THE
OKONITE
COMPANY

Post Office Box 340
Ramsey, New Jersey 07446
201-825-0300/Cable: Okonite

January 25, 2002

Satish Aggarwal, Ph.D.
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Supplemental Information – Requalification of Okonite Okolon Cable

Dear Dr. Aggarwal:

In our recent call regarding the qualification testing summarized in our December 20, 2001, letter to the NRC you requested the following supplemental information:

1. A copy of the Wyle test report
2. Technical justification for the 1.24 eV activation energy
3. Extrapolated thermal aging conditions for 60 years.

Enclosed please find the requested test report, Wyle Nuclear Environmental Test Report (NEQ) 46120-1. Report Appendix II Table I (pages II-3 and II-4) summarizes the thermal aging and radiation simulation conditions for the thirty-eight mandrel specimens. The accident simulation profile is depicted on Appendix X Figure 1 (page X-16). As documented in the report, all the specimens except for Specimens 21 through 26 and Specimen 38 successfully completed the test program, including the IEEE-383-74 post-accident high-potential test. Specimens 21 through 26 were the most severely thermally-aged specimens subsequently exposed to 200 Mrad. Specimen 38 (and Specimen 37, which successfully completed the test program) were the most severely thermally-aged specimens subsequently exposed to 100 Mrad. All other specimens with less severe thermal aging, up to <u>225 hours at 150°C and 200 Mrad</u> and <u>300 hours at 150°C and 100 Mrad</u>, successfully completed the test program and met the requirements of IEEE 383-74.

The technical basis for the 1.24 eV activation energy is provided in Attachment 1. The activation energy is based on an analysis of elongation-to-break measurements for Okonite Okolon composite insulation samples subjected to accelerated thermal aging at temperatures of 121°C, 136°C, and 150°C.

As stated in our December 20, 2001 letter, Arrhenius calculations using the qualification test program's successful thermal aging, 225 and 300 hours at 150°C, and 1.24 eV result in extrapolations of 75°C and 77°C at 40 years. Extrapolated conditions at 60 years using the same parameters are 71°C and 74°C. In our December letter to S. J. Collins we reaffirmed our conviction, as stated in Okonite Okolon Qualification Report NQRN-1A, that the Arrhenius method is an inaccurate technique for predicting long term life, giving rise to overly conservative results, and that the most realistic method of gauging the cable's aging rate is by comparison to the accelerated and natural aging of previous generations of insulation material. We continue to maintain this conviction and data supporting it will be included in Appendix 2 of Okonite Okolon Qualification Report NQRN-1A. We plan to reissue this report including the recently completed Wyle Laboratory Qualification as a revision to NQRN-1A.

JF/jj

Very truly yours,

The Okonite Company

By: [signature]
John Faranetta

Ref: 01615A
Attachments
cc: Mr. Samuel J. Collins/NRC
Mr. P. Shemanski/NRC

Technical Basis for Okonite Okolon 1.24 eV Activation Energy

Okonite has established an activation energy of 1.24 eV for the Okonite Okolon composite insulation based on an Arrhenius regression analysis of accelerated aging experiments conducted on six inch specimens of Okonite Okolon #12 awg cables. The experiments were conducted in aging ovens at temperatures of 121°C, 136°C, and 150°C with air velocities of 10 - 20 ft/min. Subsequent to the oven exposure the copper conductors were carefully removed from the specimens and elongation-at-break measurements performed using a mechanical tensile tester. The elongation data was mathematically evaluated using an exponential regression analysis. Activation energy values of 1.24 eV were calculated at elongation-to-break values of 20%, 10%, 5%, and 0%. The results of that analysis are presented in Table 1.

At Okonite, we have always used type II ovens with ventilation rates near 200 changes per hour and internal air velocity rates measured as high as 500 ft per minute for accelerated thermal aging evaluations. The experimental design and thermal conditions for these accelerated aging programs are defined in IEEE Standard 98; IEEE Guide for the Preparation of Test Procedures for the Thermal Evaluation and Establishment of Temperature Indexes of Solid Electrical Insulating Materials. In Section 7, Aging Ovens, the guide recommends that forced air circulation ovens be used for the aging program and that the amount of makeup air (rate of ventilation) and the rate of circulation or internal oven air velocity be specified. The guide implies that rates of ventilation and circulation are factors that may affect aging performance along with the oven temperature.

In the course of the thermal aging evaluation, we became concerned about the effect of such high velocities (400 – 500 feet per minute) on the accelerated thermal aging data for Okonite Okolon constructions. Obviously, this high air velocity is not part of the environment in the natural aging of Okonite Okolon cables.

One worker in the field recently reported similar concerns in regard to the accelerated air oven aging of plasticized PVC insulation compounds. K. Anandakumaran has reported that high air velocity will cause rapid depletion of plasticizer in PVC compounds leading to premature failure of these materials. He states, "*oven manufacturers generally design their ovens with very high recirculation rates in order to maintain a uniform temperature within the oven. This high velocity airflow is known to cause undue accelerated depletion of the plasticizer and lead to premature failure of the PVC insulation.*"[1]

Since the Okolon compound is plasticized with volatile aromatic mineral oils, we became concerned that high oven air flow rates created another variable factor, plasticizer loss through mass transfer, contributing to the overall aging effect in addition to the thermal effect.

In order to evaluate the effect of oven air velocity on the accelerated air oven performance of Okonite Okolon, evaluations were conducted at air velocity rates of 400 - 500 feet per minute and lower rates of 10 - 20 feet per minute and 0 feet per minute. Analysis of the results indicated that activation energies increased as air velocities decreased. At 400 - 500 feet per minute an activation energy value similar to those measured by Sandia for Hypalon materials was calculated. At 10 - 20 feet per minute a value of 1.24 eV was calculated and at 0 feet per minute the value was 1.25 eV. When performing Arrhenius calculations we recommend using an activation energy of 1.24 eV for 1/C #12 Okonite Okolon 600V since the average air oven air velocity rate of 10 - 20 feet per minute is a conservative representation of real world conditions.

In NQRN-1A Appendix 2 Okonite has stated our conviction that the Arrhenius method is an inaccurate technique for predicting long term life, giving rise to overly conservative results, and that the most realistic method of gauging the cable's aging rate is by comparison to the accelerated and natural aging of previous generations of insulation materials.

[1] Anandakumaran etal, Nuclear Qualification of PVC Insulated Cables, IEEE Transactions on Dielectrics and Electrical Insulation Vol 8 No. 5, October 2001.

Table 1

Arrhenius Calculation
F.O. 07-85810 Q.C. 14631A
1/C #12 7X 030 Okonite 015 Okolon
(aged with wires in place)

Aging Temp. (x)		Hours to % Elongation Retention (y)			
°C	1/°K	20%	10%	5%	0%
150	0.002364	62.7	70.9	75.0	79.2
136	0.002445	204.0	231.6	245.4	259.2
121	0.002538	763.2	870.8	925.5	978.3

Exponential Regression Analysis

$\ln y = \ln A + Bx$

A =	$(x10^{-13})$	1.14	1.14	1.15	1.18
B =	$(x10^{4})$	1.44	1.44	1.44	1.44
r =		0.999	0.999	0.999	0.999
Activation Energy (ev/mole)		1.24	1.24	1.24	1.24

Ref: 01616Sheet10

NUCLEAR ENVIRONMENTAL QUALIFICATION TEST REPORT OF

OKONITE OKOLON CABLES

For

The Okonite Company
Paterson, New Jersey

NEQ
Nuclear Environmental Qualification Test Report

wyle laboratories

REPORT NO. 46120-1

WYLE JOB NO. 46120

CUSTOMER P.O. NO. 9-01-429

PAGE 1 OF 223 PAGE REPORT

DATE December 26, 2001

SPECIFICATION(S) See References in Paragraph 5.0

1.0 CUSTOMER The Okonite Company

ADDRESS 959 Market Street Paterson, NJ 07513

2.0 TEST SPECIMEN One-conductor, 12 AWG, Okonite Insulation, Okolon Jacket, Wire

3.0 MANUFACTURER The Okonite Company

4.0 SUMMARY

Thirty-eight Cable Specimens and 50 Basket Specimens, as described in Paragraph 6.0 and hereinafter called the specimens, were subjected to a test program as required by The Okonite Company's Purchase Order 9-01-429 and Wyle Laboratories Test Procedure No. 46120, Revision E. This test program was performed on August 10, through December 13, 2001.

The test program requirements are summarized in Paragraph 9.0.

The specimens successfully completed the required test program as specified in Wyle Laboratories Test Procedure 46120, Revision E, except as documented in Notices of Anomaly Nos. 1 through 3, and in Paragraph 11.0 of this report.

Test requirements, procedures, and results are described in Paragraphs 9.0, 10.0, and 11.0 of this report.

STATE OF ALABAMA
COUNTY OF MADISON } ss.

Don E. Smith, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted testing ~~and is~~ to the best of his knowledge true and correct in all respects.

Don Smith 12/26/01

SUBSCRIBED and sworn to before me this 26th day of Dec, 2001

Elizabeth M. Dennis SEAL

Notary Public in and for the State of Alabama at large

My Commission expires Sept. 22, 2003

PREPARED BY Robert Hardy 12/26/01
Robert Hardy, Project Engineer

APPROVED BY Don Smith 12/26/01
Don Smith, Project Manager

WYLE Q. A. T R Hamilton 12/27/2001
T. R. Hamilton, Q.A. Manager

wyle laboratories

Huntsville, Alabama

(td)

5.0 REFERENCES

- The Okonite Company Purchase Order No. 9-01-429
- Wyle Laboratories' Quotation No. 543/010620-R1/JS
- Wyle Laboratories Test Procedure No. 46120, Revision E
- IEEE Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"
- IEEE Standard 383-1974, "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations"
- 10 CFR 21, "Reporting of Defects and Noncompliance"
- 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants"
- Wyle Laboratories' (Eastern Operations) Quality Assurance Program Manual, Revision 2

6.0 SPECIMEN DESCRIPTION

The specimens for the test program consisted of two production runs of 1-conductor, 12 AWG, Okonite Okolon-insulated and jacketed wire. Each production run was represented by 19 long specimens (38 specimens total) and 150 short specimens in 50 baskets (300 short specimens total). Each of the baskets contained six, 6-inch samples (3 of each production run). Production Run Numbers were FO-07-85810 and FO-07-7839. Note that the FO-07-7839 Production Run was differentiated by the protruding ridge in the Okolon jacket that ran the length of the cable. See Table I in Appendix II for individual specimen details.

7.0 QUALITY ASSURANCE

All work on this test program was performed in accordance with Wyle Laboratories' Quality Assurance Program, which complies with the applicable requirements of 10 CFR 50, Appendix B, ANSI N45.2, and the Regulatory Guides.

The Wyle Laboratories, Huntsville Facility, Quality Management System is registered in compliance with the ISO-9001 International Quality Standard. Registration has been completed by Quality Management Institute (QMI), a division of the Canadian Standards Association (CSA).

8.0 TEST EQUIPMENT AND INSTRUMENTATION

All instrumentation, measuring, and test equipment used in the performance of this test program were calibrated in accordance with Wyle Laboratories' Quality Assurance Program which complies with the requirements of ANSI/NCSL Z540-1, ISO 10012-1, and Military Specification MIL-STD-45662A. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

9.0 REQUIREMENTS

The specimens shall be subjected to the following:

- Receipt Inspection
- Specimen Mounting
- Baseline Functional Test
- Thermal Aging
- Post-Thermal Aging Functional Test
- Radiation Exposure
- Post-Radiation Exposure Functional Test
- Accident Simulation
- Post-Accident Simulation Functional Test
- Post-Test Inspection

10.0 PROCEDURES

10.1 Receipt Inspection

An inspection was performed upon receipt of the specimens at Wyle Laboratories. The specimens were checked to ensure that they were as described in Paragraph 6.0. Additionally, the specimens were visually inspected for any physical damage.

10.2 Specimen Mounting

The 38 long specimens were lightly coiled (to allow for differences in thermal expansion between the rubber layer and the metal mandrel) around stainless steel mandrels. The diameter of each mandrel was approximately 13.5". Each cable was attached to its mandrel by placing stainless steel safety wire through holes drilled on either side of the coiled cable and tying the specimen to the mandrel. High temperature glass cloth electrical tape (Scotch™ 69) was folded several times to make a cushion that was placed between the safety wire, from mandrel hole to mandrel hole, and the specimen cable. Each mandrel was equipped with a support arm for purposes of securely attaching the cable as it exited the mandrel. A similar method was used to attach and cushion the cable to the support arm. Each mandrel was marked with a paint pen to identify the specimens attached. Each mandrel contained two long specimens, one from each production run. Each production run was staggered as to location on the mandrel (top or bottom) so that placement of the production runs encompassed both locations. In all handling and testing, the mandrels were oriented in the same direction (support arm at the bottom).

10.0 PROCEDURES (continued)

10.2 Specimen Mounting (continued)

The center point of each long specimen was located and marked. Seven feet from the center mark, in both directions, was located and marked in the same manner. The center 14 feet of each specimen was then coiled around the mandrel (approximately 4 coils). The remaining 22 feet (11 feet on each end) exited the mandrel via the support arm.

Fifty (50) 6" x 6" x 0.5" stainless steel baskets were prepared by Okonite. Each of the baskets contained six (6) short specimens (approximately 6"), three of each production run, for Condition Monitoring purposes. Each basket was identified by Wyle with a unique identifier which indicated the basket number and the point of testing at which the basket was to be removed from the program and returned to Okonite for Condition Monitoring tests.

10.3 Baseline Functional Test

10.3.1 Insulation Resistance

Insulation resistance (IR) of individual long specimens was measured at room ambient conditions with the mandrel submerged in tap water for a minimum of 5 minutes prior to testing using a General Radio Model 1864 megohmmeter. A 500 VDC potential was applied between each specimen and its mandrel and IR measured and recorded one minute following voltage application. Following each measurement, the specimen conductor was grounded for one minute to remove the space charge.

10.3.2 Dielectric Withstand

High-potential tests were performed by applying voltage between each specimen and the mandrel while the mandrel was submerged in room temperature tap water for a minimum of 5 minutes prior to testing. The voltage was increased to the full value rapidly, but did not exceed 500 volts per mil per second. Full voltage was maintained for 1 minute and then reduced to one-quarter value in not more than 15 seconds. Leakage current was recorded. The high potential test voltage for the baseline tests was 80 VAC/mil of insulation. Per Okonite, each cable had 30 mils of insulation resulting in a test voltage of 2400 VAC.

10.4 Thermal Aging

The specimens that were to be thermally aged were placed in a Wyle Thermal Aging Chamber and aged in air at 302°F (+7/-0°F) for the duration specified in Table I. At the specified time, the specimens were removed from the thermal aging chamber. During the Thermal Aging process, a circular chart recorder which monitored chamber temperature as a function of time was used to record the chamber temperature. Additionally, one thermocouple was mounted on each mandrel, and the indicated temperature was recorded. The specimens were not energized for thermal aging.

For the mandrel specimens identified in Table I, each support arm extending off the mandrel was placed through a penetration in the oven to prevent exposure of the wire exiting the arm to the elevated temperature inside the oven.

10.0 PROCEDURES (continued)

10.5 Post-Thermal Aging Functional Test

The specimens were visually inspected after Thermal Aging. Additionally, the specimens were subjected to an Insulation Resistance Functional Test as detailed in Paragraph 10.3.1. Results of the Visual Inspection and Insulation Resistance Test are contained in Appendix VIII.

10.6 Radiation Exposure

The specimens detailed in Table I (while still mounted to the appropriate fixtures) were carefully packaged and delivered to the Georgia Institute of Technology, Neely Nuclear Research Center in Atlanta, Georgia. There, the specimens were exposed to a Cobalt 60 radiation source. The Radiation Exposure report is contained in Appendix VI. The specimens were not energized for radiation exposure.

10.7 Post-Radiation Exposure Functional Test

The specimens were visually inspected after Radiation Exposure. Additionally, the specimens were subjected to an Insulation Resistance Functional Test as detailed in Paragraph 10.3.1.

10.8 Accident Simulation

10.8.1 Test Setup

All of the mandrels and the appropriate basket specimens were placed inside a LOCA test chamber. The unaged portion of each cable specimen, exiting the support arm, was routed through a chamber penetration. Each penetration was potted following standard Wyle practices. Nineteen penetrations were used, one for each mandrel. Each mandrel was grounded via a wire attached to the mandrel at one end and the test chamber at the other end.

10.8.2 Monitoring

Each mandrel was individually monitored for applied voltage, circuit current, and leakage current throughout the duration of the LOCA Simulation Test. Figures 1 through 19 detail the electrical circuits used in monitoring the specimens.

Three thermocouples were placed at points around and within two inches of the fixture holding the specimens. The average of these thermocouples was used to control the test chamber temperature. The test chamber pressure was monitored and recorded throughout the duration of the test by means of a pressure transducer connected to the test chamber.

The chemical spray flow rate was monitored and recorded throughout the duration of the test by means of a flowmeter mounted in line with the spray discharge line.

10.8 Accident Simulation (continued)

10.8.3 Powering and Loading

The mandrel specimens were powered and loaded as detailed in Figures 1 through 19. Each mandrel was powered with a separate power source.

The basket specimens required no electrical powering or loading since they were for condition monitoring purposes only.

10.8.4 Accident Test

The test chamber average temperature was increased to approximately 120°F and held for approximately 87 minutes prior to the start of the first transient of the accident simulation. The Accident Profile shown in Figure 20 in Appendix III was used for the application of steam and pressure for the first transient. The time to reach an average chamber temperature of 345°F for the initial transient was approximately 3 minutes and 42 seconds. The total duration of the first transient was approximately 3 hours and 10 minutes.

The test chamber temperature was cooled to approximately 180°F following the completion of the first transient. The accident profile shown in Figure 20 in Appendix III was used for the application of steam and pressure for the second transient. The time to reach an average chamber temperature of 345°F for the second transient was approximately 4 minutes and 25 seconds. The resulting environmental profiles are shown in Appendix IX.

Starting at approximately the 6-minute points of the first and second transients (spray was discontinued just prior to application of the second transient), spray was initiated inside the test chamber. The chemical spray consisted of deionized water with 0.28 molar Boric Acid (H_3BO_3) (3000 ppm boron), 0.064 molar Sodium Thiosulfate ($Na_2S_2O_3$), and Sodium Hydroxide (NaOH) that made a pH of 10.5 at approximately 77°F. The area of the horizontal plane at the centerline of the specimens was measured to be approximately 21 square feet. A flow rate of 3.2 gallons per minute gives approximately 0.15 gpm/sq. ft. (3.2 gpm divided by 21 sq. ft.). The spray was continued throughout the test except where it was stopped at the 10-day point to flood the chamber and perform submerged Dielectric Withstand Tests on the specimens.

At the 10-day point of the accident simulation, the test chamber was allowed to cool to ambient temperature. The following day, the test chamber was flooded with ambient temperature tap water sufficient to submerge all the test specimens contained within. A Dielectric Withstand Test, as detailed in Paragraph 10.3.2 was performed on all the test specimens. Following the Dielectric Withstand test, the chamber was drained and the temperature was gradually increased to 212°F and testing was continued until the 30-day requirement was met.

10.9 Post-Accident Simulation Functional Test

The following steps were taken (in order) following completion of the Accident Test:

- The temperature of the test chamber was allowed to naturally decrease to laboratory ambient conditions overnight
- The door of the chamber was removed allowing access to the specimens following cool down
- The leads were cut from the specimens leaving the aged portion of the specimens on the mandrels
- One at a time, the specimens were removed from their mandrels, while still coiled, marked with an appropriate specimen marker, and submerged in room temperature tap water for storage
- Each specimen, in turn, was removed from the water, straightened, and recoiled on a metal mandrel approximately 40 times the diameter of the cable (approximately 8")
- Each specimen, while still coiled on the 8" mandrel, was submerged in room temperature tap water and subjected to a Dielectric Withstand Test as detailed in Paragraph 10.3.2 with the exception that the full voltage was maintained for 5 minutes
- The specimens were then removed from the mandrel, carefully packed, and returned to Okonite

See Table II in Appendix II for visual observations of the Post-Accident Test Inspection.

11.0 RESULTS

The specimens successfully completed the required test program with the following exceptions:

At approximately 08:30 hours on 9/8/01, the facility power went off momentarily causing the thermal aging chamber controller to trip off. The controller was reset and the chamber was allowed to return to the required temperature. The duration the temperature was out of tolerance was approximately 30 minutes. The lowest temperature the chamber dropped to was approximately 250°F. At the time of the power outage, the following mandrels and baskets were in the thermal aging chamber: Mandrels 11, 12, 13, 17, 18, and 19, and Baskets 30 through 38 and 45 through 50. 30 minutes was added to the aging time for the above referenced specimens to account for the time below 302°F (see Notice of Anomaly No 1).

During the performance of the Dielectric Withstand Test at the 10-day point of the accident simulation, the following specimens were found to have leakage current in excess of 10 milliamps (maximum capability of the test machine) at approximately 200 volts AC: Specimens 21 through 26 and Specimen 38. Following notification of the anomaly, Okonite directed that the test be restarted as detailed in the test procedure (see Notice of Anomaly No. 2).

11.0 RESULTS

During the restart of the Accident Test, following completion of the 10-day point Insulation Resistance Test, the leakage current fuse for the circuit powering Mandrel 13 (Specimens 25 and 26) opened. The circuit was left de-energized for the remainder of the Accident Test.

At approximately the 19-day, 1.5-hour point of the Accident Test, the leakage current fuse for the circuit powering Mandrel 11 (Specimens 21 and 22) opened. The circuit was left de-energized for the remainder of the Accident Test.

From the point where the test was restarted following the 10-day point Insulation Resistance Test, the circuits powering Mandrels 11 (Specimens 21 and 22), 12 (Specimens 23 and 24), and 19 (Specimens 37 and 38) had leakage currents in excess of 50 milliamps which was the highest range for the Accident Test electrical monitoring circuits. Since the electrical monitoring circuits had been set up to monitor up to 50 milliamps maximum, the resulting leakage current plots only show up to 50 milliamps. The circuits contained a 500-milliamp fuse which would have opened if leakage current had exceeded 500 milliamps. Note that at the request of Okonite, Specimen 38 was temporarily removed from the circuit on two occasions, leaving only Specimen 37 in the circuit. The resulting leakage current was less than 2 milliamps with only Specimen 37 in the electrical circuit.

Following the completion of the Accident Test, Specimens 21 through 26 and 38 were found to be split open with conductor(s) visible. It should be noted that the inspection revealed that the splits occurred only on the portion of the cable opposite the side in contact with the mandrel. Therefore, the conductor(s) never came in direct contact with the mandrel. The leakage current values for these specimens were a result of the resistance of the moisture in contact with the exposed conductor to ground. A representative of Okonite was on site for the Post-Accident Test Inspection (see Notice of Anomaly No. 3).

The following appendices are included in this report:

Appendix	Contents
I	Notices of Anomaly
II	Tables
III	Figures
IV	Photographs
V	Thermal Aging Charts and Plots
VI	Radiation Facility Component Irradiation Certification
VII	Instrumentation, Equipment Sheets
VIII	Functional Test Data Sheets
IX	Accident Simulation Test Plots
X	Wyle Laboratories Test Procedure 46120, Revision E

APPENDIX I

NOTICES OF ANOMALY

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wyle laboratories

ORIGINAL NOTICE OF ANOMALY

DATE: September 10, 2001

NOTICE NO.: 1	P.O. NUMBER: 9-01-429	CONTRACT NO.:	N/A
CUSTOMER:	The Okonite Company	WYLE JOB NO.:	46120
NOTIFICATION MADE TO:	John Faranetta	NOTIFICATION DATE:	9/10/01
NOTIFICATION MADE BY:	Robert Hardy	VIA:	Fax
CATEGORY:	☐ SPECIMEN ☐ PROCEDURE ☒ TEST EQUIPMENT	DATE OF ANOMALY:	9/8/01
PART NAME:	Cable Specimens	PART NO.	N/A
TEST:	Thermal Aging	I.D. NO.	N/A
SPECIFICATION:	WLTP 46120, Revision B	PARA. NO.	4.3

REQUIREMENTS:

The specimens that are to be thermally-aged shall be placed in a Wyle Thermal Aging Chamber and aged in air at 302°F (+7/-0°F) for the duration specified in Table I of the above referenced specification.

DESCRIPTION OF ANOMALY:

At approximately 08:30 hours on 9/8/01, the facility power went off momentarily causing the thermal aging chamber controller to trip off.

DISPOSITION - COMMENTS – RECOMMENDATIONS:

The controller was reset and the chamber was allowed to return to the required temperature. The duration the temperature was out of tolerance was approximately 30 minutes. The lowest temperature the chamber dropped to was approximately 250°F. At the time of the power outage, the following mandrels and baskets were in the thermal aging chamber: Mandrels 11, 12, 13, 17, 18, and 19; Baskets 30 through 38 and 45 through 50.

30 minutes will be added to the above referenced specimens to account for the time below 302°F.

RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ■ CUSTOMER ☐ WYLE

VERIFICATION:		PROJECT ENGINEER:	[signature] 9/10/01 Robert Hardy
TEST WITNESS:	N/A	PROJECT MANAGER:	[signature] 9/10/01 Don Smith
REPRESENTING:	-------	INTERDEPARTMENTAL COORDINATION:	
QUALITY ASSURANCE:	[signature] 9/11/01		

Wyle Form WH 1066, Rev. JUL '94

Page 1 of 1

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ORIGINAL **NOTICE OF ANOMALY** DATE: November 27, 2001

NOTICE NO.:	2	P.O. NUMBER:	9-01-429	CONTRACT NO.:	N/A
CUSTOMER:	The Okonite Company			WYLE JOB NO.:	46120
NOTIFICATION MADE TO:	John Faranetta			NOTIFICATION DATE:	11/21/01
NOTIFICATION MADE BY:	Robert Hardy			VIA:	Fax

CATEGORY: ☒ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT DATE OF ANOMALY: 11/21/01

PART NAME:	Cable Specimens	PART NO.	N/A
TEST:	Accident Test	I.D. NO.	N/A
SPECIFICATION:	WLTP 46120, Revision D	PARA. NO.	4.7.4

REQUIREMENTS:

At the 10-day point of the Accident Test, the temperature of the test chamber shall be allowed to naturally decrease to laboratory ambient conditions. When there, the test chamber shall be flooded with tap water to submerge the test specimens. Once the chamber is flooded, a Dielectric Withstand Test as detailed in Paragraph 4.2.2 shall be performed on each specimen. When completed, the water shall be drained and the temperature of the test chamber slowly returned to 212°F for the remainder of the test.

DESCRIPTION OF ANOMALY:

During the performance of the Dielectric Withstand Test, the following specimens were found to have leakage current in excess of 10 milliamps at approximately 200 volts AC:

Specimens 21 through 26 and Specimen 38

DISPOSITION - COMMENTS – RECOMMENDATIONS:

Following notification of the anomaly, Okonite directed that the test be re-started as detailed in the test procedure. The customer will make the decision as to the final disposition of this Notice of Anomaly.

RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ■ CUSTOMER ☐ WYLE

VERIFICATION:		PROJECT ENGINEER:	[signature] 11/27/01 Robert Hardy
TEST WITNESS:	N/A	PROJECT MANAGER:	[signature] 11/27/01 Don Smith
REPRESENTING:	-------	INTERDEPARTMENTAL COORDINATION:	
QUALITY ASSURANCE:	[signature] 11/27/01		

Wyle Form WH 1068, Rev. JUL '94 Page 1 of 1

wyle laboratories

ORIGINAL NOTICE OF ANOMALY

DATE: December 14, 2001

NOTICE NO.: 3	P.O. NUMBER: 9-01-429	CONTRACT NO.:	N/A
CUSTOMER:	The Okonite Company	WYLE JOB NO.:	46120
NOTIFICATION MADE TO:	John Faranetta	NOTIFICATION DATE:	11/21/01
NOTIFICATION MADE BY:	Robert Hardy	VIA:	Phone and in person
CATEGORY:	☒ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT	DATE OF ANOMALY:	11/21/01 thru 12/12/01
PART NAME:	Cable Specimens	PART NO.	N/A
TEST:	Accident Test	I.D. NO.	N/A
SPECIFICATION:	WLTP 46120, Revision E	PARA. NO.	4.7.4

REQUIREMENTS:

The cable specimens shall be powered and exposed to the Accident Test as required in the above referenced specification.

DESCRIPTION OF ANOMALY:

1. During the re-start of the Accident Test following completion of the 10-day point Insulation Resistance test, the leakage current fuse in the circuit powering Mandrel 13 (Specimens 25 and 26) opened.
2. At approximately the 19-day, 1.5-hour point of the Accident Test, the leakage current fuse in the circuit powering Mandrel 11 (Specimens 21 and 22) opened.
3. From the point of re-starting following the 10-day point Insulation Resistance test, the circuits powering Mandrels 11, 12, and 19 had leakage currents in excess of 50 milliamps which was the highest range for the Accident Test electrical monitoring circuits.
4. Following the completion of the Accident Test, Specimens 21 through 26 and 38 were found to be split open with conductor(s) visible.

DISPOSITION - COMMENTS – RECOMMENDATIONS:

1. The circuit was left de-energized for the remainder of the Accident Test.
2. The circuit was left de-energized for the remainder of the Accident Test.
3. Since the electrical monitoring circuits had been set up to monitor up to 50 milliamps maximum, the resulting leakage current plots will only show up to 50 milliamps. The circuits were fused at 500 milliamps which would have opened if leakage current had exceeded 500 milliamps.
4. A representative of Okonite was on site for the Post-Accident Test Inspection. The customer will make the final decision as to the disposition of the anomaly.

RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ■ CUSTOMER ☐ WYLE

VERIFICATION:		PROJECT ENGINEER:	Robert Hardy (signature) 12/14/01
TEST WITNESS:	N/A	PROJECT MANAGER:	Don Smith (signature) 12/17/01
REPRESENTING:	-------	INTERDEPARTMENTAL COORDINATION:	
QUALITY ASSURANCE:	(signature) 12/17/01		

Wyle Form WH 1066, Rev. JUL '94

Page 1 of 1

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APPENDIX II

TABLES

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TABLE I

SPECIMEN DETAILS

MANDREL SPECIMENS (Thermal Aging)

Specimen No.	Mandrel No.	Production Run No.	Required Thermal Aging Time (hours)	Required Thermal Aging Temperature (°F)	Actual Thermal Aging Time (hours)
1	1	FO-07-85810	Unaged	N/A	N/A
2	1	FO-07-7839	Unaged	N/A	N/A
3	2	FO-07-85810	50	302	50
4	2	FO-07-7839	50	302	50
5	3	FO-07-85810	70	302	70
6	3	FO-07-7839	70	302	70
7	4	FO-07-85810	90	302	90
8	4	FO-07-7839	90	302	90
9	5	FO-07-85810	110	302	110
10	5	FO-07-7839	110	302	110
11	6	FO-07-85810	130	302	130
12	6	FO-07-7839	130	302	130
13	7	FO-07-85810	150	302	150
14	7	FO-07-7839	150	302	150
15	8	FO-07-85810	175	302	175
16	8	FO-07-7839	175	302	175
17	9	FO-07-85810	200	302	200
18	9	FO-07-7839	200	302	200
19	10	FO-07-85810	225	302	225.6
20	10	FO-07-7839	225	302	225.6
21	11	FO-07-85810	250	302	250.4
22	11	FO-07-7839	250	302	250.4
23	12	FO-07-85810	275	302	275.23
24	12	FO-07-7839	275	302	275.23
25	13	FO-07-85810	300	302	300.23
26	13	FO-07-7839	300	302	300.23
27	14	FO-07-85810	150	302	150
28	14	FO-07-7839	150	302	150
29	15	FO-07-85810	175	302	175
30	15	FO-07-7839	175	302	175
31	16	FO-07-85810	200	302	200
32	16	FO-07-7839	200	302	200
33	17	FO-07-85810	250	302	250.4
34	17	FO-07-7839	250	302	250.4
35	18	FO-07-85810	300	302	300.23
36	18	FO-07-7839	300	302	300.23
37	19	FO-07-85810	350	302	350.31
38	19	FO-07-7839	350	302	350.31

TABLE I

SPECIMEN DETAILS

MANDREL SPECIMENS (Radiation Exposure)						
Specimen No.	Mandrel No.	Production Run No.	Required Radiation Dose (rads)	Required Radiation Dose Rate (rads/hour)	Actual Radiation Dose (rads)	Actual Radiation Dose Rate (rads/hour)
1	1	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
2	1	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
3	2	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
4	2	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
5	3	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
6	3	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
7	4	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
8	4	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
9	5	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
10	5	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
11	6	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
12	6	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
13	7	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
14	7	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
15	8	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
16	8	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
17	9	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
18	9	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
19	10	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
20	10	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
21	11	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
22	11	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
23	12	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
24	12	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
25	13	FO-07-85810	2.0E8	<1.0E6	2.049E8	5.054E5
26	13	FO-07-7839	2.0E8	<1.0E6	2.049E8	5.054E5
27	14	FO-07-85810	1.0E8	<1.0E6	1.025E8	4.88E5
28	14	FO-07-7839	1.0E8	<1.0E6	1.025E8	4.88E5
29	15	FO-07-85810	1.0E8	<1.0E6	1.025E8	4.88E5
30	15	FO-07-7839	1.0E8	<1.0E6	1.025E8	4.88E5
31	16	FO-07-85810	1.0E8	<1.0E6	1.025E8	4.88E5
32	16	FO-07-7839	1.0E8	<1.0E6	1.025E8	4.88E5
33	17	FO-07-85810	1.0E8	<1.0E6	1.025E8	4.88E5
34	17	FO-07-7839	1.0E8	<1.0E6	1.025E8	4.88E5
35	18	FO-07-85810	1.0E8	<1.0E6	1.025E8	4.88E5
36	18	FO-07-7839	1.0E8	<1.0E6	1.025E8	4.88E5
37	19	FO-07-85810	1.0E8	<1.0E6	1.025E8	4.88E5
38	19	FO-07-7839	1.0E8	<1.0E6	1.025E8	4.88E5

TABLE I (continued)

SPECIMEN DETAILS

BASKET SPECIMENS (Thermal Aging)			
Basket No.	**Required Thermal Aging Time (hours)**	**Required Thermal Aging Temperature (°F)**	**Actual Thermal Aging Time (hours)**
1	Unaged	N/A	N/A
2	Unaged	N/A	N/A
3	50	302	50
4	50	302	50
5	50	302	50
6	70	302	70
7	70	302	70
8	70	302	70
9	90	302	90
10	90	302	90
11	90	302	90
12	110	302	110
13	110	302	110
14	110	302	110
15	130	302	130
16	130	302	130
17	130	302	130
18	150	302	150
19	150	302	150
20	150	302	150
21	175	302	175
22	175	302	175
23	175	302	175
24	200	302	200
25	200	302	200

TABLE I (continued)

SPECIMEN DETAILS

BASKET SPECIMENS (Thermal Aging)			
Basket No.	Required Thermal Aging Time (hours)	Required Thermal Aging Temperature (°F)	Actual Thermal Aging Time (hours)
26	200	302	200
27	225	302	225.6
28	225	302	225.6
29	225	302	225.6
30	250	302	250.4
31	250	302	250.4
32	250	302	250.4
33	275	302	275.23
34	275	302	275.23
35	275	302	275.23
36	300	302	300.23
37	300	302	300.23
38	300	302	300.23
39	150	302	150
40	150	302	150
41	175	302	175
42	175	302	175
43	200	302	200
44	200	302	200
45	250	302	250.4
46	250	302	250.4
47	300	302	300.23
48	300	302	300.23
49	350	302	350.31
50	350	302	350.31

TABLE I (continued)

SPECIMEN DETAILS

BASKET SPECIMENS (Radiation Exposure)				
Basket No.	**Required Radiation Dose (rads)**	**Required Radiation Dose Rate (rads/hour)**	**Actual Radiation Dose (rads)**	**Actual Radiation Dose Rate (rads/hour)**
1	2.0E8	<1.0E6	2.049E8	5.054E5
2	2.0E8	<1.0E6	2.049E8	5.054E5
3	N/A	N/A	N/A	N/A
4	2.0E8	<1.0E6	2.049E8	5.054E5
5	2.0E8	<1.0E6	2.049E8	5.054E5
6	N/A	N/A	N/A	N/A
7	2.0E8	<1.0E6	2.049E8	5.054E5
8	2.0E8	<1.0E6	2.049E8	5.054E5
9	N/A	N/A	N/A	N/A
10	2.0E8	<1.0E6	2.049E8	5.054E5
11	2.0E8	<1.0E6	2.049E8	5.054E5
12	N/A	N/A	N/A	N/A
13	2.0E8	<1.0E6	2.049E8	5.054E5
14	2.0E8	<1.0E6	2.049E8	5.054E5
15	N/A	N/A	N/A	N/A
16	2.0E8	<1.0E6	2.049E8	5.054E5
17	2.0E8	<1.0E6	2.049E8	5.054E5
18	N/A	N/A	N/A	N/A
19	2.0E8	<1.0E6	2.049E8	5.054E5
20	2.0E8	<1.0E6	2.049E8	5.054E5
21	N/A	N/A	N/A	N/A
22	2.0E8	<1.0E6	2.049E8	5.054E5
23	2.0E8	<1.0E6	2.049E8	5.054E5
24	N/A	N/A	N/A	N/A
25	2.0E8	<1.0E6	2.049E8	5.054E5

TABLE I (continued)

SPECIMEN DETAILS

BASKET SPECIMENS (Radiation Exposure)				
Basket No.	**Required Radiation Dose (rads)**	**Required Radiation Dose Rate (rads/hour)**	**Actual Radiation Dose (rads)**	**Actual Radiation Dose Rate (rads/hour)**
26	2.0E8	<1.0E6	2.049E8	5.054E5
27	N/A	N/A	N/A	N/A
28	2.0E8	<1.0E6	2.049E8	5.054E5
29	2.0E8	<1.0E6	2.049E8	5.054E5
30	N/A	N/A	N/A	N/A
31	2.0E8	<1.0E6	2.049E8	5.054E5
32	2.0E8	<1.0E6	2.049E8	5.054E5
33	N/A	N/A	N/A	N/A
34	2.0E8	<1.0E6	2.049E8	5.054E5
35	2.0E8	<1.0E6	2.049E8	5.054E5
36	N/A	N/A	N/A	N/A
37	2.0E8	<1.0E6	2.049E8	5.054E5
38	2.0E8	<1.0E6	2.049E8	5.054E5
39	1.0E8	<1.0E6	1.025E8	4.88E5
40	1.0E8	<1.0E6	1.025E8	4.88E5
41	1.0E8	<1.0E6	1.025E8	4.88E5
42	1.0E8	<1.0E6	1.025E8	4.88E5
43	1.0E8	<1.0E6	1.025E8	4.88E5
44	1.0E8	<1.0E6	1.025E8	4.88E5
45	1.0E8	<1.0E6	1.025E8	4.88E5
46	1.0E8	<1.0E6	1.025E8	4.88E5
47	1.0E8	<1.0E6	1.025E8	4.88E5
48	1.0E8	<1.0E6	1.025E8	4.88E5
49	1.0E8	<1.0E6	1.025E8	4.88E5
50	1.0E8	<1.0E6	1.025E8	4.88E5

TABLE II

RESULTS OF POST-ACCIDENT TEST INSPECTION

Specimen No.	Comments
1	Flexible, no visible damage other than frequent jacket blisters.
2	Flexible, no visible damage other than frequent jacket blisters.
3	Flexible, no visible damage other than frequent jacket blisters.
4	Flexible, no visible damage other than frequent jacket blisters.
5	Flexible, no visible damage other than minor jacket blisters.
6	Flexible, no visible damage other than minor jacket blisters.
7	Flexible, very few minor longitudinal cracks.
8	Flexible, no visible damage.
9	Flexible, very few minor longitudinal cracks.
10	Flexible, no visible damage.
11	Flexible, very few longitudinal cracks in jacket (slight cracks).
12	Flexible, no visible damage.
13	Flexible, very few longitudinal cracks in jacket (slight cracks).
14	Flexible, no visible damage.
15	Stiff, multiple longitudinal cracks in jacket.
16	Stiff, few longitudinal cracks in jacket.
17	Stiff, multiple longitudinal cracks in jacket.
18	Stiff, few longitudinal cracks in jacket.
19	Stiff, multiple longitudinal cracks in jacket. Cracking through jacket but not into insulation.
20	Stiff, multiple longitudinal cracks in jacket. Cracking through jacket but not into insulation.
21	Stiff, visible conductor, multiple large cracks
22	Stiff, visible conductor, multiple large cracks
23	Stiff, visible conductor, multiple large cracks
24	Stiff, visible conductor, multiple large cracks
25	Stiff, visible conductor, multiple large cracks
26	Stiff, visible conductor, multiple large cracks
27	Stiff, limited longitudinal cracks in jacket. Cracking is not deep.
28	Stiff, no cracking observed.
29	Stiff, limited longitudinal cracks in jacket. Cracking is not deep.
30	Stiff, no cracking observed.
31	Stiff, multiple longitudinal cracks in jacket. Cracking through jacket but not into insulation.
32	Stiff, multiple longitudinal cracks in jacket. Cracking through jacket but not into insulation.
33	Very stiff, multiple longitudinal cracks in jacket, circumferential cracks following bend test. Cracking through jacket but not into insulation.
34	Very stiff, multiple longitudinal cracks in jacket, circumferential cracks following bend test. Cracking through jacket but not into insulation.
35	Very stiff, multiple longitudinal cracks in jacket, circumferential cracks following bend test. Cracking through jacket but not into insulation.
36	Very stiff, multiple longitudinal cracks in jacket, circumferential cracks following bend test. Cracking through jacket but not into insulation.
37	Very stiff, multiple longitudinal deep cracks in jacket, circumferential cracks following bend test. Cracking through jacket possibly into insulation.
38	Very stiff, visible conductor, multiple large cracks

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APPENDIX III

FIGURES

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OKONITE LOCA SIMULATION ELECTRICAL SETUP

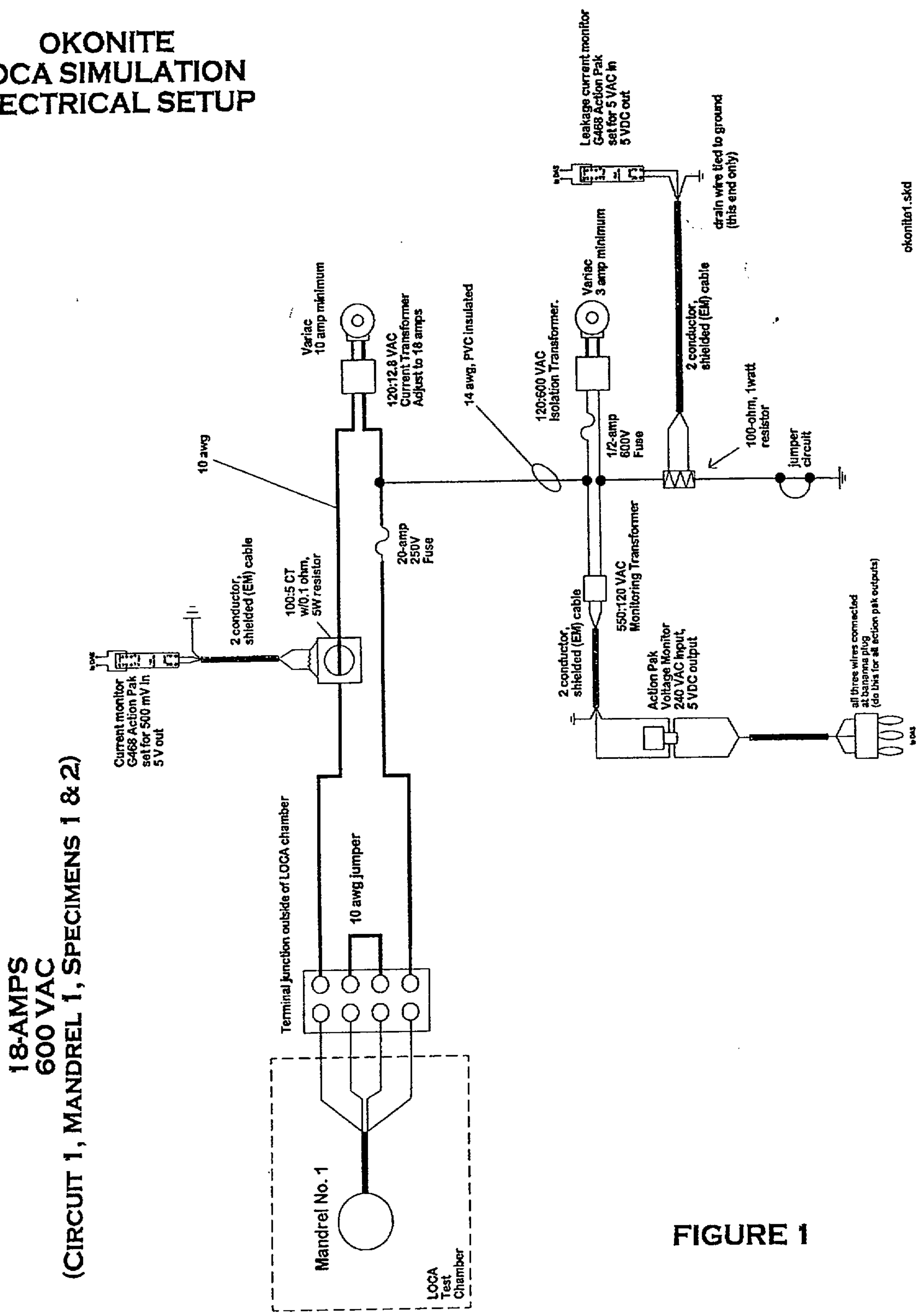


FIGURE 1

OKONITE
LOCA SIMULATION
ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 2, MANDREL 2, SPECIMENS 3 & 4)

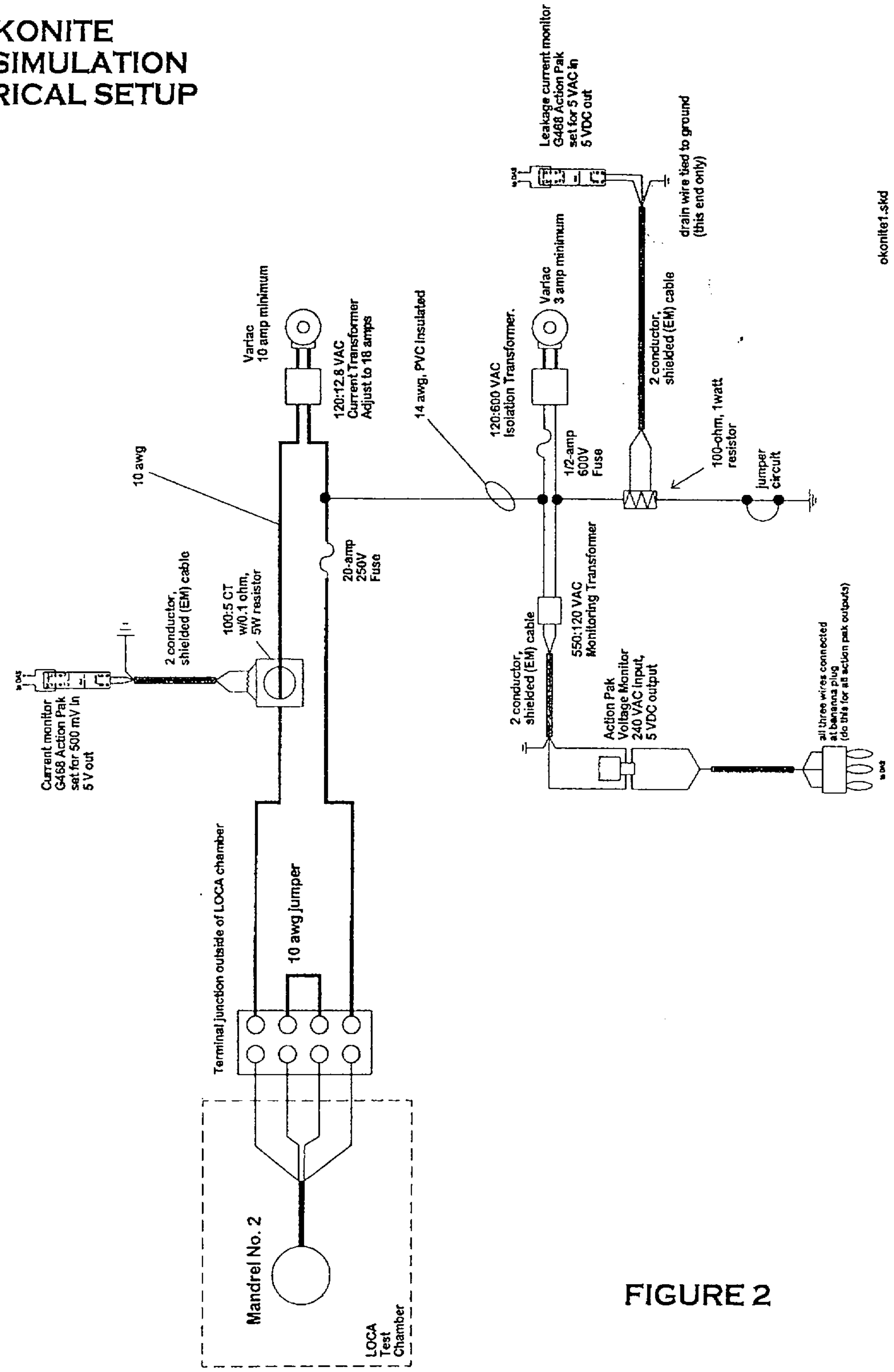


FIGURE 2

OKONITE
LOCA SIMULATION
ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 3, MANDREL 3, SPECIMENS 5 & 6)

