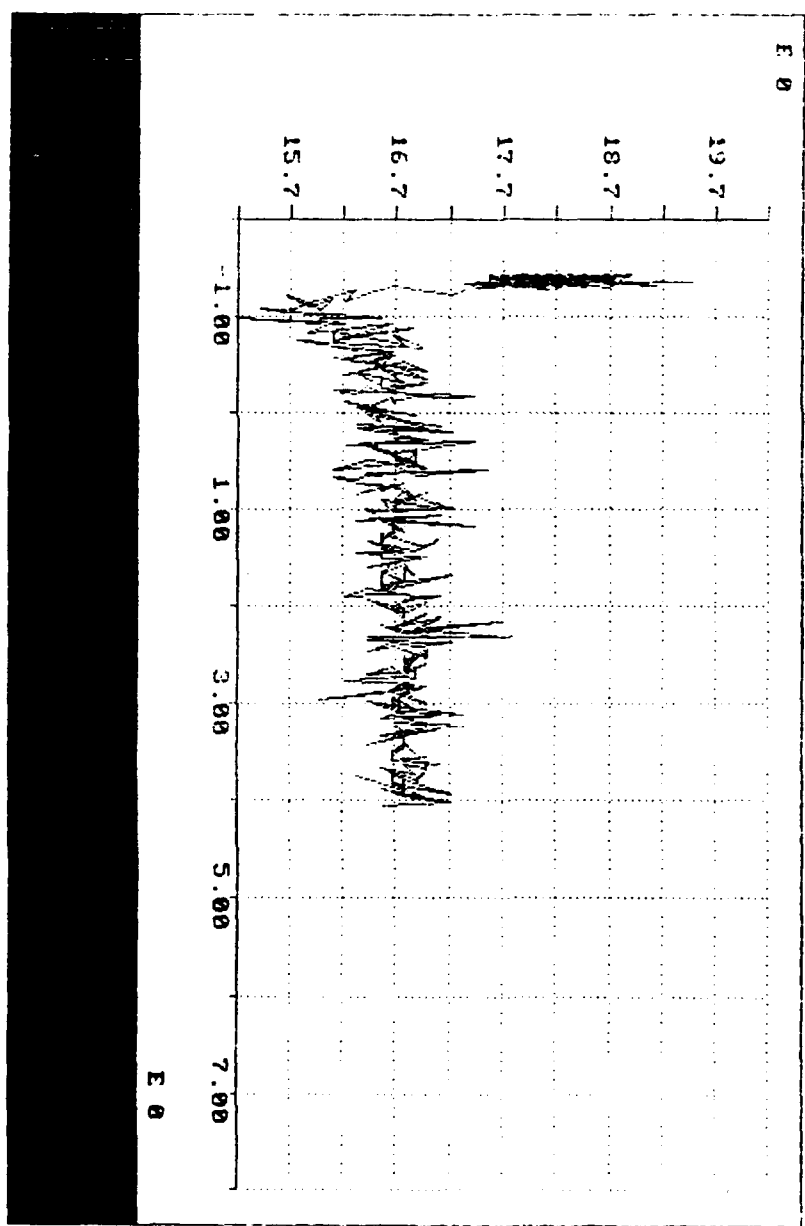
Read/Write/Append:



```

***** File Input/Output *****
      <C:\SEP21AD.USR>
      Date/Time:
      Subfile:
      Row (0=all):
      Start Column:
      # of Columns:
      Read/Write/Append/Scroll/Plot/Quit:
*****
      CONTROLLED AT 70
      VARIABLE CHANGES
      NO WELD
      6>
      7>
      8>
*****
      I/O Variable (R = 1)
      Subfile:
      Row (0=all):
      Start Column:
      # of Columns:
      Read/Write/Append/Scroll/Plot/Quit:
*****

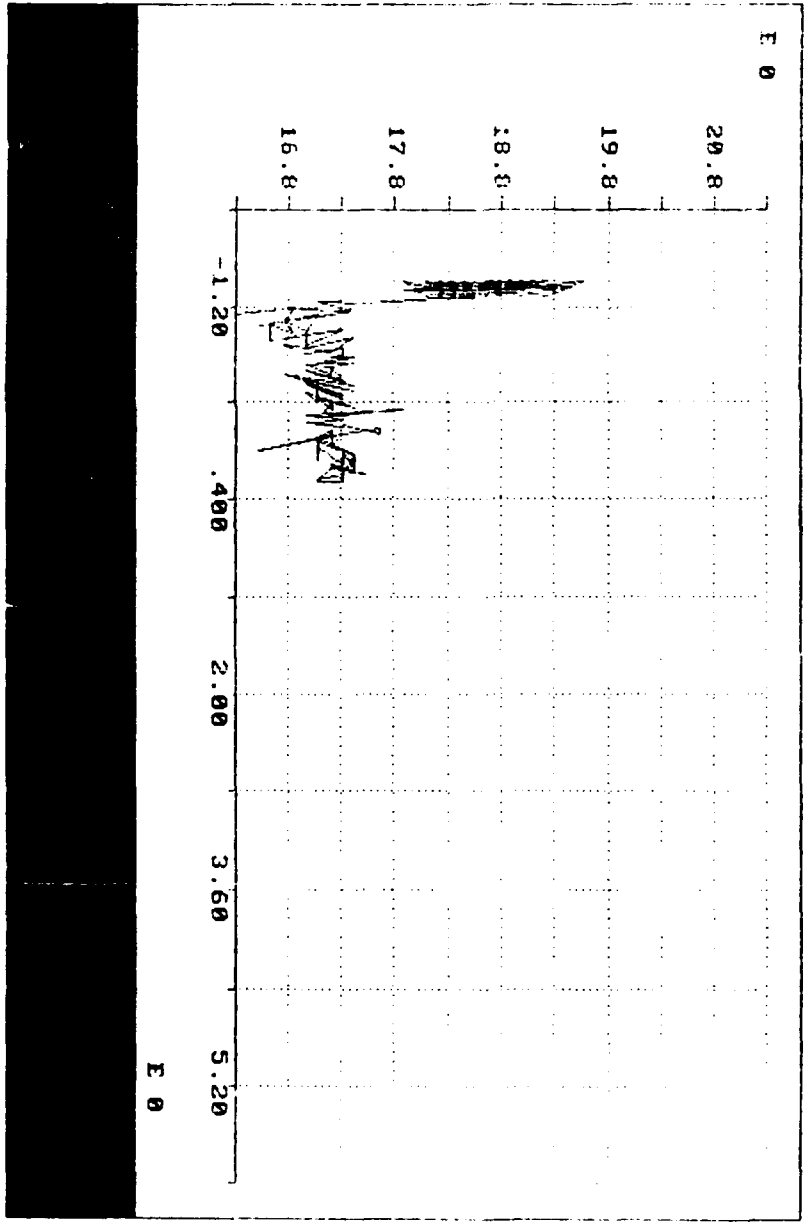
```



```

:
: File Name: KC-30 10-1-78
:
: 8 Comments
: 1: ICG CONTROL
: 2: NO VISIRLE
: 3: NO SMOKE
: 4:
: 5: NO WELD
: 6:
: 7:
: 8:
:
: I/O Variable (R)
:
: Subfile:
: Row (0=all): 0
: Start Column: 1
: # of Columns:
:
: Read/Write/Append/Control/Status/Unit:
:
:

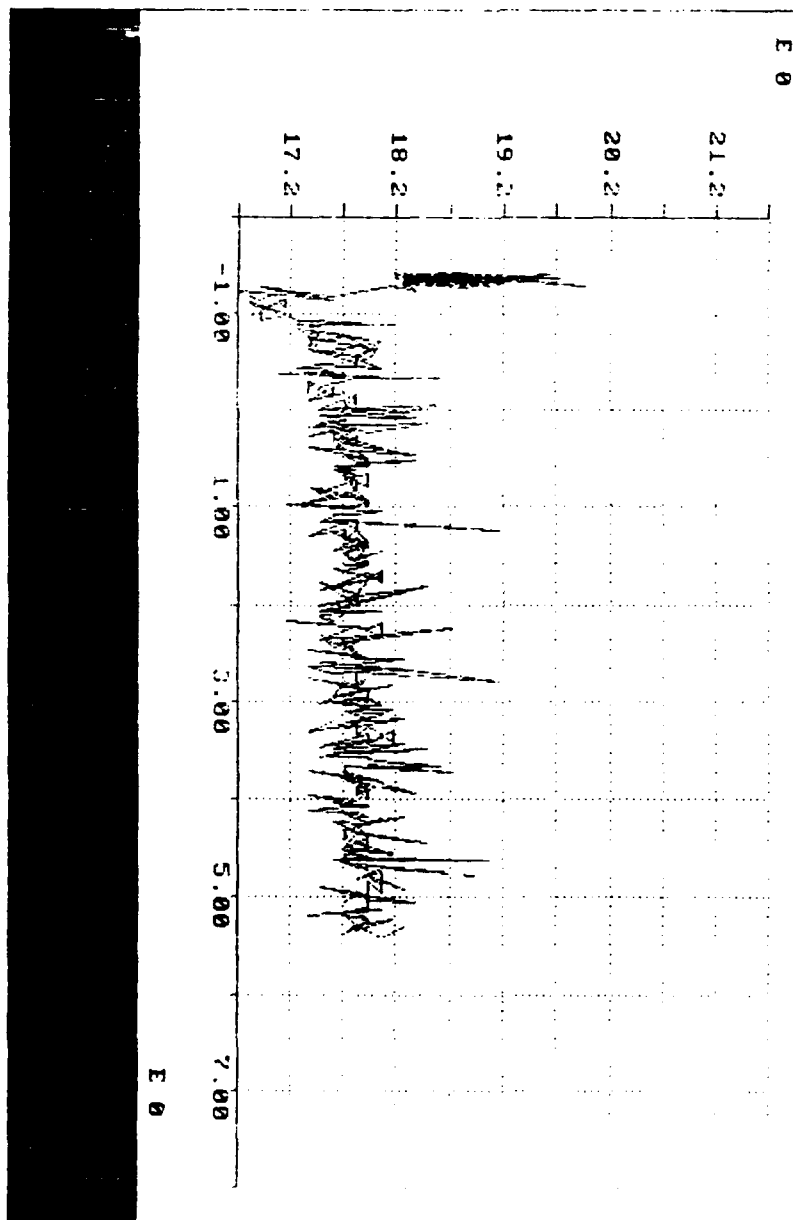
```



```

*****
: File Name: 11
:
: 8 Comments
*****
: 1 ICS CONTROLLED
: 2 BLANCHING AIR
: 3 NO CHARRING
: 4 NO SMOKE
: 5
: 6 REOF WELL
: 7
:
*****
: 1 Variable
:
: Subfile:
: Row (0=all):