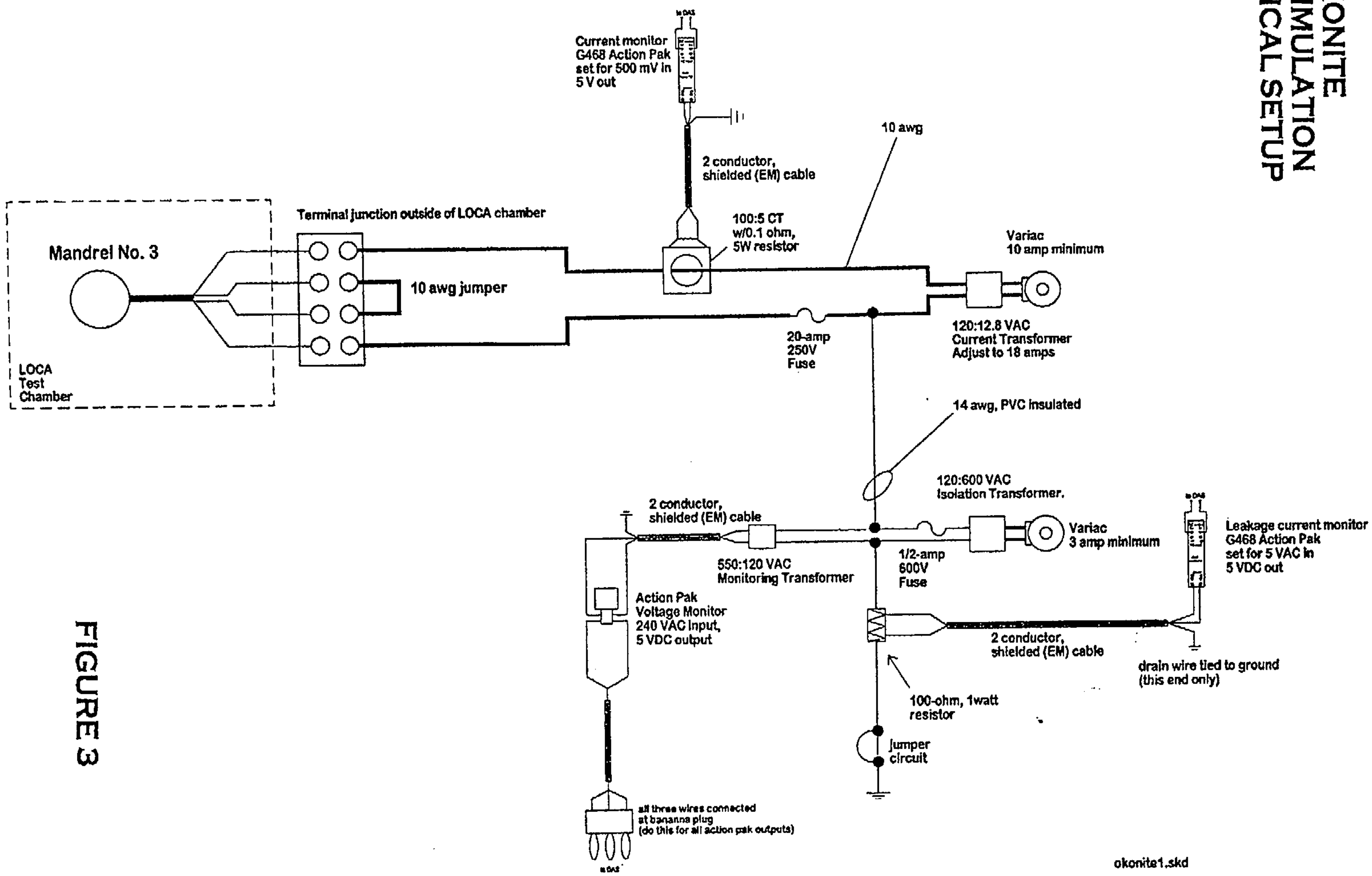


FIGURE 3

OKONITE
LOCA SIMULATION
ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 4, MANDREL 4, SPECIMENS 7 & 8)

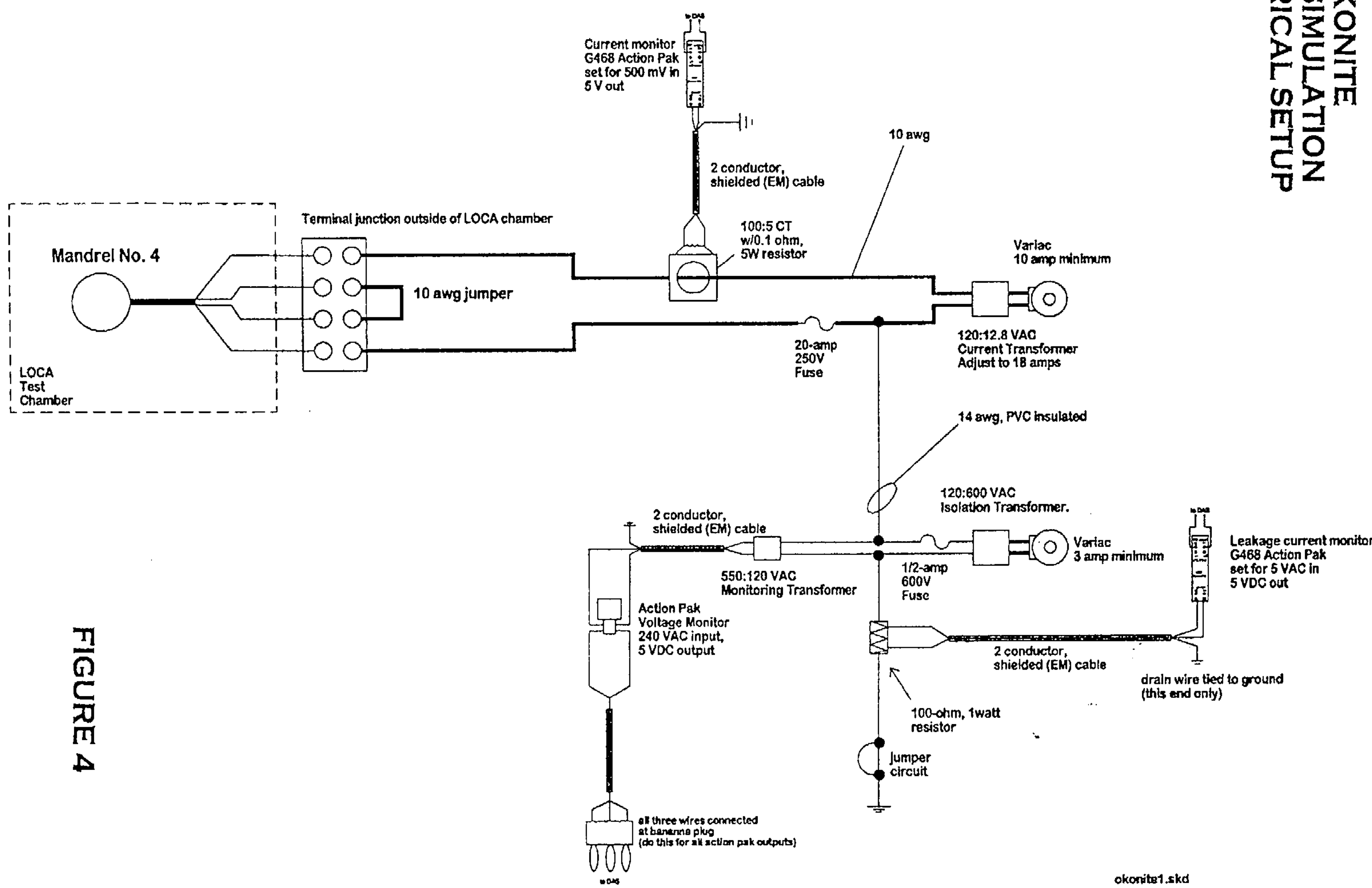


FIGURE 4

OKONITE LOCA SIMULATION ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 5, MANDREL 5, SPECIMENS 9 & 10)

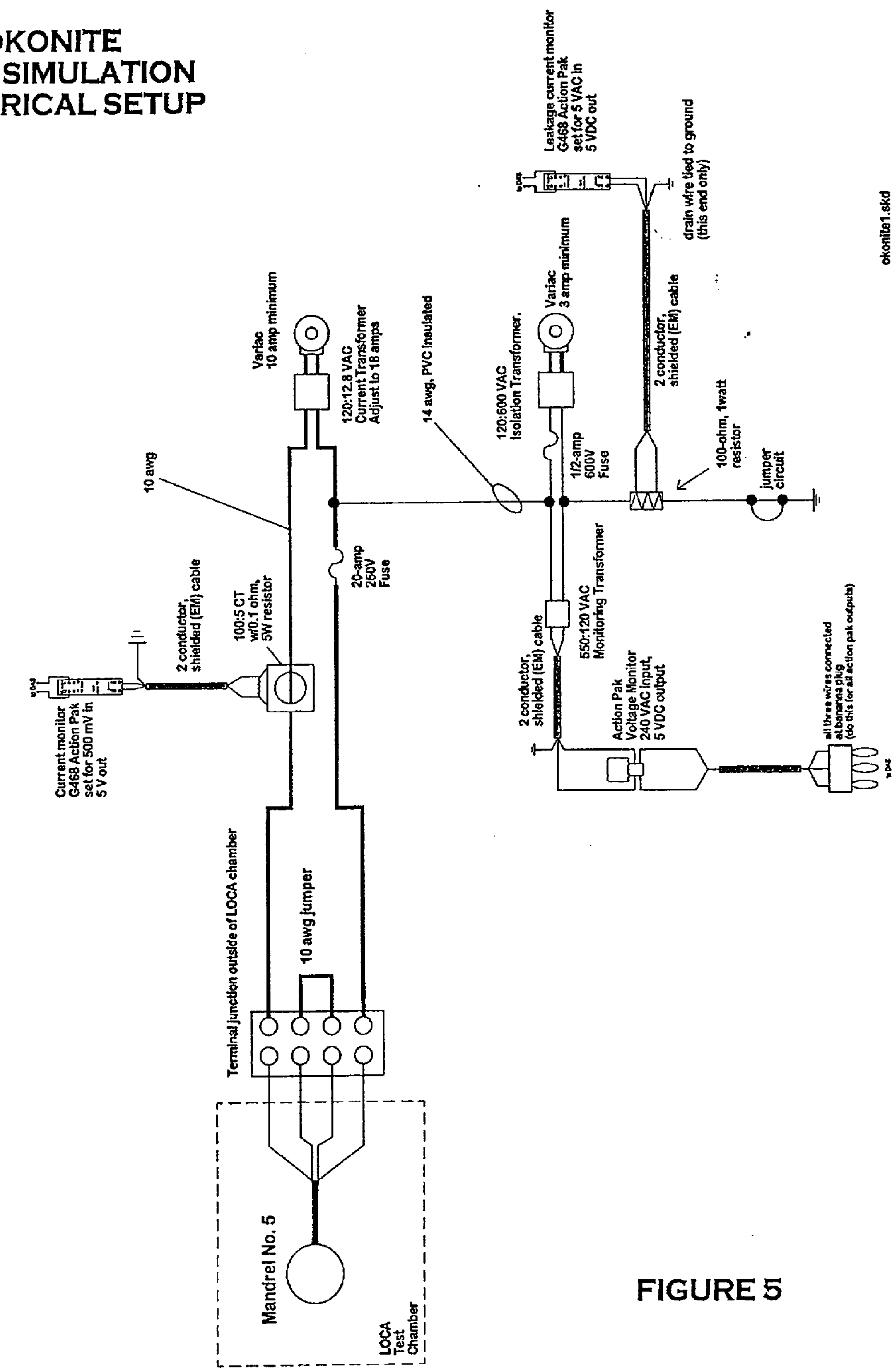


FIGURE 5

OKONITE LOCA SIMULATION ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 6, MANDREL 6, SPECIMENS 11 & 12)

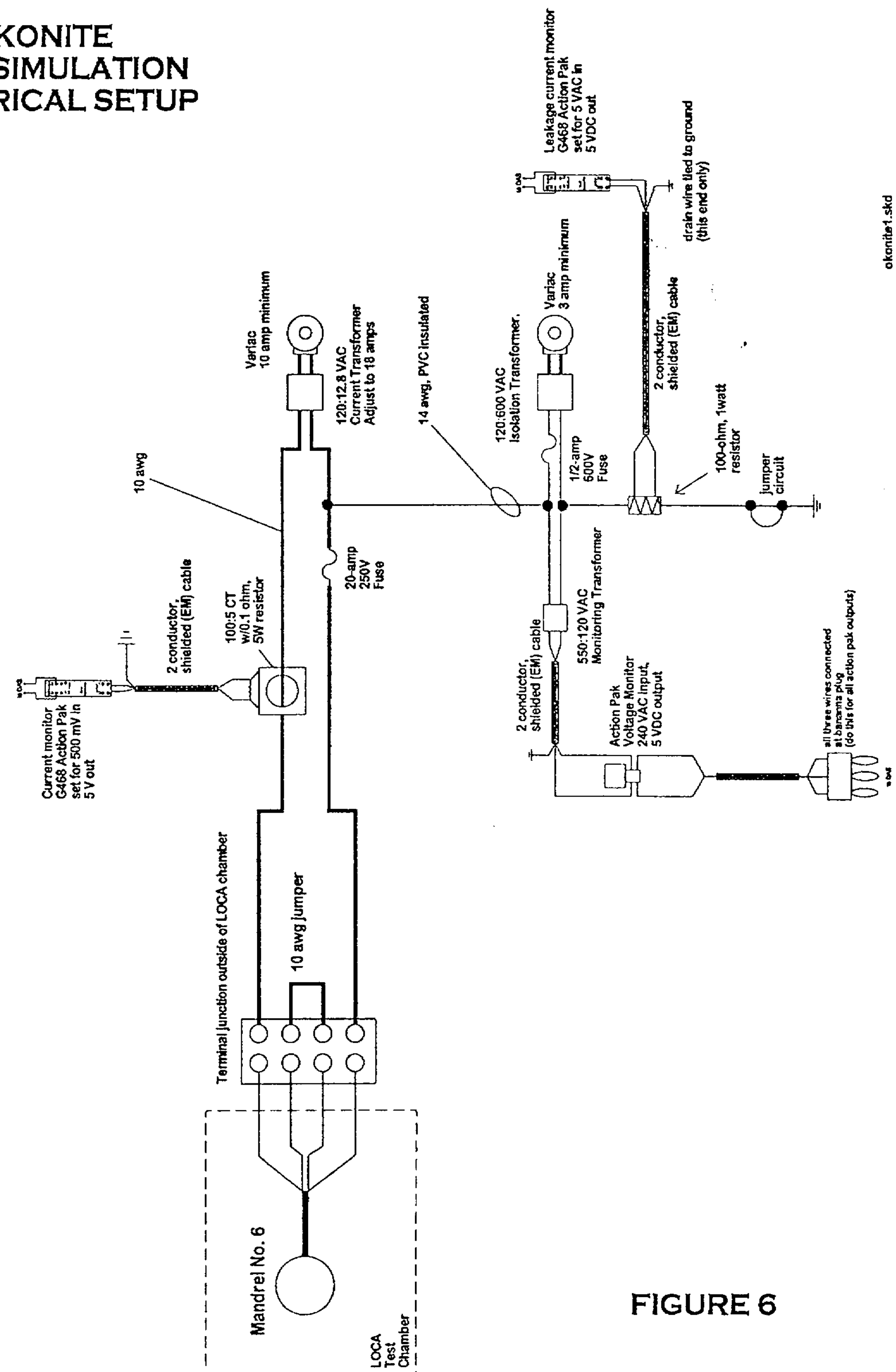
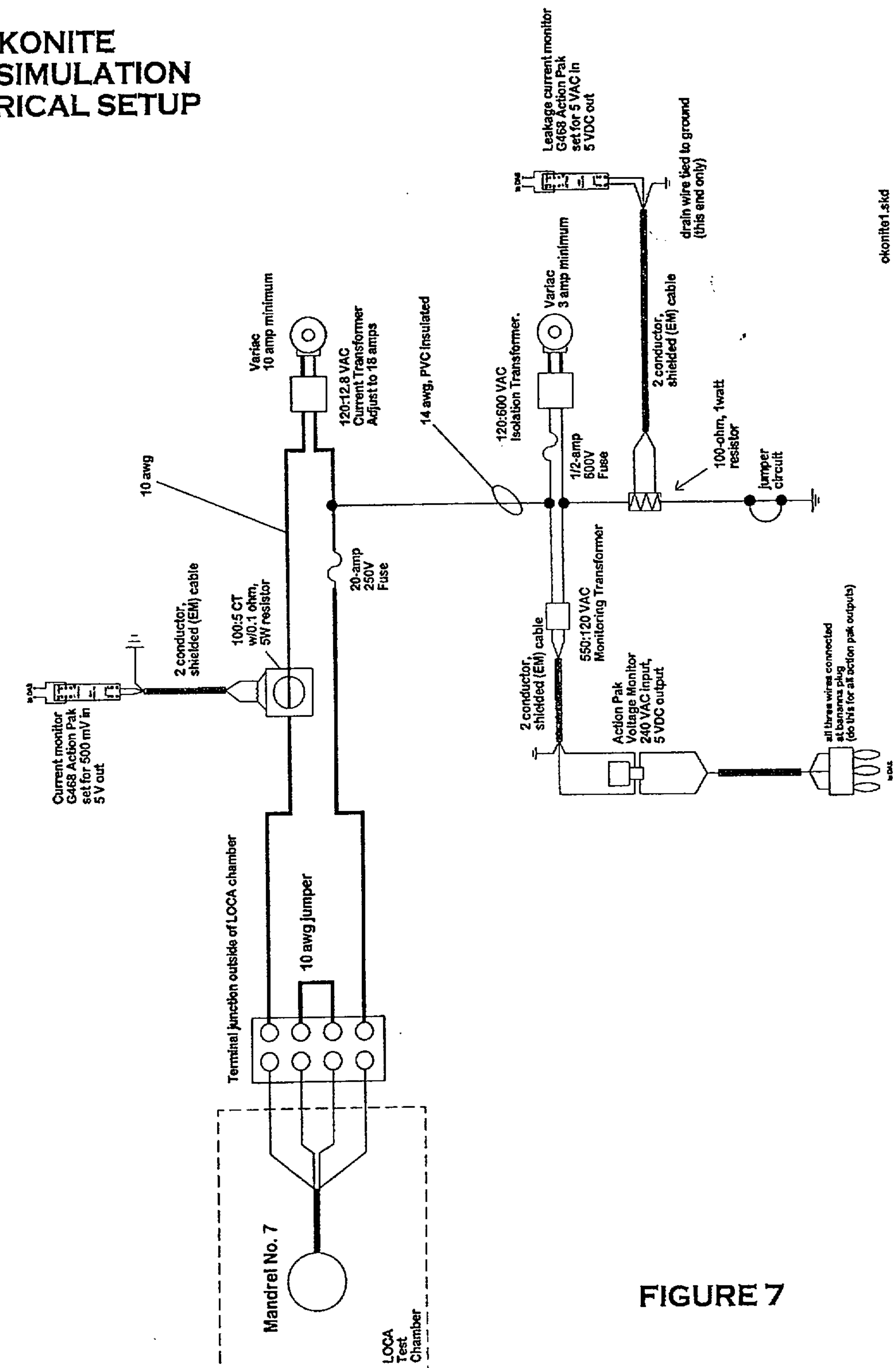


FIGURE 6

OKONITE LOCA SIMULATION ELECTRICAL SETUP



18-AMPS
600 VAC
(CIRCUIT 7, MANDREL 7, SPECIMENS 13 & 14)

FIGURE 7

OKONITE
LOCA SIMULATION
ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 8, MANDREL 8, SPECIMENS 15 & 16)

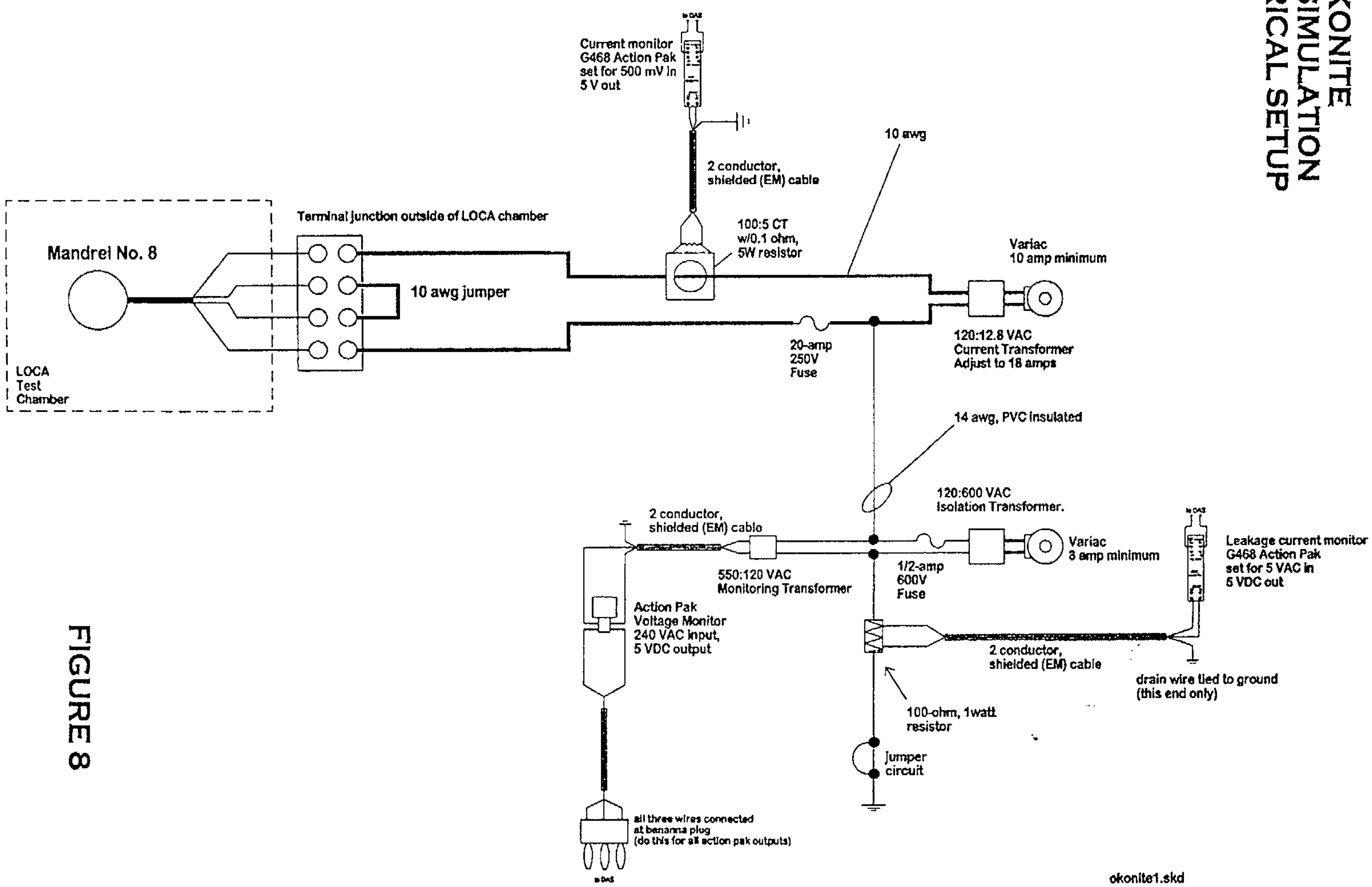


FIGURE 8

WYLE LABORATORIES
Huntsville Facility

OKONITE LOCA SIMULATION ELECTRICAL SETUP

18-AMPS 600 VAC (CIRCUIT 9, MANDREL 9, SPECIMENS 17 & 18)

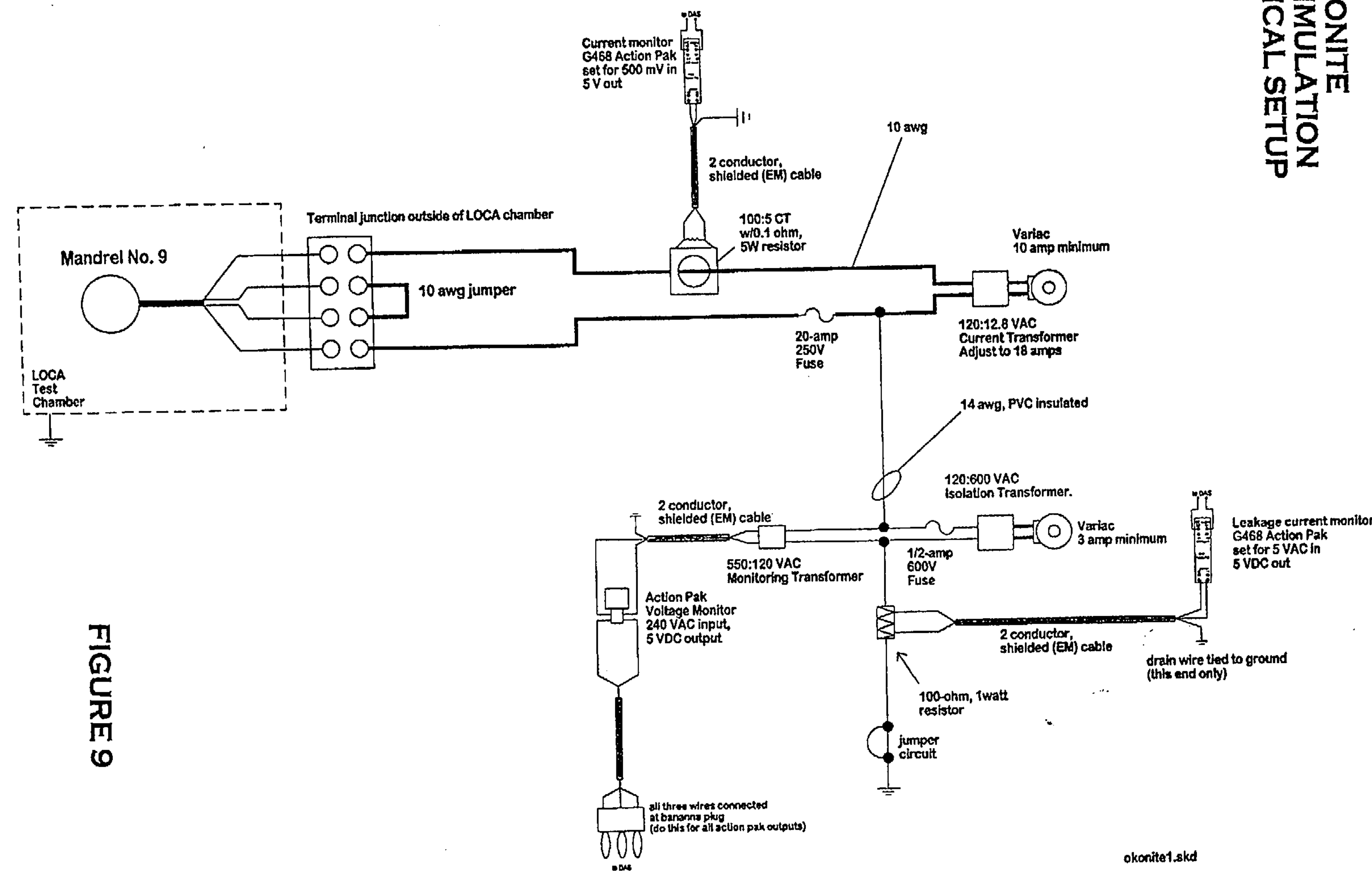


FIGURE 9

OKONITE
LOCA SIMULATION
ELECTRICAL SETUP

18-AMPS
600 VAC
(Circuit 10, Mandrel 10, Specimens 19 & 20)

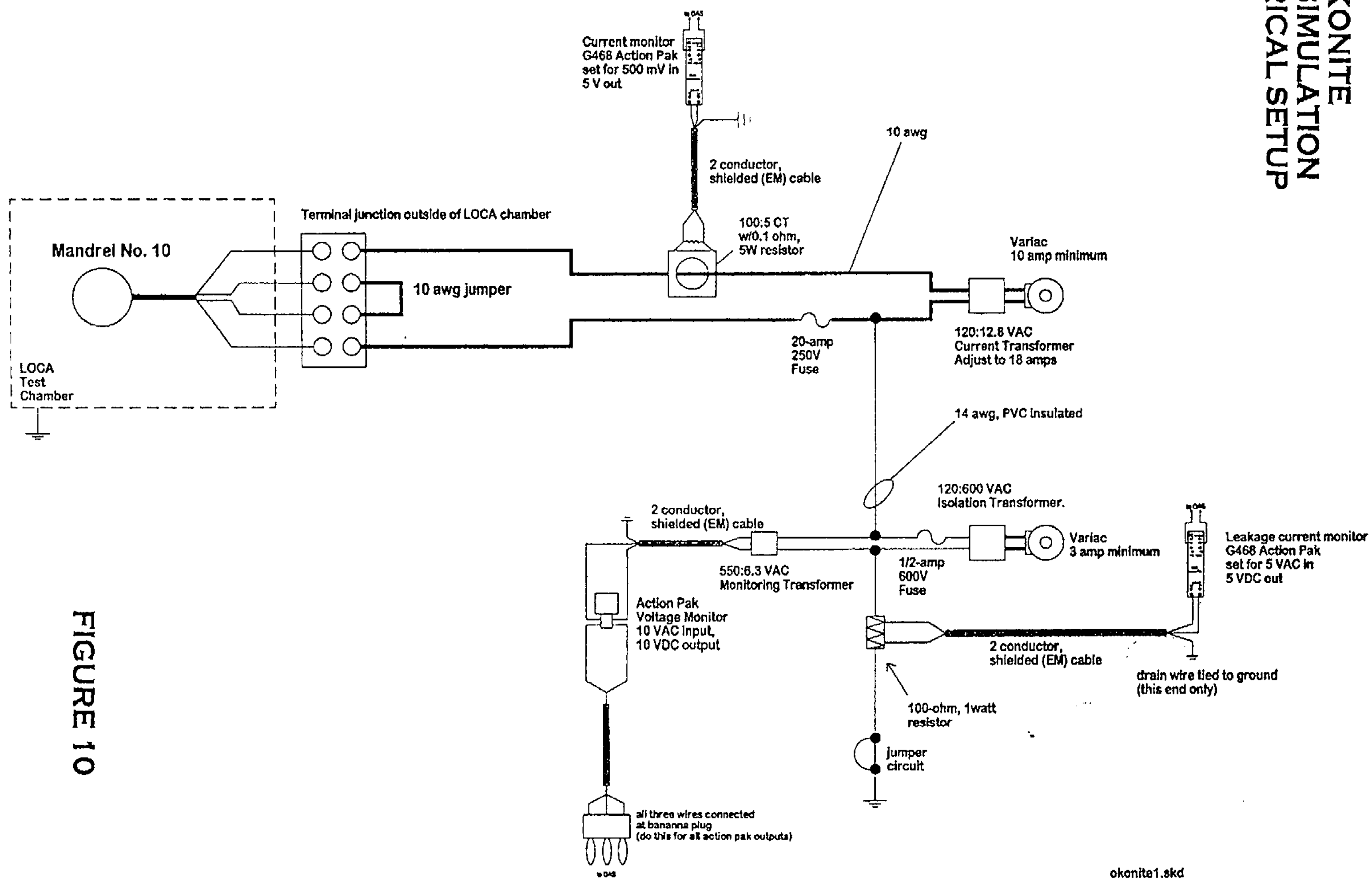
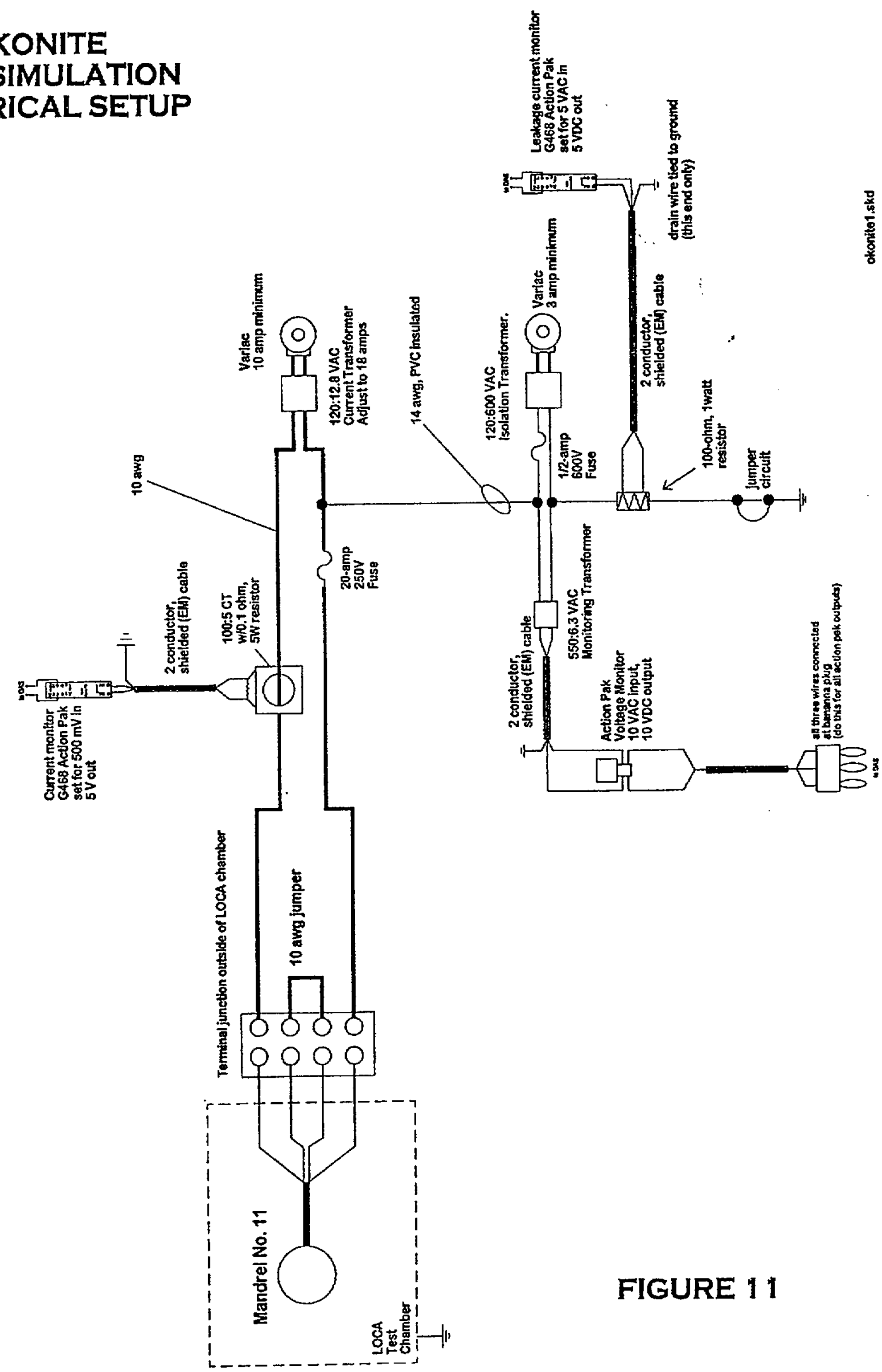


FIGURE 10

WYLE LABORATORIES
Huntsville Facility

OKONITE LOCA SIMULATION ELECTRICAL SETUP



18-AMPS
600 VAC
(CIRCUIT 11, MANDREL 11, SPECIMENS 21 & 22)

FIGURE 11

OKONITE
LOCA SIMULATION
ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 12, MANDREL 12, SPECIMENS 23 & 24)

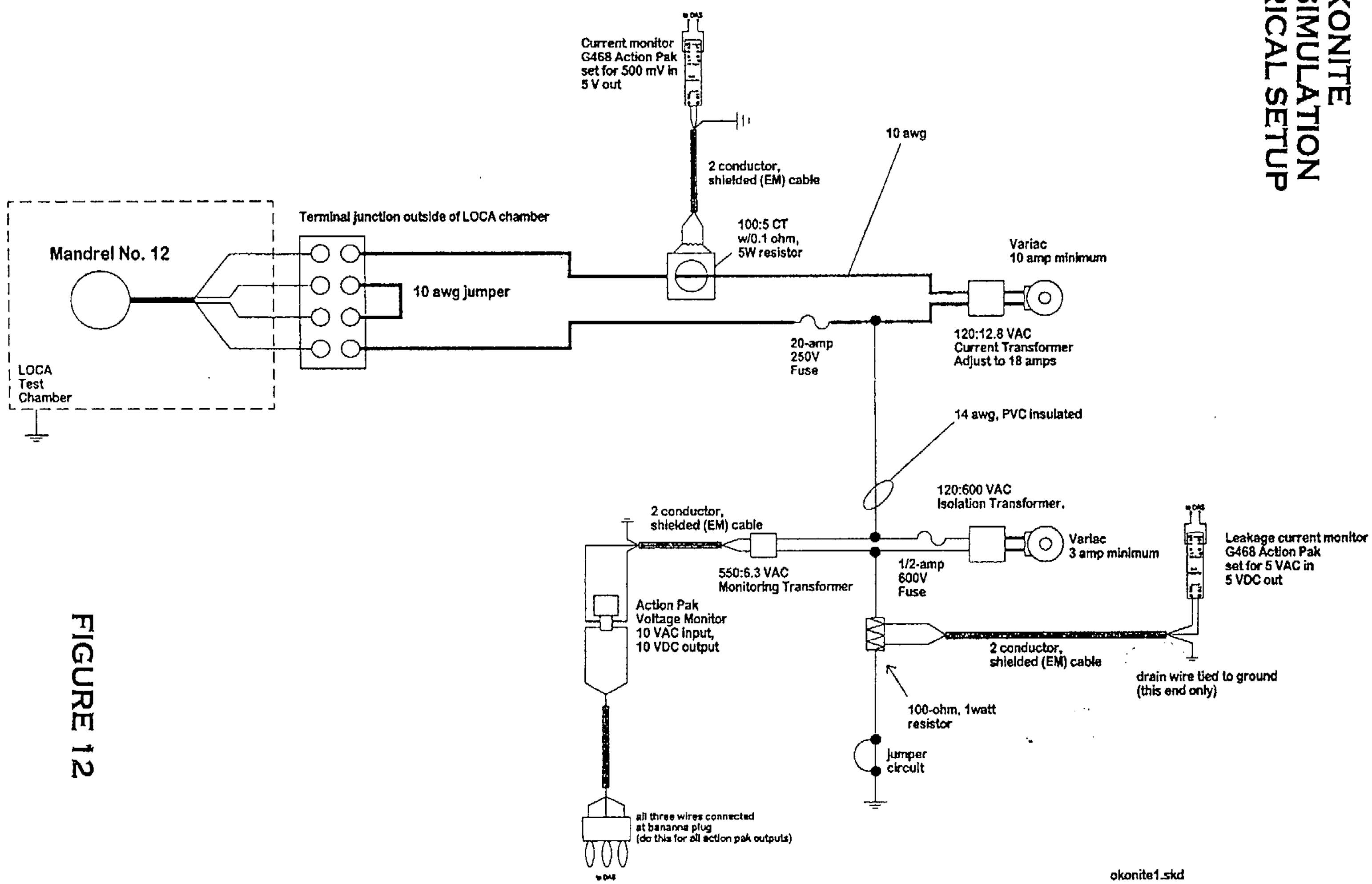


FIGURE 12

OKONITE LOCA SIMULATION ELECTRICAL SETUP

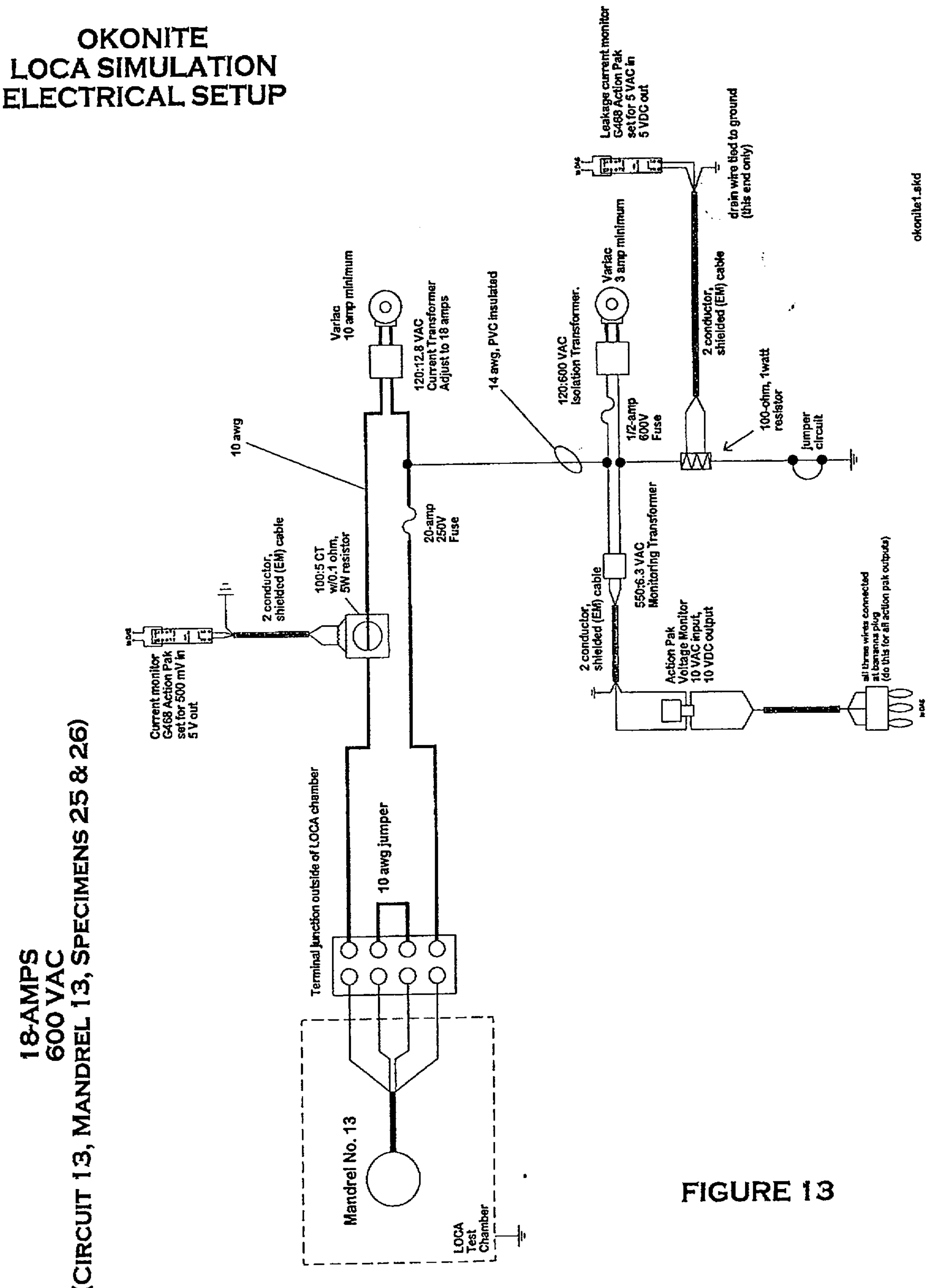


FIGURE 13

OKONITE LOCA SIMULATION ELECTRICAL SETUP

18-AMPS 600 VAC (CIRCUIT 14, MANDREL 14, SPECIMENS 27 & 28)

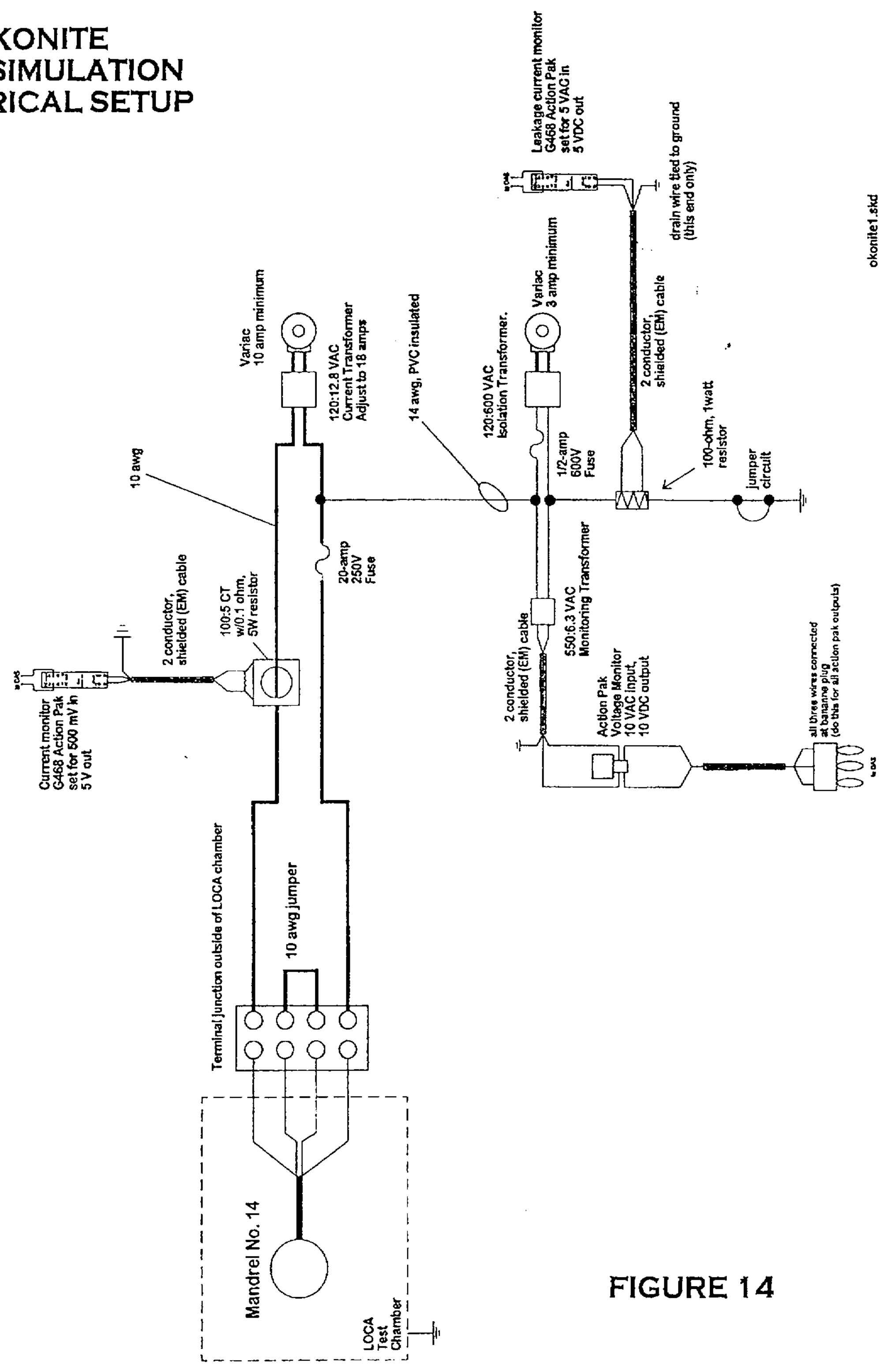


FIGURE 14

OKONITE LOCA SIMULATION ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 15, MANDREL 15, SPECIMENS 29 & 30)

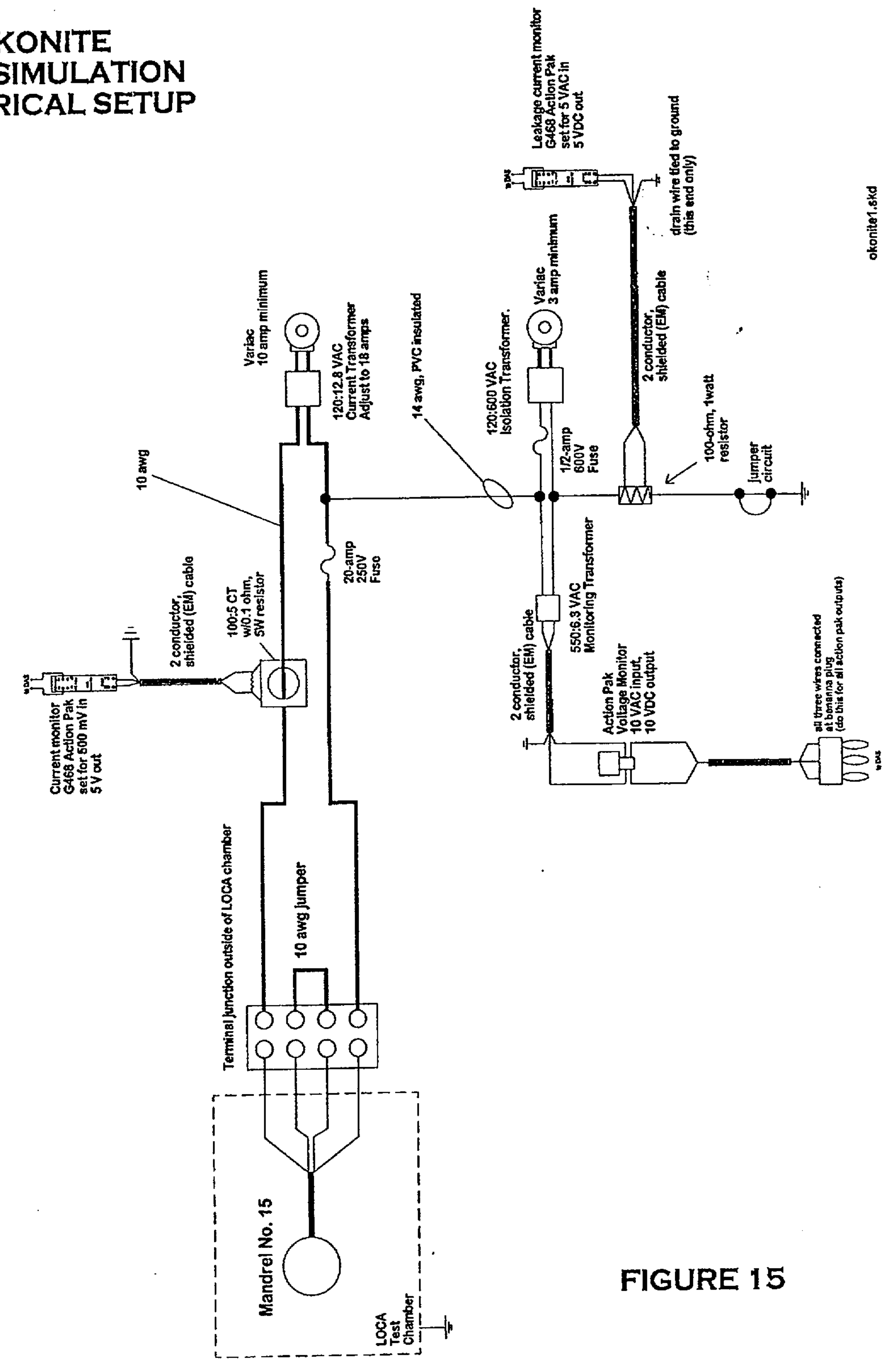


FIGURE 15

OKONITE
LOCA SIMULATION
ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 16, MANDREL 16, SPECIMENS 31 & 32)