: Start Column: 1
: # of Columns: 100
:
: Read/Write/Append: Scroll/Get/Edit/Link/Draw file/Print:
:
*****

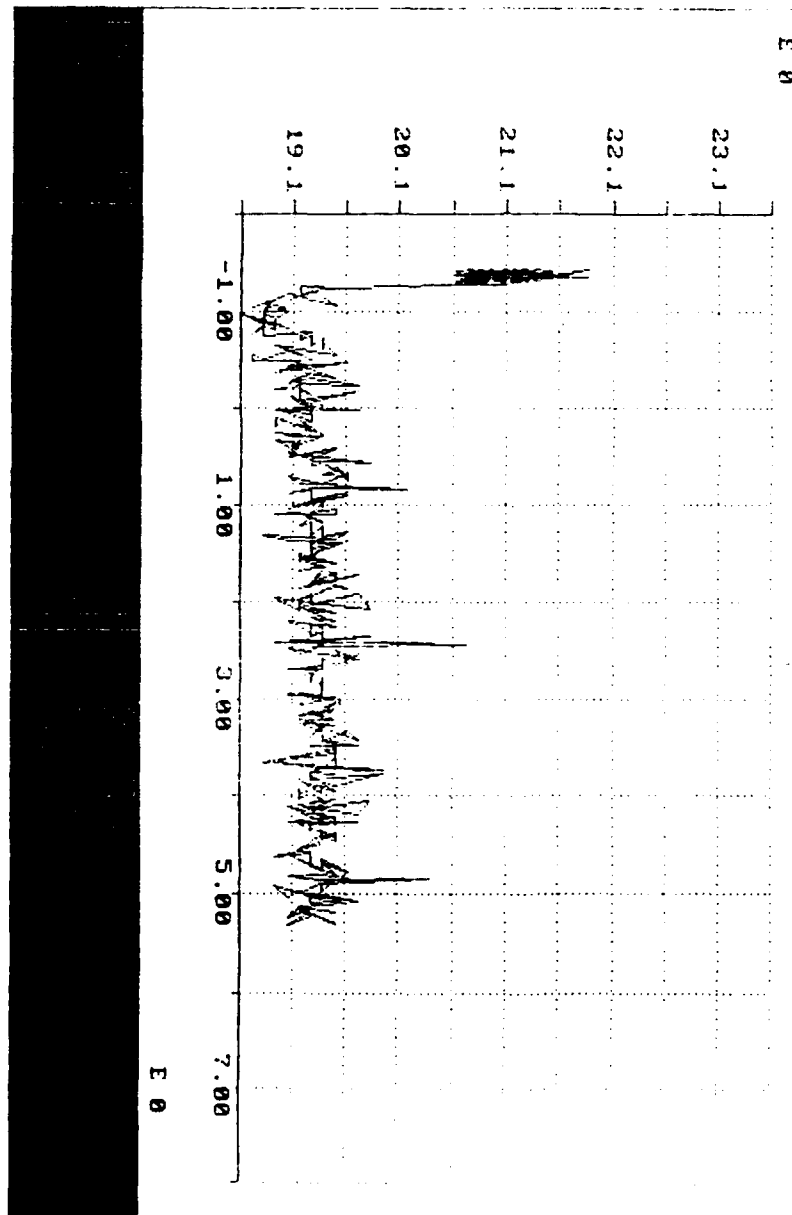
```



```

*****
:
:   File Name: (*****).
:
:   9 Comments
*****
: 1: INDIA INK UNFOLDED LAYER OF
: 2:
: 3:
: 4:
: 5:
: 6:
: 7:
: 8:
*****
: I/O Variable (*****):
:
: Subfile:
: Row (0=all): 0
: Start Column: 1
: # of Columns: 256
:
: Read/Write/Append/Ignore/Force/Print/Plot/Save/Wait: 1
:
*****

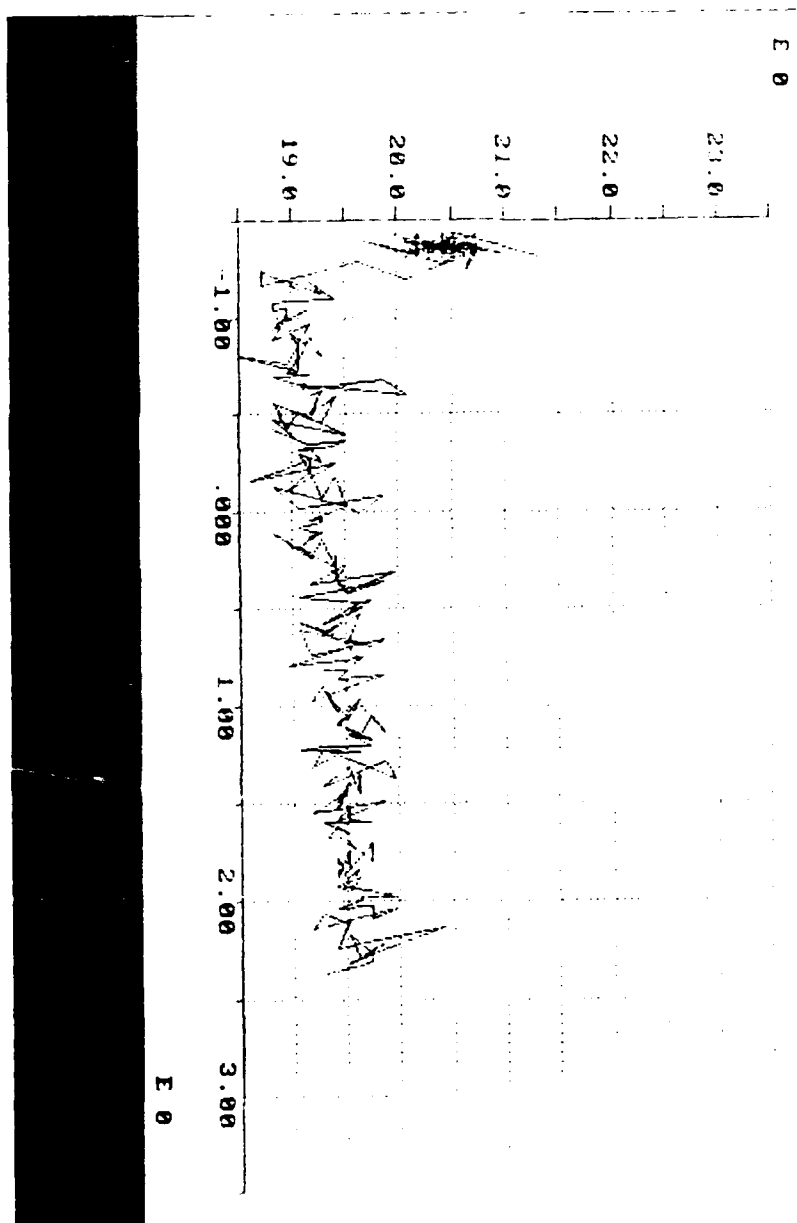
```



```

#####
: File Name: C:\...