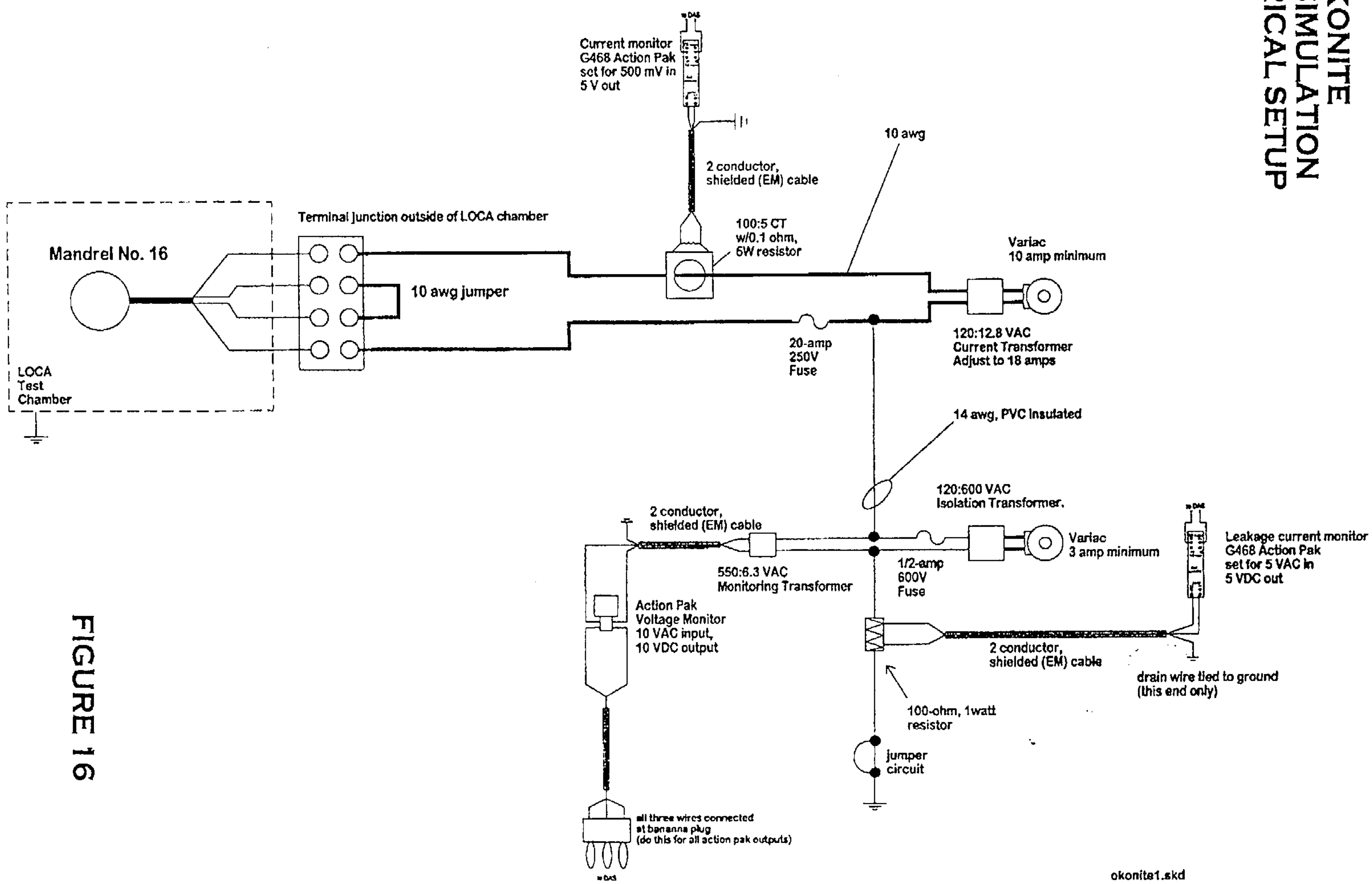


FIGURE 16

okonite1.skd

OKONITE LOCA SIMULATION ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 17, MANDREL 17, SPECIMENS 33 & 34)

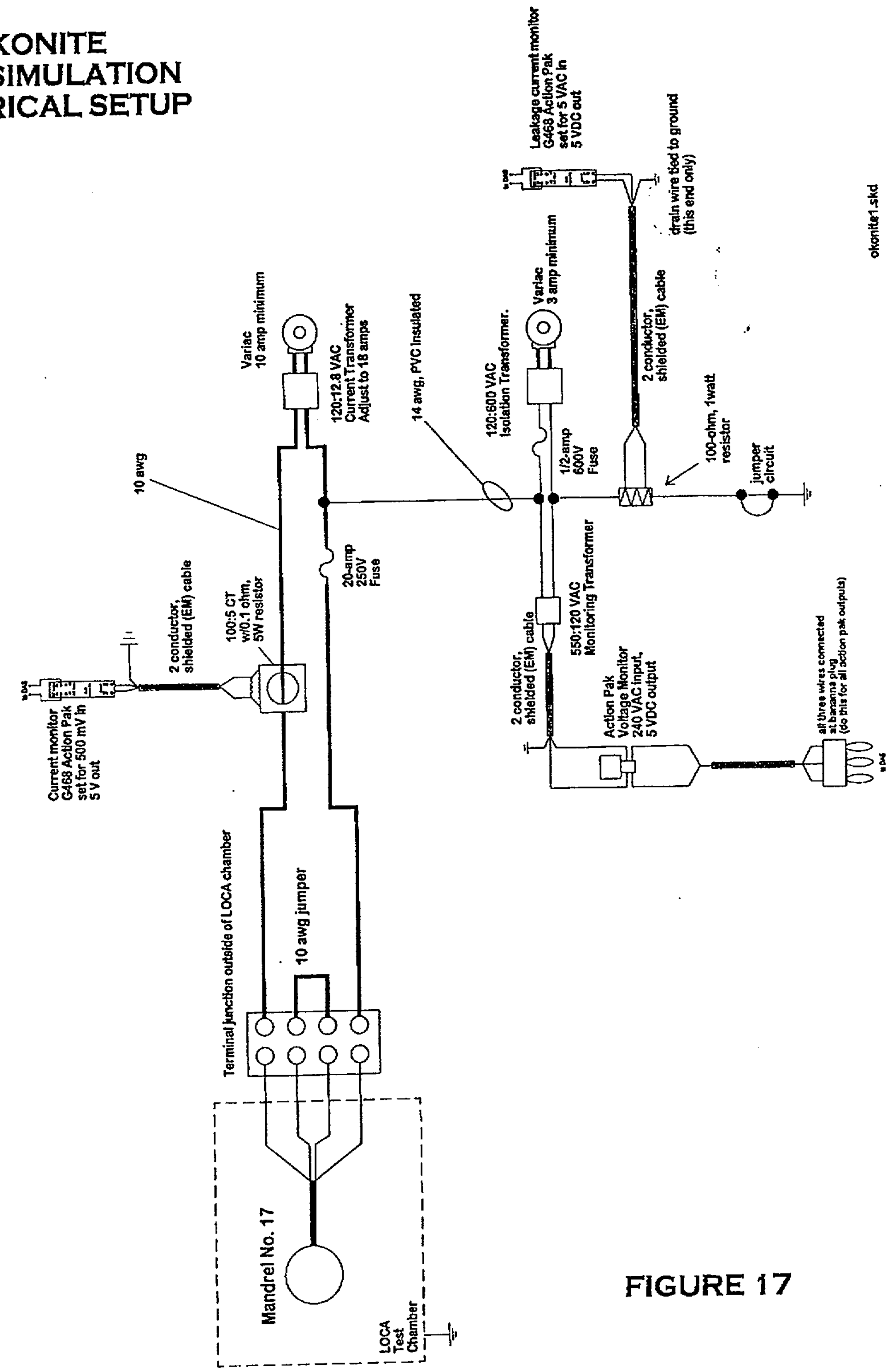


FIGURE 17

OKONITE LOCA SIMULATION ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 18, MANDREL 18, SPECIMENS 35 & 36)

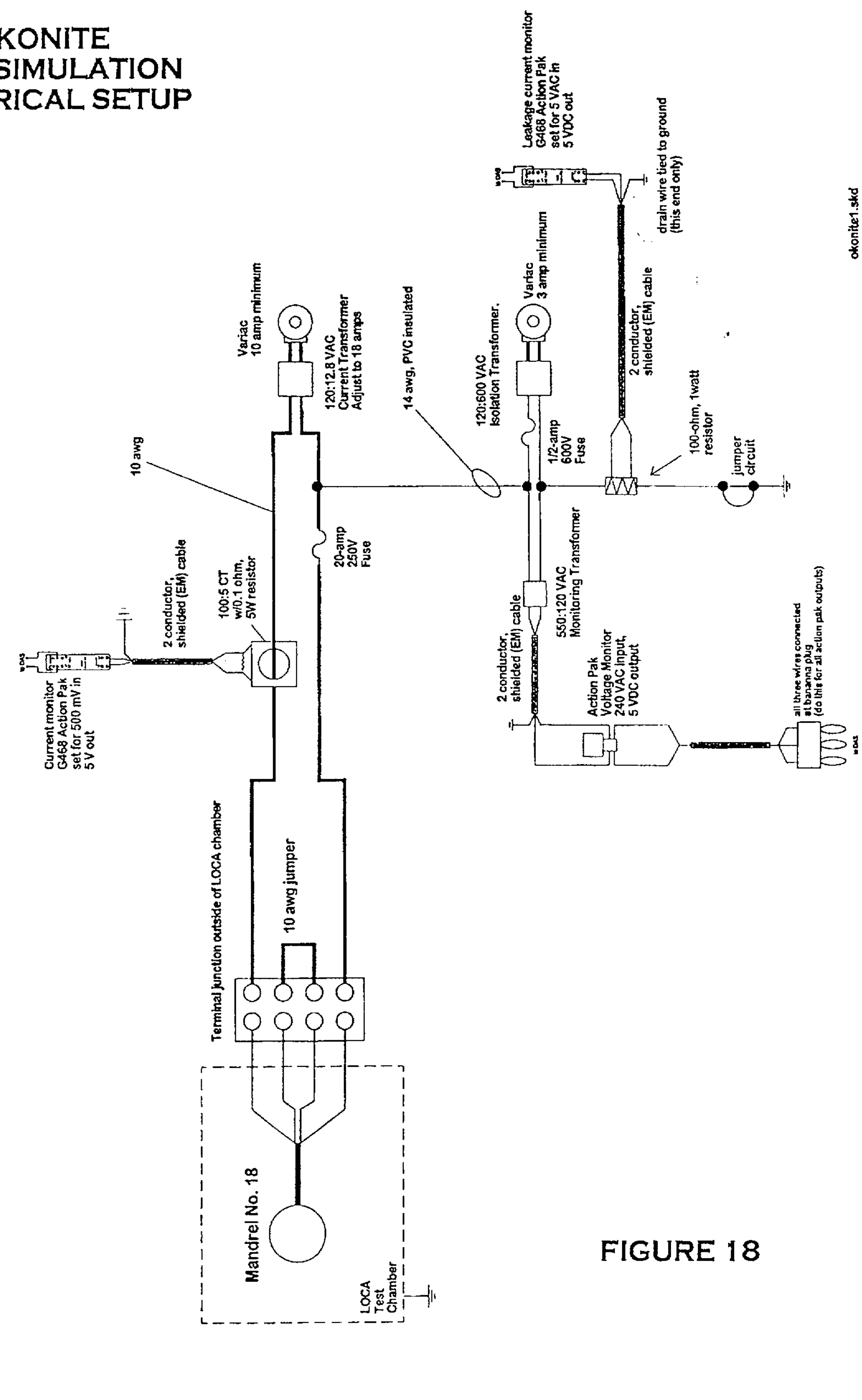


FIGURE 18

OKONITE
LOCA SIMULATION
ELECTRICAL SETUP

18-AMPS
600 VAC
(CIRCUIT 19, MANDREL 19, SPECIMENS 37 & 38)

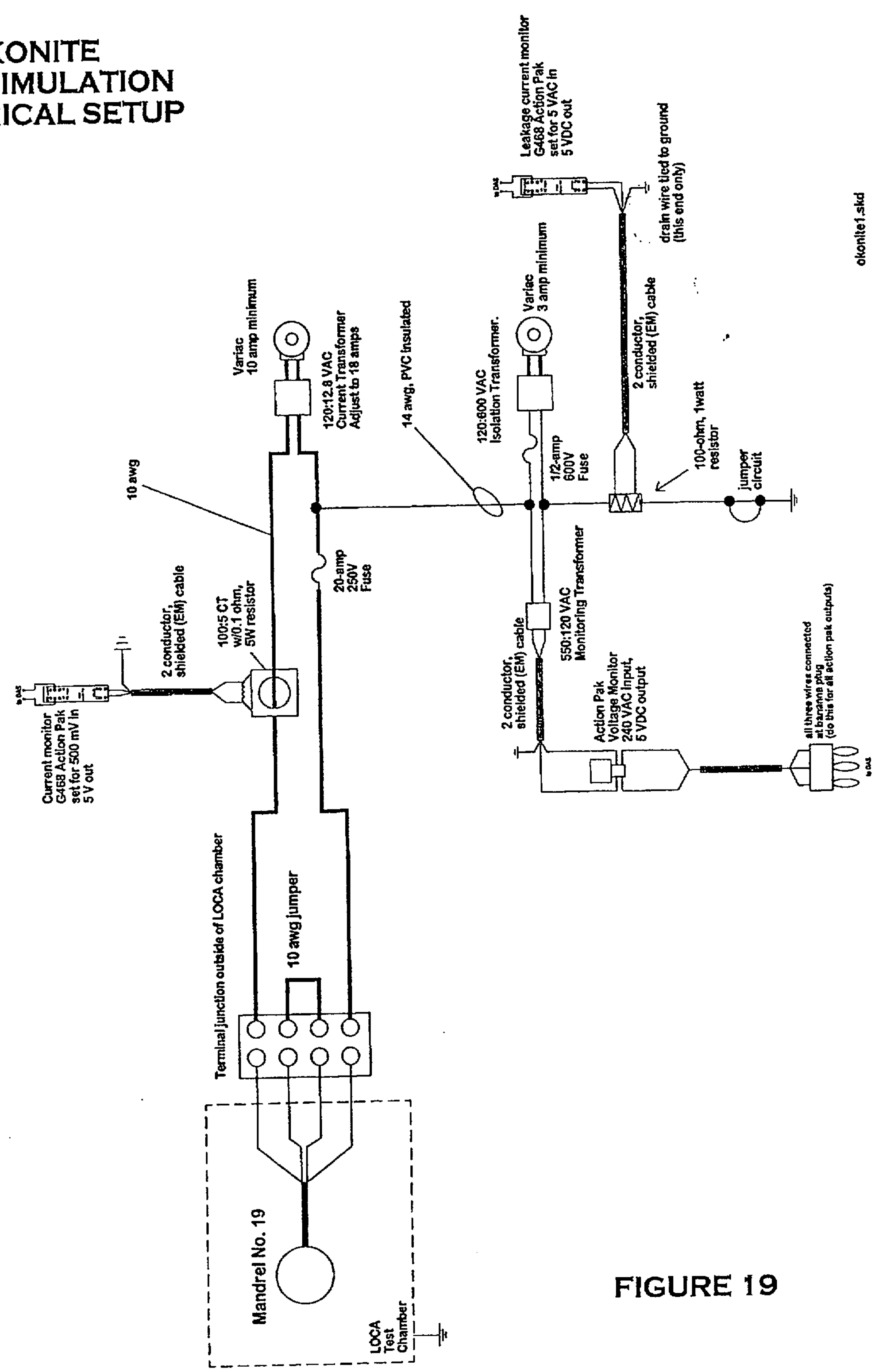
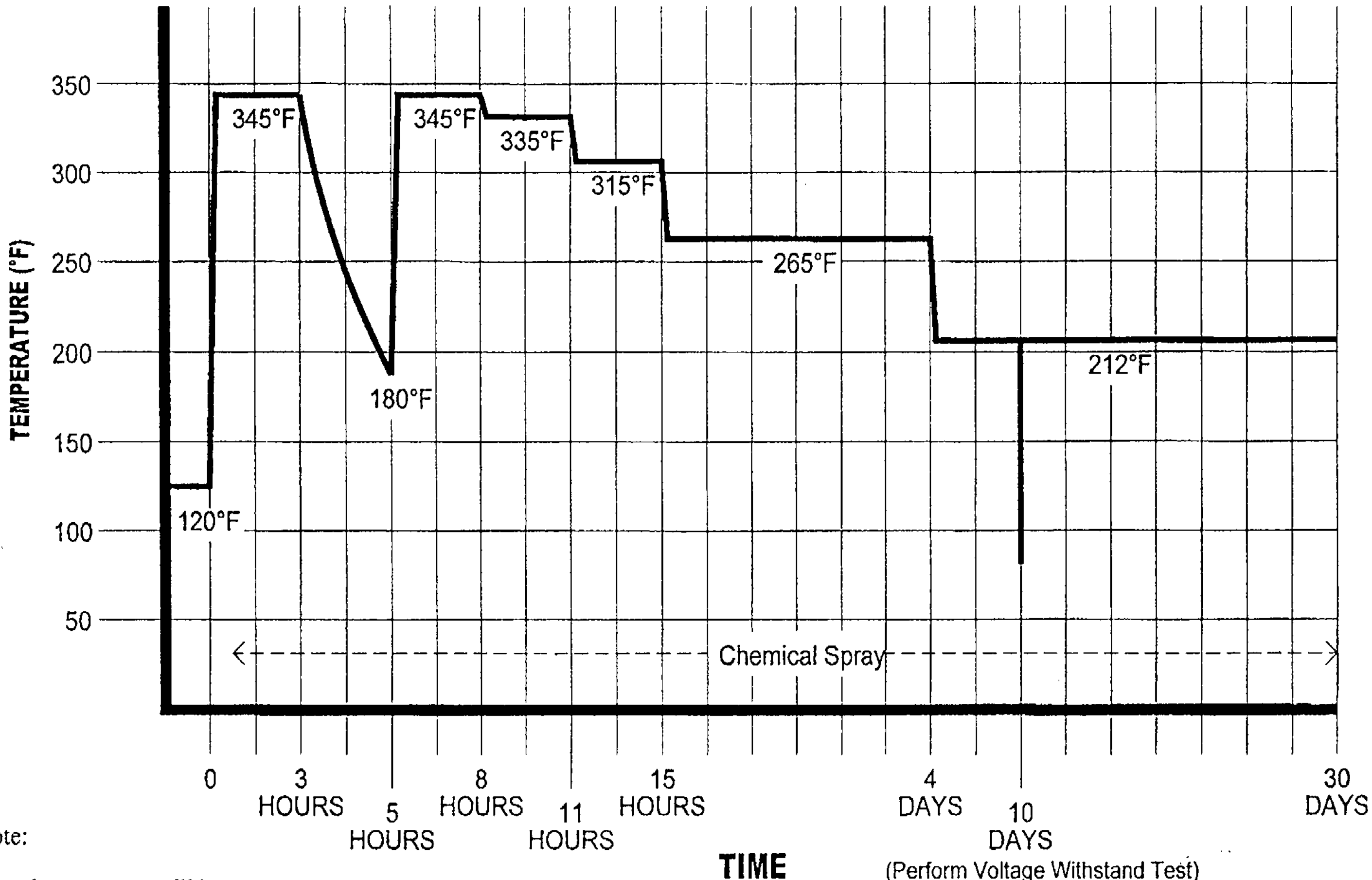


FIGURE 19



Note:

Chamber pressure will be based on saturated conditions.

FIGURE 20

ACCIDENT SIMULATION ENVIRONMENTAL PROFILE

okonite2.skd

APPENDIX IV

PHOTOGRAPHS

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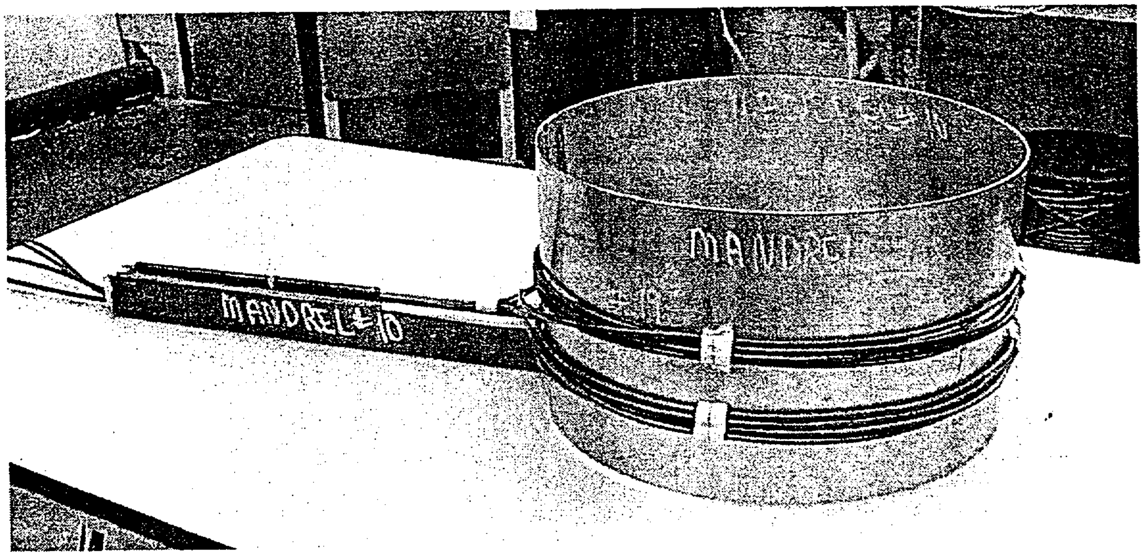
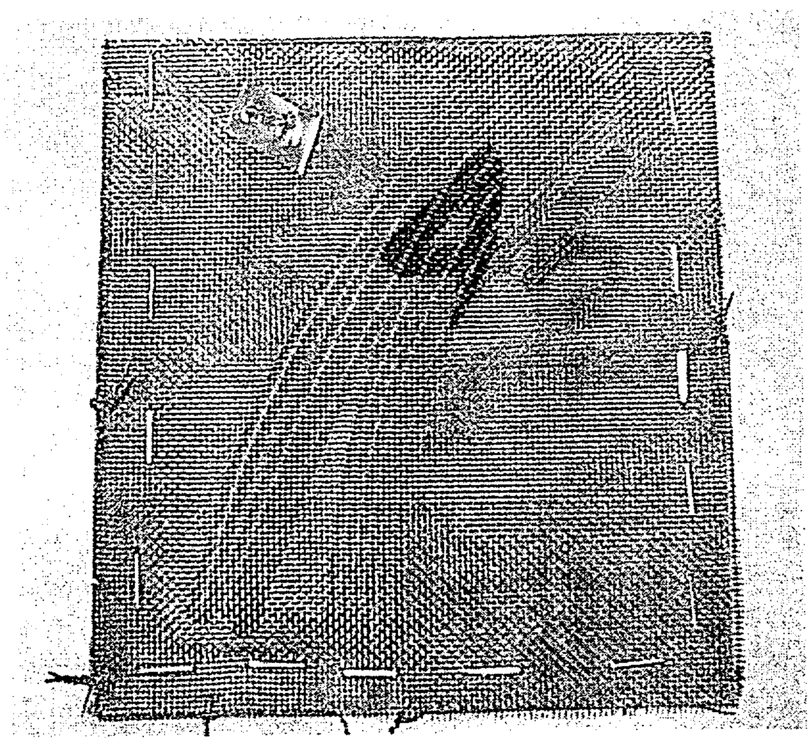


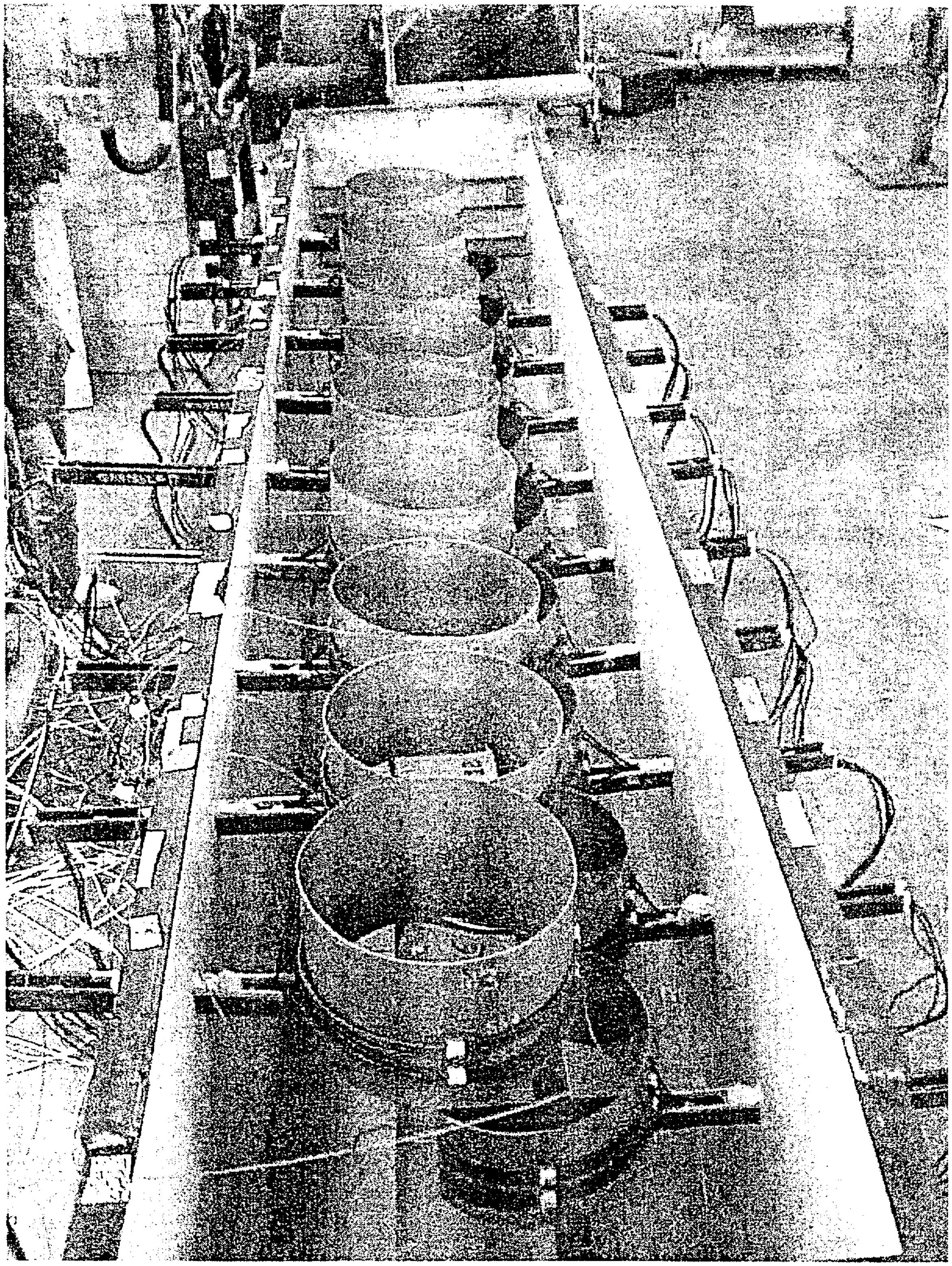
PHOTOGRAPH 1

TYPICAL MANDREL SPECIMEN
(MANDREL NO. 10, SPECIMENS 19 AND 20 SHOWN)



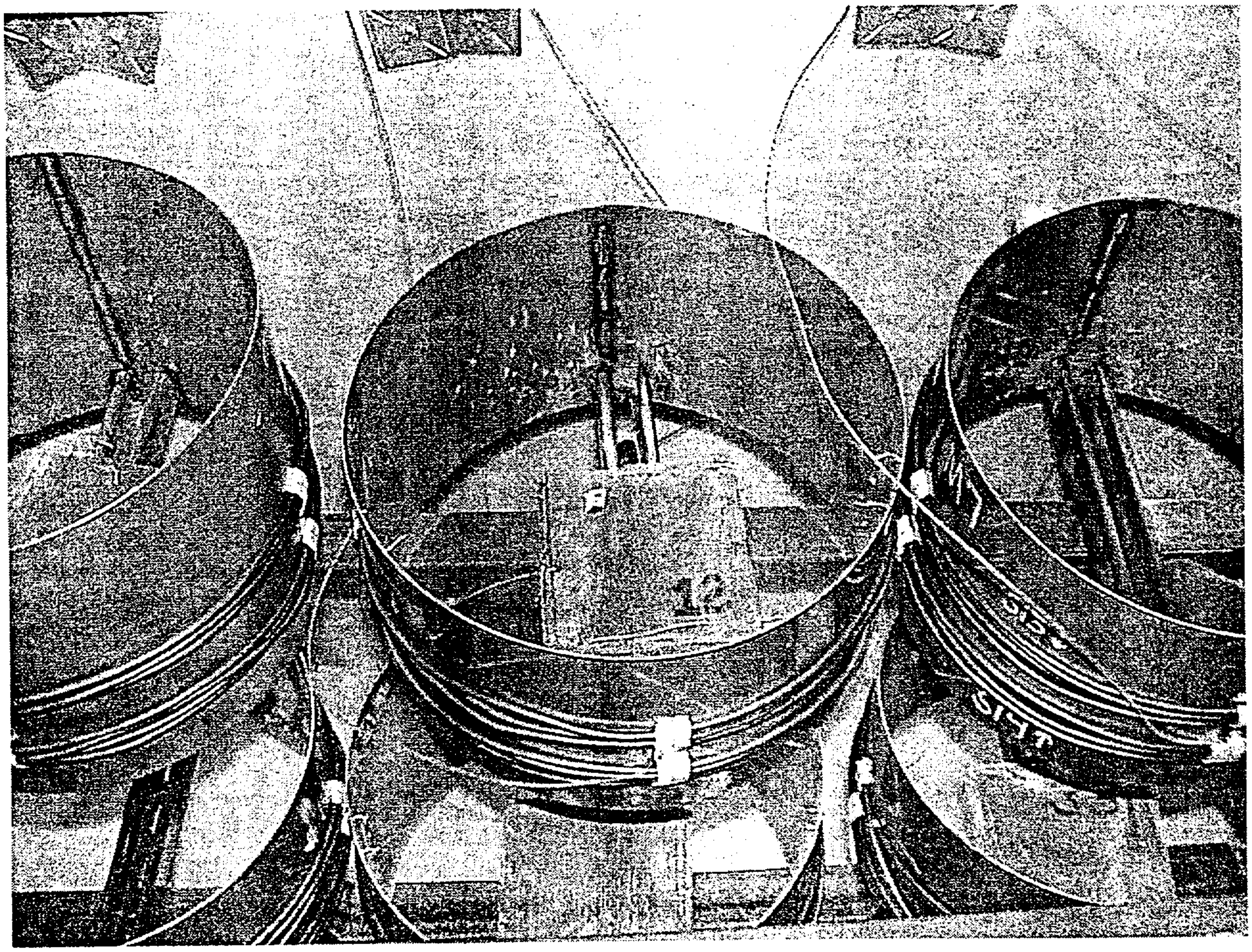
PHOTOGRAPH 2

TYPICAL BASKET SPECIMEN
(BASKET NO. 46 SHOWN)



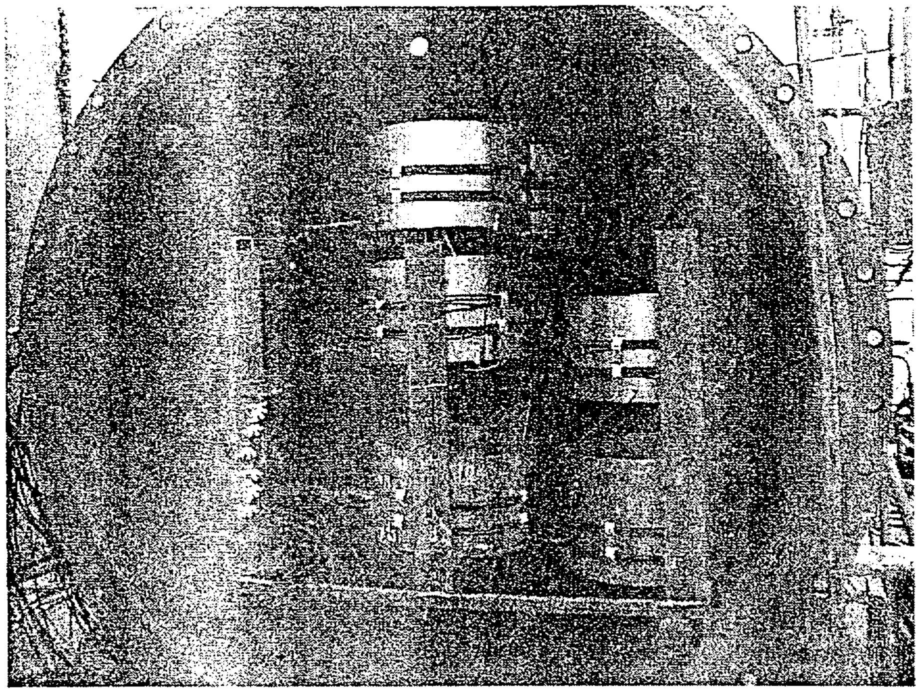
PHOTOGRAPH 3

SPECIMENS PLACED IN THE THERMAL AGING CHAMBER



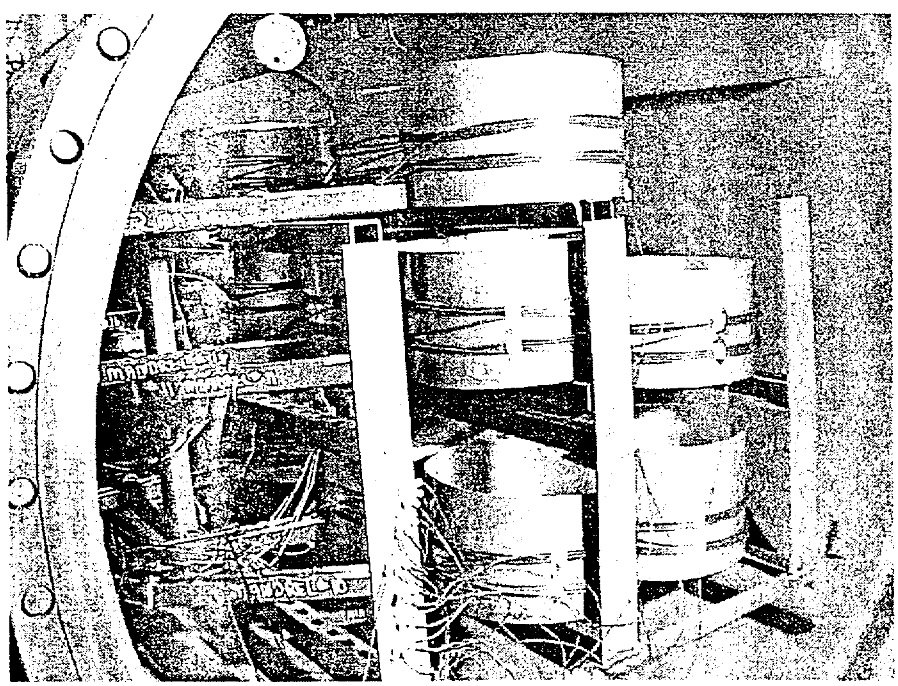
PHOTOGRAPH 4

PLACEMENT OF THE BASKET SPECIMENS WITHIN THE MANDRELS DURING THERMAL AGING



PHOTOGRAPH 5

PRE-ACCIDENT TEST VIEW OF SPECIMENS INSTALLED IN TEST CHAMBER

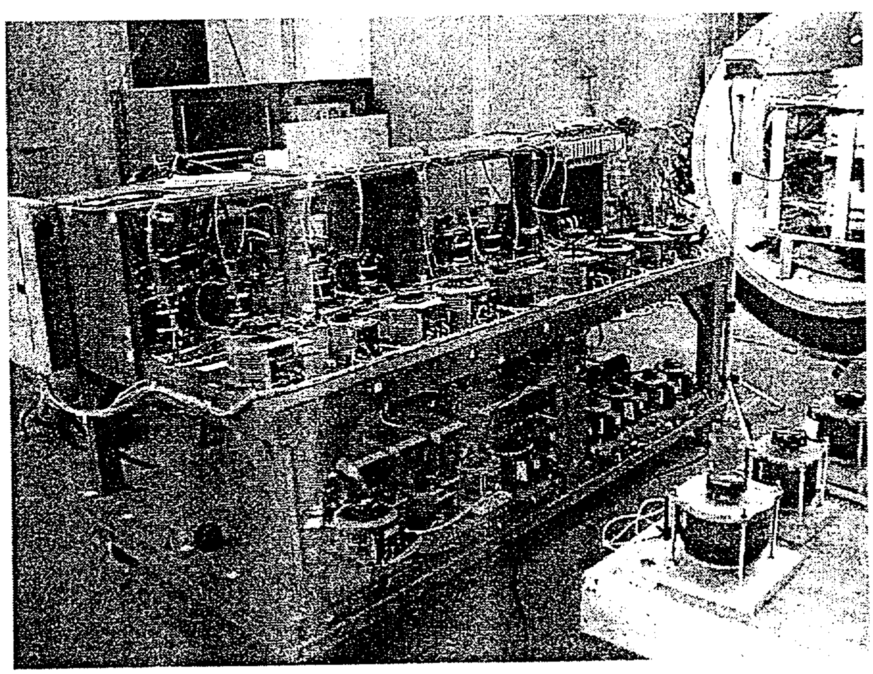


PHOTOGRAPH 6

PRE-ACCIDENT TEST VIEW OF SPECIMENS INSTALLED IN TEST CHAMBER

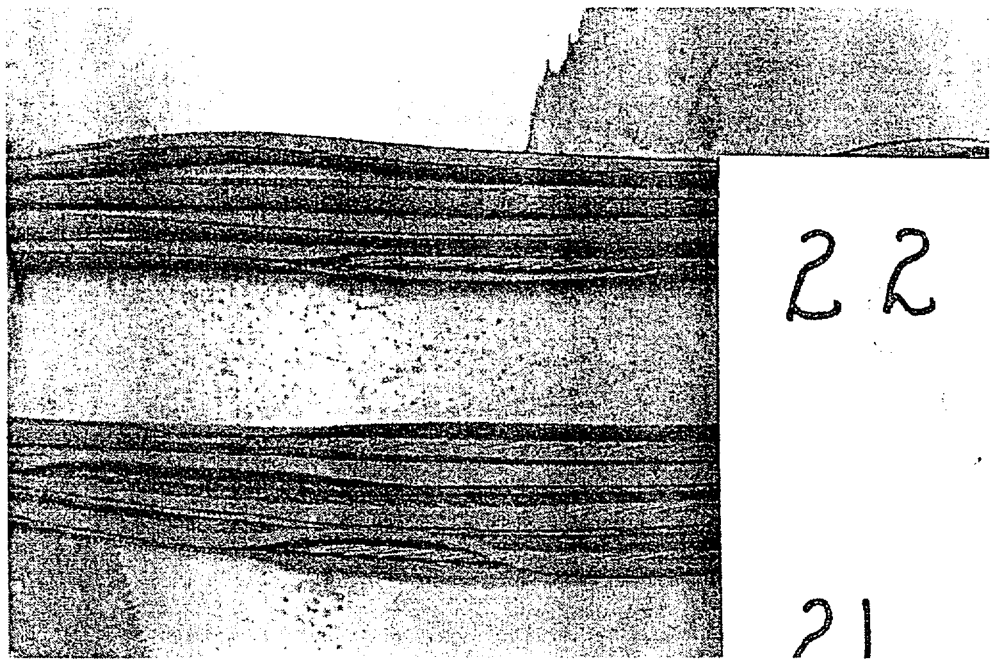
PHOTOGRAPH 7

VIEW OF SPECIMEN WIRES EXITING THE TEST CHAMBER



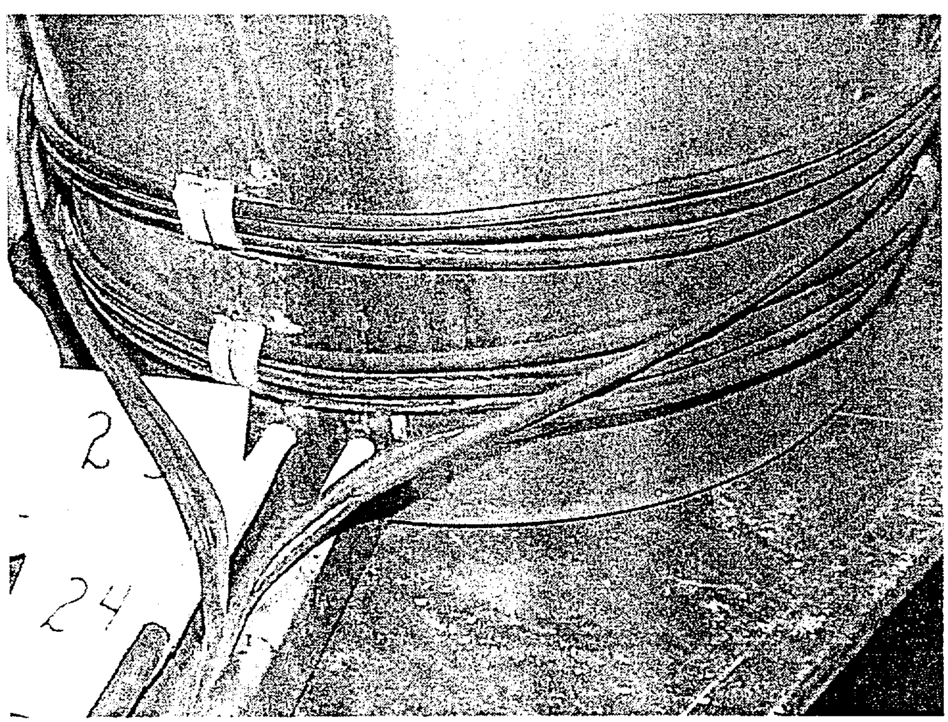
PHOTOGRAPH 8

VIEW OF ONE OF TWO TABLES USED FOR ELECTRICAL POWERING CIRCUITS



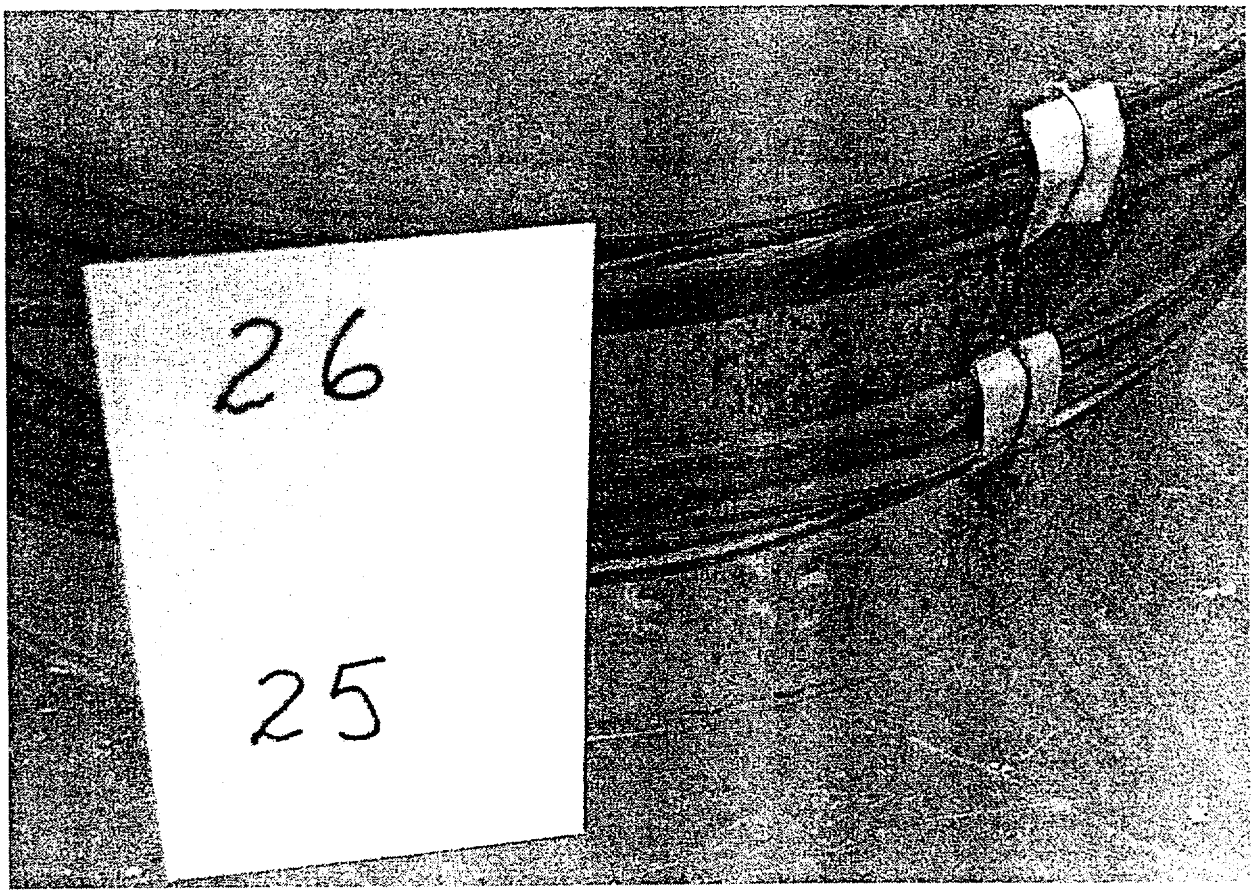
PHOTOGRAPH 9

POST-ACCIDENT TEST VIEW OF SPECIMENS 21 (BOTTOM) AND 22 (TOP)



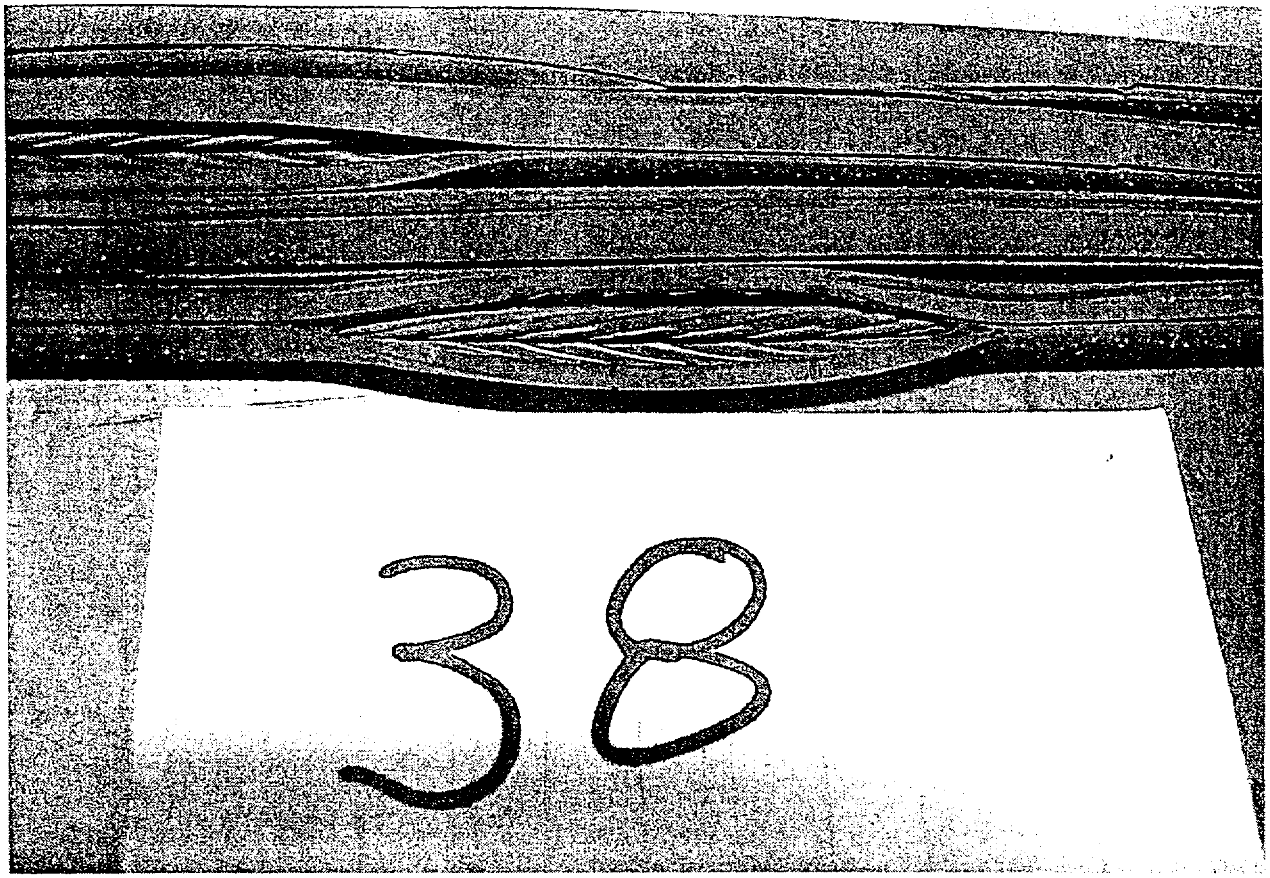
PHOTOGRAPH 10

POST-ACCIDENT TEST VIEW OF SPECIMENS 23 (TOP) AND 24 (BOTTOM)



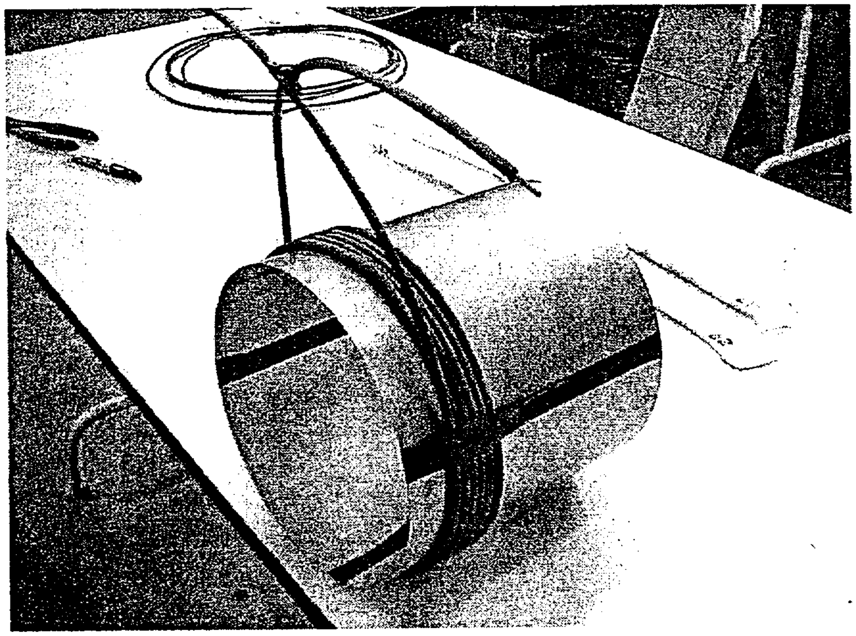
PHOTOGRAPH 11

POST-ACCIDENT TEST VIEW OF SPECIMENS 25 (BOTTOM) AND 26 (TOP)