:
: @ Comments
#####
: 1: INDIA TPL CUP...
: 2: SLIGHT BLANKET...
: 3: NO SMOKE
: 4: NO CHARRING
: 5:
: 6: NO WELD
: 7:
: 8:
#####
: I/O Variable (K = ...
:
: Subfile:
: Row (0=all):
: Start Column:
: # of Columns:
:
: Read/Write: Append
:
#####

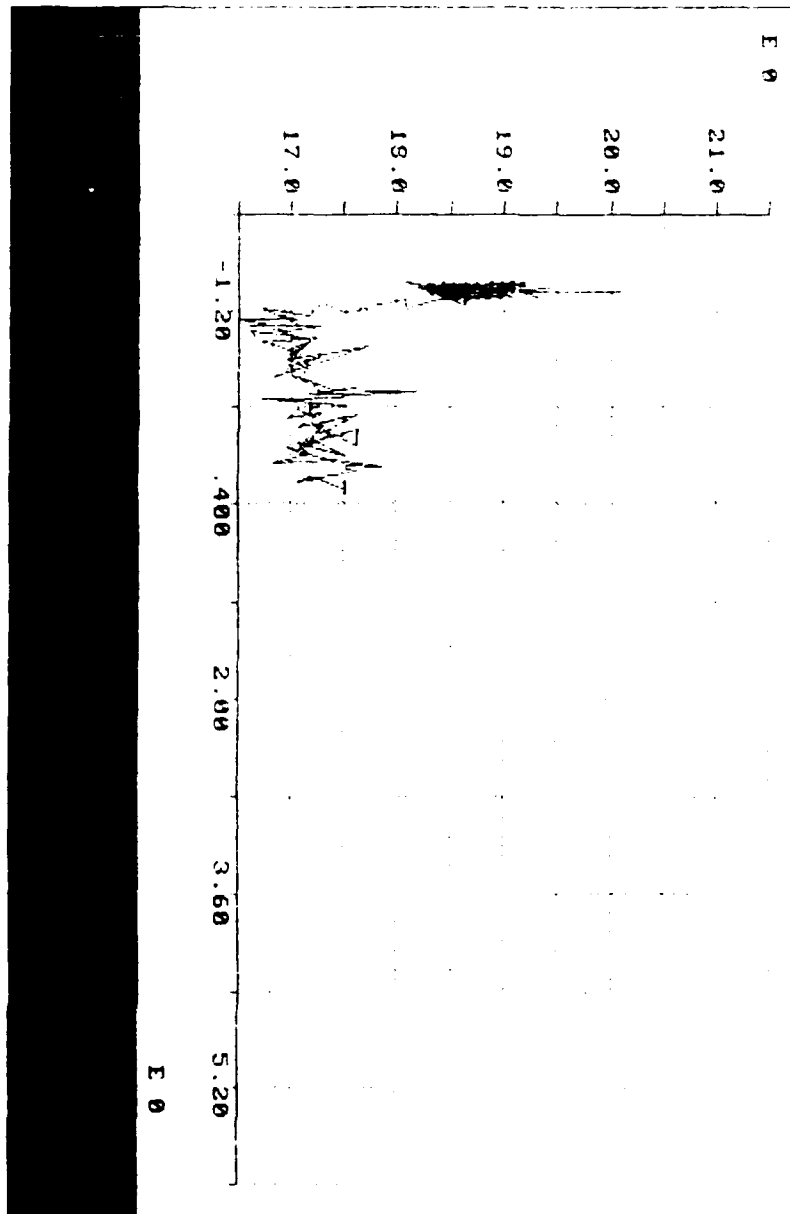
```



```

:
: File Name:
:
: 3 Comments
:
: 1: INDIA INK CONT
: 2: NO VISIBLE CH
: 3: NO SMOKE
: 4
: 5 NO WFLP
: 6
: 7
: 8
:
: I/O Variable (
:
: Subfile:
: Row (0=all):
: Start Column:
: # of Columns:
:
: Read/Write/Append:
:
:

```



File Name: C:\M

8 Elements

1. INDIA INI CON

2. TIGHT DEGREE

3. MINIMAL BURST

4. NO SHOE

5.

6. NO WELD

7.

8.

1.0 Variable (1)

2.

Subfile:

low (if=11)

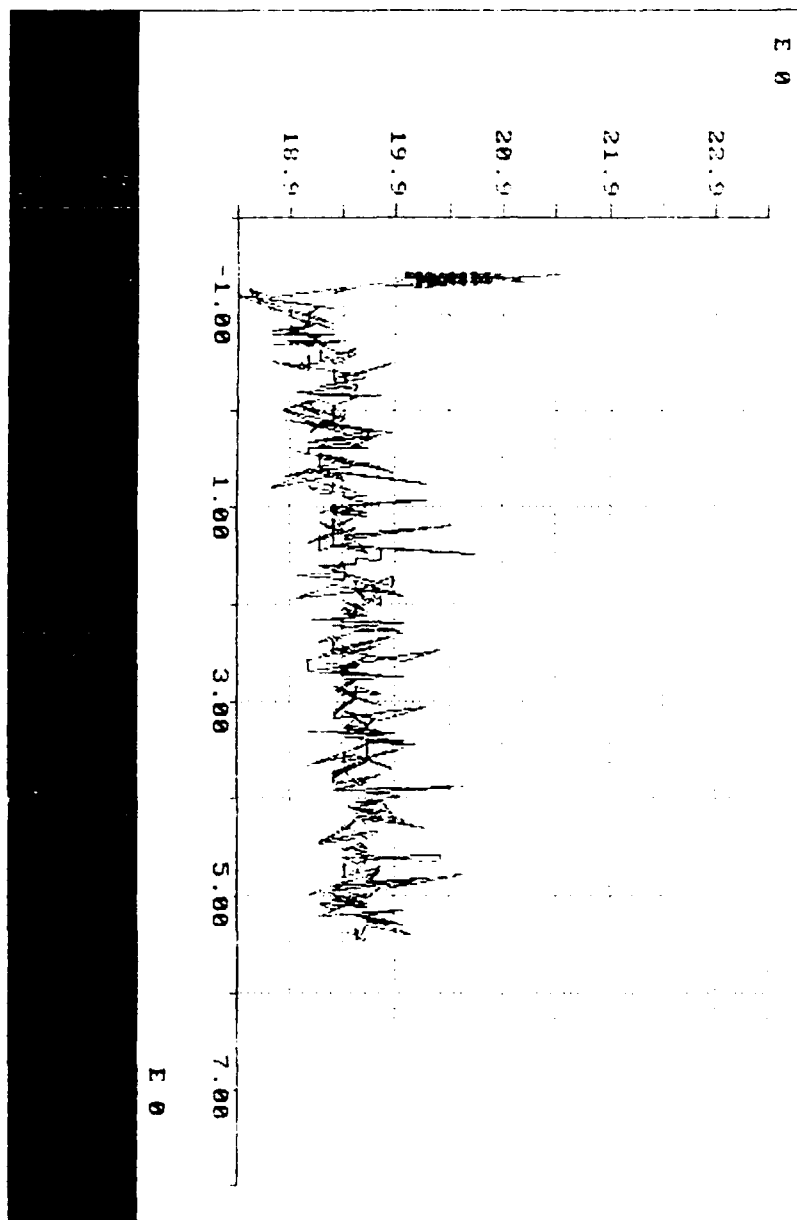
Start Column:

of Columns: 112

3.