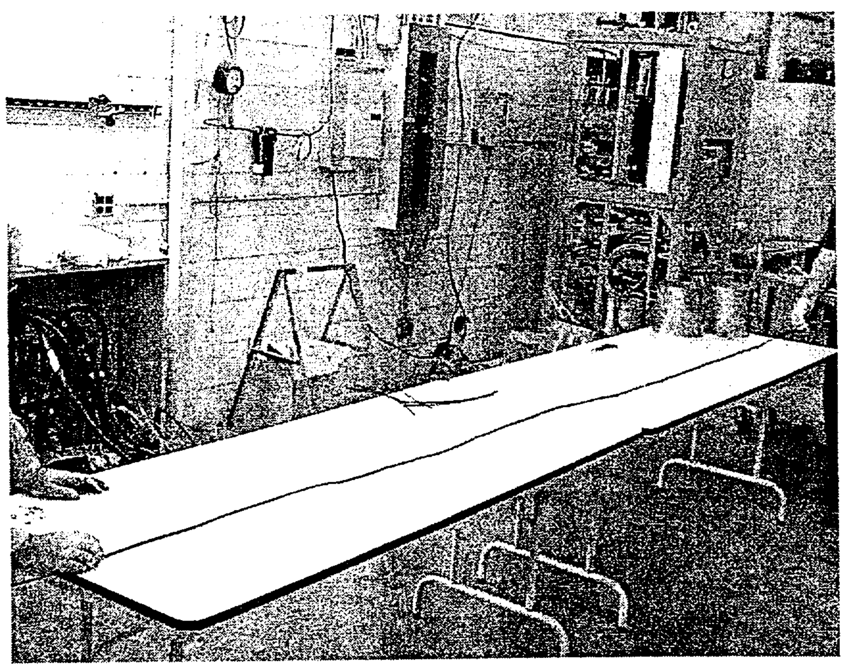
PHOTOGRAPH 12

POST-ACCIDENT TEST VIEW OF SPECIMEN 38



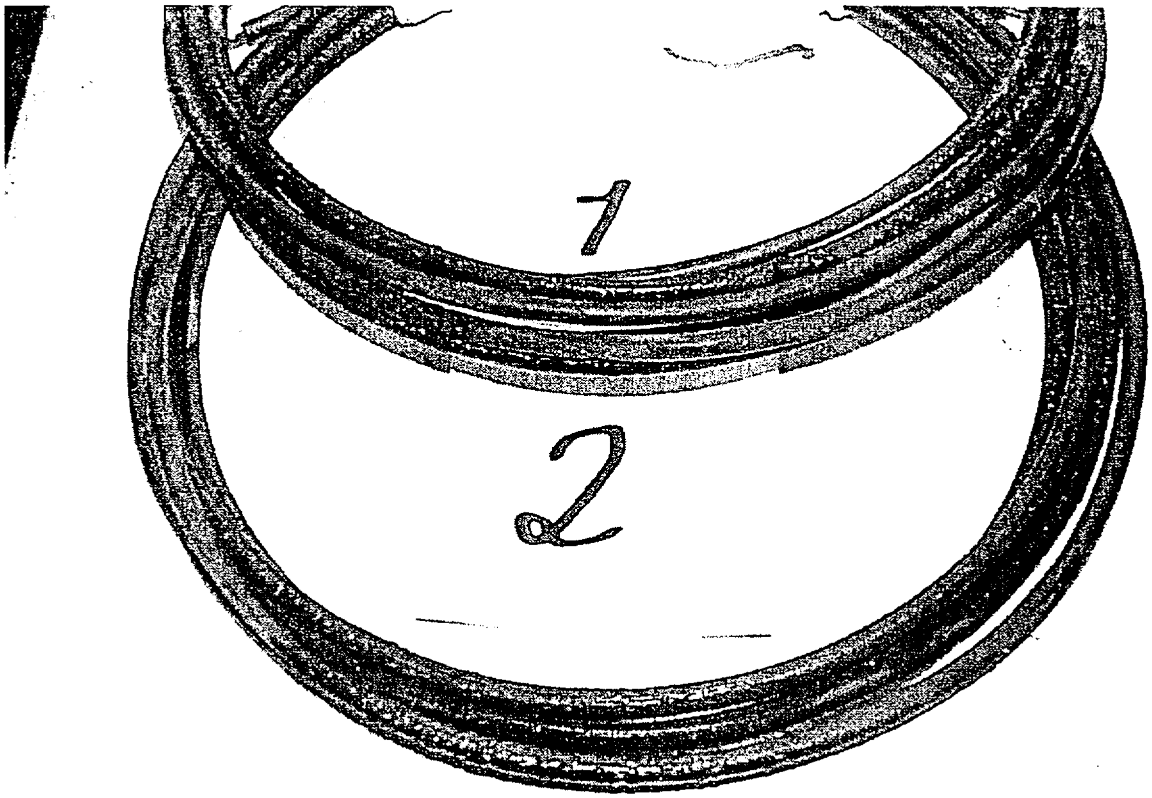
PHOTOGRAPH 13

VIEW OF SPECIMEN WRAPPED ON 8" MANDREL FOR POST-ACCIDENT FUNCTIONAL TEST



PHOTOGRAPH 14

VIEW OF SPECIMEN STRAIGHTENED DURING POST-ACCIDENT FUNCTIONAL TEST

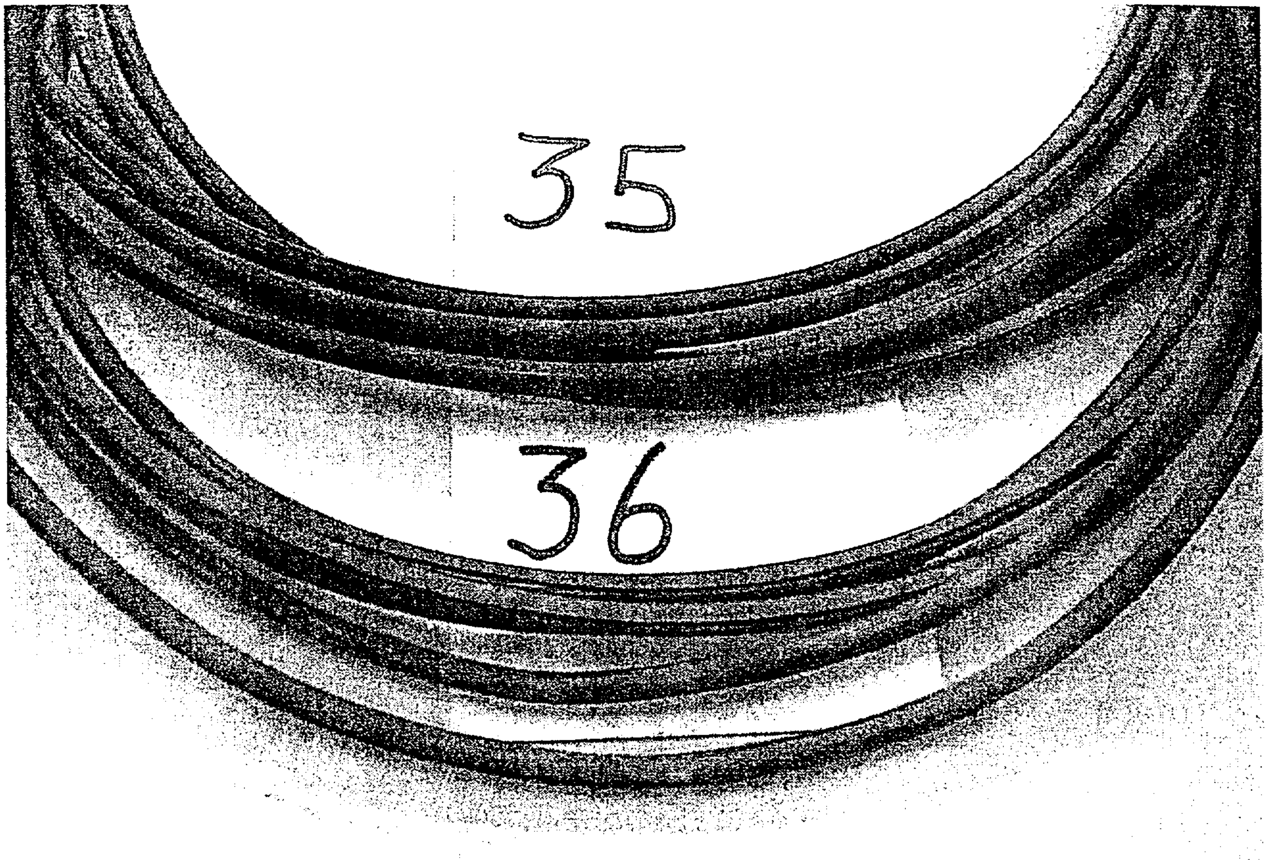


PHOTOGRAPH 15

VIEW OF SPECIMENS 1 AND 2 FOLLOWING POST-ACCIDENT FUNCTIONAL TEST

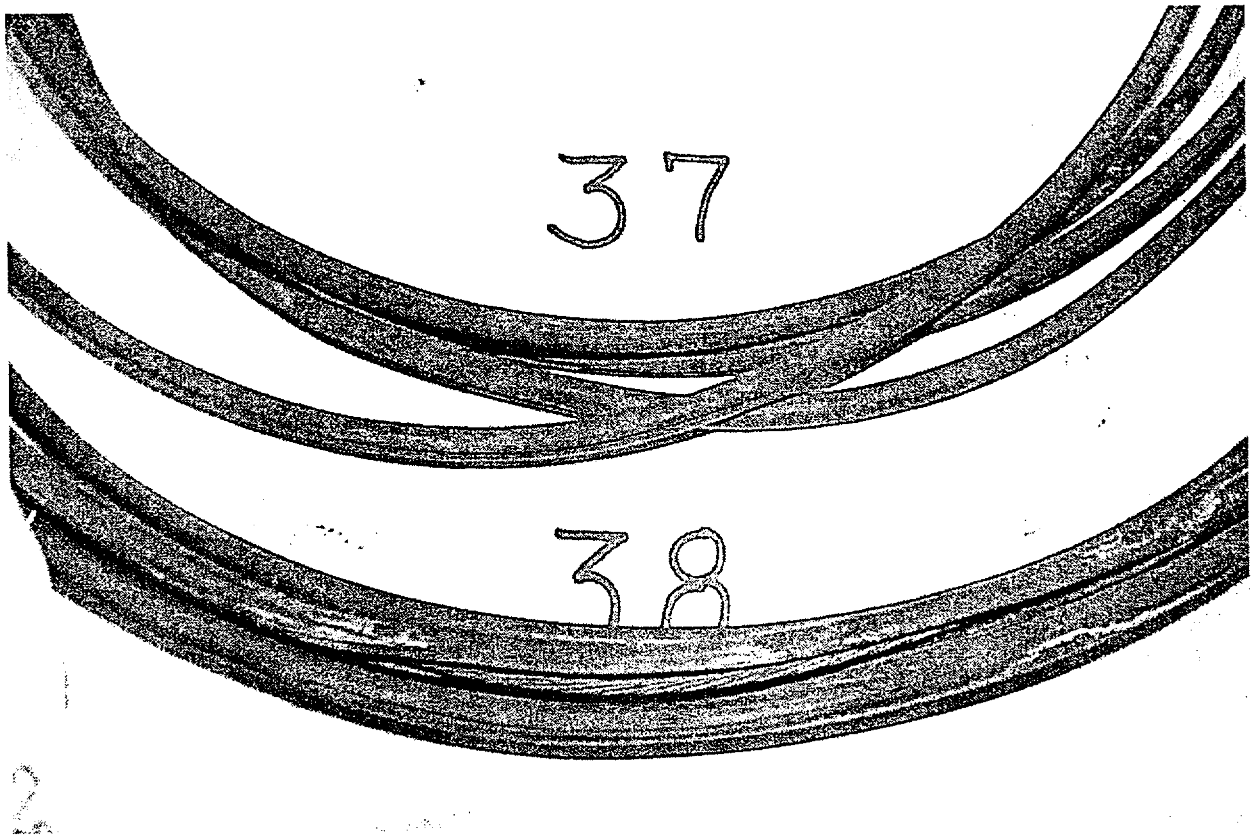
PHOTOGRAPH 16

VIEW OF SPECIMENS 19 AND 20 FOLLOWING POST-ACCIDENT FUNCTIONAL TEST



PHOTOGRAPH 17

VIEW OF SPECIMENS 35 AND 36 FOLLOWING POST-ACCIDENT FUNCTIONAL TEST



PHOTOGRAPH 18

VIEW OF SPECIMENS 37 AND 38 FOLLOWING POST-ACCIDENT FUNCTIONAL TEST

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APPENDIX V

THERMAL AGING CHARTS AND PLOTS

NOTE:

The circular charts are of a single thermocouple mounted in the center of the aging oven. The plots are individual thermocouples mounted in direct contact with individual mandrels.

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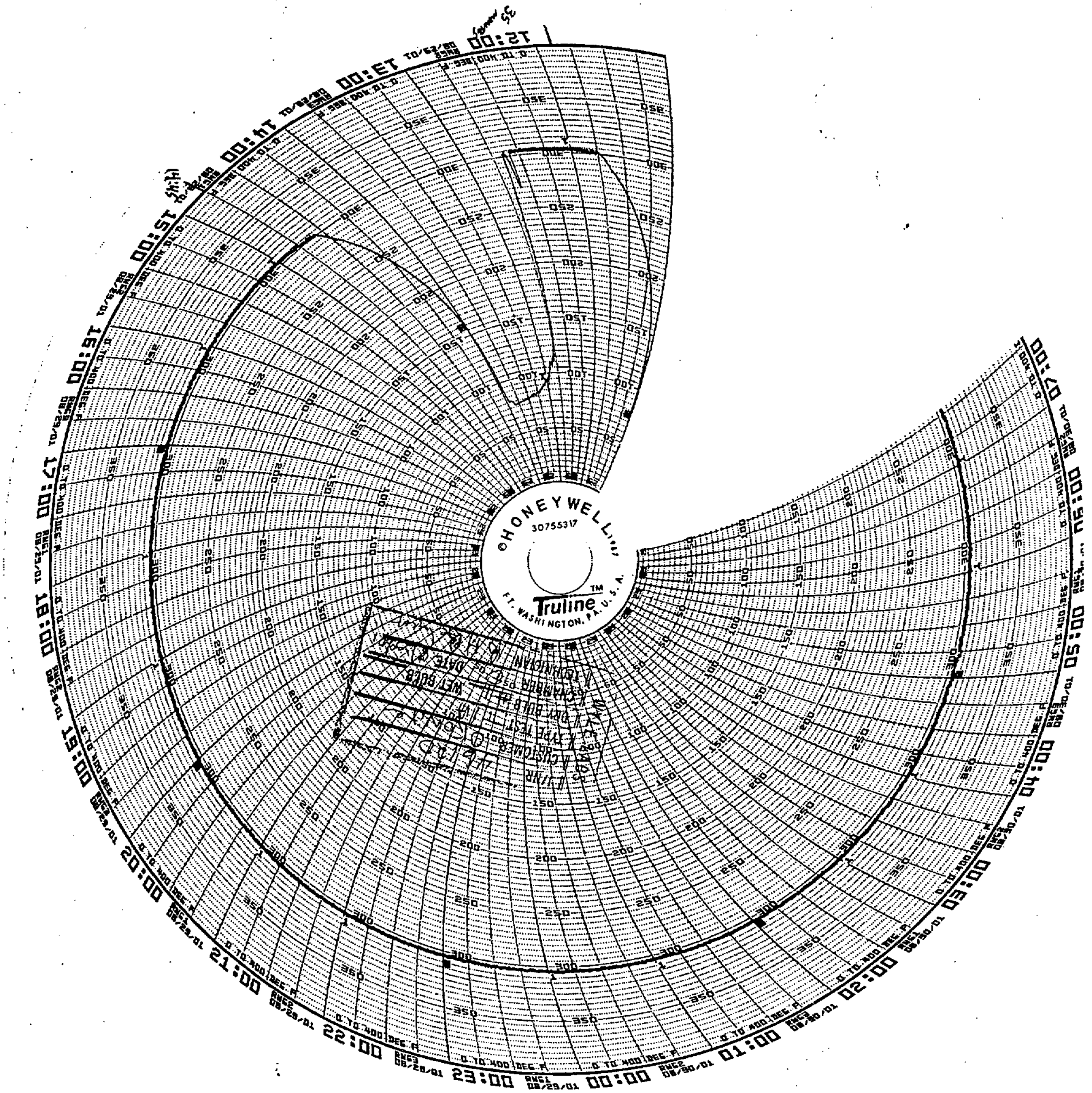

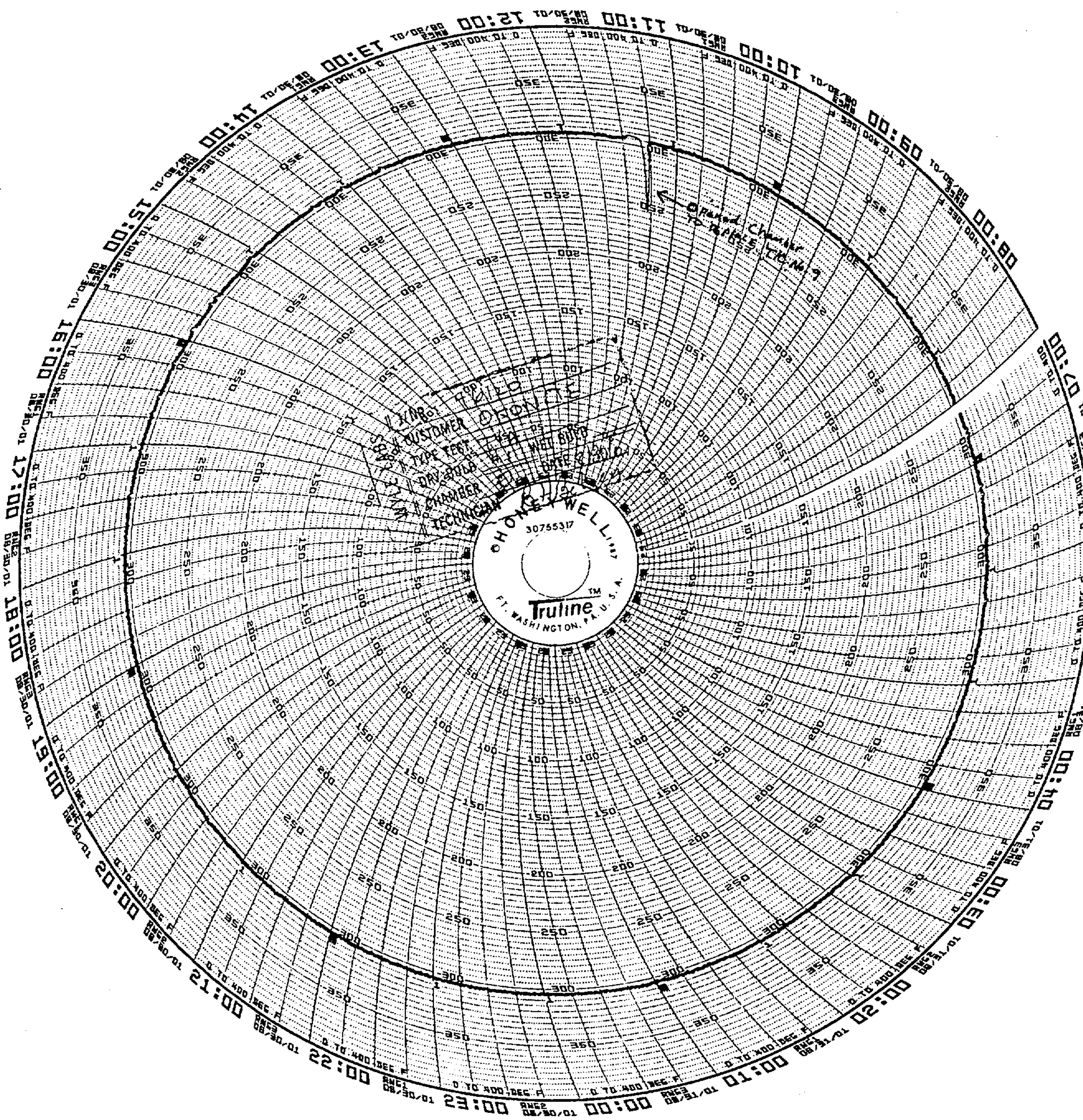

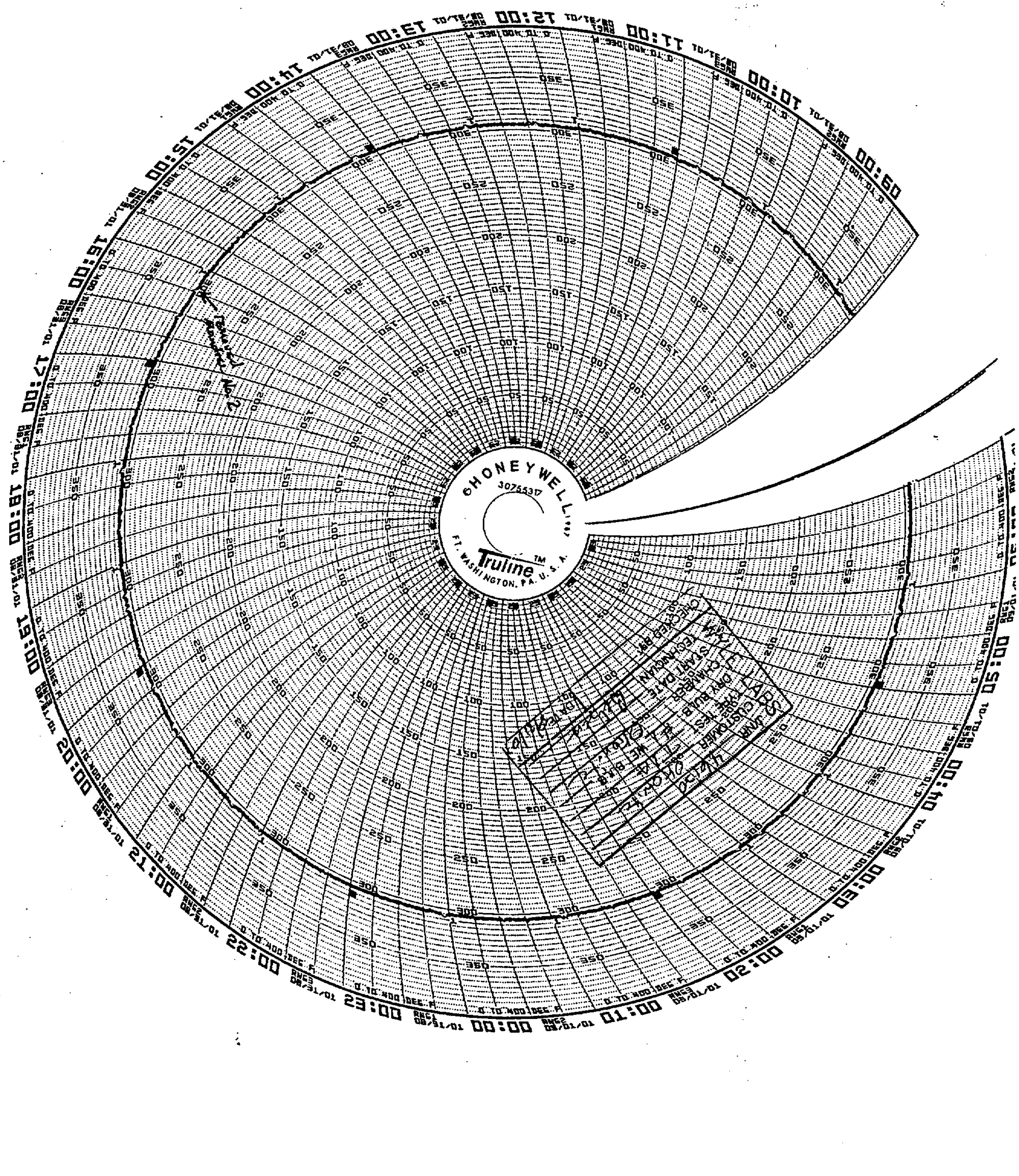

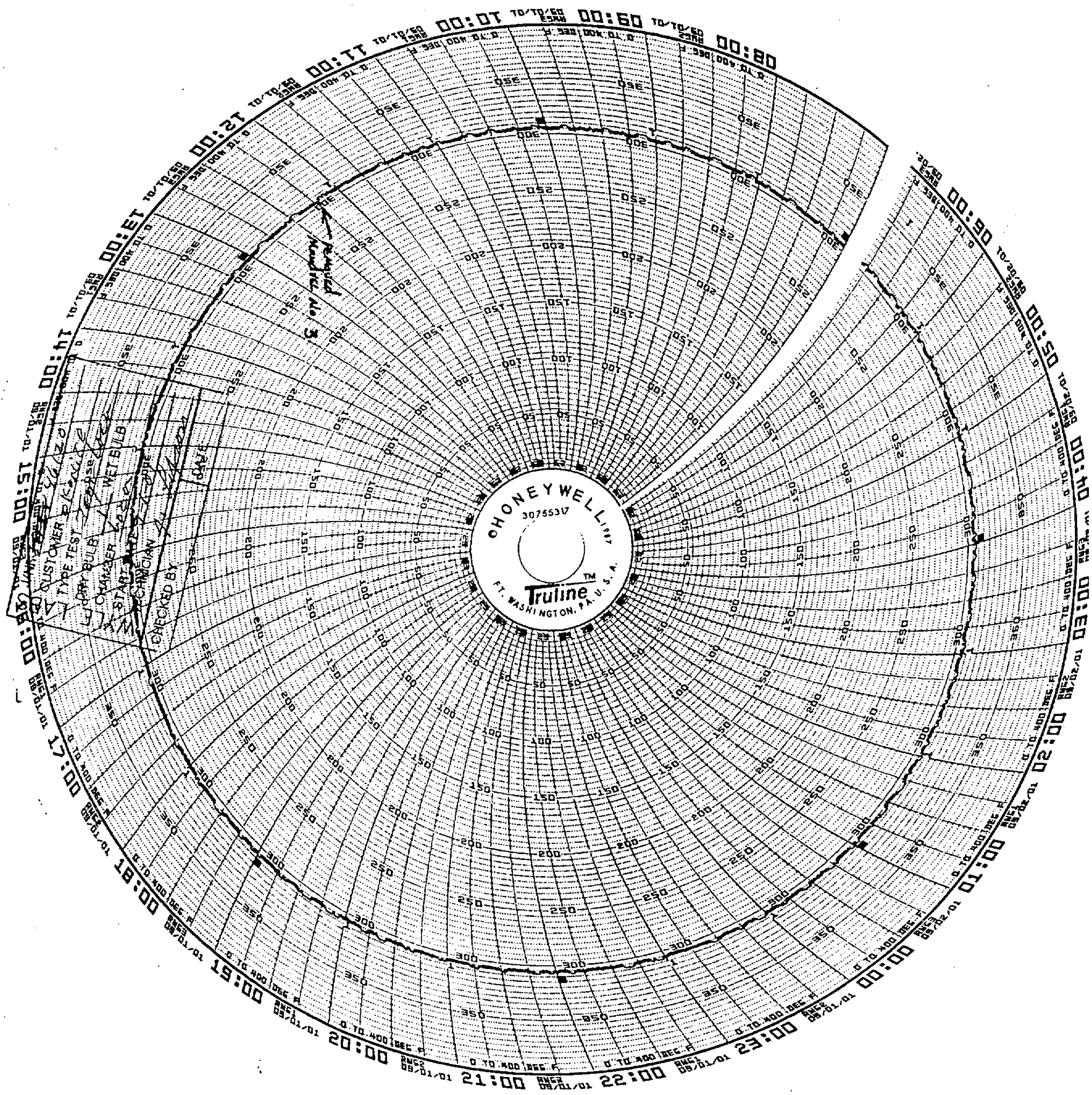
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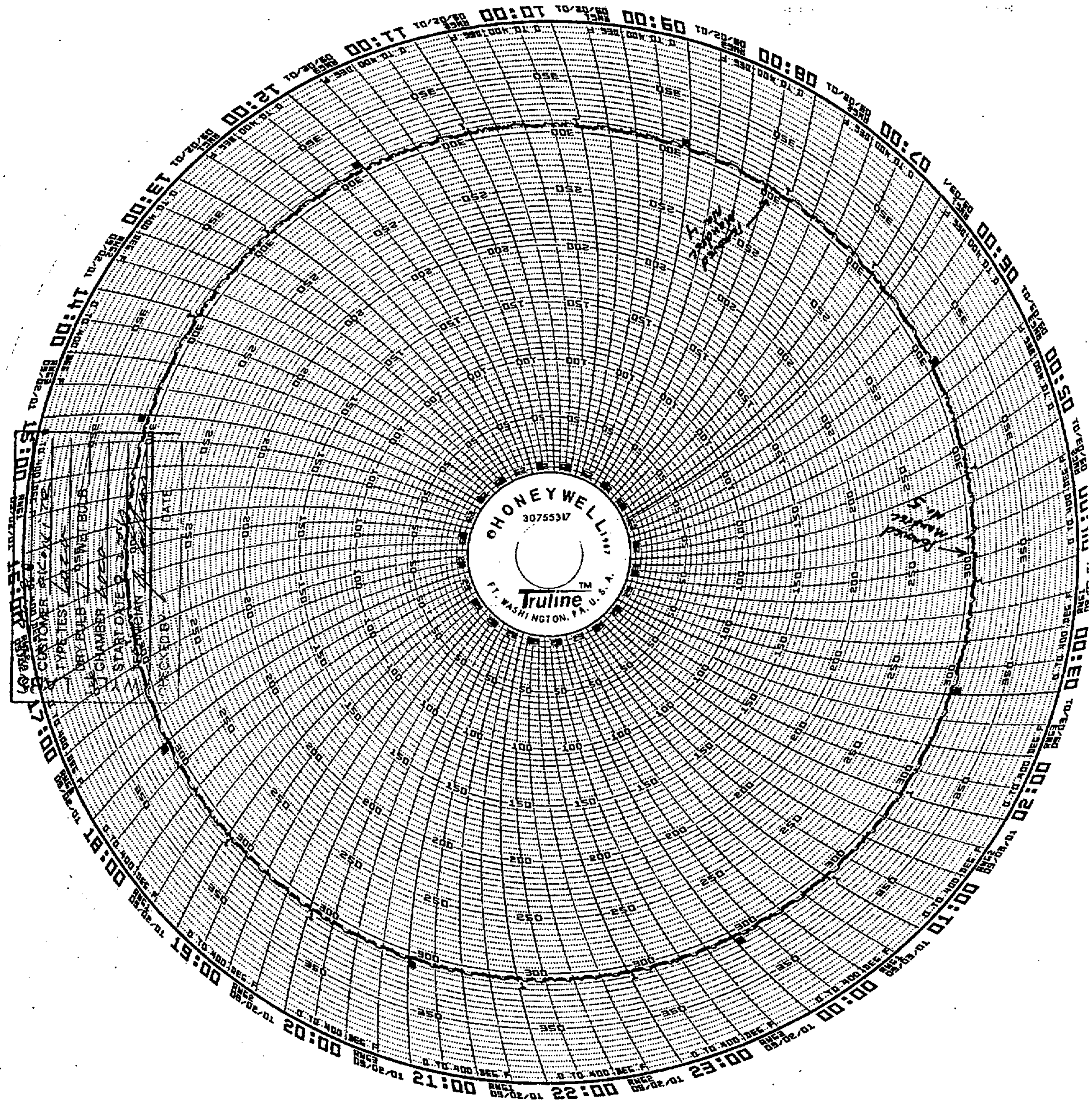
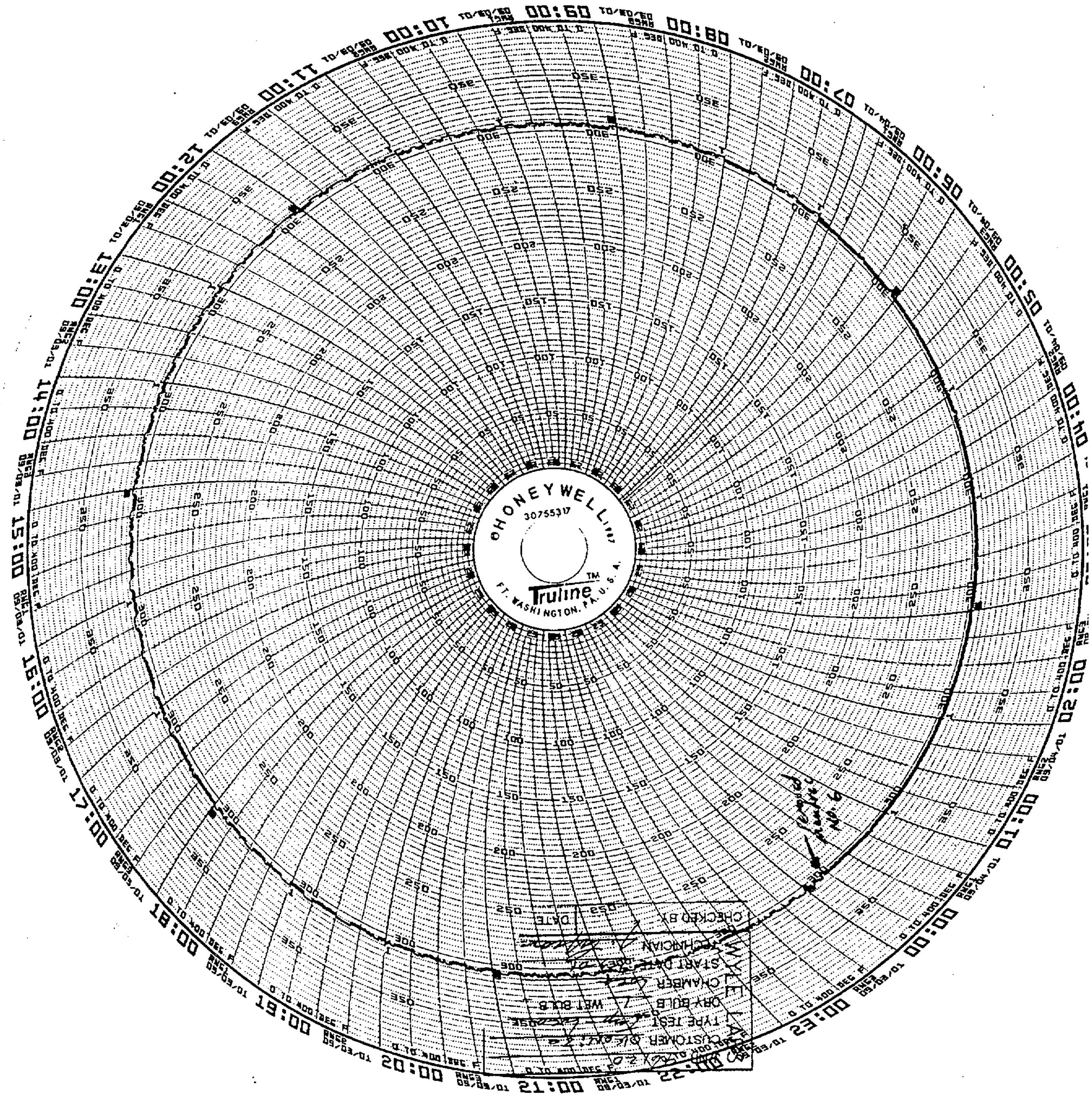
Truline
FT. WASHINGTON, PA. U.S.A.

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Truline
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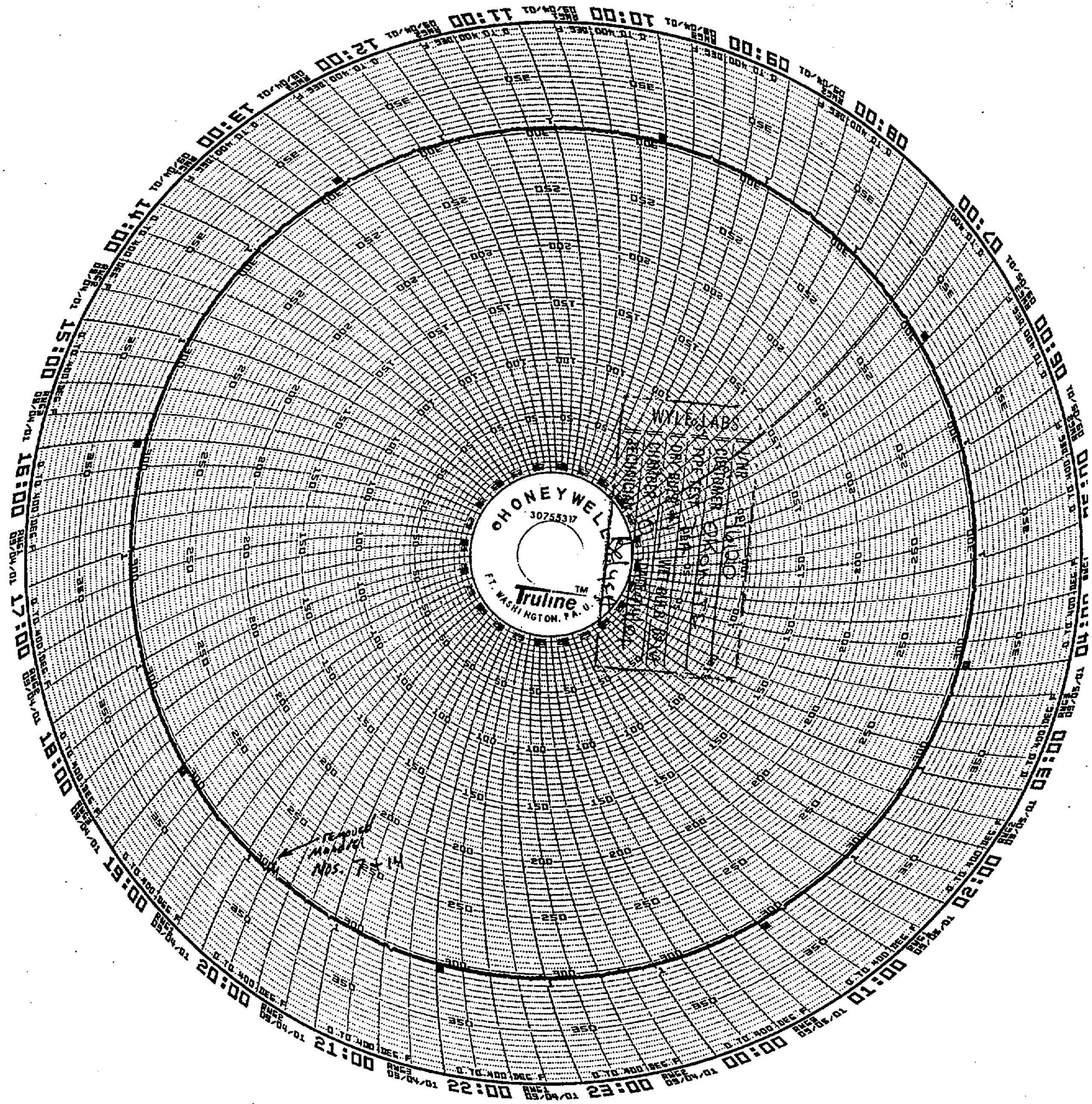
DATE
TECHNICIAN
START DATE
CHAMBER
DRY BULB
WET BULB
TYPE TEST
CUSTOMER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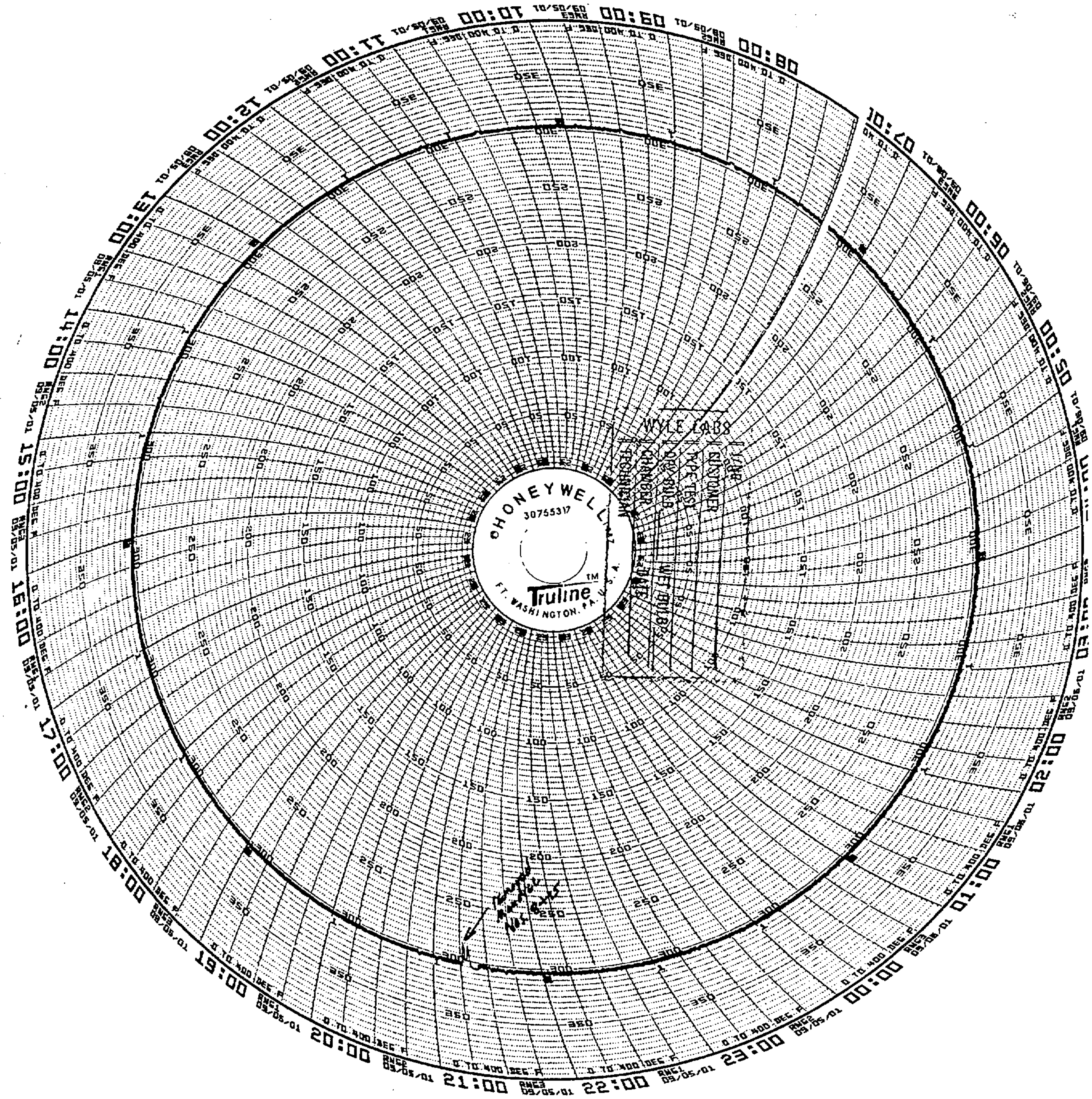
FT. WASHINGTON, P.A., U.
WYLE LABS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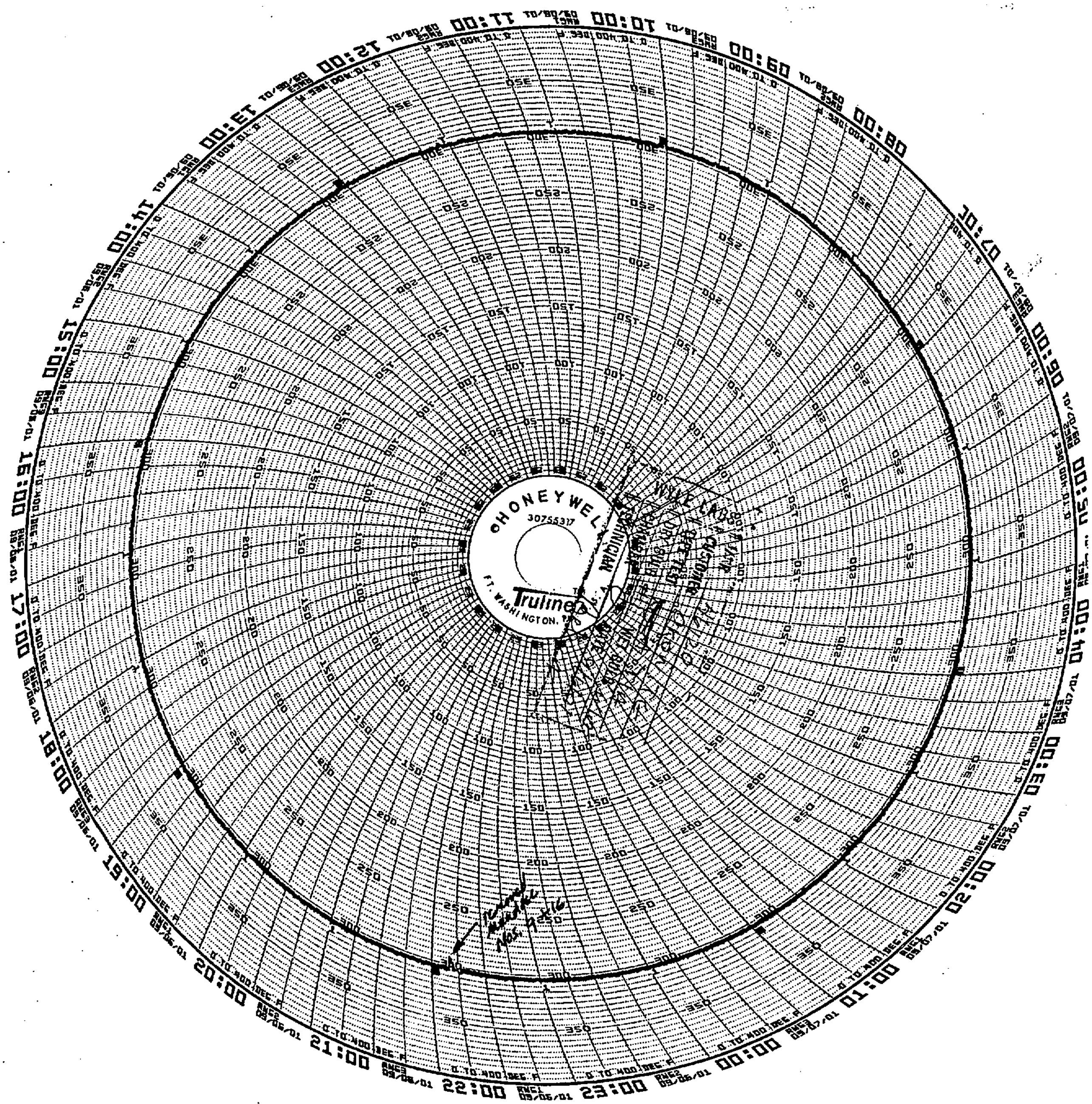
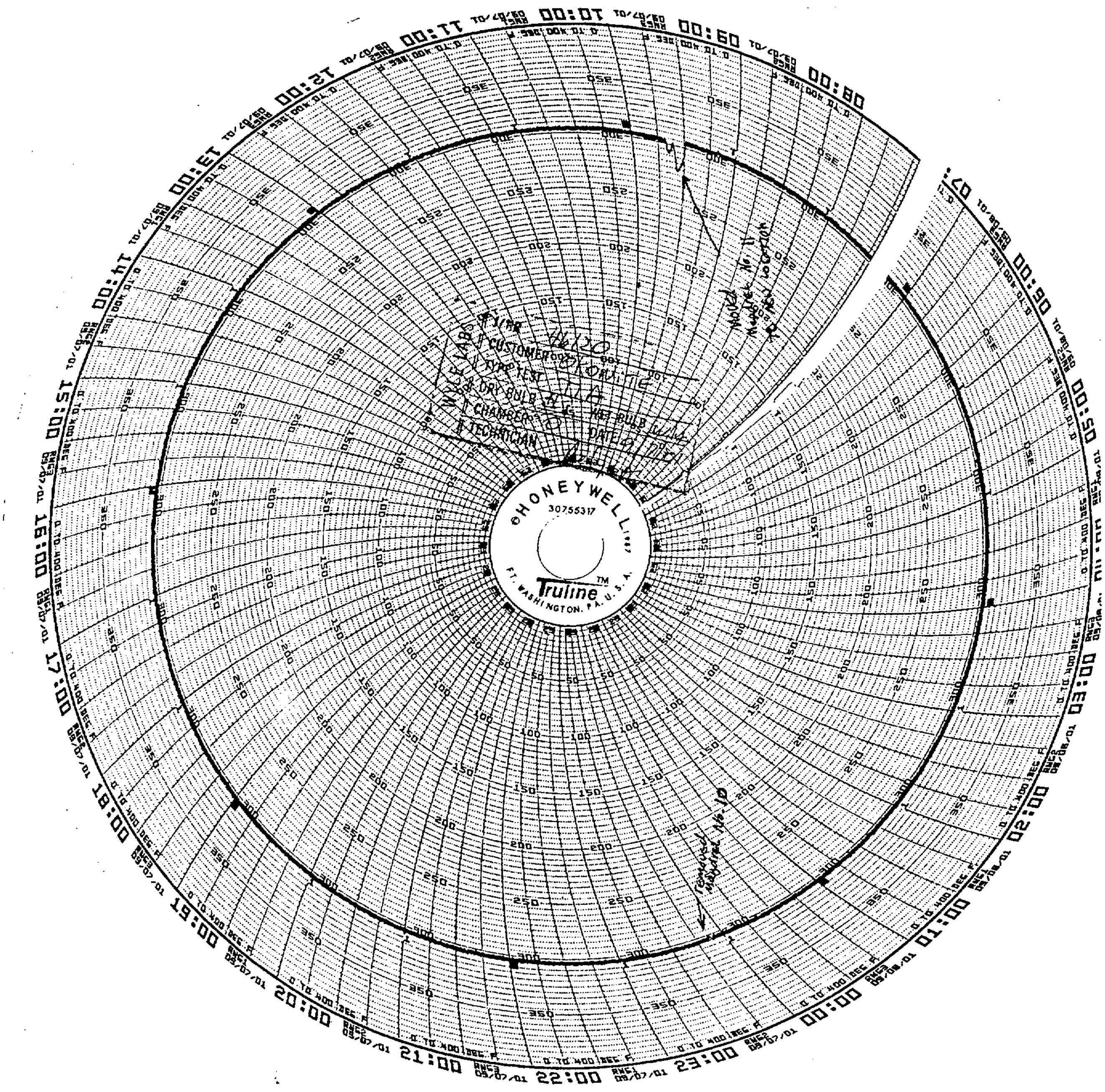
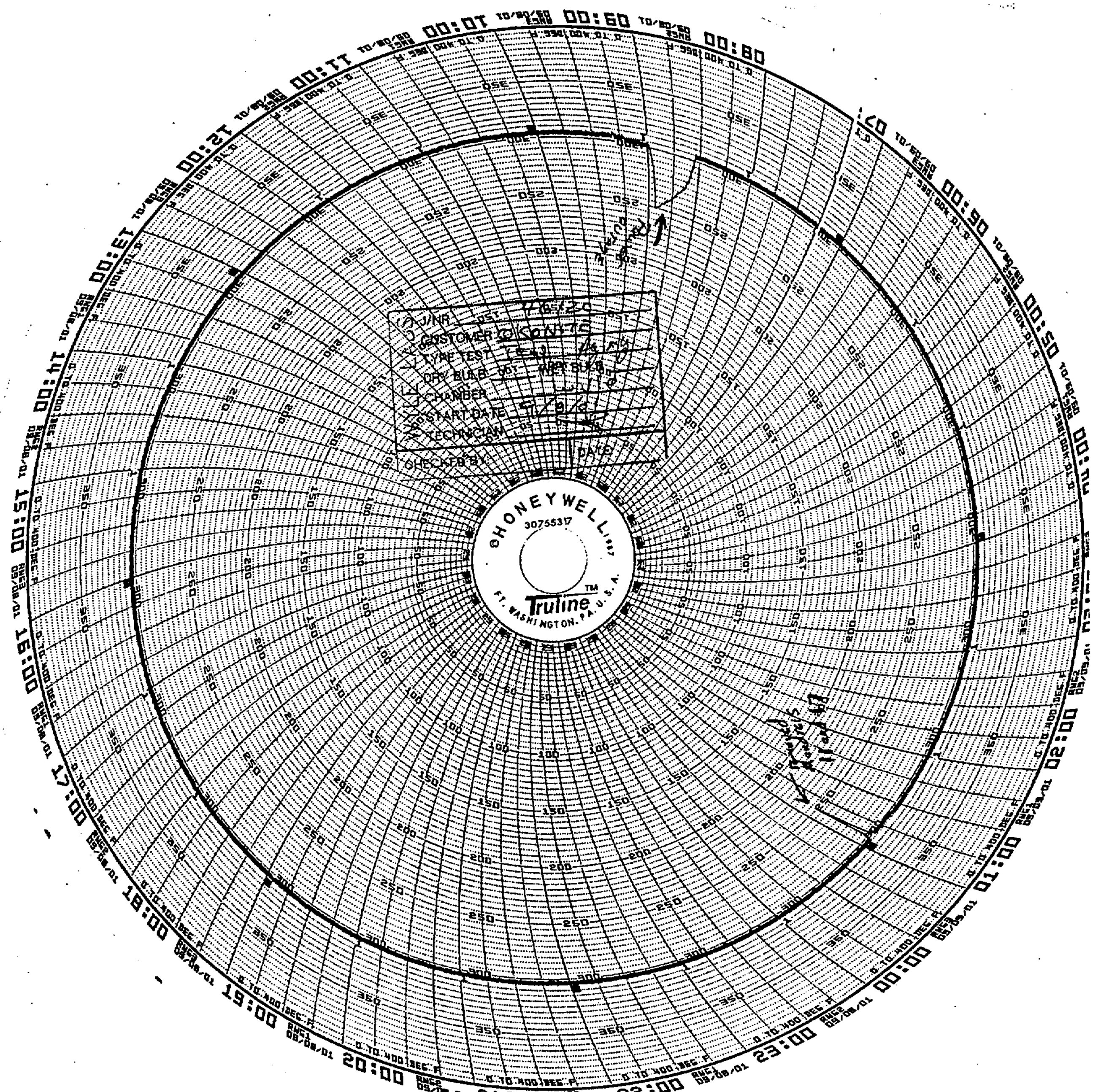
FT. WASHINGTON, PA. U.S.A.