Read/Write/Append

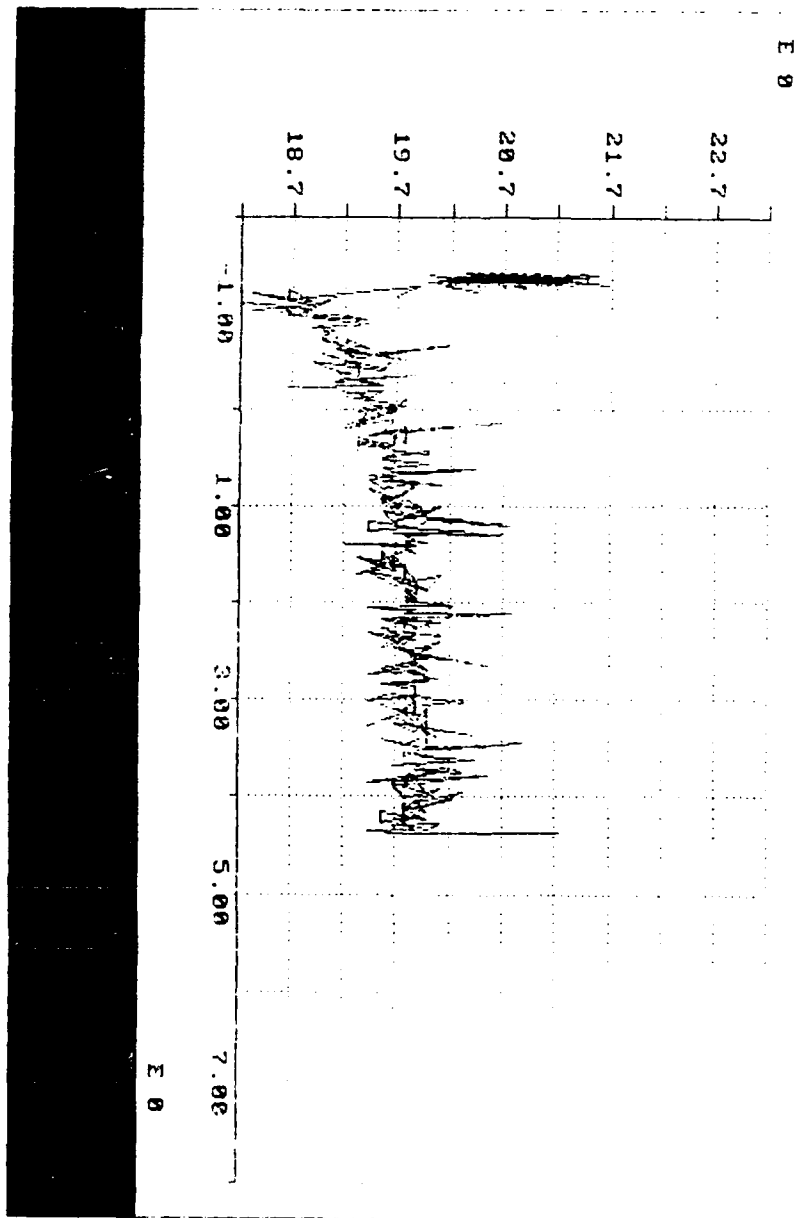
4.



```

:
: File Name:
:
: 8 Comments
:
: 1 INDIA INK COIL
: 2 SLIGHT DESSIN
: 3 NO SMUDG
: 4 NO CHARTER
: 5
: 6 NOT MOUNT ON
:
: 8
: I/O Variable (1)
:
: Subfile: 1
: Row (0=all): 0
: Start Column: 1
: # of Columns: 25
:
: Read/Write/Append
:
:

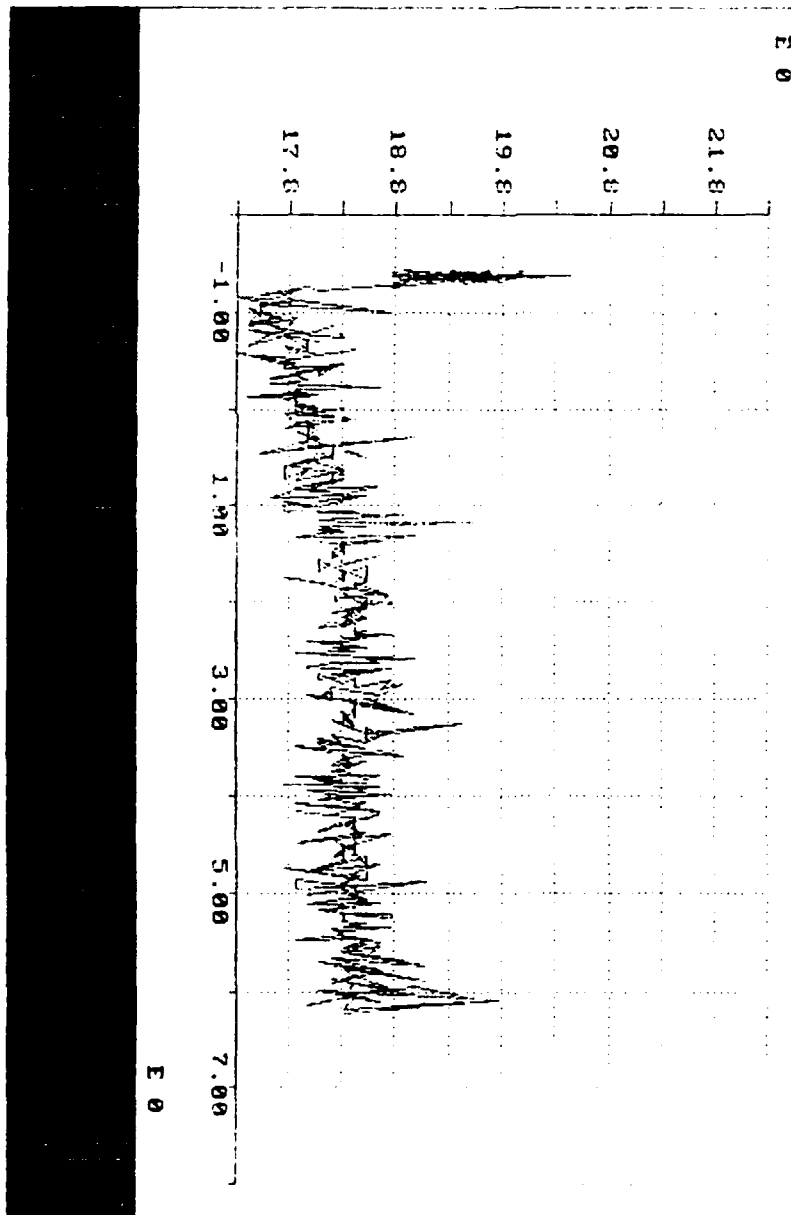
```



```

#####
: File Name: ( )
:
: 9 Comments
#####
: 1 INDIA IN COMET
: 2 MODERATE DE
: 3 NO SHOT
: 4 NO CHARGING
: 5
: 6 WEAF WELD
: 7
: 8
#####
: I/O Variable ( )
:
: Subfile:
: Row (Oall):
: Start Column:
: # of Columns:
:
: Read/Write/Append ( )
:
#####