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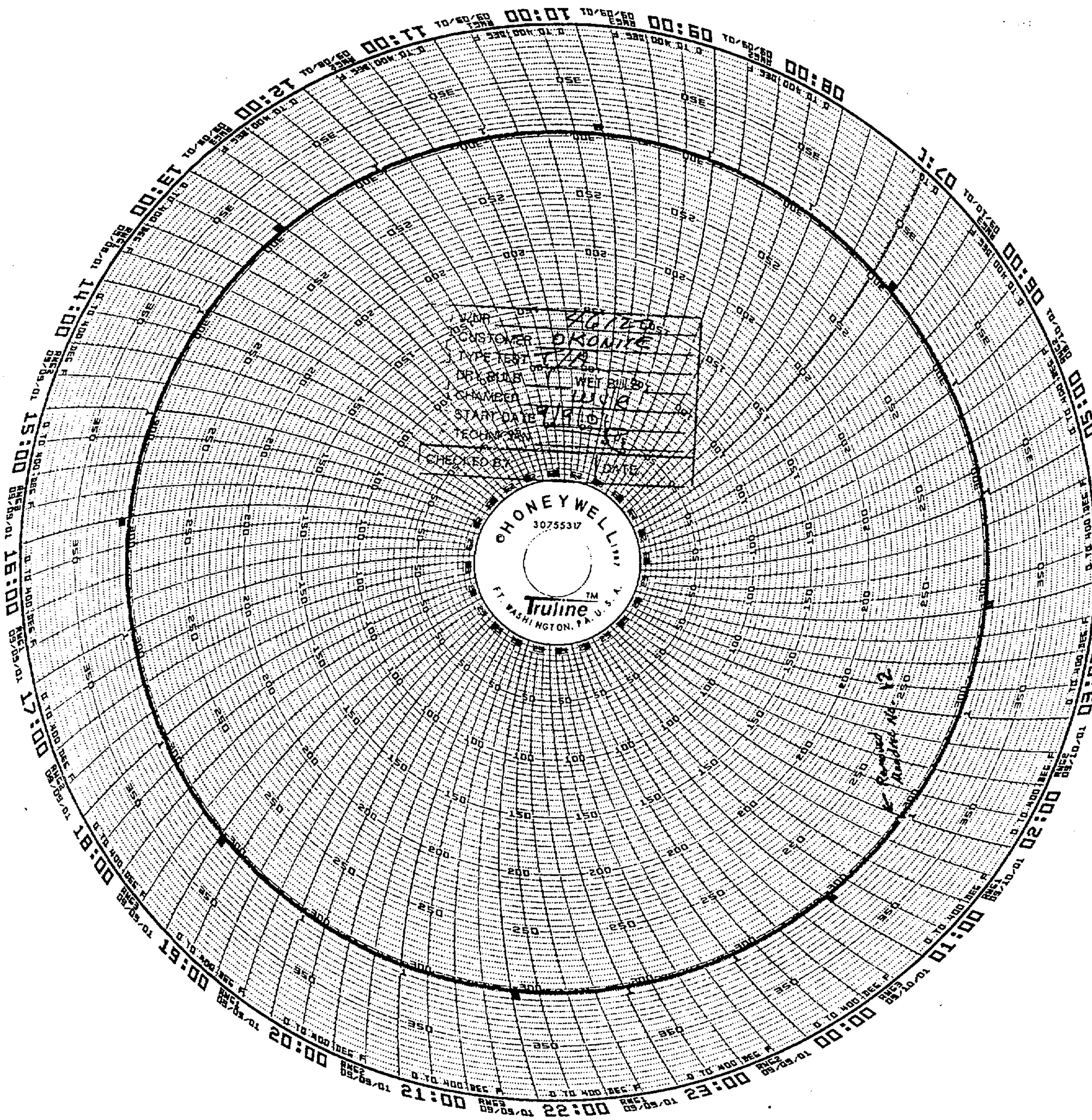
START DATE
TECHNICIAN
CHECKED BY
DATE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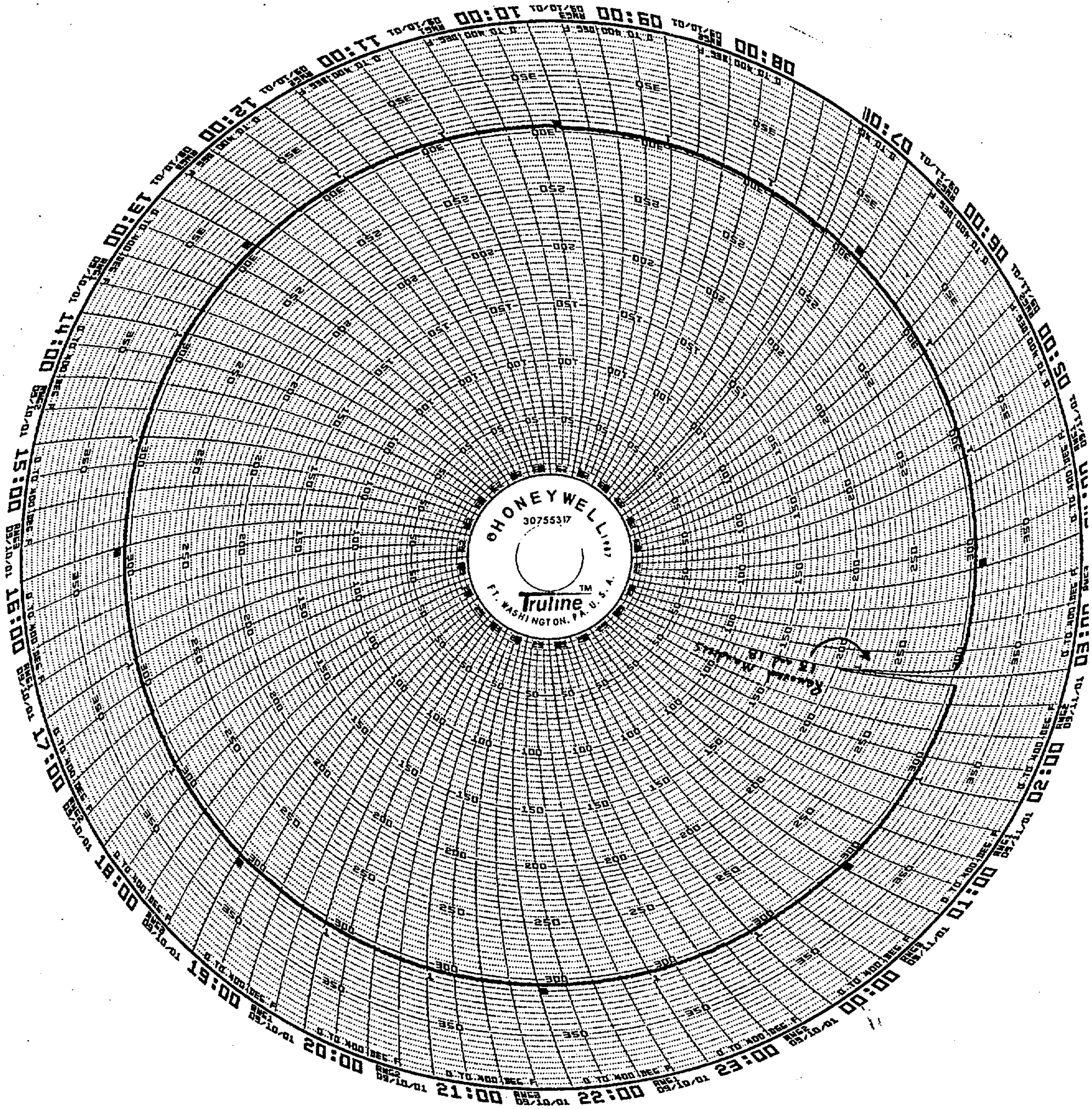
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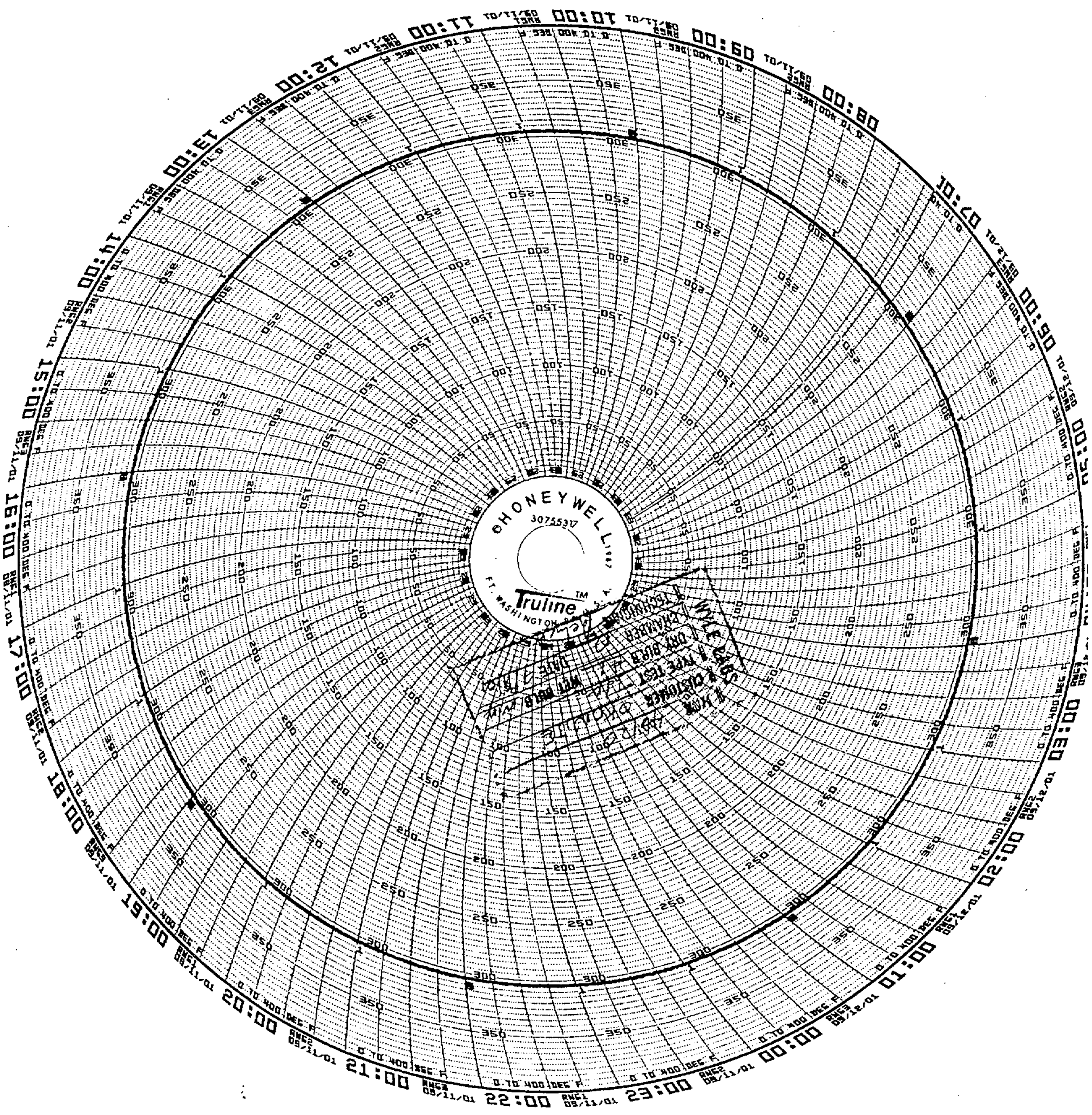

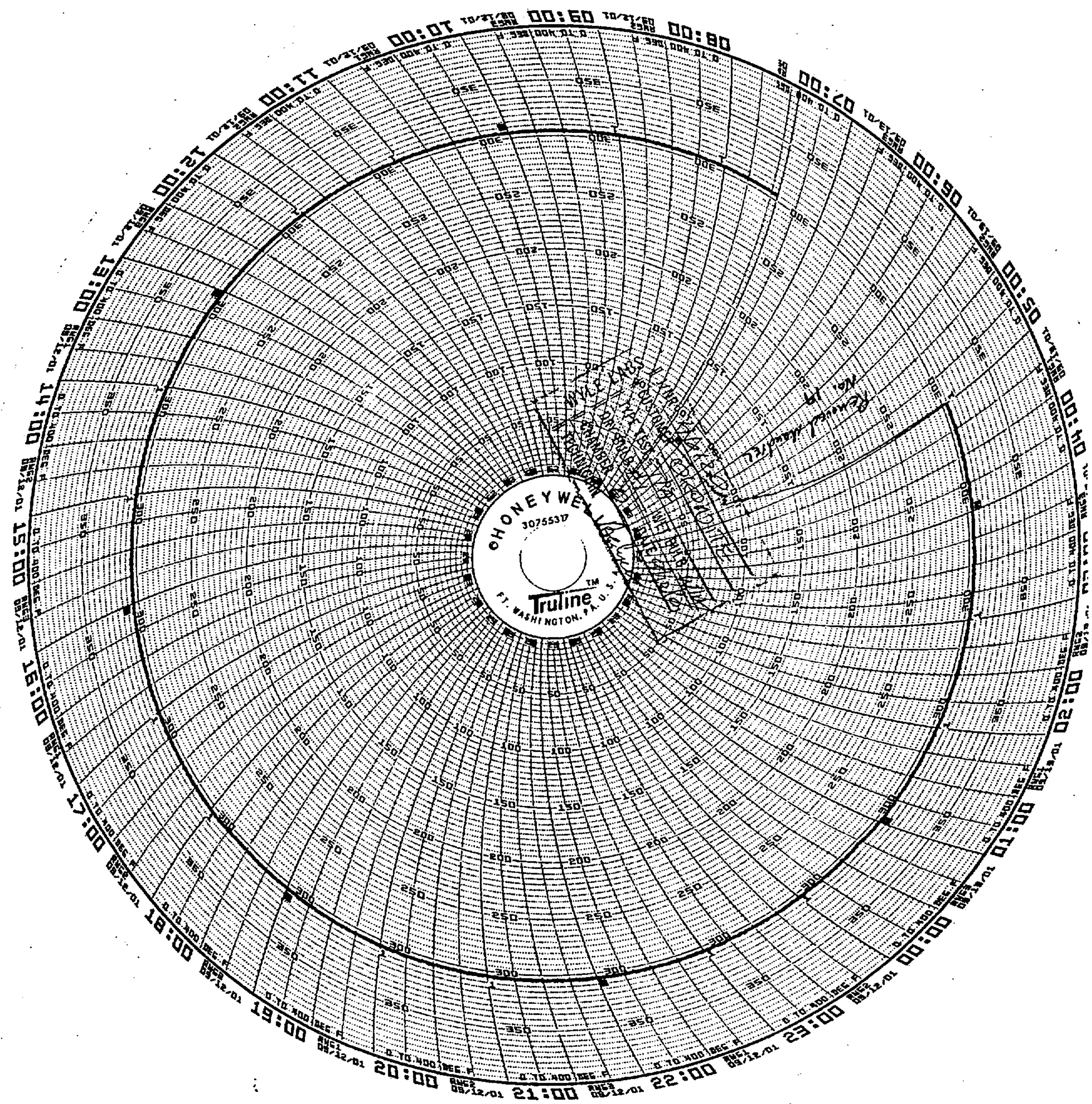
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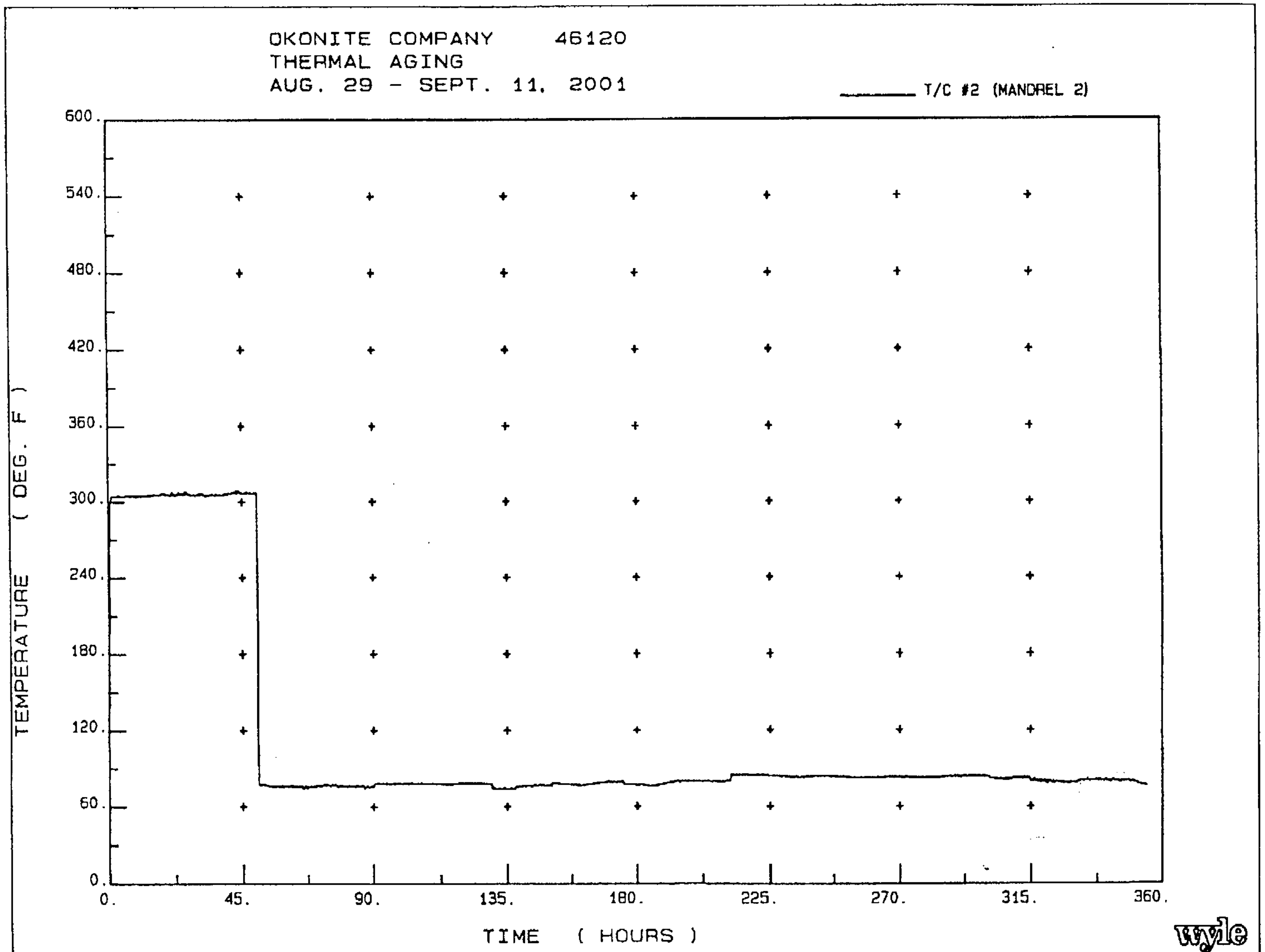

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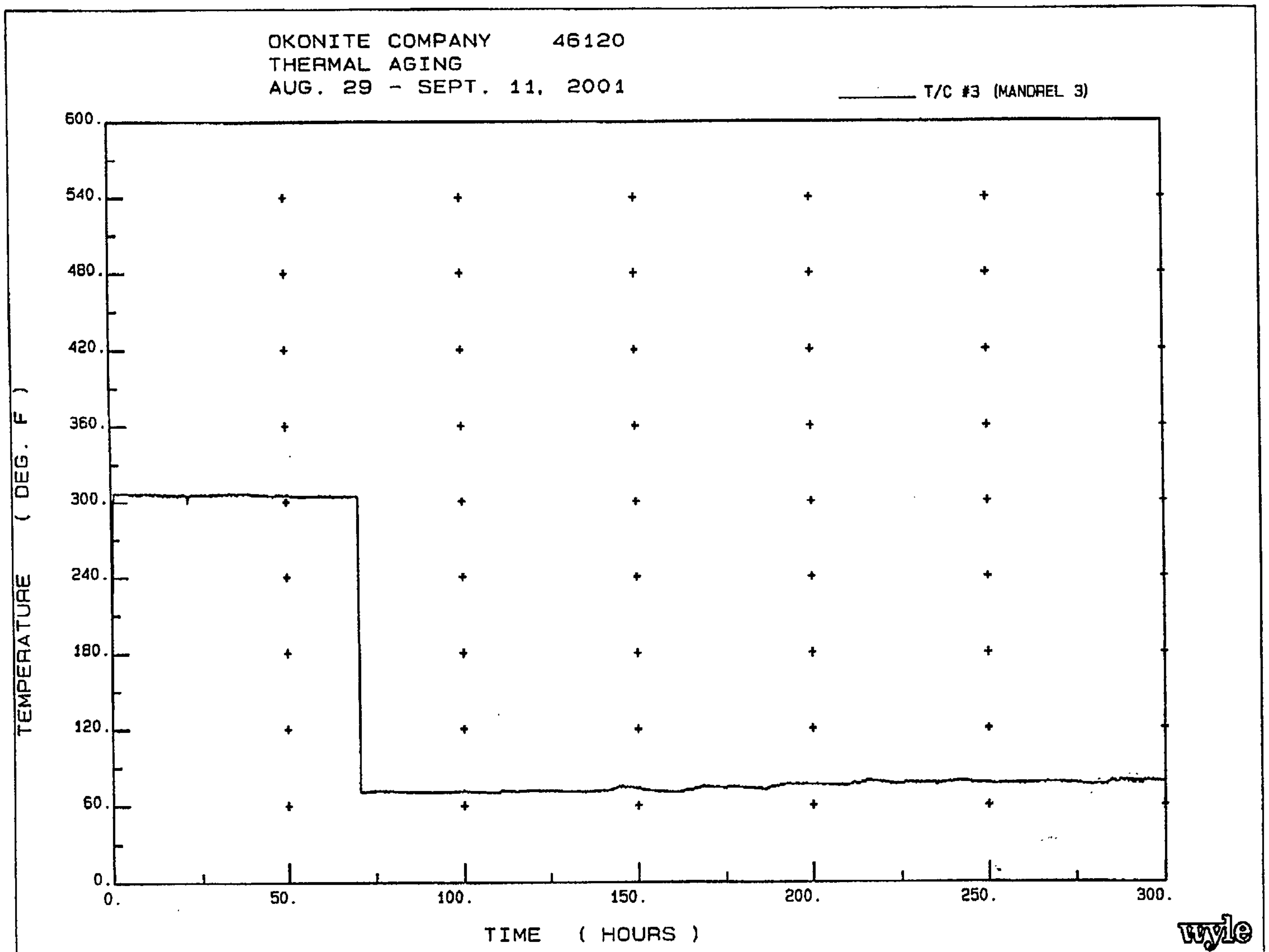

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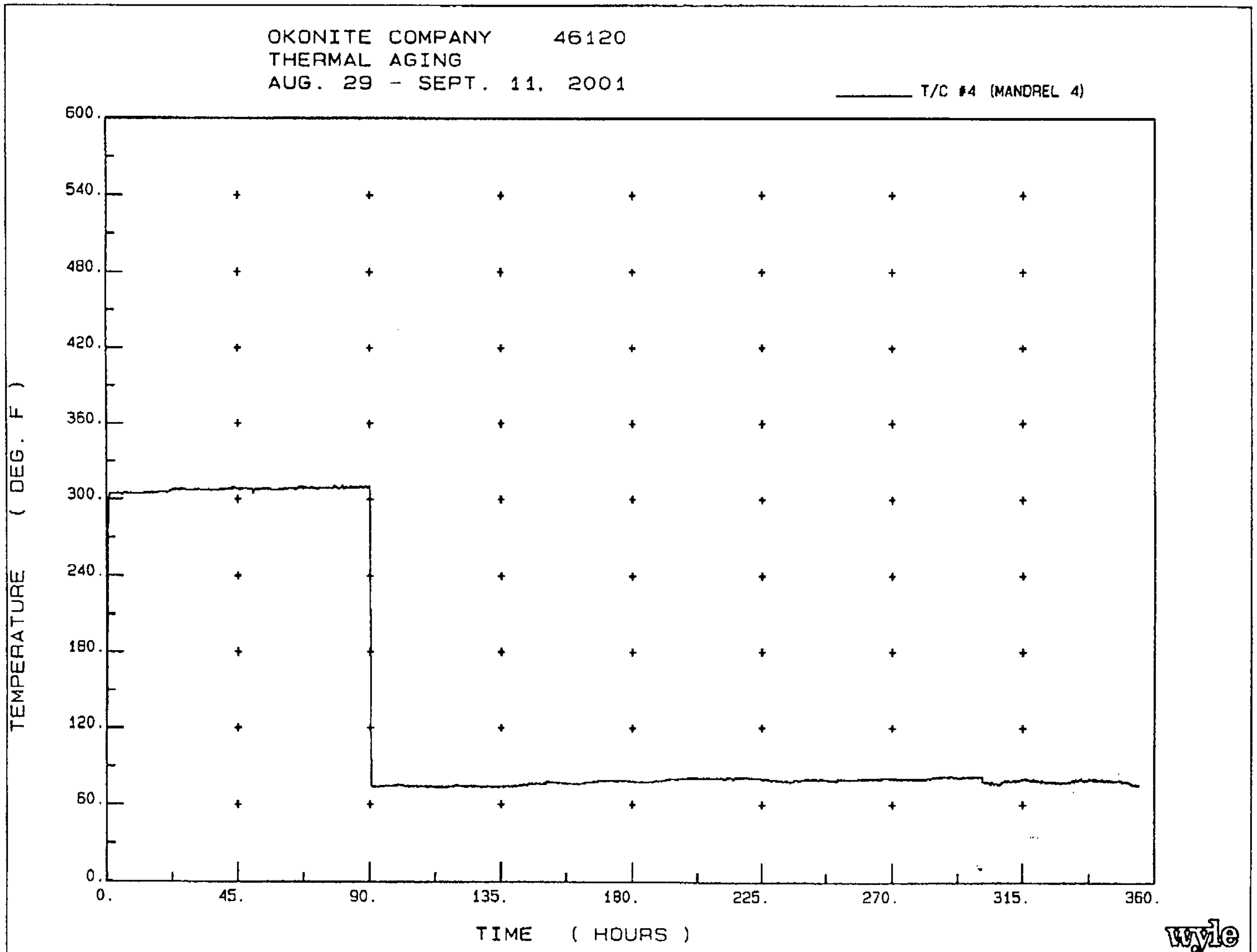

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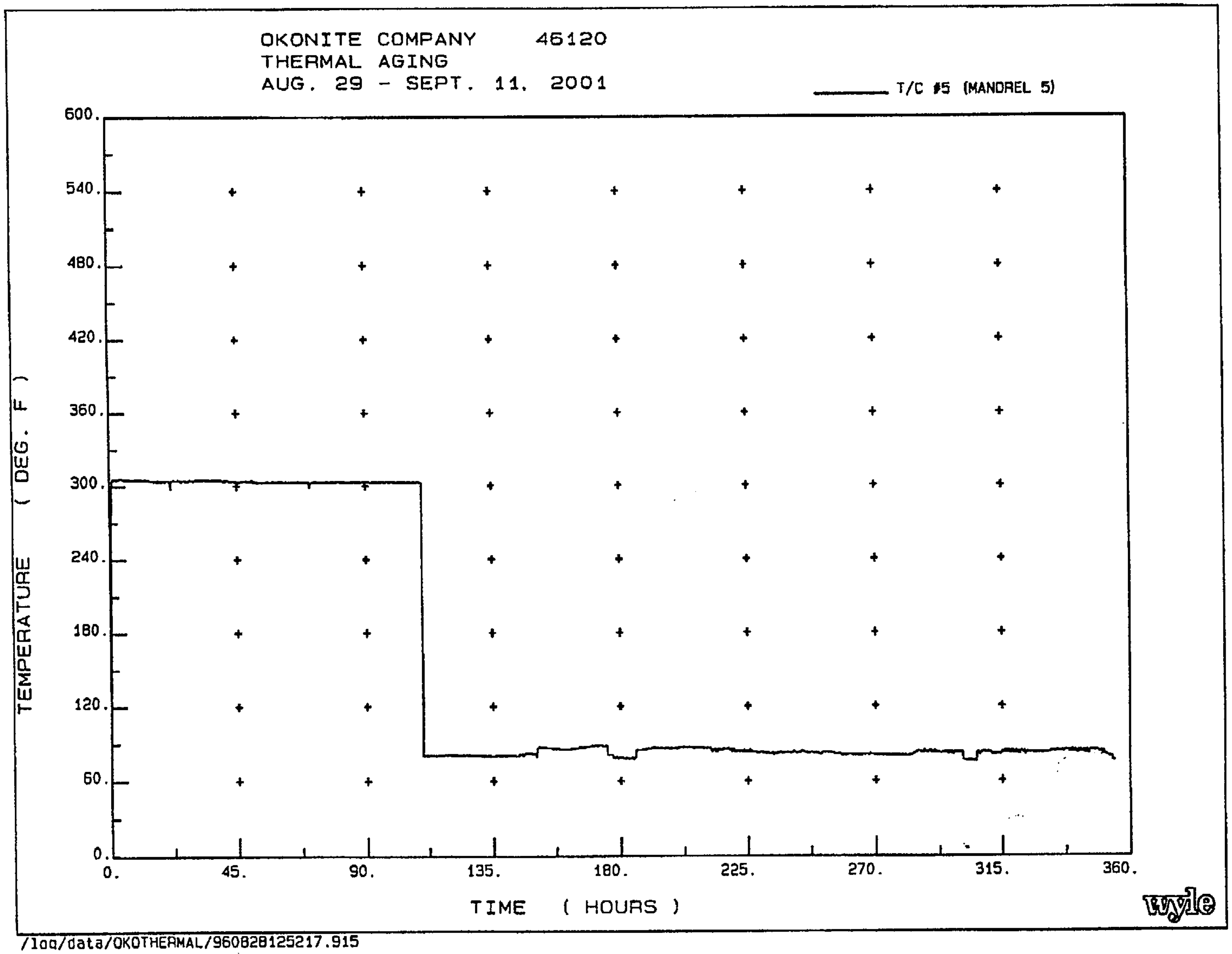
OKONITE COMPANY 46120
THERMAL AGING
AUG. 29 - SEPT. 11, 2001
T/C #5 (MANDREL 5)
600.
540.
480.
420.
360.
300.
240.
180.
120.
60.
0.
TEMPERATURE (DEG. F)
0.
45.
90.
135.
180.
225.
270.
315.
360.
TIME (HOURS)
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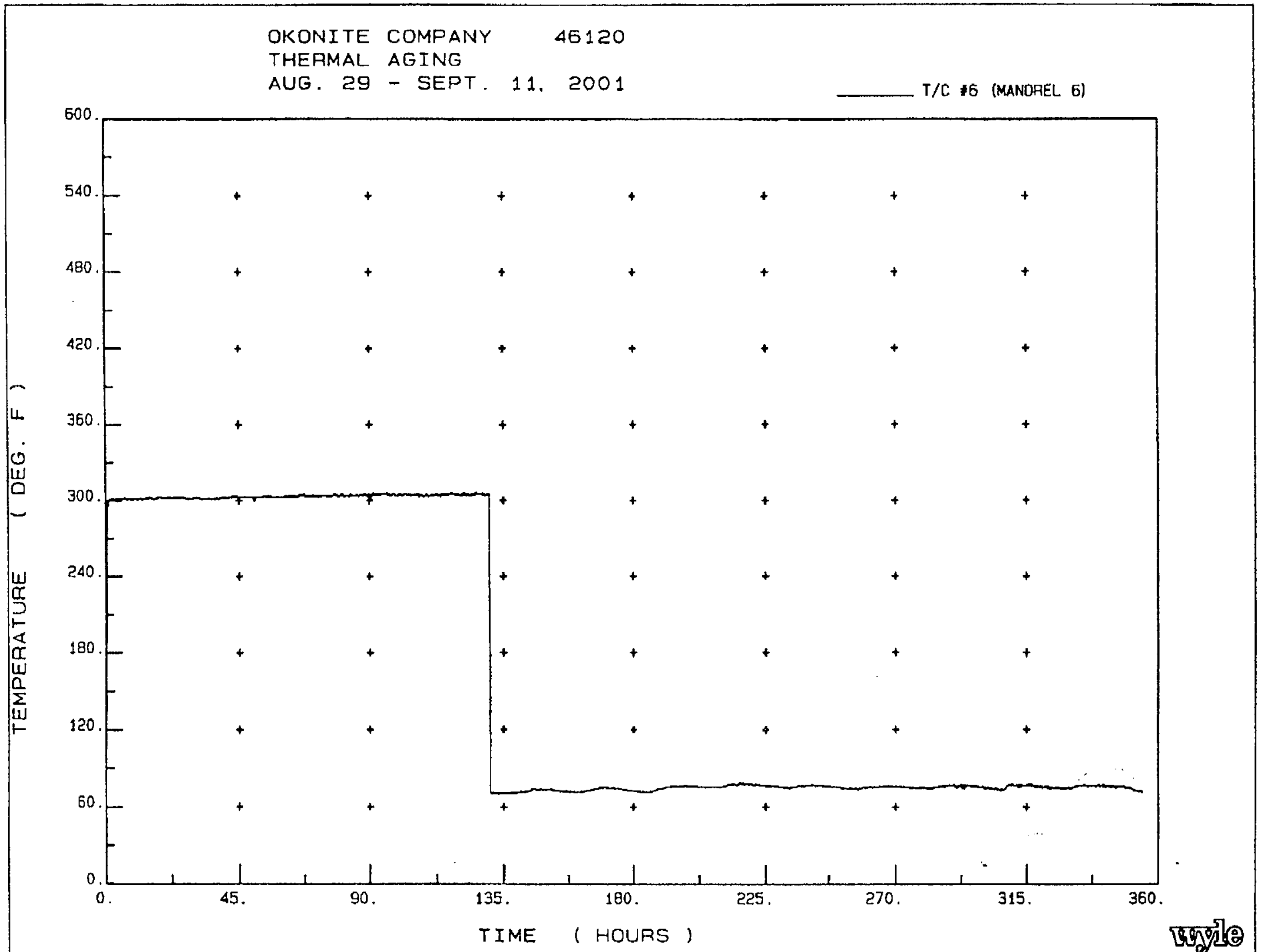

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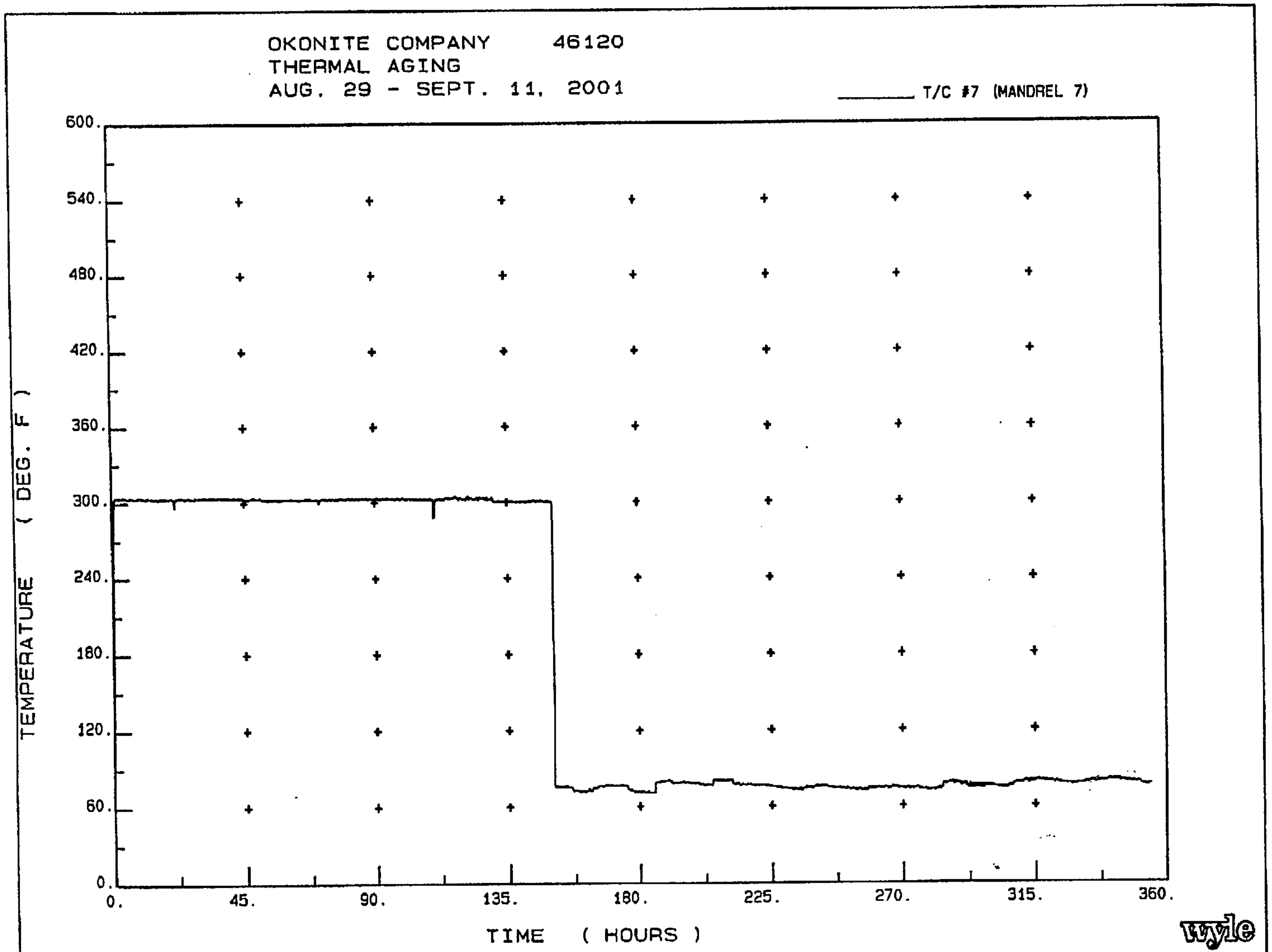

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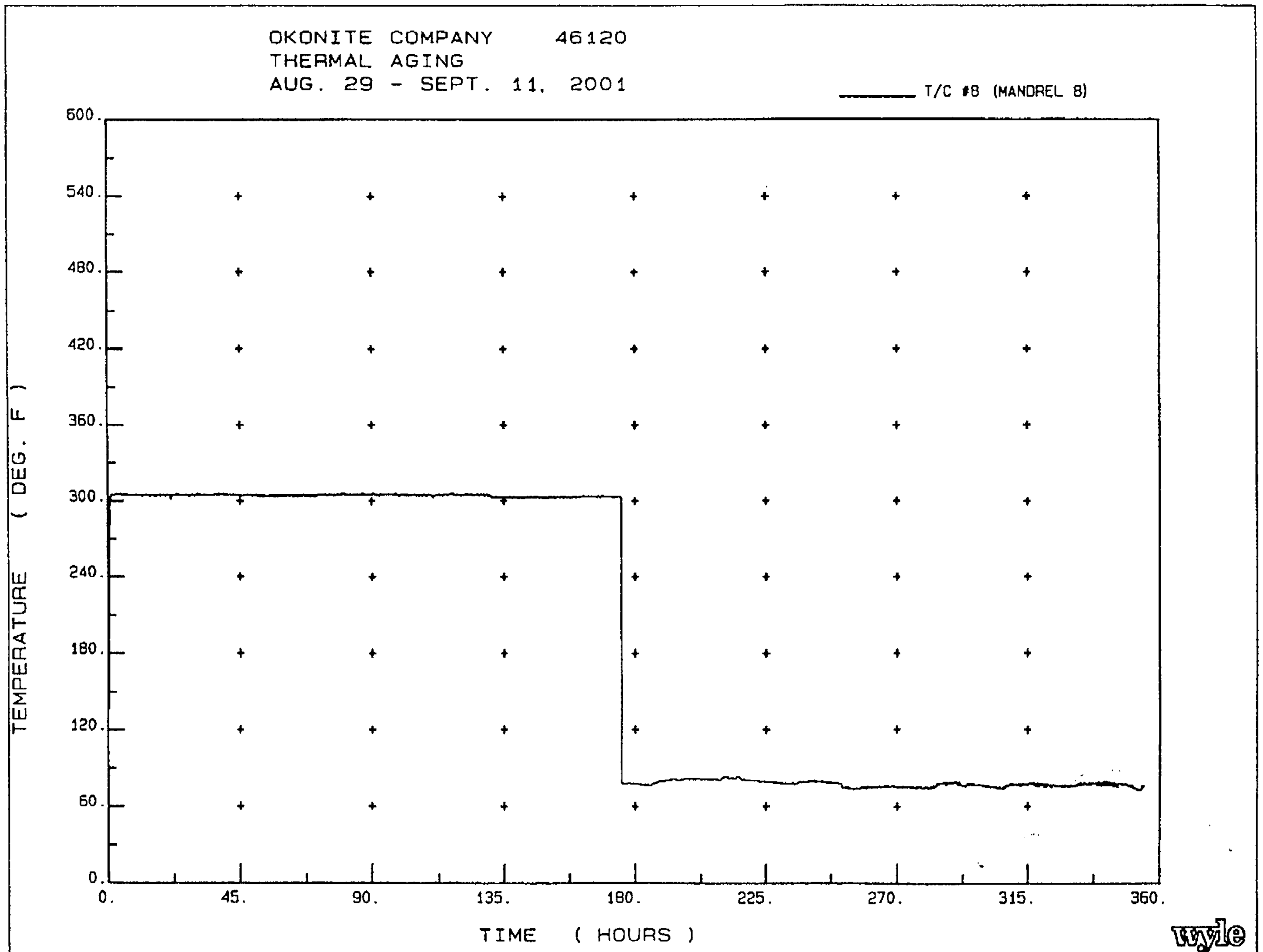

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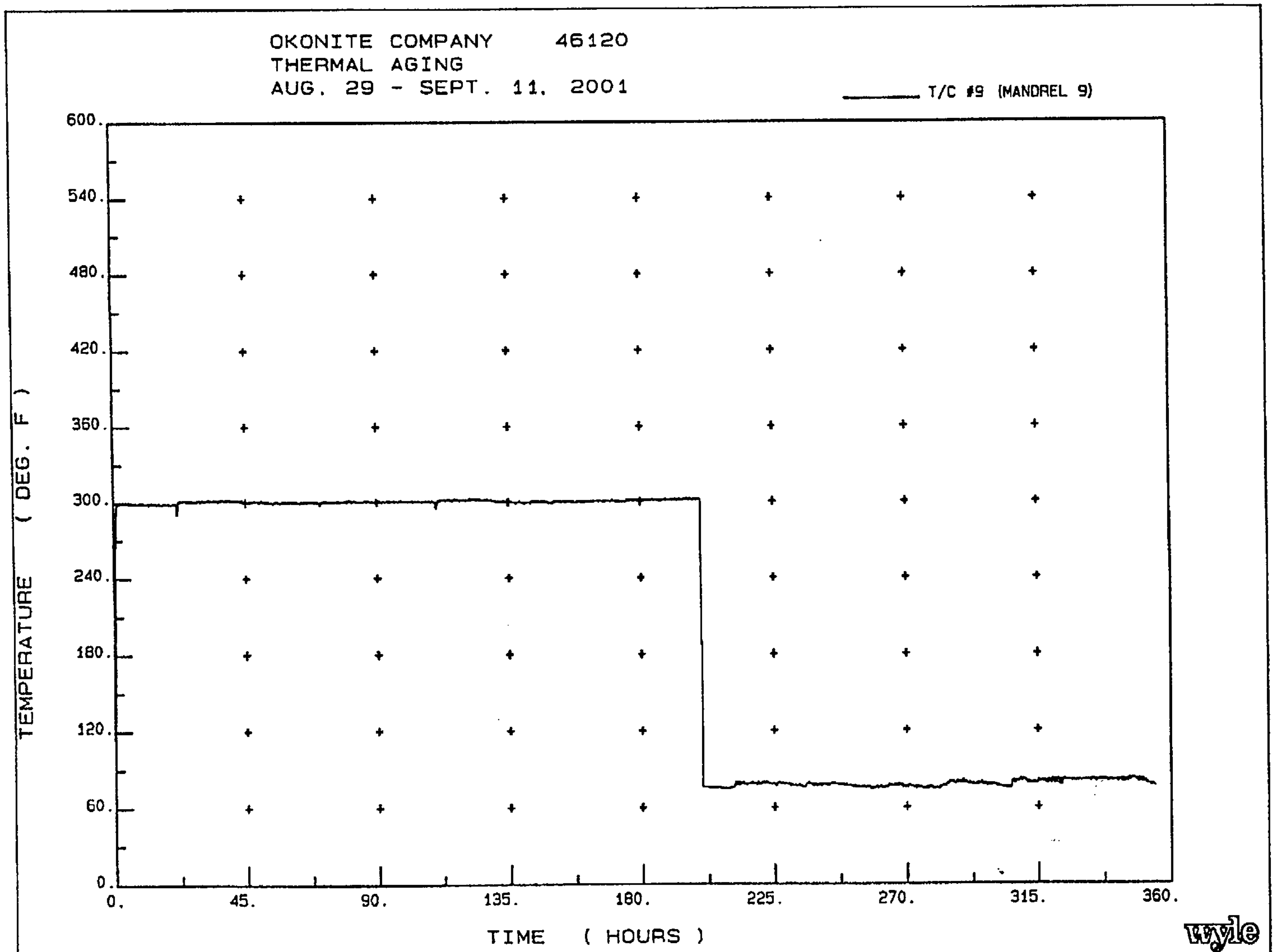

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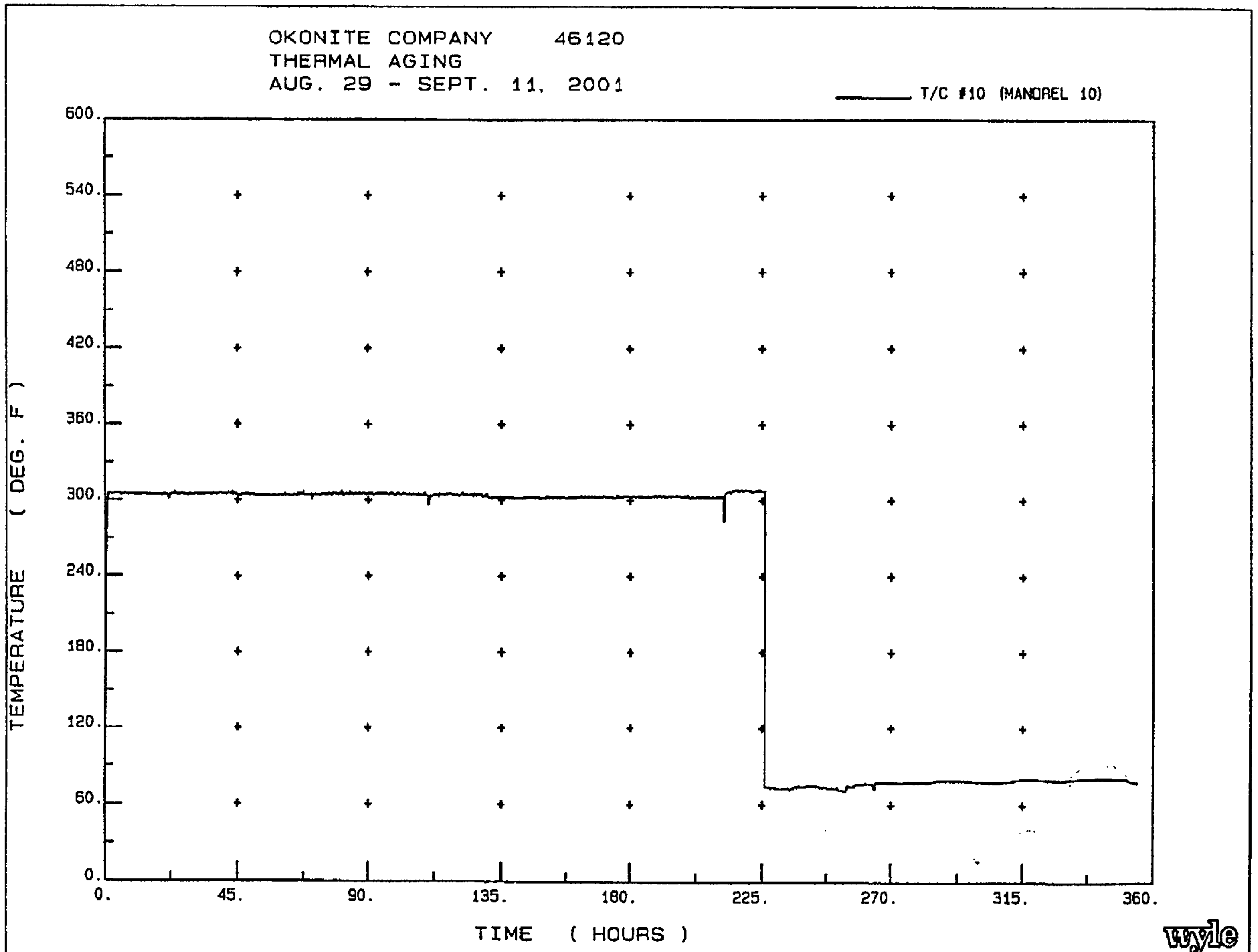

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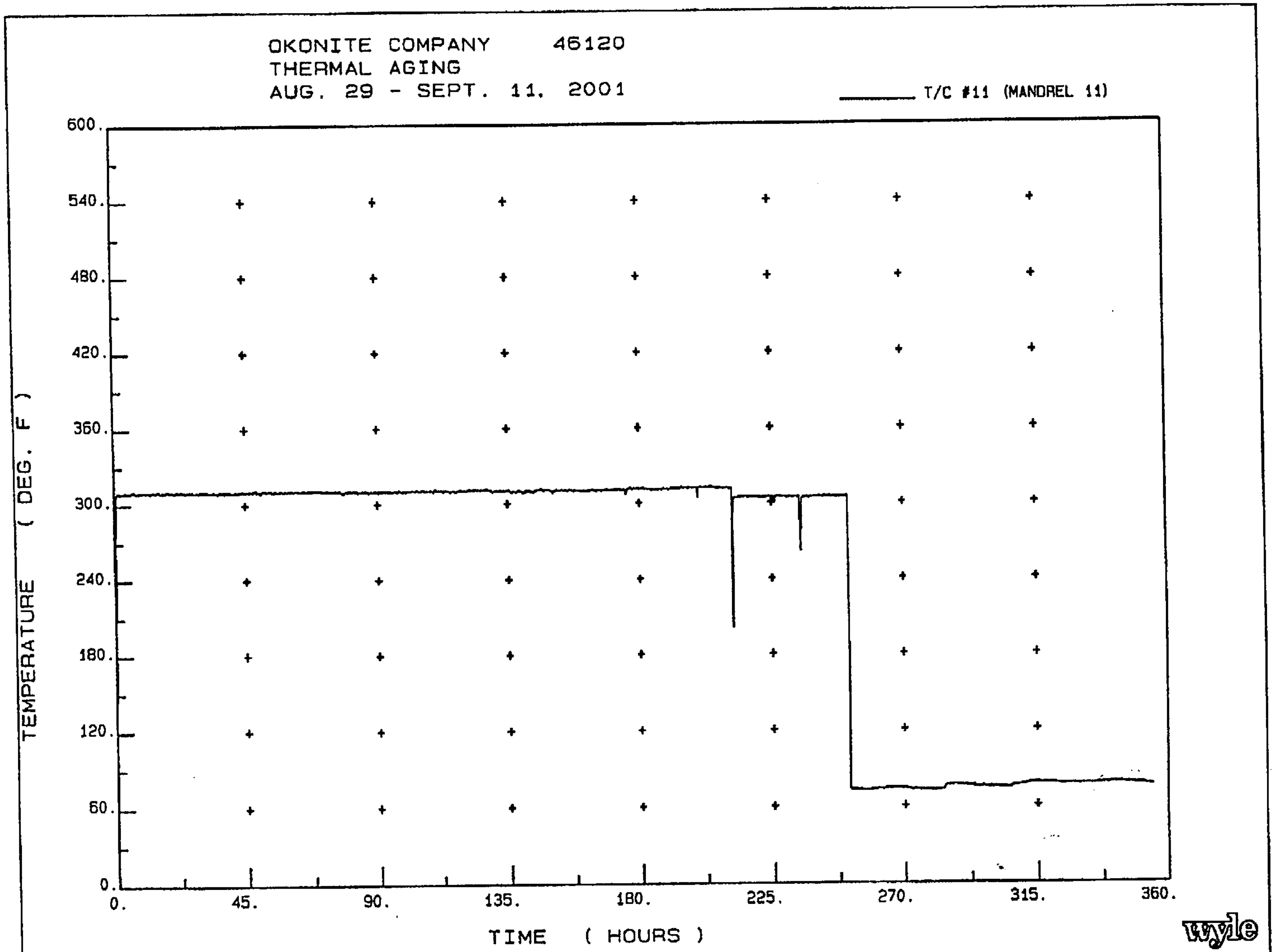

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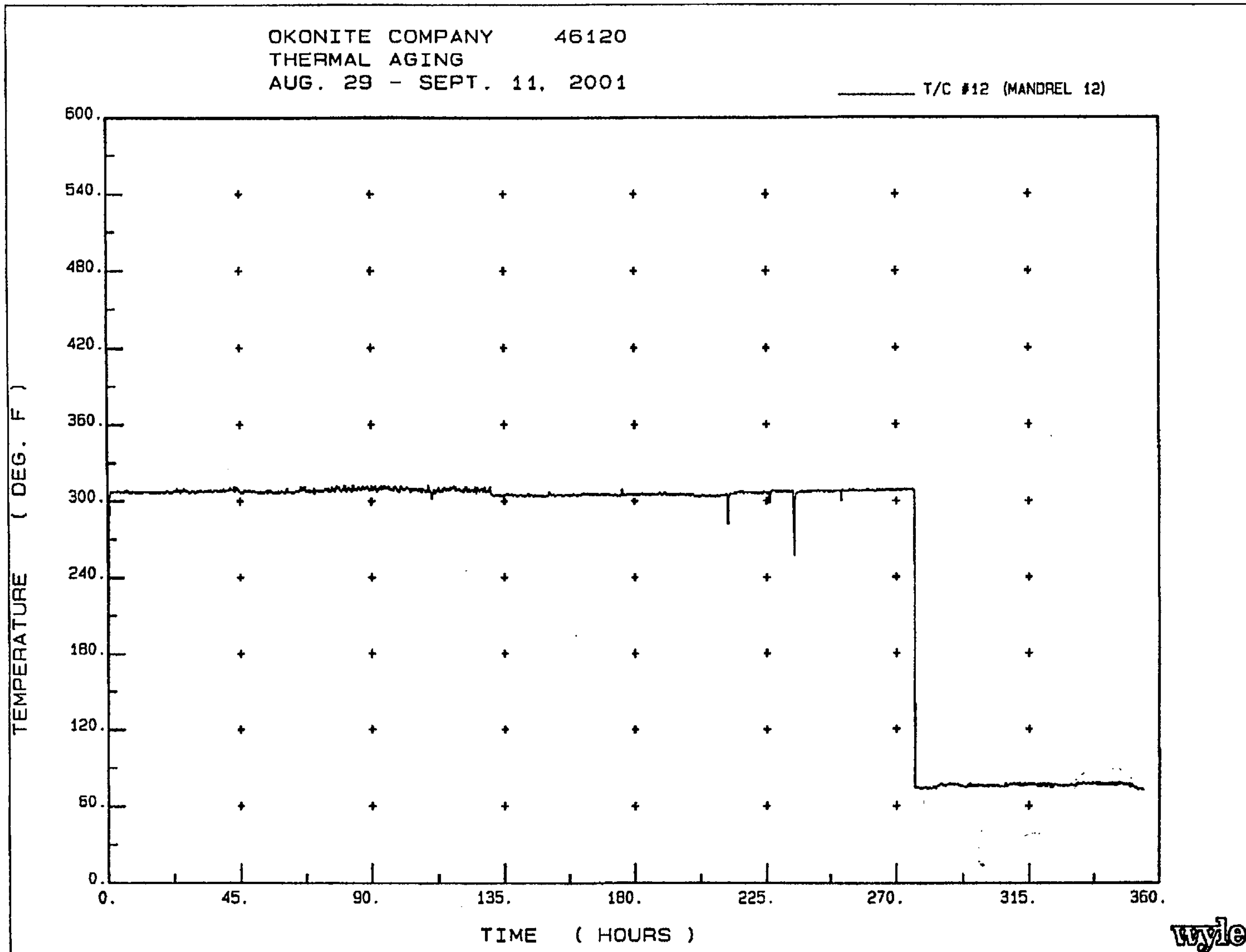

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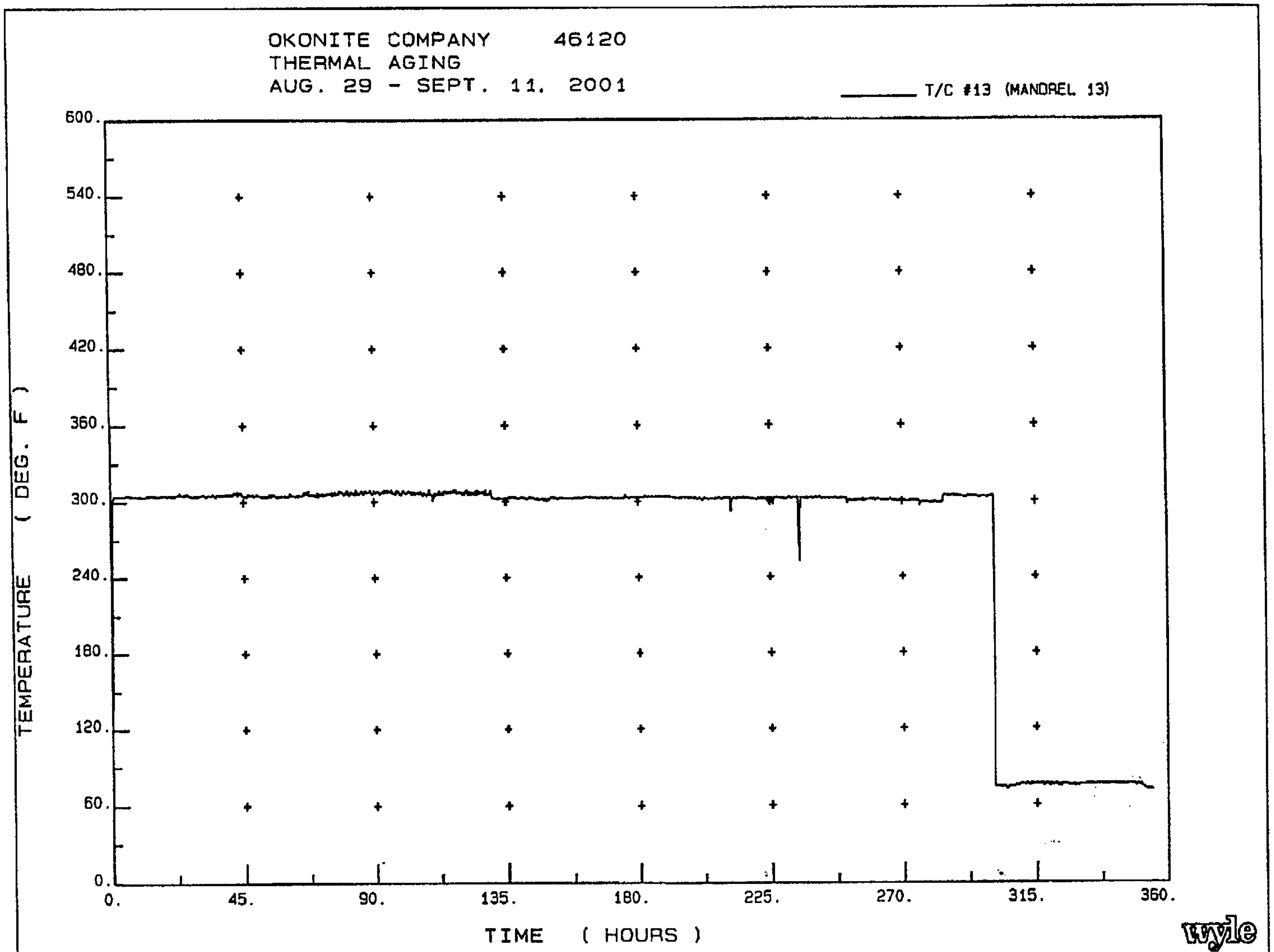

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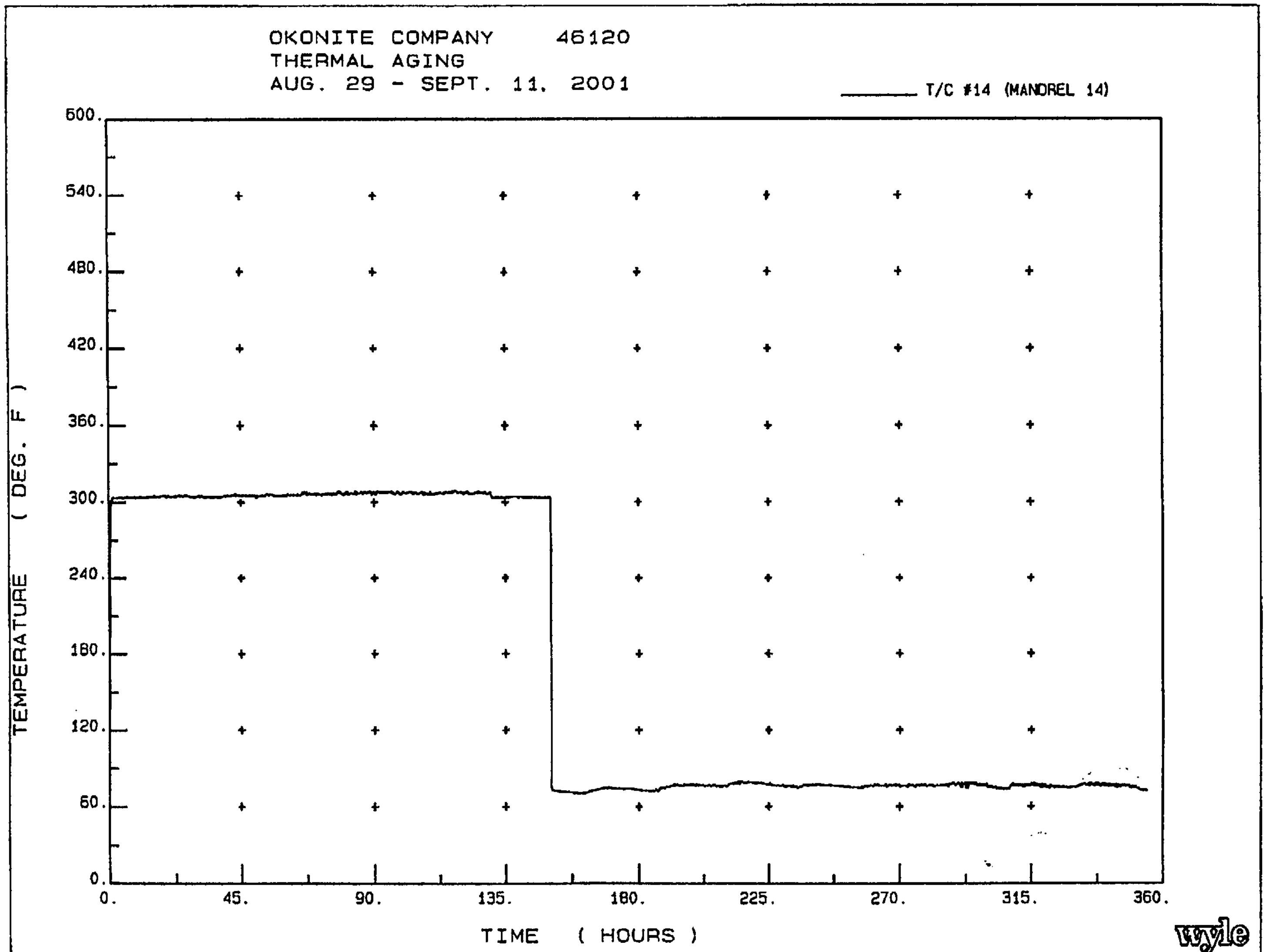

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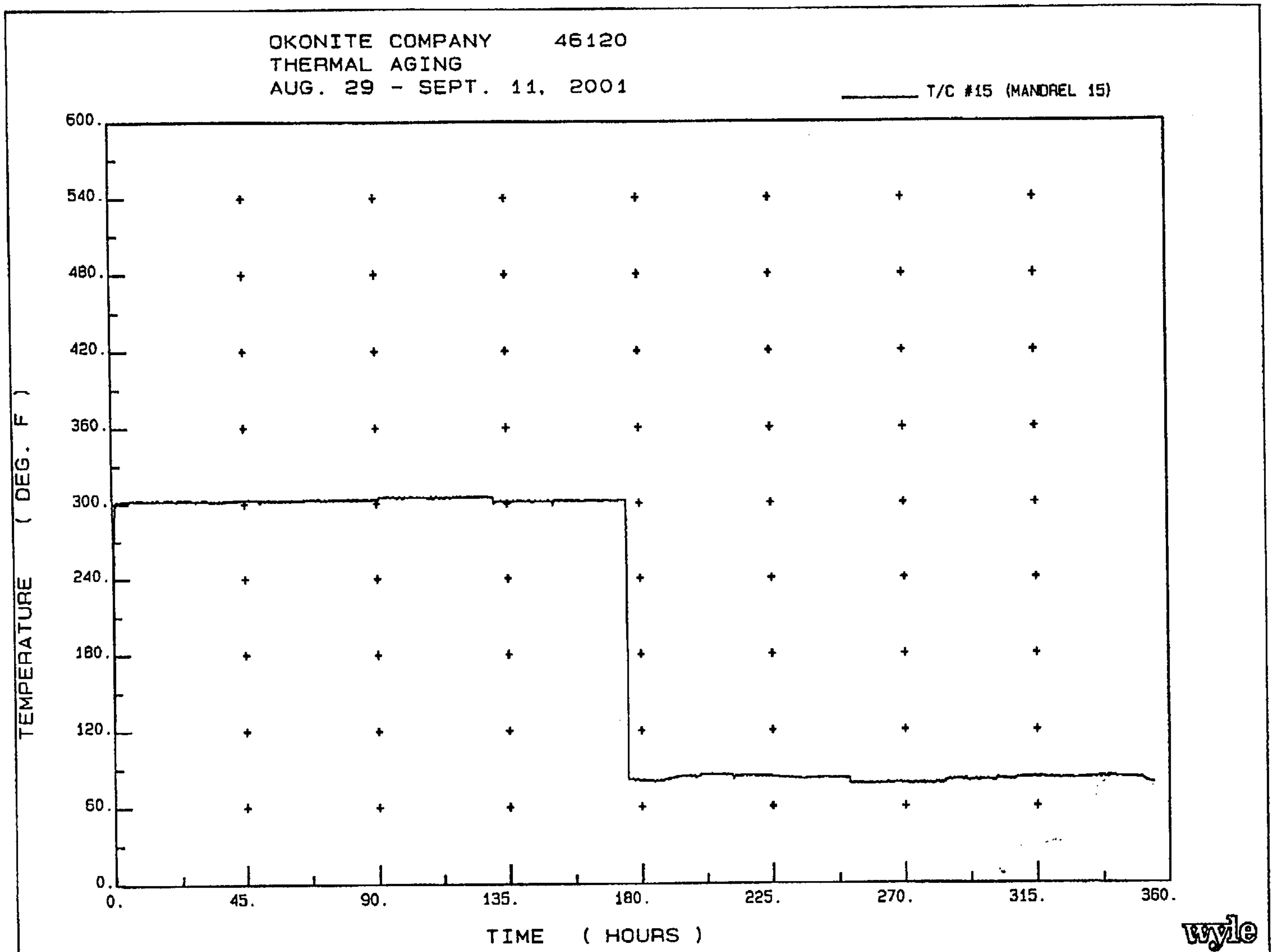

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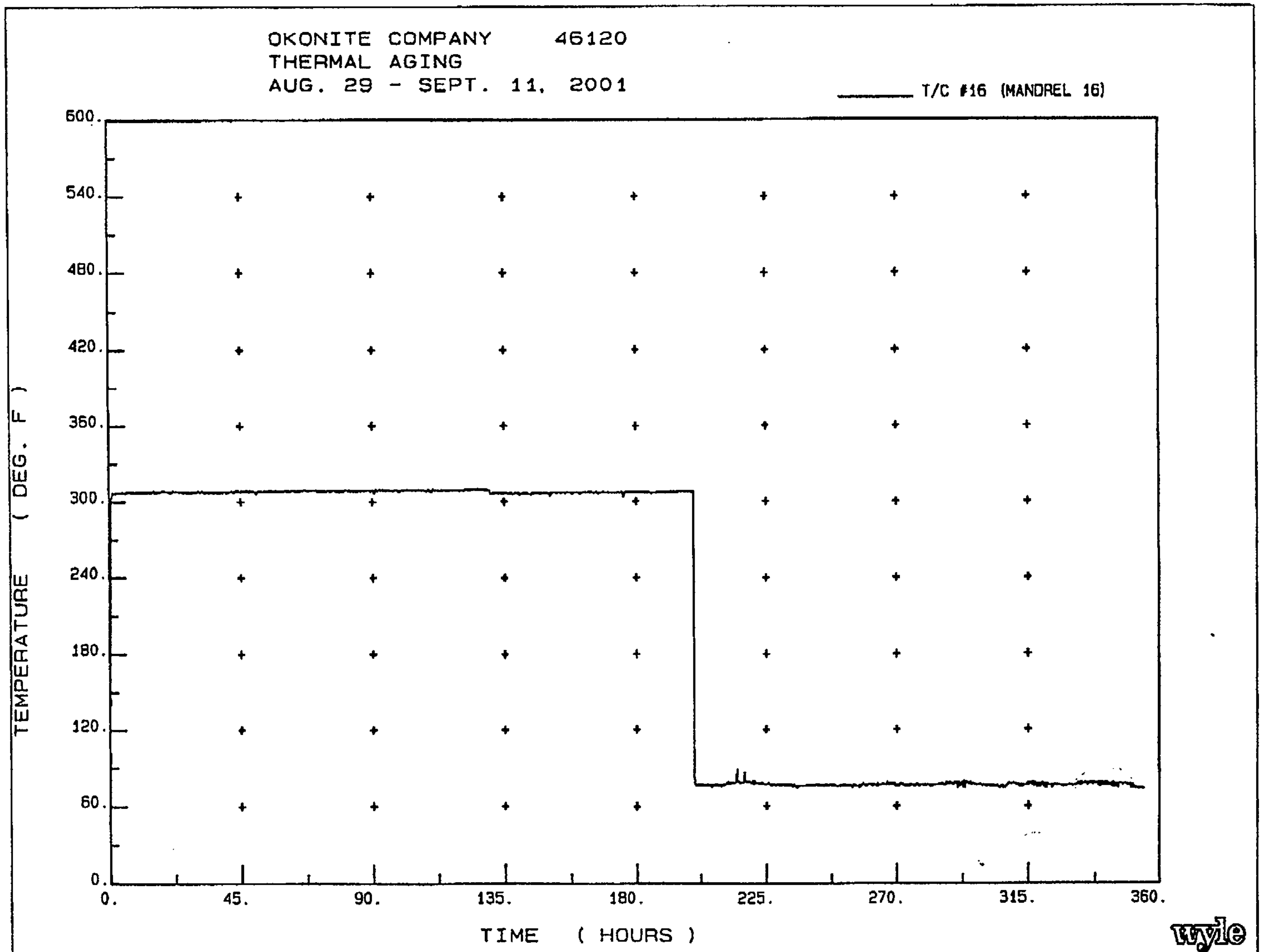

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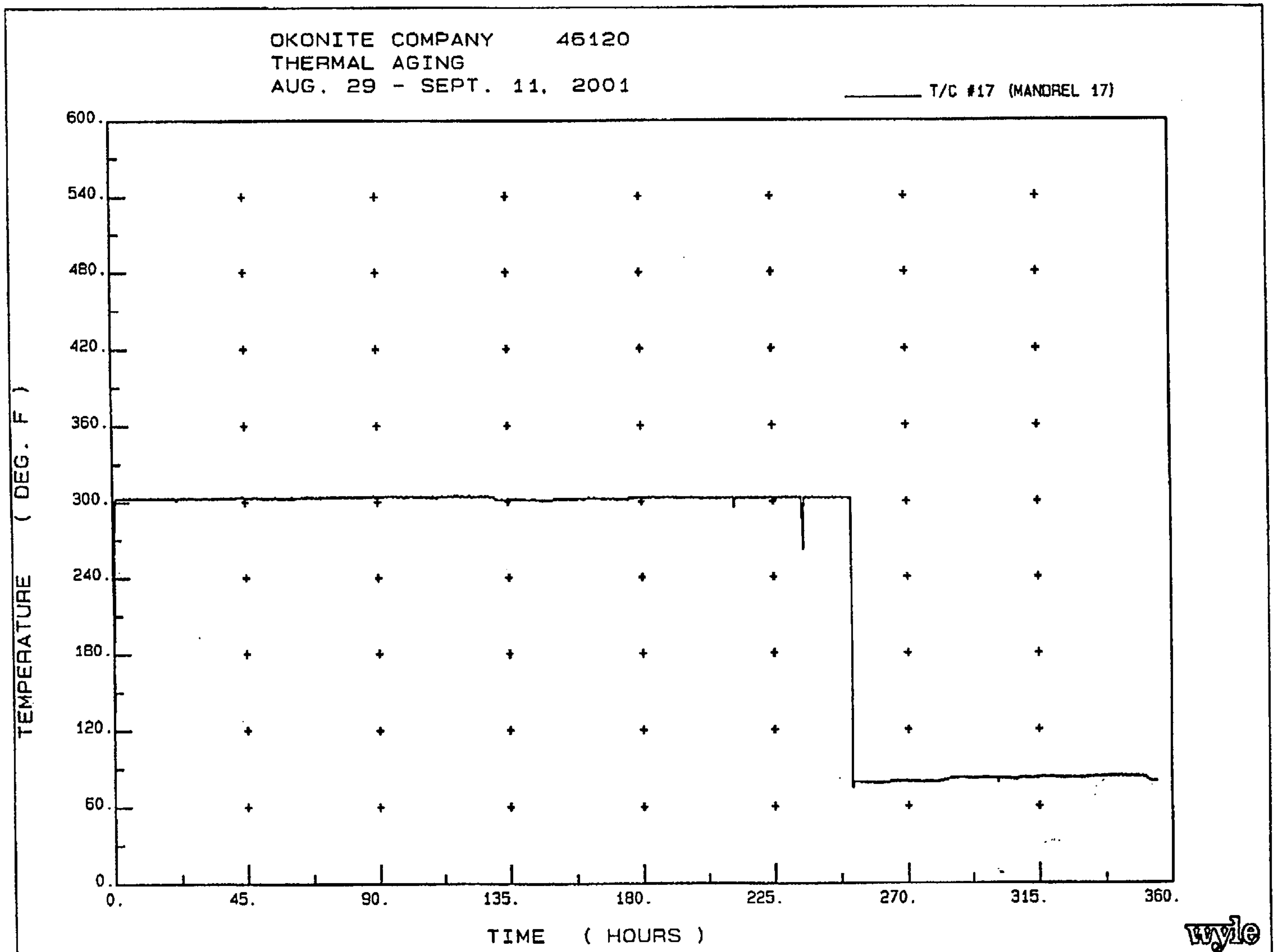

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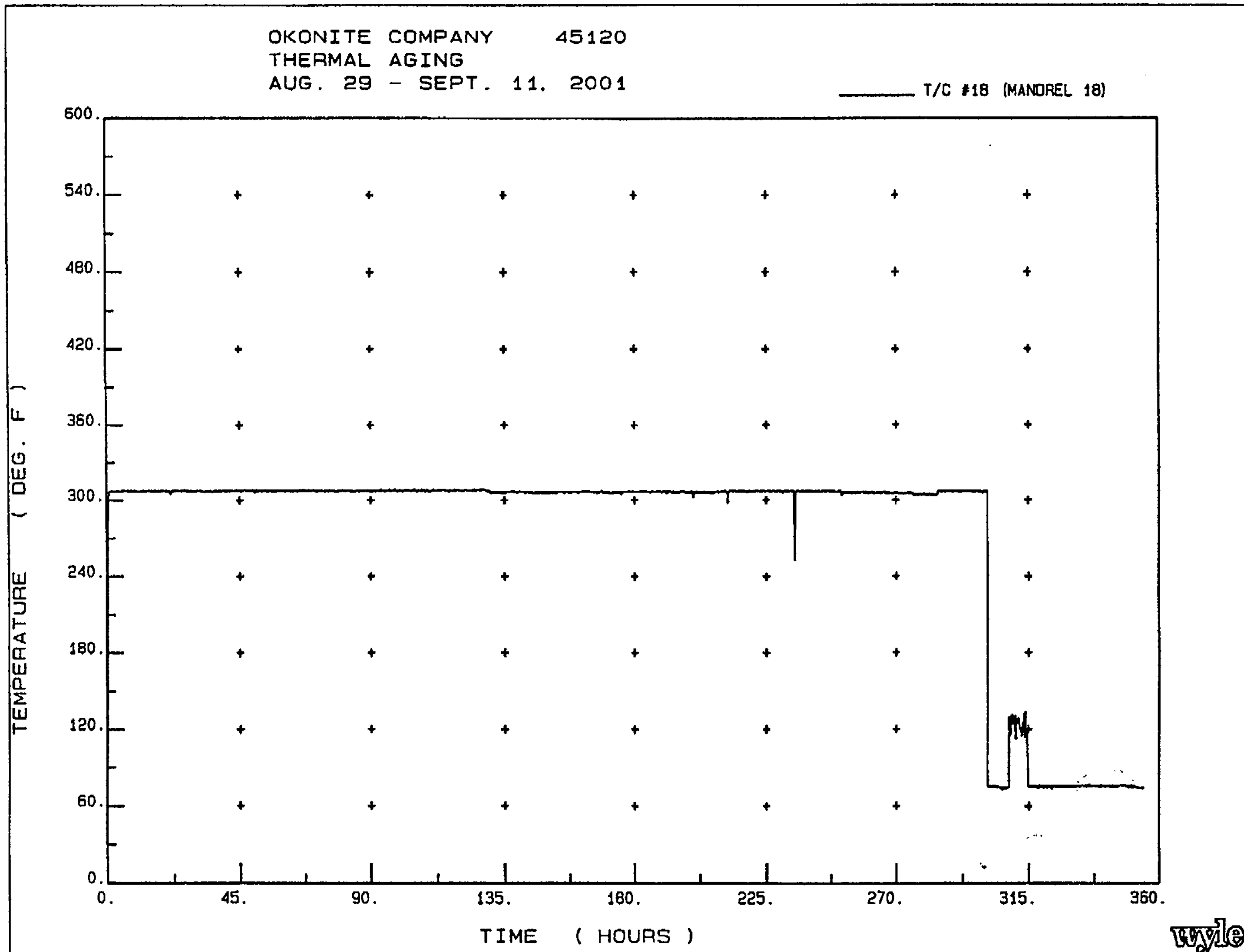

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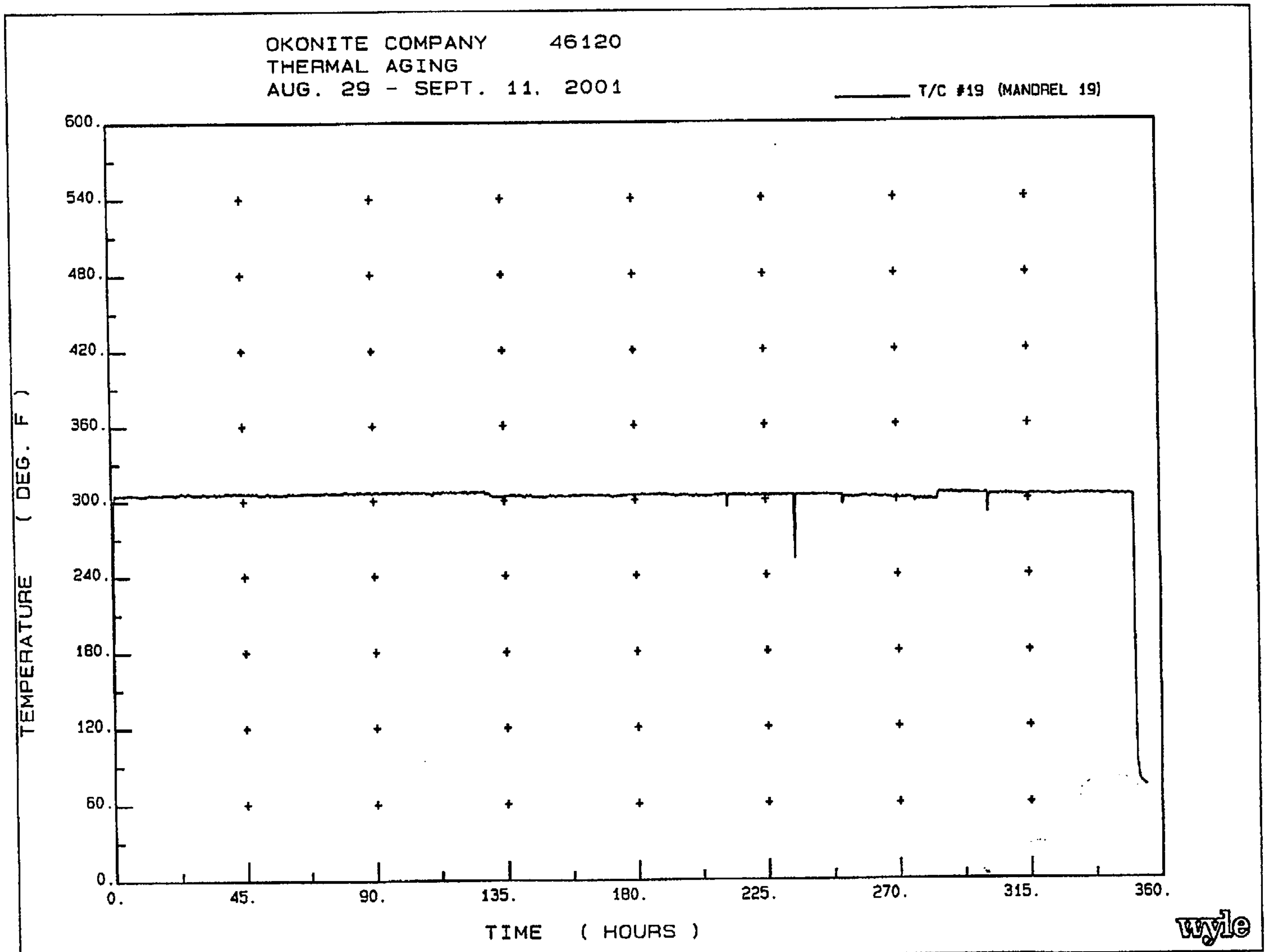

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APPENDIX VI

RADIATION FACILITY COMPONENT IRRADIATION CERTIFICATION

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Georgia Institute of Technology

Neely Nuclear Research Center
Hot Cell Operations
900 Atlantic Drive
Atlanta, Georgia 30332-0425
(404) 894-3600 FAX: (404) 894-9325
http://www.nnrc.gatech.edu/

October 24, 2001

Wyle Laboratories
7800 Highway 20 West
Huntsville, AL 35806

Attention: Bobby Hardy

Client Reference: HSV0022607
GT Reference: 2001-29

The items covered by the above numbers have been irradiated in accordance with quality assurance requirements using Cobalt-60 (gamma energies 1.173 MeV, 1.331 MeV) to the total dose requested.

We certify the specifics of the irradiation as follows:

Irradiation Period	Intervals between 14:50 on 09/26/01 and 08:50 on 10/22/01 as shown on the enclosed Gamma Irradiation Log Sheets.
Dose Rate	Less than 1.0E6 Rads/hr average (Air Equivalent); maximum error plus or minus 2.43%.
Total Dose	Minimum of 2.0E8 Rads (Air Equivalent) as shown on the enclosed Gamma Irradiation Log Sheets; maximum error plus or minus 2.43%.
Dose Measurement	Keithley Autoranging Picoammeter Model 485 with LND Ionization Chamber Probe. Calibration completed by Georgia Institute of Technology traceable to NIST Cobalt-60.

The specific calculations for the irradiation are enclosed. Please let me know if any additional information is required.

Sincerely,

Dwayne P. Blaylock
Manager, Hot Cell Operations
Neely Nuclear Research Center

Enclosures

A Unit of the University System of Georgia

An Equal Education and Employment Opportunity Institution

Georgia Institute of Technology
Neely Nuclear Research Center
900 Atlantic Drive, N.W.
Atlanta, GA 30332-0425

Gamma Irradiation Log and Dose Rate Measurement Sheet

Client:	Wyle Laboratories	**NRC Reference:**	2001-29a
Reference:	HSV0022607	**Total Dose:**	1.0E8 w/ Unc
Items:	Mandrel 14-19 Baskets 39-50	**Dose Rate:**	≤1.0E6 Rads/hr

Start Date	Start Time	End Date	End Time	Lapsed Hours	Dose Rate Rads/hr	Total Dose Rads	Cum Dose Rads
09/26/01	14:50	10/05/01	8:50	210.00	4.880E+05	1.025E+08	1.025E+08

Dose Rate Determination*

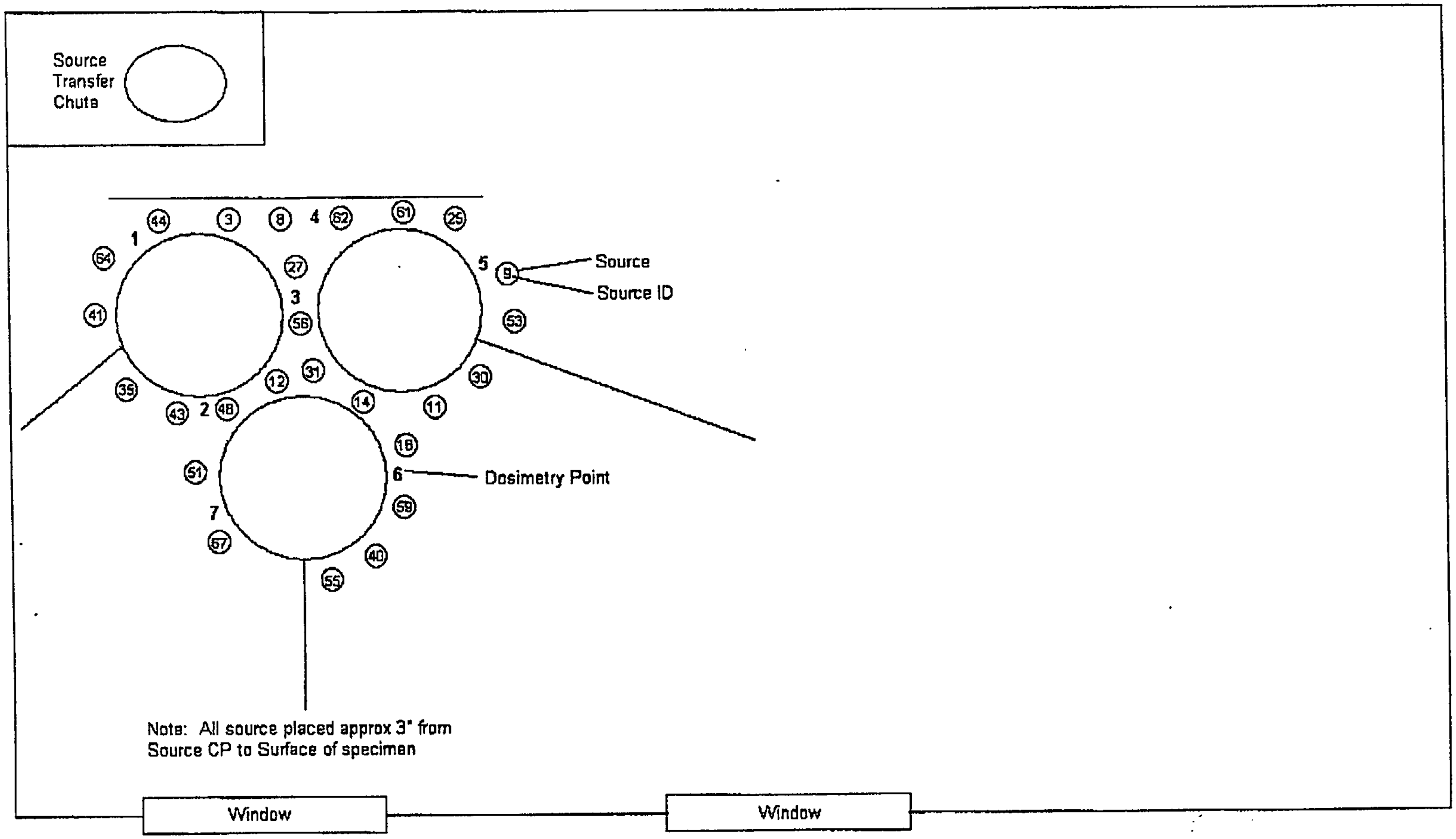
Dosimetry Measurement	Current (Amps)	Dose Rate (Rads/hr)
1	6.352E-07	4.858E+05
2	6.382E-07	4.892E+05
3	6.391E-07	4.902E+05
4	6.377E-07	4.887E+05
5	6.349E-07	4.855E+05
6	6.384E-07	4.894E+05
7	6.361E-07	4.869E+05

Average Dose Rate (Rads/hr): 4.880E+05

*Dose Rate determined from ionization probe current using the following formula:
DR(Rads/hr)= 5.609E17 * (Amps)2 + 4.085E11 * (Amps) + 56.191

Completed: [signature] Date: 10/23/01

Reviewed: [signature] Date: 10.23.01

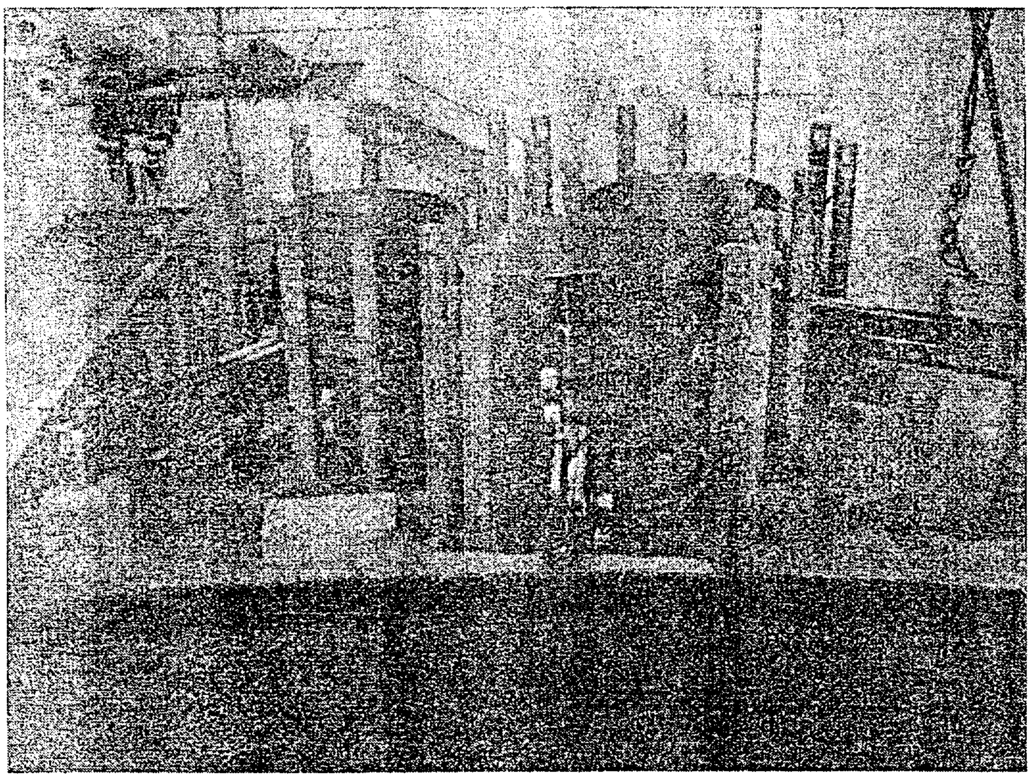


Georgia Institute of Technology
Neely Nuclear Research Center
Hot Cell Operations / Gamma Irradiation Services

Client: Wyle Laboratories
Job #: 2001-29a

Not To Scale

Wyle Laboratories
Hot Cell Job# 2001-29a



Georgia Institute of Technology
Neely Nuclear Research Center
900 Atlantic Drive, N.W.
Atlanta, GA 30332-0425

Gamma Irradiation Log and Dose Rate Measurement Sheet

Client:	Wyle Laboratories	**NRC Reference:**	2001-29b
Reference:	HSV0022607	**Total Dose:**	2.0E8 w/ Unc
Items:	Mandrels 1-13 Baskets 1,2,4,5 ,7,8,10,11,13,14,16,17,19 20,22,23,25,26,28,29,31,32,34,35,37,38	**Dose Rate:**	≤1.0E6 Rads/hr

Start Date	Start Time	End Date	End Time	Lapsed Hours	Dose Rate Rads/hr	Total Dose Rads	Cum Dose Rads
10/05/01	11:20	10/22/01	8:50	405.50	5.054E+05	2.049E+08	2.049E+08

Dose Rate Determination*

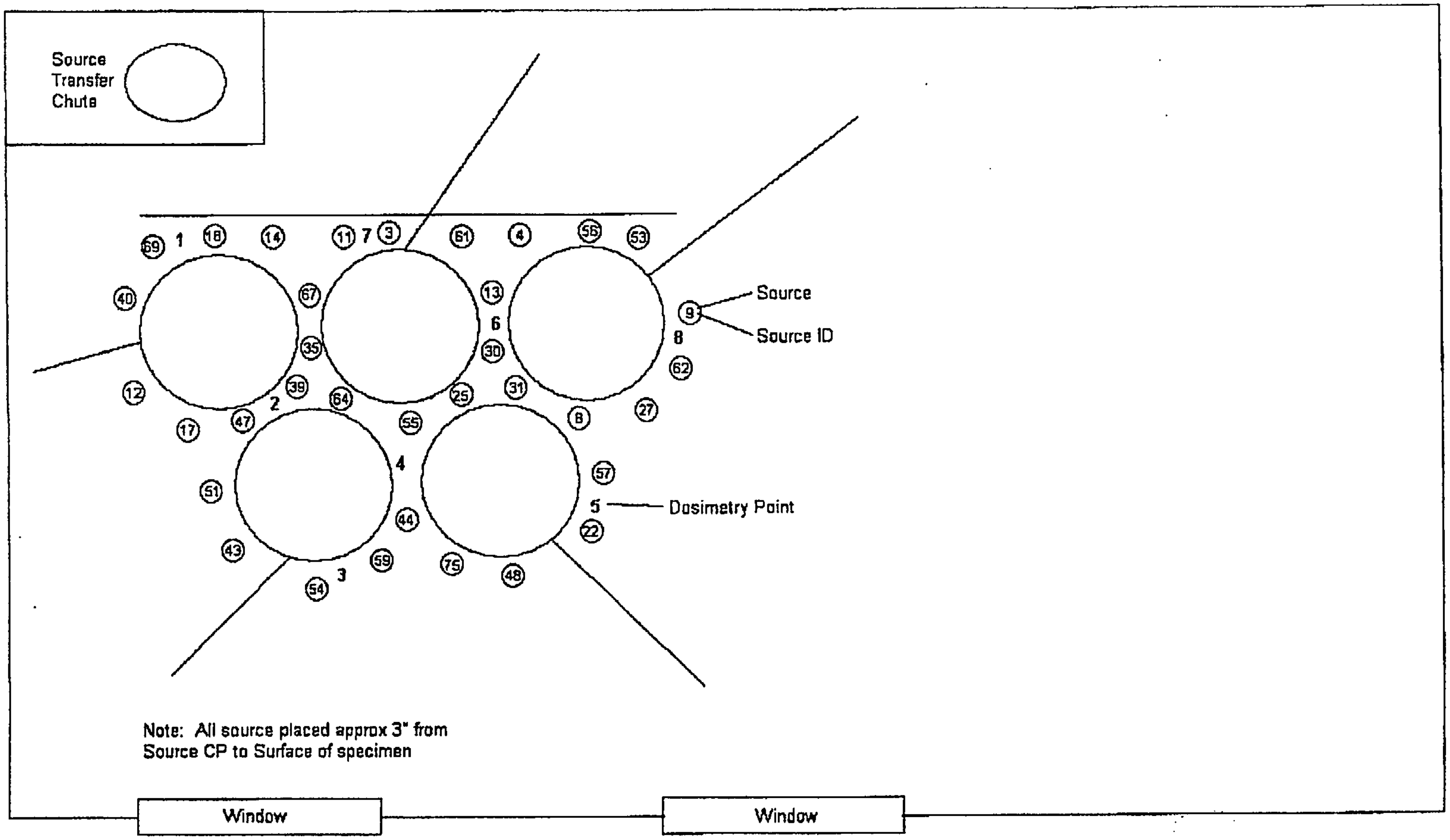
Dosimetry Measurement	Current (Amps)	Dose Rate (Rads/hr)
1	6.625E-07	5.169E+05
2	6.475E-07	4.997E+05
3	6.576E-07	5.112E+05
4	6.502E-07	5.028E+05
5	6.530E-07	5.060E+05
6	6.494E-07	5.019E+05
7	6.548E-07	5.080E+05
8	6.450E-07	4.969E+05

Average Dose Rate (Rads/hr): 5.054E+05

*Dose Rate determined from ionization probe current using the following formula:
DR(Rads/hr)= 5.609E17 * (Amps)2 + 4.085E11 * (Amps) + 56.191

Completed: [signature] Date: 10/23/01

Reviewed: [signature] Date: 10.23.01

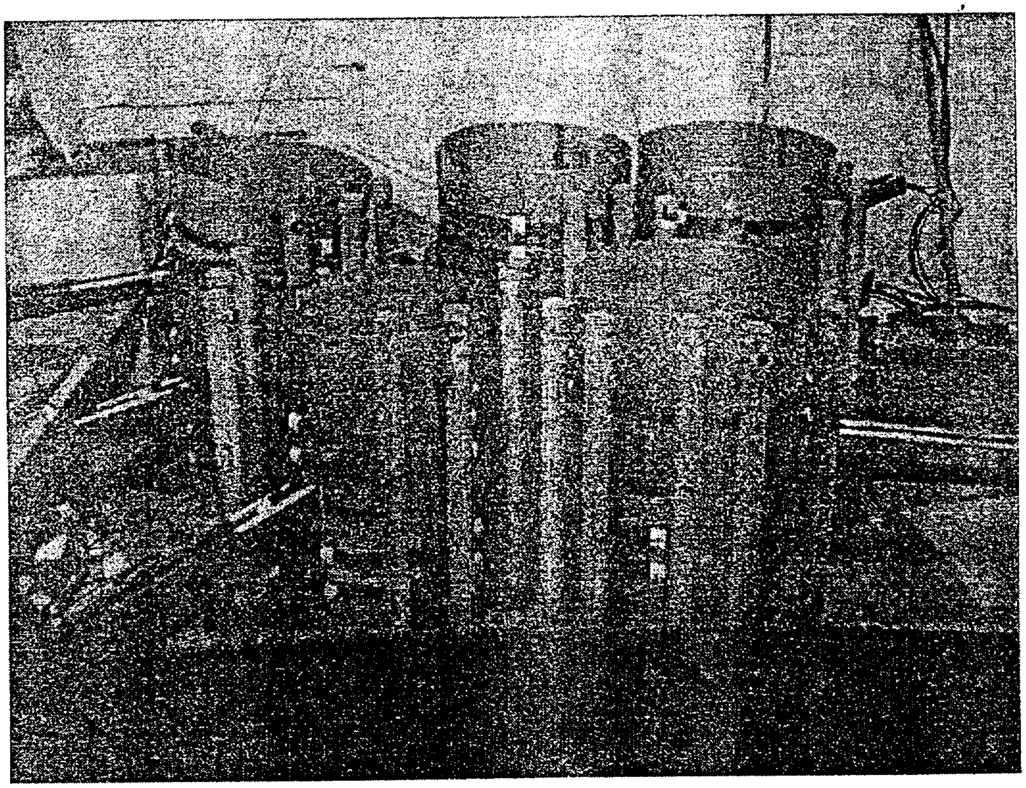


Georgia Institute of Technology
Neely Nuclear Research Center
Hot Cell Operations / Gamma Irradiation Services

Client: Wyle Laboratories
Job #: 2001-29b

Not To Scale

Wyle Laboratories
Hot Cell Job# 2001-29b



Georgia Institute of Technology

Neely Nuclear Research Center
Hot Cell Operations
900 Atlantic Drive
Atlanta, Georgia 30332-0425
(404) 894-3600 FAX: (404) 894-9325
http://www.nnrc.gatech.edu

Certificate of Calibration
October 10, 2000

Manufacturer:	LND PROBE
Model:	52120
Description:	Ionization Probe
Serial No.:	NNRC-110
Calibrated by:	Georgia Institute of Technology Neely Nuclear Research Center Atlanta, GA 30332-0425

Next Calibration Due 7/21/01 ± 25%

This certificate attests that this instrument has been calibrated with standards traceable to the National Institute of Standards and Technology.