```



Appendix C- Supplemental Figures and Illustrations

Figure 1- Thermocouple Placement

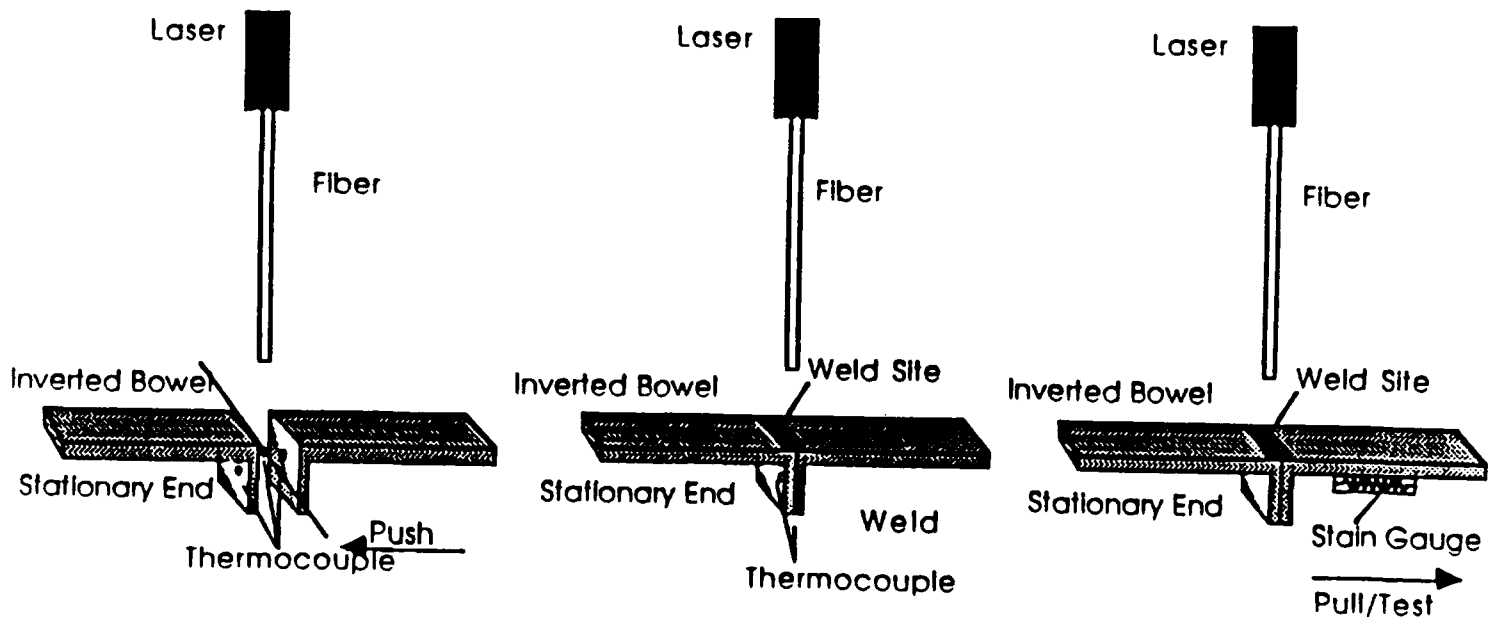


Figure 2- Experimental Protocols

LASER TISSUE WELDING OPTIMIZATION PROTOCOL

<u>Time (s)</u>	<u>Aperture Size (mm)</u>	<u>Power (W)</u>	<u>Chromophore</u>
2	0.5 x 4.0	0.05	None
10	0.5 x 4.0	0.05	None
2	2.0 x 4.0	0.05	None
10	2.0 x 4.0	0.05	None
2	0.5 x 4.0	2.0	None
10	0.5 x 4.0	2.0	None
2	2.0 x 4.0	2.0	None
10	2.0 x 4.0	2.0	None
2	0.5 x 4.0	5.0	None
10	0.5 x 4.0	5.0	None
2	2.0 x 4.0	5.0	None
10	2.0 x 4.0	5.0	None
2	0.5 x 4.0	0.05	India Ink
10	0.5 x 4.0	0.05	India Ink
2	2.0 x 4.0	0.05	India Ink
10	2.0 x 4.0	0.05	India Ink
2	0.5 x 4.0	2.0	India Ink
10	0.5 x 4.0	2.0	India Ink
2	2.0 x 4.0	2.0	India Ink
10	2.0 x 4.0	2.0	India Ink
2	0.5 x 4.0	5.0	India Ink
10	0.5 x 4.0	5.0	India Ink
2	2.0 x 4.0	5.0	India Ink
10	2.0 x 4.0	5.0	India Ink
2	0.5 x 4.0	0.05	ICG
10	0.5 x 4.0	0.05	ICG
2	2.0 x 4.0	0.05	ICG
10	2.0 x 4.0	0.05	ICG
2	0.5 x 4.0	2.0	ICG
10	0.5 x 4.0	2.0	ICG
2	2.0 x 4.0	2.0	ICG
10	2.0 x 4.0	2.0	ICG
2	0.5 x 4.0	5.0	ICG
10	0.5 x 4.0	5.0	ICG
2	2.0 x 4.0	5.0	ICG
10	2.0 x 4.0	5.0	ICG
2	0.5 x 4.0	0.05	Blood
10	0.5 x 4.0	0.05	Blood
2	2.0 x 4.0	0.05	Blood
10	2.0 x 4.0	0.05	Blood
2	0.5 x 4.0	2.0	Blood
10	0.5 x 4.0	2.0	Blood
2	2.0 x 4.0	2.0	Blood
10	2.0 x 4.0	2.0	Blood
2	0.5 x 4.0	5.0	Blood
10	0.5 x 4.0	5.0	Blood
2	2.0 x 4.0	5.0	Blood
10	2.0 x 4.0	5.0	Blood

Rabbit Animal Prep Protocol

Supplies Needed:

Alcohol Preps

1 ml Tuberculin Syringe

3 ml Syringe

#18 Needle

#22 Needle

Gemini Xylazine (Rompun)

Ketaset (Ketamine)

100 ml. bag of 0.9% NaCl or 5% Dextrose in Water for intravenous use

Microdrip (60 drops per ml) dispenser and tubing

Animal Clippers

Manual (non-electric) Razor

Artificial Tears Ointment

#22 JELCO IV Catheter Placement Unit

Paper Tape

Beuthanasia (sodium pentobarbital or formerly known as Sleepaway)

Procedure:

1. One day prior to desired surgery, remove food container from rabbit's cage. Leave water bottle.
2. Prepare tray of surgical instruments for autoclaving. Place blue cloth drape under and over instruments. Add hemoclips, needle holders, atraumatic clamps, and other specialized instruments as needed. Autoclave instruments.
3. Collect all supplies listed above. Place in rabbit room.
4. Close door to rabbit room.
5. Determine amount of Rompun injection. A chart which indicates the appropriate amount to inject is appended to this document.
6. Prepare Rompun injection. Wipe the septum of the Rompun bottle with an alcohol prep. Remove tuberculin syringe from packaging. Insert syringe into bottle and carefully dispense correct amount.
7. With syringe in hand, gently and quietly open door to selected rabbit's cage. Pet rabbit gently to reassure. After calming rabbit, obtain control over the animal by grasping firmly at the neck. Hold down rabbit and inject Rompun into the muscle in the hind quarter.
8. Close rabbit cage. Wait approximately 10 minutes for rabbit to become sedated. Rabbit may slouch or turn head to side.
9. Remove rabbit from cage, supporting head and neck carefully.
10. Transfer rabbit to sink.
11. Using chart in appended to this document and the actual weight of the rabbit, determine the appropriate amount of Ketaset to inject.
12. Prepare injection of Ketaset. Remove the 3 ml. syringe from its packaging and place the #18 needle on the end of the syringe. Wipe the septum of the Ketaset bottle with an alcohol prep, and insert syringe. Remove desired amount of Ketaset and then carefully change needles from the #18 to the #22. Grasp the rabbit firmly and inject Ketaset, using the #22 needle, into the hind quarter.
13. Wait approximately 10 minutes for the rabbit to become completely anesthetized. The rabbit is completely anesthetized when it can be picked up and placed on its back and does not attempt to turn itself over.
14. While waiting, prepare intravenous anesthetic cocktail. To the 100 ml. 0.9% NaCl bag add 4.0 ml. Rompun and 8.0 ml. Ketaset. Invert bag to mix. Hang bag on IV pole. Insert microdrip and tubing into bag and then remove plastic cover from distal end of tubing. Place three or four strips of paper tape on the IV pole for later use.
15. Place three or four paper towels on the countertop next to the sink and two paper towels inside the sink. Place rabbit, belly up, on the countertop.