NIST Traceability

Reference Test: 846/260730-98
HD9903
NIST DB 960/017

Georgia Institute of Technology

Neely Nuclear Research Center
Hot Cell Operations
900 Atlantic Drive
Atlanta, Georgia 30332-0425
(404) 894-3600 FAX: (404) 894-9325
http://www.nnrc.gatech.edu

Certificate of Calibration

September 14, 2000

Manufacturer:	Keithley
Model:	485
Description:	Autoranging Picoammeter
Serial No.:	472783
Calibrated by:	Georgia Institute of Technology Neely Nuclear Research Center Atlanta, GA 30332-0425

Next Calibration Due 06/17/02 ± 25%

This certificate attests that this instrument has been calibrated with standards traceable to the National Institute of Standards and Technology.

Standards Used in Calibration

Keithley Picoampere Source, Model No. 263, SN 0558088

Calibrated:	September 28, 2000 Due 10/19/01 ± 25%
Calibrated by:	Keithley Instruments, Inc 28775 Aurora Road Cleveland, Ohio 44139

Traceability:

Keithley Certificate of Calibration: 0558088

Revision 01 (01/98)

RS - 120

Georgia Institute of Technology

Office of Radiological Safety
Neely Nuclear Research Center
900 Atlantic Drive, NW
Atlanta, Georgia 30332-0425
(404) 894-3605 FAX: (404) 894-9325
http://www.ors.gatech.edu/

Radioactive Contamination Clearance

Client: Wyle Laboratories

Client Reference Number: HSV0022607

Georgia Tech Reference Number: 2001-29

Item(s): Mandrels and baskets

Direct Radiation Survey: <100 cpm

Instrument Used: Ludlum II Serial Number: 48835 Cal. Due: 12/19/01

Contamination Survey: <100 dpm Beta <20 dpm Alpha

Instrument Used: LB5100 Serial Number: 13795 Cal. Due: 08/01/02

Release for Shipment:

This certifies that the above listed items have been surveyed and are free from radioactive contamination. Authorization is hereby given for release of the items from the Neely Nuclear Research Center.

Office of Radiological Safety — Date: 10-22-01

Neely Nuclear Research Center Operations — Date: 10-22-01

WYLE LABORATORIES
Huntsville Facility

LB-5100 Low Background Counting System Smear Analysis

Date: 10/22/01

Batch ID: Smears - 200110221023

Group ID: F

Description: Hot Cell Job

Alpha Activity Action Level (DPM): 20
Beta Activity Action Level (DPM): 100

High Voltage Setting (volts): 1500

Alpha Efficiency Std: 166-012-00
Alpha Efficiency: 0.29
Alpha Background CPM: 0.20
Alpha to Beta Crosstalk: 0.36

Beta Efficiency Std: 166-011-00
Beta Efficiency: 0.42
Beta Background CPM: 2.10
Beta to Alpha Crosstalk: 0.01

Sample ID	Time (sec)	Alpha Activity (dpm)	Beta Activity (dpm)	Net Alpha (cpm)	Net Beta (cpm)	Alpha 2 Sigma	Alpha MDA	Beta 2 Sigma	Beta MDA
11	60	-0.7	2.3	-0.21	0.98	4.33	16.32	10.35	22.44
12	60	-0.8	4.7	-0.22	1.98	4.34	16.32	11.39	22.44
13	60	-0.9	11.9	-0.26	4.99	4.34	16.32	14.07	22.44

Performed by: SSauber

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APPENDIX VII

INSTRUMENTATION EQUIPMENT SHEETS

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wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

1

DATE: 8/14/01 JOB NUMBER: 46120 TEST AREA: LOCA
TECHNICIAN: C.DAVIS CUSTOMER: OKONITE TYPE TEST: BASELINE FUNCTIONAL

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	METER	GEN RAD	1864	1864-9700-00	106840	50K - 50TOHM	MFG	2/28/01	8/27/01
2	TEMP/HUM IND	EXTECH	445703	na	114448	10-90%	5%	8/24/00	8/24/01
3	STOP WATCH	ACCUSPLIT	603EBL	N/A	116465	10HR	.01SEC/HR	6/29/01	9/27/01
4	HIPOT TSTR	HIPOTRONICS	760-2HVT	M9312176	112086	30KVAC	2%	8/ 6/01	2/ 1/02

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 8/14/01 CHECKED & RECEIVED BY R. Hard 8/14/01

Q.A. Bonda Moss 8/14/01

WH-1029A, REV, APR '99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

1

DATE: 8/29/01 JOB NUMBER: 46120 TEST AREA: LOCA
TECHNICIAN: B.BELYEA CUSTOMER: OKONITE TYPE TEST: TEMP AGING

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	TEMP RECORDER	HONEYWELL	DR45AT	994549439851	115943	-200°-600°F	±.4°	7/13/01	10/11/01
2	TEMP CONTROLLE	RESEARCH	61011	825061	000723	-175-375°F	±0.5%	8/ 1/01	1/28/02
3	TEMP ALARM	RESEARCH	61034	31524-01-14	000742	-175-375°F	±0.5%	4/30/01	10/26/01
4	TEMP CONTROLLE	RESEARCH	61011	06048825-061	000731	-175-375°F	±0.5%	4/30/01	10/26/01
5	DATA SYSTEM	DAYTRONIC	10K6	N/A	101936	MULTI	MFG	7/13/01	7/12/02
6	TEMP IND	BARNANT	600-1010	N/A	115286	-250-400°C	.2%RD+1°C	8/10/01	8/ 9/02

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 8/29/01 CHECKED & RECEIVED BY R. Hart 8/29/01

Q.A. [signature] 8/29/01

WH-1029A, REV. APR '99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

1

DATE: 9/ 4/01
TECHNICIAN: C.DAVIS
JOB NUMBER: 46120
CUSTOMER: OKONITE
TEST AREA: LOCA
TYPE TEST: POST TA FUNCT

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	HIPOT TSTR	HIPOTRONICS	760-2HVT	M9312176	112086	30KVAC	2%	8/ 6/01	2/ 1/02
2	TEMP/HUM IND	EXTECH	445703	N/A	116283	T:14-140°F H:1	T:±1.8°F H:±5%	11/16/00	11/16/01
3	METER	GEN RAD	1864	1864-9700-00	106840	50K - 50TOHM	2%	8/27/01	2/22/02
4	STOP WATCH	ACCUSPLIT	603EBL	N/A	116465	10HR	.01SEC/HR	6/29/01	9/27/01

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 9/4/01 CHECKED & RECEIVED BY R. Hardy 9/4/01

Q.A. [signature] 9/4/2001

WH-1029A, REV, APR '99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE: 10/22/01 JOB NUMBER: 46120 TEST AREA: LOCA 1
TECHNICIAN: C.DAVIS CUSTOMER: OKOMITE TYPE TEST: POST RAD FUNCT

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	TEMP/HUM IND	EXTECH	445703	na	114448	10-90%	5%	9/19/01	9/19/02
2	STOP WATCH	CRONUS	603	NA	115836	10HR	0.5 SEC	9/27/01	12/26/01
3	METER	GEN RAD	1864	1864-9700-00	106840	50K - 50TOHM	2%	8/27/01	2/22/02

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 10/22/01 CHECKED & RECEIVED BY R. Hart 10/23/01

Q.A. [signature] 10/23/01

WH-1029A, REV. APR '99

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INSTRUMENTATION EQUIPMENT SHEET

1

DATE: 10/31/01 JOB NUMBER: 46120 TEST AREA: LOCA
TECHNICIAN: C.DAVIS CUSTOMER: OKONITE TYPE TEST: PRE-LOCA FUNCTIONAL

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	TEMP/HUM IND	EXTECH	445703	na	114448	10-90%	5%	9/19/01	9/19/02
2	STOP WATCH	CRONUS	603	NA	115836	10HR	0.5 SEC	9/27/01	12/26/01
3	METER	GEN RAD	1864	1864-9700-00	106840	50K - 50TOHM	2%	8/27/01	2/22/02

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 10/31/01 CHECKED & RECEIVED BY R. Hauf 10/31/01

Q.A. [signature] 11/01/01

WH-1029A, REV. APR '99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE: 11/ 8/01 JOB NUMBER: 46120 TEST AREA: LOCA 1
TECHNICIAN: C.DAVIS CUSTOMER: OKONITE TYPE TEST: ACCIDENT SIMULATION

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	AC ISOLATOR	ACTION INSTR	G468-000	ABDVZ	112907	MULTI	.5%	10/ 1/01	10/ 1/02
2	AC ISOLATOR	ACTION INSTR	G486	ABDWF	112928	MULTI	.5%	8/21/01	8/21/02
3	AC ISOLATOR	ACTION INSTR	G468-000	ABDSX	112895	MULTI	.5%	10/ 1/01	10/ 1/02
4	AC ISOLATOR	ACTION INSTR	G468-000	ABDSY	112921	MULTI	.5%	2/ 2/01	2/ 1/02
5	AC ISOLATOR	ACTION INSTR	G468-000	B5CER	115197	MULTI	.5%	2/13/01	2/13/02
6	AC ISOLATOR	ACTION INSTR	G468-000	ABDVN	112916	MULTI	.5%	8/21/01	8/21/02
7	AC ISOLATOR	ACTION INSTR	G468-000	ABDVP	112904	MULTI	.5%	10/ 1/01	10/ 1/02
8	ACTION PAK	ACTION INSTR	6010	7923	100917	240VAC	.5%FS	8/13/01	2/ 8/02
9	ACTION PAK	ACTION INSTR	6010	N/A	101890	240VAC	.5%FS	8/13/01	2/ 8/02
10	ACTION PAK	ACTION INSTR	6010	N/A	101892	240VAC	.5%FS	8/13/01	2/ 8/02
11	ACTION PAK	ACTION INSTR	60101	N/A	100918	240VAC	.5%FS	8/14/01	2/ 8/02
12	AC ISOLATOR	ACTION INSTR	G468-000	B5CEL	115191	MULTI	.5%	2/ 2/01	2/ 1/02
13	AC ISOLATOR	ACTION INSTR	G468-000	B5CDP	115190	MULTI	.5%	2/ 2/01	2/ 1/02
14	AC ISOLATOR	ACTION INSTR	G468-000	B5CE8	115192	MULTI	.5%	10/ 1/01	10/ 1/02
15	AC ISOLATOR	ACTION INSTR	G468-000	B5CEN	115196	MULTI	.5%	2/13/01	2/13/02
16	CURRENT XFORM	METERMASTER	7SFT101	N/A	103445	100:5	2%	8/17/01	2/13/02
17	CURRENT XFORM	METERMASTER	7SFT101	N/A	103443	100:5	2%	8/17/01	2/13/02
18	CURRENT XFORM	METERMASTER	7SFT101	N/A	103449	100:5	2%	8/17/01	2/13/02
19	CURRENT XFORM	METERMASTER	7SFT101	N/A	103438	100:5	2%	8/17/01	2/13/02
20	CURRENT XFORM	METERMASTER	7SFT101	N/A	103444	100:5	2%	8/17/01	2/13/02
21	CURRENT XFORM	METERMASTER	7SFT101	N/A	103447	100:5	2%	8/17/01	2/13/02
22	CURRENT XFORM	METERMASTER	7SFT-101	N/A	103446	100:5	2%	8/17/01	2/13/02
23	CURRENT XFORM	METERMASTER	7SFT101	N/A	103441	100:5	2%	8/17/01	2/13/02
24	CURRENT XFORM	METERMASTER	7SFT101	N/A	103451	100:5	2%	8/17/01	2/13/02
25	CURRENT XFORM	METERMASTER	7SFT101	103437	103437	100:5	2%	8/17/01	2/13/02
26	CURRENT XFORM	METERMASTER	7SFT101	N/A	103450	100:5	2%	8/17/01	2/13/02
27	CURRENT XFORM	METERMASTER	7SFT101	N/A	103439	100:5	2%	8/17/01	2/13/02
28	CURRENT XFORM	METERMASTER	SFT-101	N/A	102396	100:5	2%	8/17/01	2/13/02
29	CURRENT XFORM	BROWNELL	5SFT-101	N/A	100664	100:5	2%	6/ 8/01	12/ 5/01
30	CURRENT XFORM	METERMASTER	5SFT-101	N/A	108052	100:5	2%	8/17/01	2/13/02
31	CURRENT XFORM	BROWNELL	5SFT-101	N/A	100665	100:5	2%	8/17/01	2/13/02
32	CURRENT XFORM	BROWNELL	5SFT-101	N/A	100657	100:5	2%	8/17/01	2/13/02
33	CURRENT XFORM	BROWNELL	5SFT-101	N/A	100674	100:5	2%	8/17/01	2/13/02
34	CURRENT XFORM	METERMASTER	7SFT101	N/A	108707	100:5	2%	8/17/01	2/13/02
35	POWER SUPPLY	POWERTRON	3300D	670988	112889	40V/25A	.1%	8/15/01	2/11/02
36	CURRENT CLAMP	FLUKE	801-600	102190	102190	600A	3%	8/14/01	2/ 8/02
37	DMM	FLUKE	87	68880231	113962	MULTI	MFG	1/ 9/01	1/ 9/02
38	DMM	FLUKE	87	59490233	109959	MULTI	MFG	1/20/01	1/18/02
39	PH XMITTER	OMEGA	PHTX-8710	69908067399	115881	0 to 14 PH	1%	7/12/01	1/ 8/02

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 11/8/01 CHECKED & RECEIVED BY R. Hand 11/09/01

Q.A. [signature] 11/09/01

WH 1029A, REV. APR '99

2

DATE: 11/8/01 JOB NUMBER: 46120 TEST AREA: LOCA
TECHNICIAN: C.DAVIS CUSTOMER: OKONITE TYPE TEST: ACCIDENT SIMULATION

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
40	PRESSURE GAGE	USG	4.5 IN	NA	108918	160 PSI	1% FS	10/ 2/01	12/31/01
41	PRESSURE XDUCE	SENSOTEC	TJE	600142	113857	200PSIG	.25%FS	9/14/01	12/13/01
42	METER	GEN RAD	1864	1864-9700-00	106840	50K - 50TOHM	2%	8/27/01	2/22/02
43	STOP WATCH	CRONUS	603	NA	115836	10HR	0.5 SEC	9/27/01	12/26/01
44	AMP TEMP MV	AGM ELEC	EA4002	56-411	116524	1000°F	±1%	10/26/01	4/24/02
45	AMP TEMP MV	AGM ELEC	EA4002	55-643	116525	1000°F	±1%	10/26/01	4/24/02
46	AMP TEMP MV	AGM ELEC	EA4002	55-647	116526	1000°F	±1%	10/26/01	4/24/02
47	AMP TEMP MV	AGM ELEC	EA4002	645	092914	1000°F	±1%	10/26/01	4/24/02
48	AMP TEMP MV	AGM ELEC	EA4002	648	092917	1000°F	±1%	10/26/01	4/24/02
49	ACTION PAK	ACTION INSTR	6010	N/A	101898	240VAC	.5%FS	8/14/01	2/ 8/02
50	ACTION PAK	ACTION INSTR	6010	N/A	101895	240VAC	05%FS	8/14/01	2/ 8/02
51	ACTION PAK	ACTION INSTR	60101	N/A	101908	240VAC	.5%FS	8/14/01	2/ 8/02
52	ACTION PAK	ACTION INSTR	6010	N/A	101904	240VAC	.5%FS	8/14/01	2/ 8/02
53	ACTION PAK	ACTION INSTR	6010	4726	100919	240VAC	.5%FS	8/14/01	2/ 8/02
54	ACTION PAK	ACTION INSTR	6010	N/A	101905	240VAC	.5%FS	8/14/01	2/ 8/02
55	ACTION PAK	ACTION INSTR	6010	N/A	101909	240VAC	.5%FS	8/14/01	2/ 8/02
56	ACTION PAK	ACTION INSTR	6010	N/A	101914	240VAC	.5%FS	8/14/01	2/ 8/02
57	ACTION PAK	ACTION INSTR	6010	N/A	101915	240VAC	.5%FS	8/14/01	2/ 8/02
58	AC ISOLATOR	ACTION INSTR	G468-000	AAATI	112915	MULTI	.5%	2/ 2/01	2/ 1/02
59	AC ISOLATOR	ACTION INSTR	G468-000	ABDSW	112899	MULTI	.5%	10/ 1/01	10/ 1/02
60	AC ISOLATOR	ACTION INSTR	G468-000	ABDW6	112924	MULTI	.5%	2/ 2/01	2/ 1/02
61	AC ISOLATOR	ACTION INSTR	G468-000	ABDTI	112911	MULTI	.5%	10/ 1/01	10/ 1/02
62	AC ISOLATOR	ACTION INSTR	G468-000	ABDWC	112935	MULTI	.5%	2/ 2/01	2/ 1/02
63	AC ISOLATOR	ACTION INSTR	G468-000	ABDVE	112933	MULTI	.5%	10/ 1/01	10/ 1/02
64	AC ISOLATOR	ACTION INSTR	G468	ABDTZ	112900	MULTI	.5%	8/21/01	8/21/02
65	AC ISOLATOR	ACTION INSTR	G468-000	ABDTY	112909	MULTI	.5%	2/13/01	2/13/02
66	AC ISOLATOR	ACTION INSTR	G468-000	ABDSL	112922	MULTI	.5%	8/21/01	8/21/02
67	AC ISOLATOR	ACTION INSTR	G468-000	AAAAG	112934	MULTI	.5%	2/13/01	2/13/02
68	AC ISOLATOR	ACTION INSTR	G468-000	ABDWE	112932	MULTI	.5%	2/ 2/01	2/ 1/02
69	AC ISOLATOR	ACTION INSTR	G468-000	ABDVG	112903	MULTI	.5%	2/13/01	2/13/02
70	AC ISOLATOR	ACTION INSTR	G468-000	ABDWO	114570	MULTI	.5%	2/13/01	2/13/02
71	AC ISOLATOR	ACTION INSTR	G468-000	ABDSZ	112920	MULTI	.5%	10/ 1/01	10/ 1/02
72	AC ISOLATOR	ACTION INSTR	G468-000	ABDVT	112919	MULTI	.5%	2/13/01	2/13/02
73	AC ISOLATOR	ACTION INSTR	G468-000	ABDVF	112926	MULTI	.5%	2/13/01	2/13/02
74	AC ISOLATOR	ACTION INSTR	G468-000	ABDVX	112918	MULTI	.5%	2/13/01	2/13/02
75	AC ISOLATOR	ACTION INSTR	G468-000	ABDVU	112902	MULTI	.5%	10/ 1/01	10/ 1/02
76	AC ISOLATOR	ACTION INSTR	G468-000	ABDVR	112893	MULTI	.5%	8/24/01	8/23/02
77	AC ISOLATOR	ACTION INSTR	G468-000	AAAAL	112894	MULTI	.5%	8/21/01	8/21/02
78	AC ISOLATOR	ACTION INSTR	G468-000	B5CE7	115193	MULTI	.5%	10/ 1/01	10/ 1/02
79	AC ISOLATOR	ACTION INSTR	G468-000	AABE2	112901	MULTI	.5%	8/24/01	8/23/02
80	AC ISOLATOR	ACTION INSTR	G468-000	ABDVS	112891	MULTI	.5%	8/21/01	8/21/02
81	AC ISOLATOR	ACTION INSTR	G468-000	B5CEM	115194	MULTI	.5%	10/ 1/01	10/ 1/02
82	AC ISOLATOR	ACTION INSTR	G468-000	ABDTO	114571	MULTI	.5%	8/24/01	8/23/02
83	AC ISOLATOR	ACTION INSTR	G468-000	ABDVH	112923	MULTI	.5%	8/21/01	8/21/02
84	AC ISOLATOR	ACTION INSTR	G468-000	B5CE9	115195	MULTI	.5%	10/ 1/01	10/ 1/02
85	AC ISOLATOR	ACTION INSTR	G468-000	ABDW2	112913	MULTI	.5%	8/24/01	8/23/02
86	AC ISOLATOR	ACTION INSTR	G468-000	ABDVQ	112890	MULTI	.5%	8/21/01	8/21/02
87	AC ISOLATOR	ACTION INSTR	G468-000	ABDTF	112910	MULTI	.5%	10/ 1/01	10/ 1/02

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 11/08/01 CHECKED & RECEIVED BY R. Hart 11/09/01

Q.A. [signature] 11/9/01

WH 1029A, REV. APR '99

DATE: 11/ 8/01 JOB NUMBER: 46120 TEST AREA: LOCA 3
TECHNICIAN: C.DAVIS CUSTOMER: OKONITE TYPE TEST: ACCIDENT SIMULATION

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
88	AC ISOLATOR	ACTION INSTR	G468-000	A42B9	112994	MULTI	.5%	8/24/01	8/23/02
89	AC ISOLATOR	ACTION INSTR	G468-000	ABDWB	112898	MULTI	.5%	8/21/01	8/21/02
90	AC ISOLATOR	ACTION INSTR	G468-000	ABDWI	112892	MULTI	.5%	10/ 1/01	10/ 1/02
91	AC ISOLATOR	ACTION INSTR	G468-000	ABDSU	112897	MULTI	.5%	8/24/01	8/23/02
92	AC ISOLATOR	ACTION INSTR	G468-000	ABDWD	112908	MULTI	.5%	8/21/01	8/21/02
93	AC ISOLATOR	ACTION INSTR	G468-000	ABDVD	112905	MULTI	.5%	10/ 1/01	10/ 1/02
94	AC ISOLATOR	ACTION INSTR	G468-000	ABDT3	112906	MULTI	.5%	8/24/01	8/23/02
95	AC ISOLATOR	ACTION INSTR	G468-000	ABTF3	112995	MULTI	.5%	2/ 2/01	2/ 1/02
96	COND STRAIN	VISHAY	2120	34403	000415	GAIN	±2%	8/15/01	2/11/02
97	COND STRAIN	VISHAY	2120	31124	096694	GAIN	±2%	8/15/01	2/11/02
98	COND STRAIN	VISHAY	2120	15707	096204	GAIN	2%	8/15/01	2/11/02
99	COND STRAIN	VISHAY	2120	073259	104114	GAIN	2%	8/15/01	2/11/02
100	COND STRAIN	VISHAY	2120	21317	011605	GAIN	2%	8/15/01	2/11/02
101	STRAIN PWR	VISHAY	2110	15888	096226	15VDC	1%REG	8/15/01	2/11/02
102	DATA SYSTEM	DAYTRONIC	10K6	N/A	101936	MULTI	MFG	7/13/01	7/12/02
103	TEMP CONTROLLE	RESEARCH	61011	32-033	100163	1500°F	±0.5%	6/20/01	12/17/01
104	TEMP CONTROLLE	RESEARCH	61011	25-061	000735	1500°F	±0.5%	6/20/01	12/17/01
105	TEMP CONTROLLE	RESEARCH	61011	825061	000721	1500°F	±0.5%	6/20/01	12/17/01
106	TEMP CONTROLLE	RESEARCH	61011	06013446-120	001356	0-1500°C	MFG	6/20/01	12/17/01
107	TEMP ALARM	RESEARCH	61034	401-81	100158	1000°F	±0.5%	6/20/01	12/17/01
108	TEMP ALARM	RESEARCH	61034	401-90	100160	2000°F	±0.5%	6/20/01	12/17/01
109	TEMP ALARM	RESEARCH	61034	401-78	100161	2000°F	±0.5%	6/20/01	12/17/01
110	TEMP ALARM	RESEARCH	61034	31524	094515	2000°F	±0.5%	6/20/01	12/17/01
111	TEMP ALARM	RESEARCH	639LLP	312910	011796	1000°F	±0.5%	6/20/01	12/17/01
112	TEMP ALARM	RESEARCH	639LLP	31291-01-24	011807	-125-375°F	±0.5%	6/20/01	12/17/01
113	TEMP ALARM	RESEARCH	61031	101-55	000704	2000°F	±0.5%	6/20/01	12/17/01
114	TEMP ALARM	RESEARCH	61031	1-0154	000707	2000°F	±0.5%	6/20/01	12/17/01
115	TEMP ALARM	RESEARCH	61031	101-56	000708	2000°F	±0.5%	6/20/01	12/17/01
116	TEMP CONTROLLE	RESEARCH	61011	32-032	100162	1500°F	±0.5%	6/20/01	12/17/01
117	TEMP IND	BARNANT	600-1010	N/A	115286	-250-400°C	.2%RD+1°C	8/10/01	8/ 9/02
118	RES DECADE	IET	RS-201	N/A	103258	10MOHM	.1%	9/10/01	9/10/02
119	TEMP RECORDER	HONEYWELL	DR45AT	9753Y7343125	114314	-200-600°F	.4°F	11/ 8/01	2/ 6/02
120	TEMP ALARM	RESEARCH	61034	102515	100310	-175-375°F	±0.5%	11/ 8/01	5/ 7/02
121	TEMP CONTROLLE	RESEARCH	61011	060155	094530	-175-375°F	±0.5%	11/ 8/01	5/ 7/02
122	TEMP ALARM	RESEARCH	61034	31524-01-14	000742	-175-375°F	±0.5%	11/ 8/01	5/ 7/02
123	TEMP CONTROLLE	RESEARCH	61011	06048825-061	000731	-175-375°F	±0.5%	11/ 8/01	5/ 7/02
124	TEMP CONTROLLE	RESEARCH	61011	060155	094531	-175-375°F	±0.5%	11/ 8/01	5/ 7/02
125	FLOW METER	RAMAPO	MARK V	0001107	116134	1-10GPM WFE	1% RATE ACCU	11/ 6/01	11/ 6/02
126	SCALE	SETRA	SUPER COUNT	15864	113735	27/500	±.0005LBS	4/25/01	4/25/02
127	SCALE	INDIANA SCALES	1616-MB	7634	112556	500LB	.01LB	4/25/01	4/25/02
128	STOP WATCH	ACCUSPLIT	603EBL	N/A	116465	10HR	.01SEC/HR	9/26/01	12/25/01
129	STOP WATCH	ACCUSPLIT	603EBL	N/A	116467	10HR	.01SEC/HR	9/26/01	12/25/01
130	POWER SUPPLY	TENMA	72-2015	9902271	116071	60V/1A	MFG	7/20/01	7/19/02

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 11/08/01 CHECKED & RECEIVED BY R. Hard 11/09/01

Q.A. [signature] 11/9/01

WH-1029A, REV, APR '99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE: 11/16/01
TECHNICIAN: C.DAVIS
JOB NUMBER: 46120
CUSTOMER: OKONITE
TEST AREA: LOCA
TYPE TEST: LOCA ACCIDENT SIM

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	ACCURACY	CAL DATE	CAL DUE
1	HIPOT TSTR	HIPOTRONICS	760-2HVT	M9312176	112086	30KVAC	2%	8/ 6/01	2/ 1/02

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 11/16/01 CHECKED & RECEIVED BY R. [signature] 11/16/01

Q.A. [signature] 11/16/01

WH-1029A, REV. APR '99

wyle laboratories

INSTRUMENTATION EQUIPMENT SHEET

DATE: 12/11/01 | JOB NUMBER: 46120 | TEST AREA: LOCA
TECHNICIAN: C.DAVIS | CUSTOMER: OKONITE | TYPE TEST: POST-ACCIDENT FUNC

1

NO.	INSTRUMENT	MANUFACTURER	MODEL #	SERIAL #	WYLE #	RANGE	UNCERTAINTY	CAL DATE	CAL DUE
1	TEMP/HUM IND	EXTECH	445703	na	114448	10-90%	5%	9/19/01	9/19/02
2	HIPOT TSTR	HIPOTRONICS	760-2HVT	M9312176	112086	30KVAC	2%	8/ 6/01	2/ 1/02
3	STOP WATCH	CRONUS	603	NA	115836	10HR	0.5 SEC	9/27/01	12/26/01

This is to certify that the above Instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION C. Davis 12/11/01 CHECKED & RECEIVED BY R. Hart 12/11/01

Q.A. Brenda Mason 12/11/01

WH-1029A, REV. APR '99

APPENDIX VIII

FUNCTIONAL TEST DATA SHEETS

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DATA SHEET

WYLE LABORATORIES

Customer: Okonite Company
Specimen: Okolon Cables
Part No. FO-07-85810 & FO-07-7839
Spec. WLTP 46120
Para. 4.2
S/N N/A
GSI N/A

Amb. Temp. 70.2°F
Photo yes
Test Med. Tap water
Specimen Temp. amb.

Job No. 46120
Report No. 46120-1
Start Date 8/14/01

Test Title: **Baseline Functional Testing**

4.2.1 Insulation Resistance

Specimen No.	Insulation Resistance (ohms)	Applied Voltage (VDC)	Specimen No.	Insulation Resistance (ohms)	Applied Voltage (VDC)
1	4.0 E11	500	20	7.4 E11	500
2	4.0 E11	500	21	6.8 E11	500
3	5.8 E11	500	22	4.5 E11	500
4	4.5 E11	500	23	4.0 E11	500
5	4.0 E11	500	24	4.0 E11	500
6	5.8 E11	500	25	4.0 E11	500
7	4.5 E11	500	26	1.5 E11	500
8	4.0 E11	500	27	4.5 E11	500
9	7.0 E11	500	28	3.0 E11	500
10	7.2 E11	500	29	2.4 E11	500
11	7.0 E11	500	30	2.4 E11	500
12	7.2 E11	500	31	4.0 E11	500
13	4.0 E11	500	32	6.6 E11	500
14	3.0 E11	500	33	4.0 E11	500
15	5.6 E11	500	34	4.5 E11	500
16	4.0 E11	500	35	6.0 E11	500
17	4.5 E11	500	36	6.4 E11	500
18	4.0 E11	500	37	6.4 E11	500
19	4.5 E11	500	38	6.8 E11	500

Tested By C. Davis Date: 8/16/01
Witness N/A Date: —
Sheet No. 1 of 2
Approved R. [illegible] 8/16/01

Notice of Anomaly None

Wyle Form WH 614A, Rev. APR '84

DATA SHEET

WYLE LABORATORIES

Customer Okonite Company
Specimen Okolon Cables
Part No. FO-07-85810 & FO-07-7839
Spec. WLTP 46120
Para. 4.2
S/N N/A
GSI N/A

Amb. Temp. 70.2°F
Photo yes
Test Med. Tap water
Specimen Temp. amb.

Job No. 46120
Report No. 46120-1
Start Date 8/14/01

Test Title **Baseline Functional Testing**

4.2.2 Dielectric Withstand

Specimen No.	Leakage Current (microamps)	Applied Voltage (VAC)	Specimen No.	Leakage Current (microamps)	Applied Voltage (VAC)
1	1300	2400	20	1300	2400
2	1200	2400	21	1400	2400
3	1400	2400	22	1300	2400
4	1200	2400	23	1300	2400
5	1300	2400	24	1200	2400
6	1200	2400	25	1300	2400
7	1300	2400	26	1200	2400
8	1200	2400	27	1300	2400
9	1400	2400	28	1200	2400
10	1200	2400	29	1400	2400
11	1400	2400	30	1200	2400
12	1300	2400	31	1400	2400
13	1300	2400	32	1200	2400
14	1200	2400	33	1300	2400
15	1300	2400	34	1300	2400
16	1200	2400	35	1300	2400
17	1400	2400	36	1200	2400
18	1200	2400	37	1300	2400
19	1400	2400	38	1200	2400

Tested By C. Davis Date: 8/16/01
Witness N/A Date: —
Sheet No. 2 of 2
Approved R. [illegible] 8/16/01

Notice of Anomaly None

Wyle Form WH 614A, Rev. APR '84

DATA SHEET

WYLE LABORATORIES

Customer: Okonite Company
Specimen: Okolon Cables
Part No. FO-07-85810 & FO-07-7839
Spec. WLTP 46120
Para. 4.4
S/N: N/A
GSI: N/A

Amb. Temp. ≈ 73° F
Photo: yes
Test Med. Tap water
Specimen Temp. amb.

Job No. 46120
Report No. 46120-1
Start Date 9/4/01

Test Title: **Post-Thermal Aging Functional Test**

4.2.1 Insulation Resistance

Specimen No.	Insulation Resistance (ohms)	Applied Voltage (VDC)	Specimen No.	Insulation Resistance (ohms)	Applied Voltage (VDC)
1	N/A	N/A	20	4.5E11	500
2	N/A	N/A	21	3.2E11	500
3	3.5E11	500	22	4.5E11	500
4	4.0E11	500	23	3.0E11	500
5	2.5E11	500	24	3.5E11	500
6	4.0E11	500	25	5.5E11	500
7	9.4E10	500	26	6.8E11	500
8	4.5E11	500	27	4.5E11	500
9	2.6E11	500	28	5.6E11	500
10	3.5E11	500	29	4.0E11	500
11	2.8E11	500	30	5.0E11	500
12	4.0E11	500	31	5.4E11	500
13	3.5E11	500	32	6.7E11	500
14	4.0E11	500	33	4.0E11	500
15	4.0E11	500	34	5.4E11	500
16	5.0E11	500	35	4.5E11	500
17	4.5E11	500	36	6.6E11	500
18	6.8E11	500	37	5.6E11	500
19	3.5E11	500	38	7.4E11	500

Tested By: R. Hauf Date: 9/13/01
Witness: N/A Date: ------
Sheet No. 1 of 1
Approved: Don Smith 9/13/01

Notice of Anomaly: None

Wyle Form WH 614A, Rev. APR '84

DATA SHEET

WYLE LABORATORIES

Customer: Okonite Company
Specimen: Okolon Cables
Part No. FO-07-85810 & FO-07-7839
Spec. WLTP 46120
Para. 4.4
S/N: N/A
GSI: N/A

Amb. Temp. ≈ 76°F
Photo: yes
Test Med. air
Specimen Temp. amb.

Job No. 46120
Report No. 46120-1
Start Date 9/14/01

Test Title: **Post-Thermal Aging Inspection**

General observations pertaining to all aged specimens:

All the specimens are slightly stiff, the more aged the specimen, the stiffer it feels. No radical bending was employed to determine the stiffness. The specimens were lightly touched to determine that they were stiff. Additionally, the specimens are slightly stuck to the stainless steel mandrel and to themselves where they touch. Slight pressure causes them to become un-stuck.

Specific observations pertaining to aged specimens:

Specimen 24 – there are a few small round spots (approximately 0.2" diameter) along sections of the jacket. The spots will rub off with light finger pressure.

Specimen 34 – there is one area approximately 2' long with blotches on the jacket. Additionally, there is what appears to be a longitudinal crack in the jacket about ½" long. This may have been a manufacturing blemish. The crack does not appear to go all the way through the jacket.

Specimen 38 – there is one area approximately 1' long with blotches on the jacket.

Tested By: R. Hanet Date: 9/14/01
Witness: N/A Date: -------
Sheet No. 1 of 1
Approved: N/A

Notice of Anomaly: None

Wyle Form WH 614A, Rev. APR '84

DATA SHEET

WYLE LABORATORIES

Customer: Okonite Company
Specimen: Okolon Cables
Part No. FO-07-85810 & FO-07-7839
Spec. WLTP 46120
Para. 4.6
S/N N/A
GSI N/A

Amb. Temp. 73.6°F
Photo no
Test Med. Tap water
Specimen Temp. amb.

Job No. 46120
Report No. 46120-1
Start Date 10/23/01

Test Title: **Post-Radiation Exposure Functional Test**

4.2.1 Insulation Resistance

Specimen No.	Insulation Resistance (ohms)	Applied Voltage (VDC)	Specimen No.	Insulation Resistance (ohms)	Applied Voltage (VDC)
1	6.9E11	500	20	3.5E11	500
2	8.4E11	500	21	2.0E11	500
3	6.6E11	500	22	3.0E11	500
4	9.0E11	500	23	1.9E11	500
5	5.4E11	500	24	2.8E11	500
6	6.7E11	500	25	1.5E11	500
7	4.5E11	500	26	2.8E11	500
8	6.0E11	500	27	3.0E11	500
9	4.0E11	500	28	4.5E11	500
10	6.2E11	500	29	3.0E11	500
11	3.5E11	500	30	4.5E11	500
12	5.0E11	500	31	4.5E11	500
13	3.0E11	500	32	3.5E11	500
14	4.5E11	500	33	2.0E11	500
15	2.8E11	500	34	3.5E11	500
16	4.0E11	500	35	1.6E11	500
17	3.0E11	500	36	2.9E11	500
18	5.2E11	500	37	1.4E11	500
19	2.2E11	500	38	2.7E11	500

Tested By R. Hauck Date: 10/23/01
Witness N/A Date: -------
Sheet No. 1 of 1
Approved Don Smith 10/23/01

Notice of Anomaly None

Wyle Form WH 614A, Rev. APR '84

DATA SHEET

WYLE LABORATORIES

Customer Okonite Company
Specimen Okolon Cables
Part No. FO-07-85810 & FO-07-7839
Spec. WLTP 46120
Para. 4.7.1
S/N N/A
GSI N/A

Amb. Temp. 74.9 oF
Photo yes
Test Med. Air*
Specimen Temp. amb.

Job No. 46120
Report No. 46120-1
Start Date 10/23/01

Test Title LOCA Installation Check (prior to LOCA Test)

Insulation Resistance					
Specimen No.	Insulation Resistance (ohms)	Applied Voltage (VDC)	Specimen No.	Insulation Resistance (ohms)	Applied Voltage (VDC)
1	1.6 E11	500	20	7.8 E10	500
2	1.7 E11	500	21	7.8 E10	500
3	1.7 E11	500	22	1.0 E11	500
4	1.8 E11	500	23	7.6 E10	500
5	1.9 E11	500	24	1.1 E11	500
6	1.6 E11	500	25	6.0 E10	500
7	9.2 E10	500	26	5.8 E10	500
8	7.0 E10	500	27	7.2 E10	500
9	1.1 E11	500	28	9.4 E10	500
10	1.2 E12	500	29	8.4 E10	500
11	1.1 E11	500	30	9.0 E10	500
12	1.2 E11	500	31	7.2 E10	500
13	1.1 E11	500	32	9.6 E10	500
14	1.3 E11	500	33	8.6 E10	500
15	1.1 E11	500	34	1.0 E11	500
16	1.3 E11	500	35	6.8 E10	500
17	6.8 E10	500	36	8.8 E10	500
18	1.0 E11	500	37	5.8 E10	500
19	8.2 E10	500	38	8.0 E10	500

*Specimens wet by spraying with tap water from a hose.

Tested By C. Davis Date: 11/1/01
Witness N/A Date: -------
Sheet No. 1 of 1
Approved R. Hauf 11/01/01

Notice of Anomaly None

DATA SHEET

WYLE LABORATORIES

Customer Okonite Company
Specimen Okolon Cables
Part No. FO-07-85810 & FO-07-7839
Spec. WLTP 46120
Para. 4.7.4
S/N N/A
GSI N/A

Amb. Temp. 67.8° F
Photo yes
Test Med. Tap water
Specimen Temp. amb.

Job No. 46120
Report No. 46120-1
Start Date 11/21/01

Test Title Functional Testing at 10-Day Point

4.2.2 Dielectric Withstand

Specimen No.	Leakage Current (microamps)	Applied Voltage (VAC)	Specimen No.	Leakage Current (microamps)	Applied Voltage (VAC)
1	2400	2400	20	2500	2400
2	2200	2400	21	>10,000	< 200
3	2600	2400	22	>10,000	< 200
4	2200	2400	23	>10,000	< 200
5	2700	2400	24	>10,000	< 200
6	2400	2400	25	>10,000	< 200
7	2600	2400	26	>10,000	< 200
8	2300	2400	27	3000	2400
9	2800	2400	28	2600	2400
10	2500	2400	29	2800	2400
11	2700	2400	30	2500	2400
12	2300	2400	31	2900	2400
13	2900	2400	32	2600	2400
14	2500	2400	33	3200	2400
15	3100	2400	34	2800	2400
16	2700	2400	35	3200	2400
17	2800	2400	36	2600	2400
18	2400	2400	37	3400	2400
19	3000	2400	38	>10,000	< 200

Tested By C. Davis Date: 11/21/01
Witness N/A Date: —
Sheet No. 1 of 1
Approved R. Haug 11/21/01

Notice of Anomaly No. 2

Wyle Form WH 614A, Rev. APR '84

DATA SHEET

Customer Okonite Company

WYLE LABORATORIES

Specimen Okolon Cables

Part No. FO-07-85810 & FO-07-7839 Amb. Temp. 72.7°F Job No. 46120

Spec. WLTP 46120 Photo yes Report No. 46120-1

Para. 4.8 Test Med. Tap water Start Date 12/12/01

S/N N/A Specimen Temp. amb.

GSI N/A

Test Title **Post-Accident Functional Test**

4.2.2 Dielectric Withstand

Specimen No.	Leakage Current (microamps)	Applied Voltage (VAC)	Specimen No.	Leakage Current (microamps)	Applied Voltage (VAC)
1	1300	2400	20	1700	2400
2	1200	2400	21	N/A	N/A
3	1500	2400	22	N/A	N/A
4	1300	2400	23	N/A	N/A
5	1400	2400	24	N/A	N/A
6	1400	2400	25	N/A	N/A
7	1700	2400	26	N/A	N/A
8	1500	2400	27	1800	2400
9	1700	2400	28	1600	2400
10	1400	2400	29	2000	2400
11	1800	2400	30	1600	2400
12	1500	2400	31	2000	2400
13	1800	2400	32	1600	2400
14	1500	2400	33	2200	2400
15	1900	2400	34	1800	2400
16	1600	2400	35	2800	2400
17	1900	2400	36	2000	2400
18	1700	2400	37	2900	2400
19	2200	2400	38	N/A	N/A

Tested By C. Davis Date: 12/13/01

Witness John Fannanetta of Okonite Date: 12/13/01

Sheet No. 1 of 1

Notice of Anomaly No. 3

Approved R. [illegible] 12/14/01

Wyle Form WH 614A, Rev. APR '84

APPENDIX IX

ACCIDENT SIMULATION TEST PLOTS

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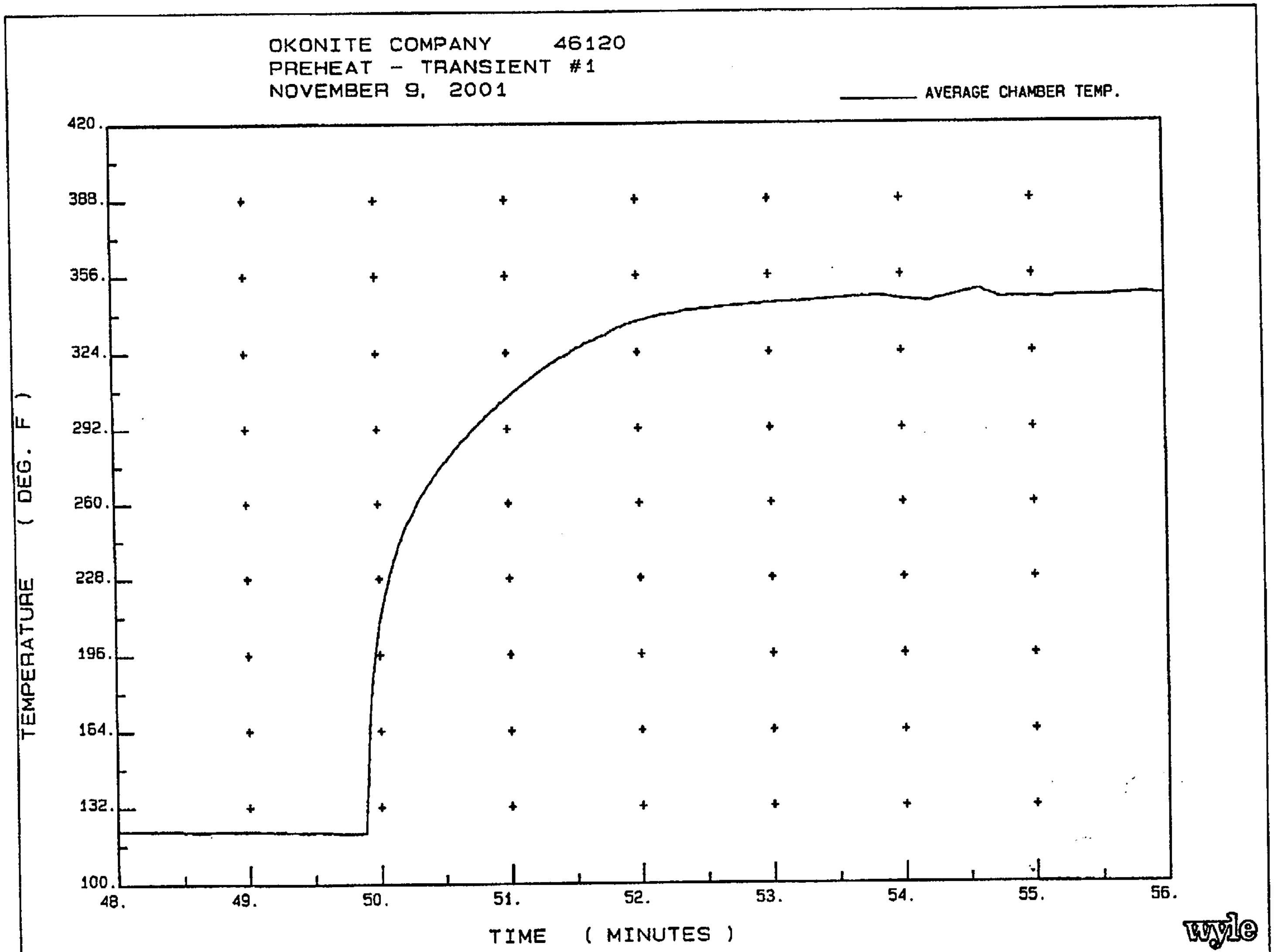

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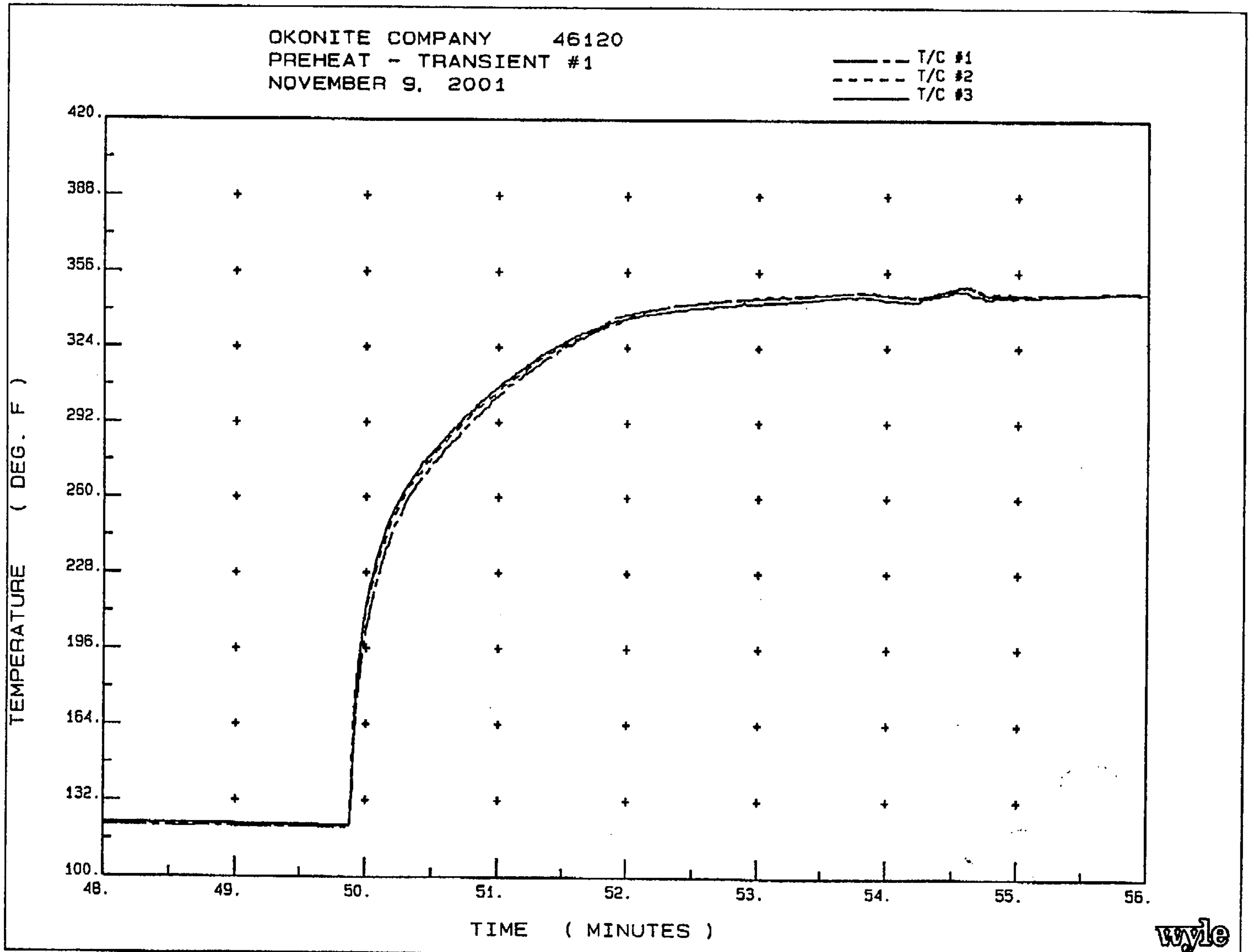