16. Apply Artificial Tears to the rabbit's eyes to prevent painful drying.
17. Using a marker, number the rabbit by writing its identification number from the experimental protocol inside its ear
18. Use electric clippers to shave appropriate area of rabbit, usually abdomen and groin. Push excess fur onto the paper towels. Quickly remove paper towels and fur as soon as clipping is completed.
19. With non-electric razor, gently remove hair from the ears, particularly along the external vein. This vein will be used for the intravenous anesthetic.
20. Transfer the rabbit to the surgical site.
21. Wipe the external ear vein region with an alcohol prep. This should improve visualization of the vein.
22. Remove JELCO catheter from its packaging. Insert catheter into the external vein. Use needle to enter vein and then pull back on the needle so that the catheter slides along the inside of the vein. Watch catheter slide inside the vein. Look for a backflow of blood into the top part of the catheter placement unit. Remove the needle completely when the catheter has been correctly positioned.
23. Attach the tubing from the IV bag to the top part of the catheter placement unit. Test catheter placement by slowly opening the anesthetic flow regulator and watching for anesthesia flow. Alternatively, open the saline regulator if one has been piggy-backed, and watch its flow. When adequate placement is verified, carefully tape the tubing and the catheter placement unit to the rabbit's ear. Tape excess tubing to the table.
24. Adjust the anesthetic flow rate to 1 drop every 4 seconds. Watch the rabbit's chest rise and pupil size to monitor anesthesia. If rabbit begins to come out of the anesthesia, increase rate to 1 drop every 2 seconds for about 1 minute. Return to 1 drop every 4 seconds, and wait until rabbit is sedated (1-2 minutes).
25. If rabbit is to be euthanized, inject 4.0 ml. of 1:1 diluted Beuthanasia into the septum of the IV line. The bottle will indicate if it has already been diluted. If it has not been diluted, mix equal parts of concentrated Beuthanasia and 0.9% NaCl, and inject this solution into the IV line. Do not inject concentrated Beuthanasia into the IV line because it is very viscous, and therefore, it is difficult to force it out of the tubing and into the rabbit.
26. After rabbit has died, remove IV line and place rabbit remains into a large brown plastic bag.
27. Carefully wash instruments. Alconox or similar detergent should be used. Never leave instruments soaking in water. Rinse instruments and place them on a towel to dry.

RABBIT ANESTHESIA

INITIAL INTRAMUSCULAR DOSE OF XYLAZINE GIVEN, FOLLOWED
10 MINUTES LATER BY AN INTRAMUSCULAR DOSE OF KETAMINE.
DOSAGE BASED ON WEIGHT OF RABBIT.

WEIGHT(LBS.)	XYLAZINE 20 MG/ML ML	KETAMINE 100 MG/ML ML
4	0.5	0.72
4.25	0.53	0.77
4.5	0.56	0.81
4.75	0.59	0.86
5	0.63	0.9
5.25	0.66	0.95
5.5	0.69	0.99
5.75	0.72	1.04
6	0.75	1.08
6.25	0.78	1.13
6.5	0.81	1.17
6.75	0.84	1.22
7	0.88	1.26

INTRAOPERATIVE ANESTHESIA CONSISTS OF 4 MG KETAMINE +
2 MG XYLAZINE IN 50 ML DILUENT, INFUSED AT 1 DROP EVERY
4-6 SECONDS FOR A 6-8 LB. RABBIT.

Tissue Preparation for Weld Strength Optimization Study

1. Make a midline incision with a #15 scalpel.
2. Identify and isolate the small bowel.
3. Place an atraumatic clamp across the mesentery at the section to be resected.
4. Place a hemoclip at the site of the nearest vessels to occlude blood flow.
5. Resect a small segment of bowel measuring approximately 5 cm.
6. Return the remaining in situ bowel to the abdomen.
7. Make a longitudinal cut in the bowel segment, and open it up. Carefully rinse the bowel segment in physiological saline to remove succus entericus.
8. Using the specialized cutters, cut two strips measuring 4.0 x 20.0 mm. Place the two strips into the clamps, making sure that the strips are aligned relative to the marks on the clamps.
9. Apply a barely visible amount of chromophore with a cotton-tipped applicator. The chromophore should be applied to both tissue strips.
10. Position the thermocouple between the two tissue strips.
11. Slowly bring the two tissue strips into apposition using the computer-controlled piezoelectric motor.
12. Verify appropriate thermocouple placement (1 mm below surface of weld).
13. Set laser welding parameters in laser welding control program. Weld tissue.
14. Switch to the tensiometry data acquisition program. Pull tissue apart and measure the load required to rupture the weld.
15. Repeat steps 5-14 to prepare additional tissue strips.
16. Import data into Lotus or Symphony to generate load versus distance plots.