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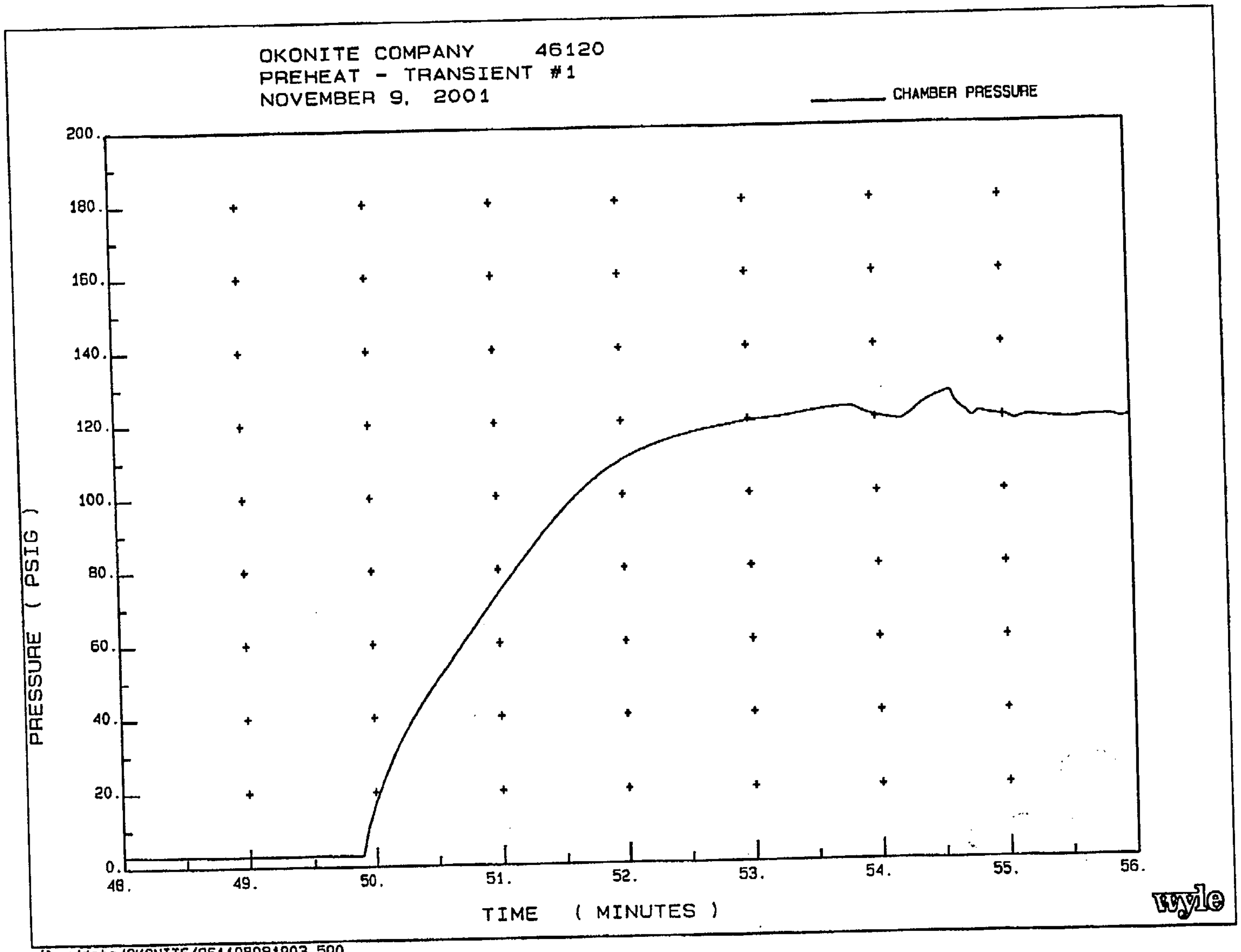
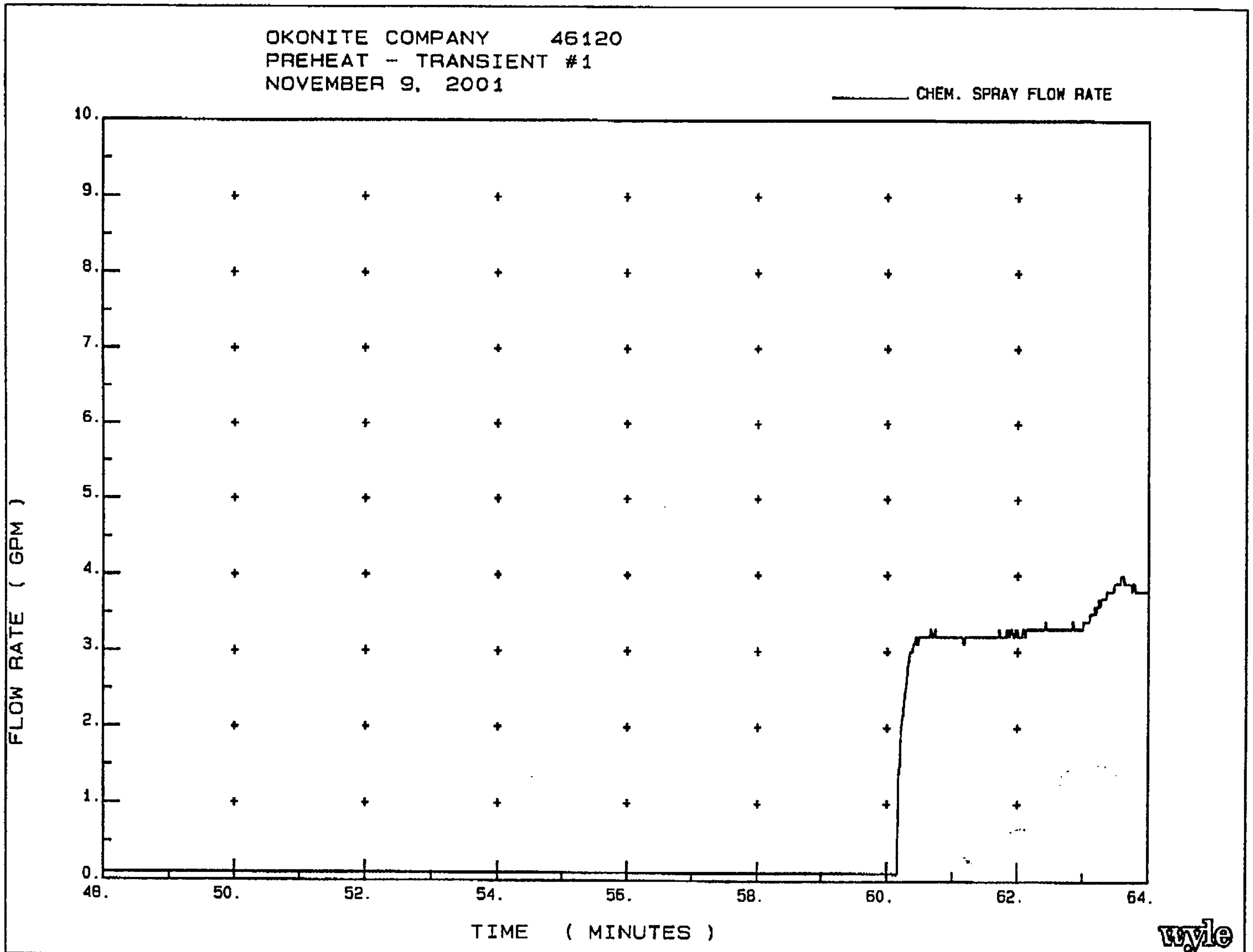

OKONITE COMPANY 46120
PREHEAT - TRANSIENT #1
NOVEMBER 9, 2001
CHAMBER PRESSURE
PRESSURE (PSIG)
200.
180.
160.
140.
120.
100.
80.
60.
40.
20.
0.
48.
49.
50.
51.
52.
53.
54.
55.
56.
TIME (MINUTES)
wyle
/log/data/OKONITE/961108081903.500



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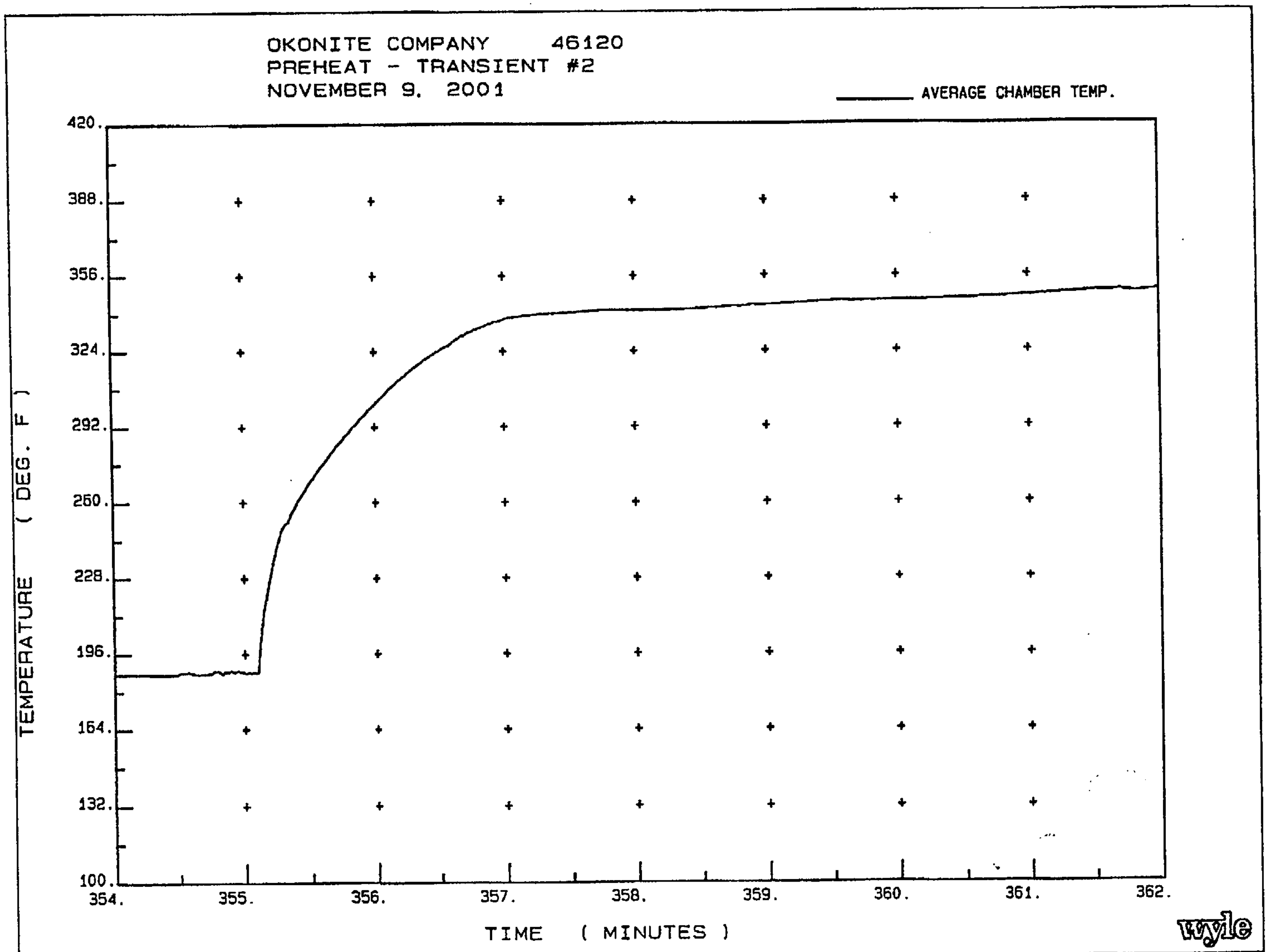

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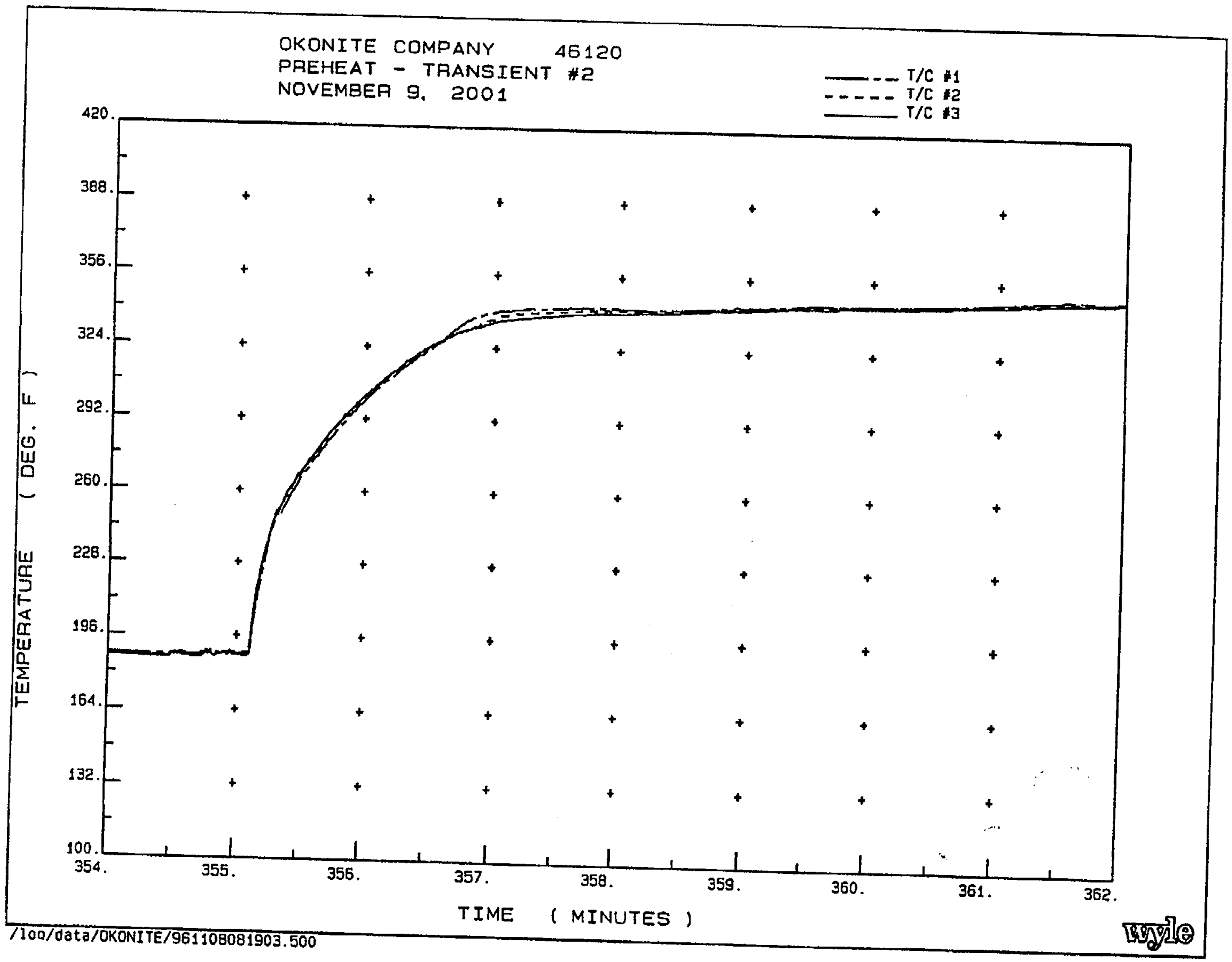
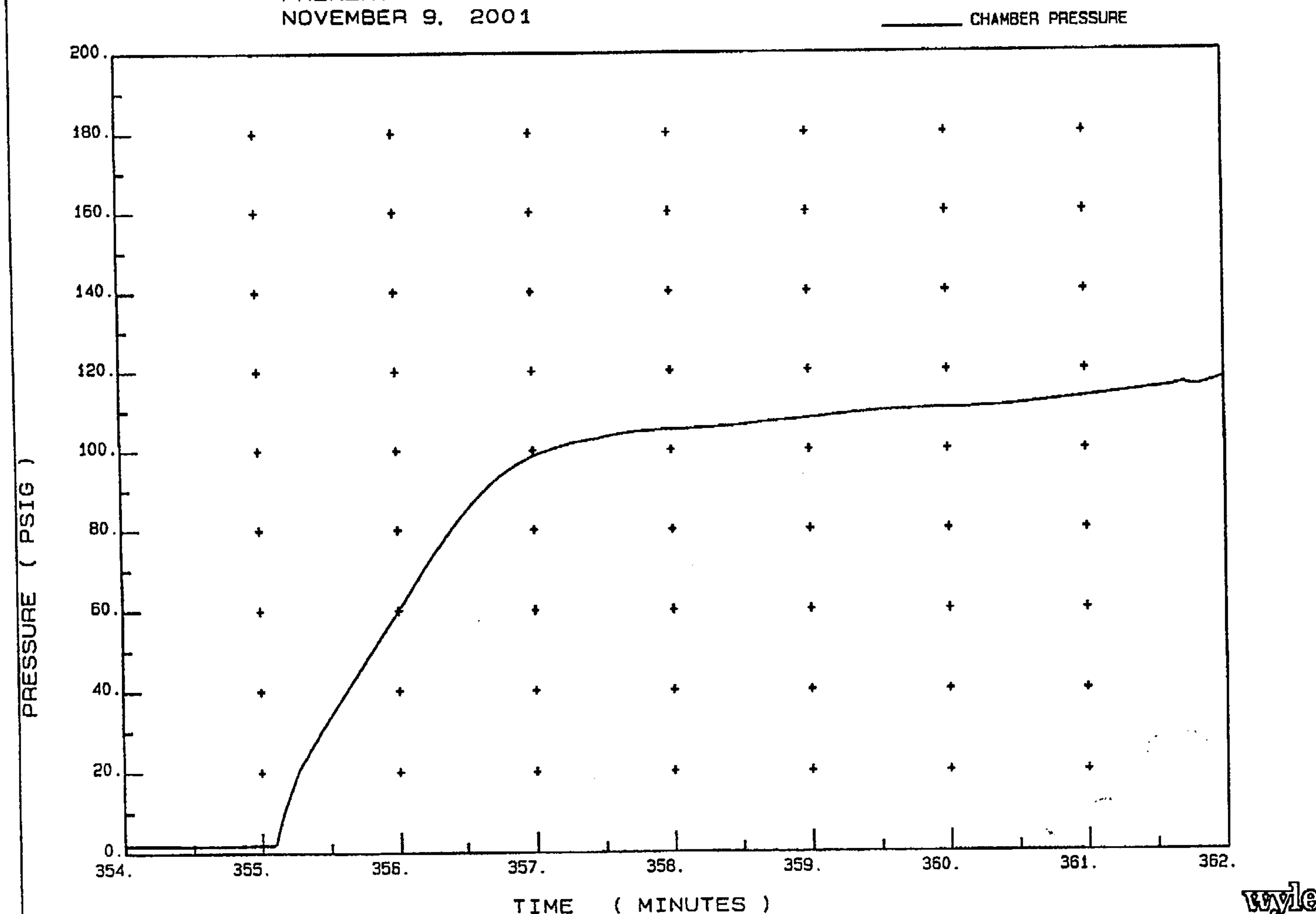

OKONITE COMPANY 46120
PREHEAT - TRANSIENT #2
NOVEMBER 9, 2001
T/C #1
T/C #2
T/C #3
420.
388.
356.
324.
292.
260.
228.
196.
164.
132.
100.
TEMPERATURE (DEG. F)
354.
355.
356.
357.
358.
359.
360.
361.
362.
TIME (MINUTES)
/log/data/OKONITE/961108081903.500
wyle

OKONITE COMPANY 46120
PREHEAT - TRANSIENT #2
NOVEMBER 9, 2001



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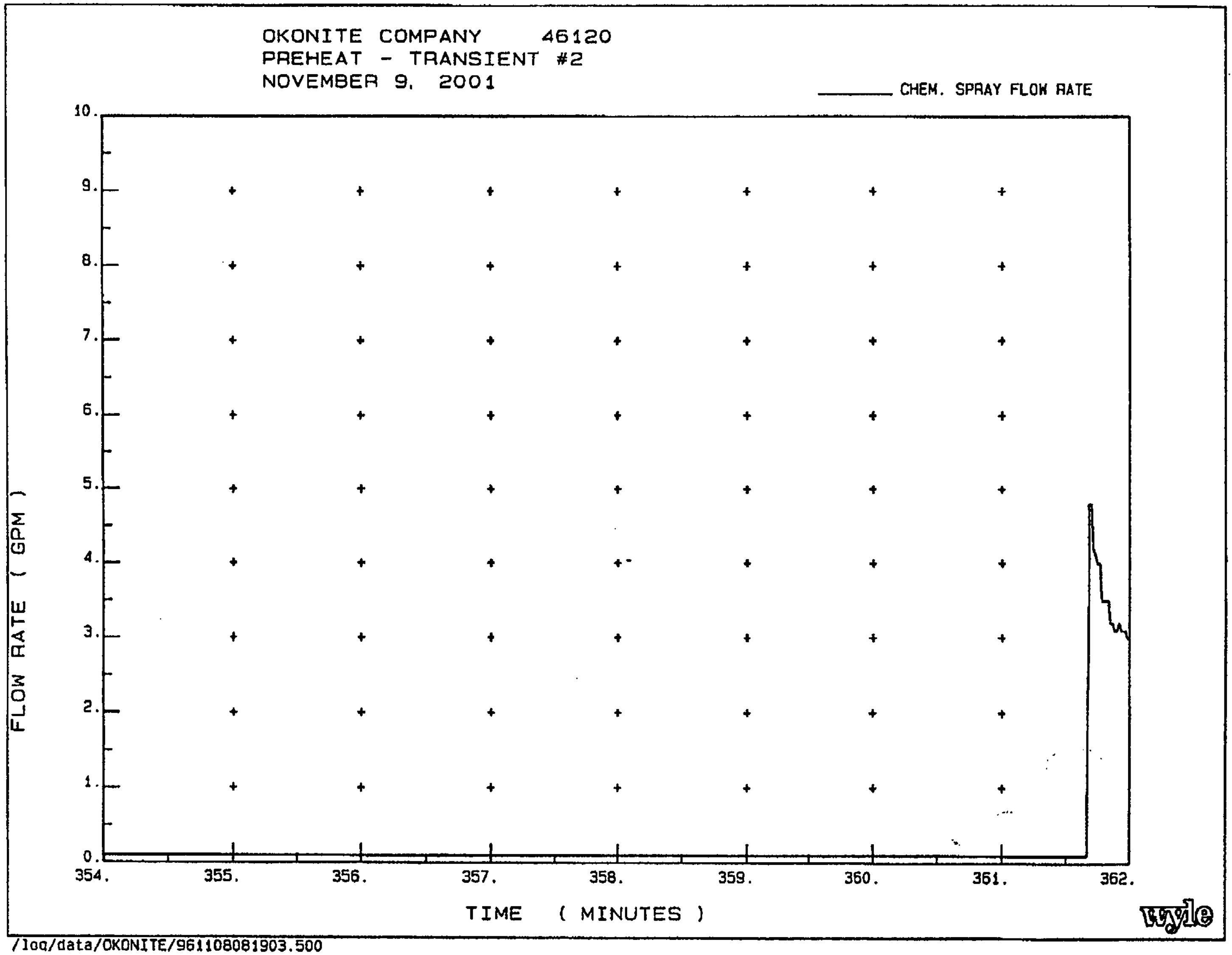
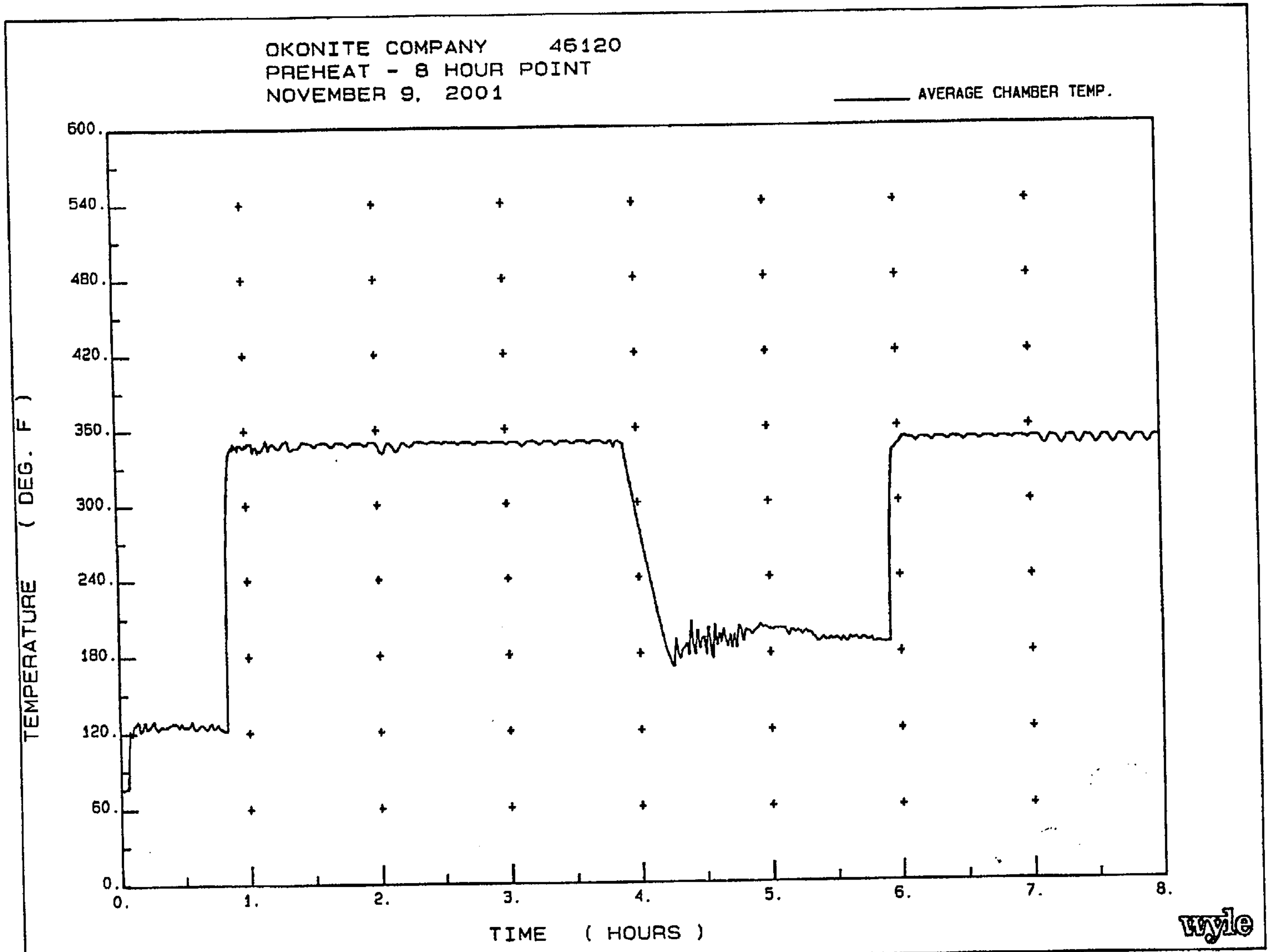

OKONITE COMPANY 46120
PREHEAT - TRANSIENT #2
NOVEMBER 9, 2001
CHEM. SPRAY FLOW RATE
FLOW RATE (GPM)
10.
9.
8.
7.
6.
5.
4.
3.
2.
1.
0.
354.
355.
356.
357.
358.
359.
360.
361.
362.
TIME (MINUTES)
wyle
/log/data/OKONITE/961108081903.500



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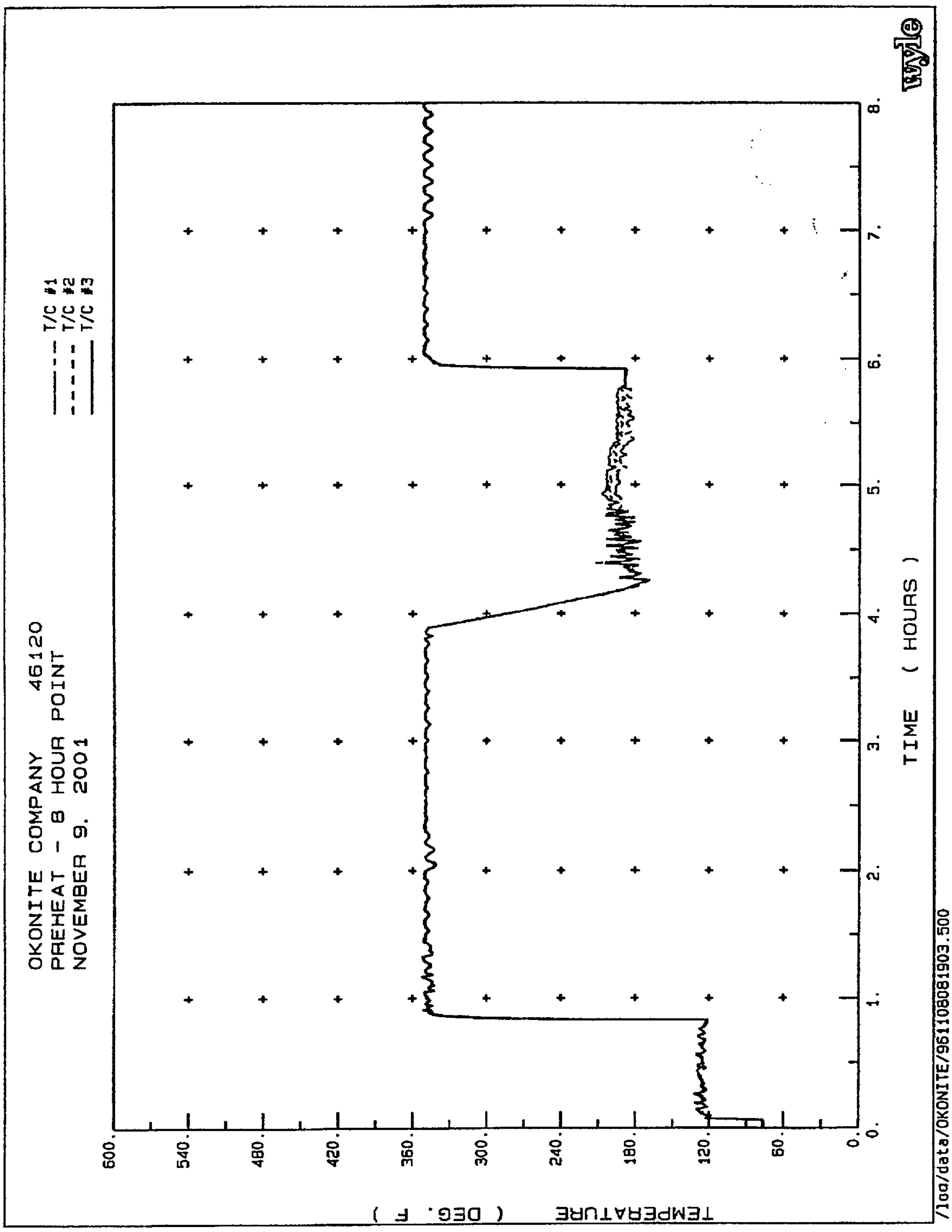
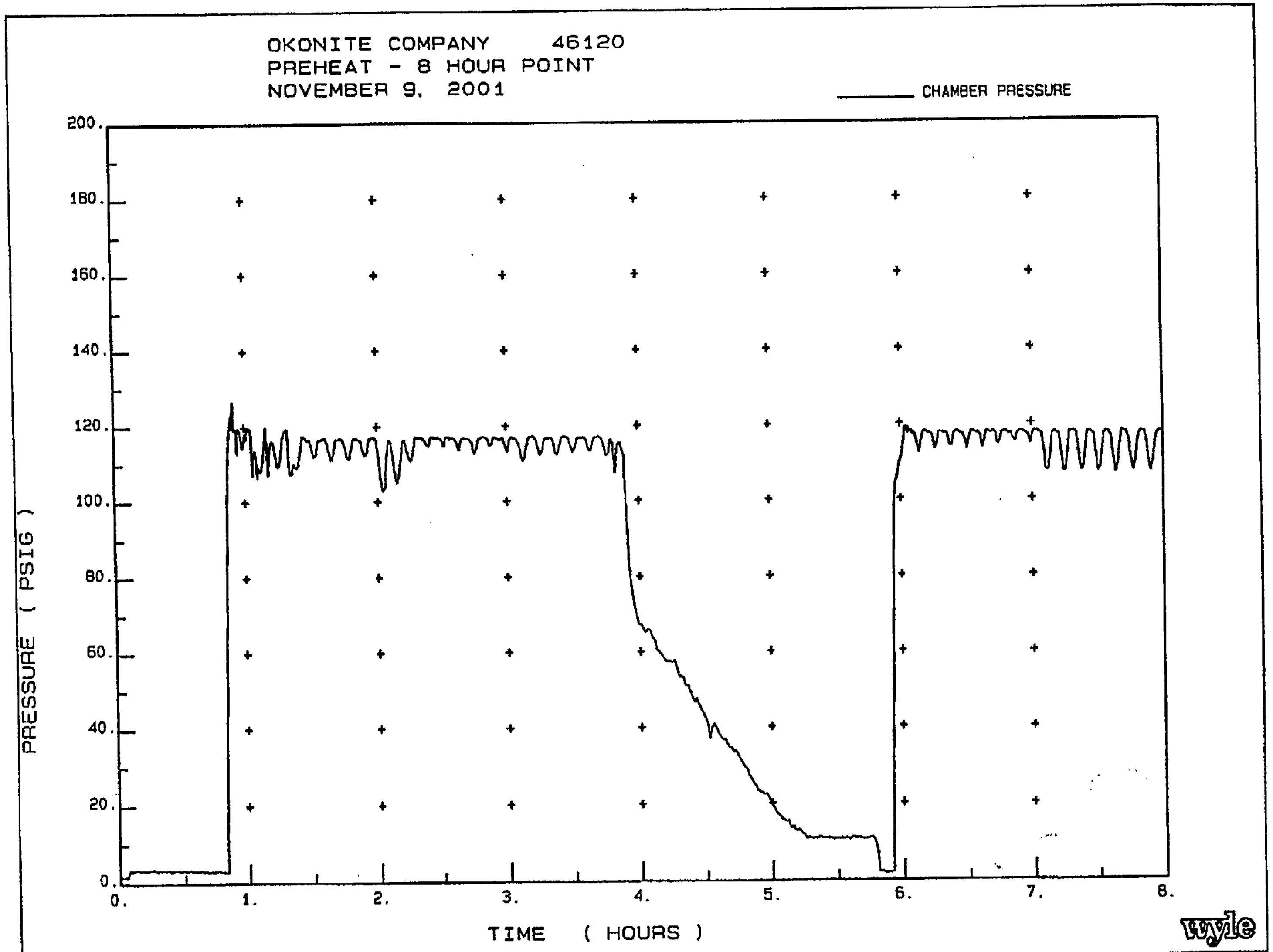

OKONITE COMPANY 46120
PREHEAT - 8 HOUR POINT
NOVEMBER 9, 2001
T/C #1
T/C #2
T/C #3
TEMPERATURE (DEG. F)
600.
540.
480.
420.
360.
300.
240.
180.
120.
60.
0.
1.
2.
3.
4.
5.
6.
7.
8.
TIME (HOURS)
wyle
/log/data/OKONITE/961108081903.500



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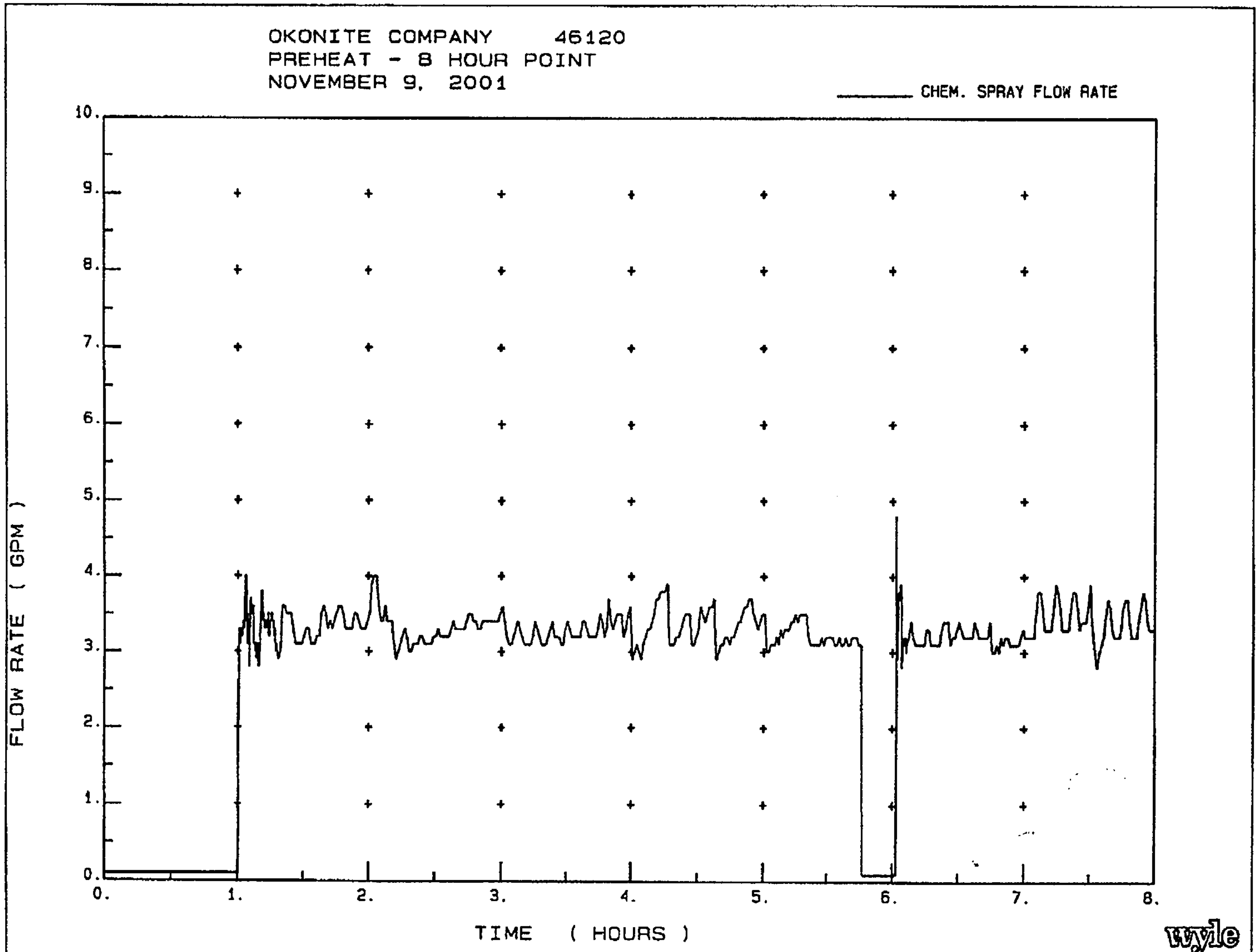

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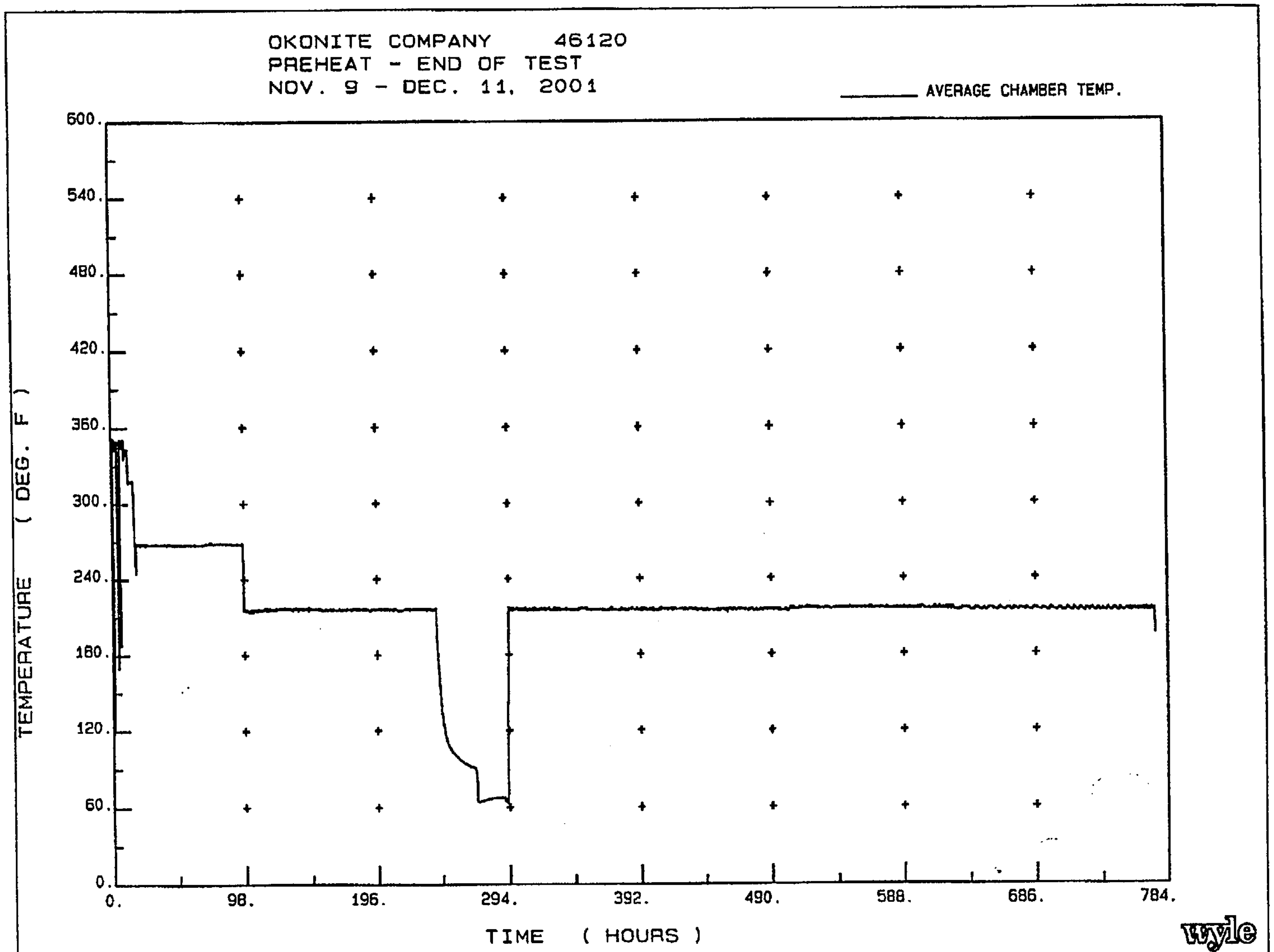

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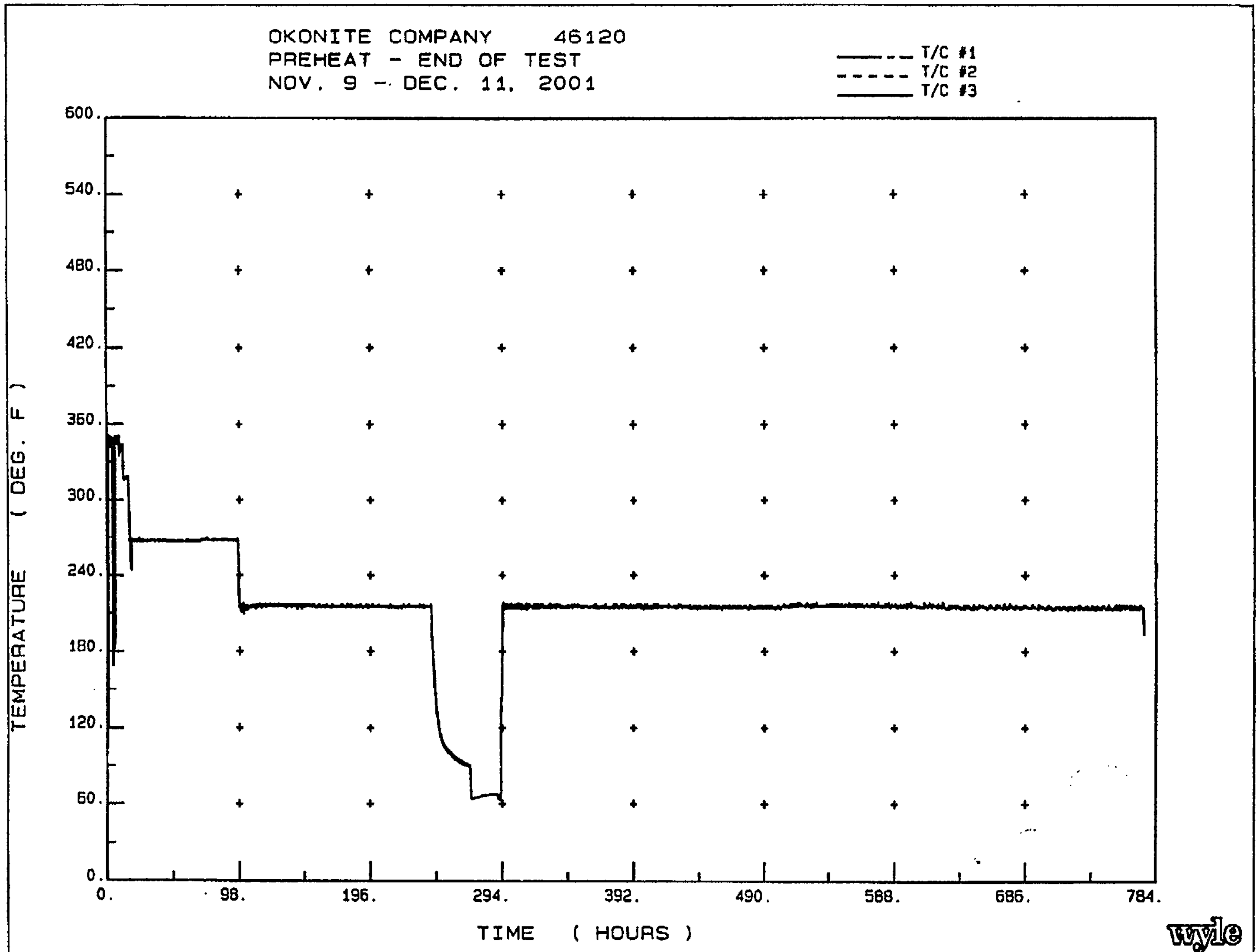

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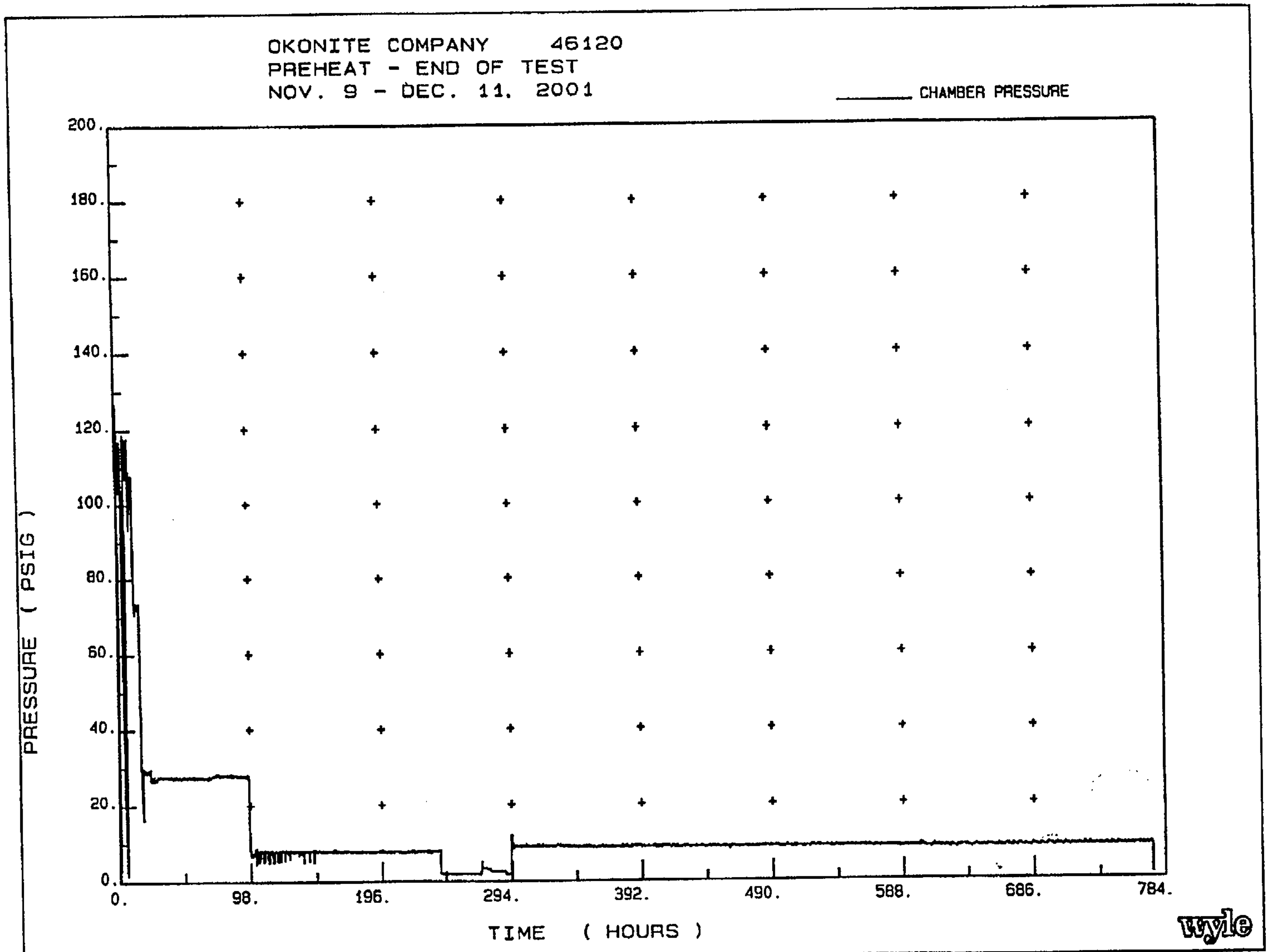

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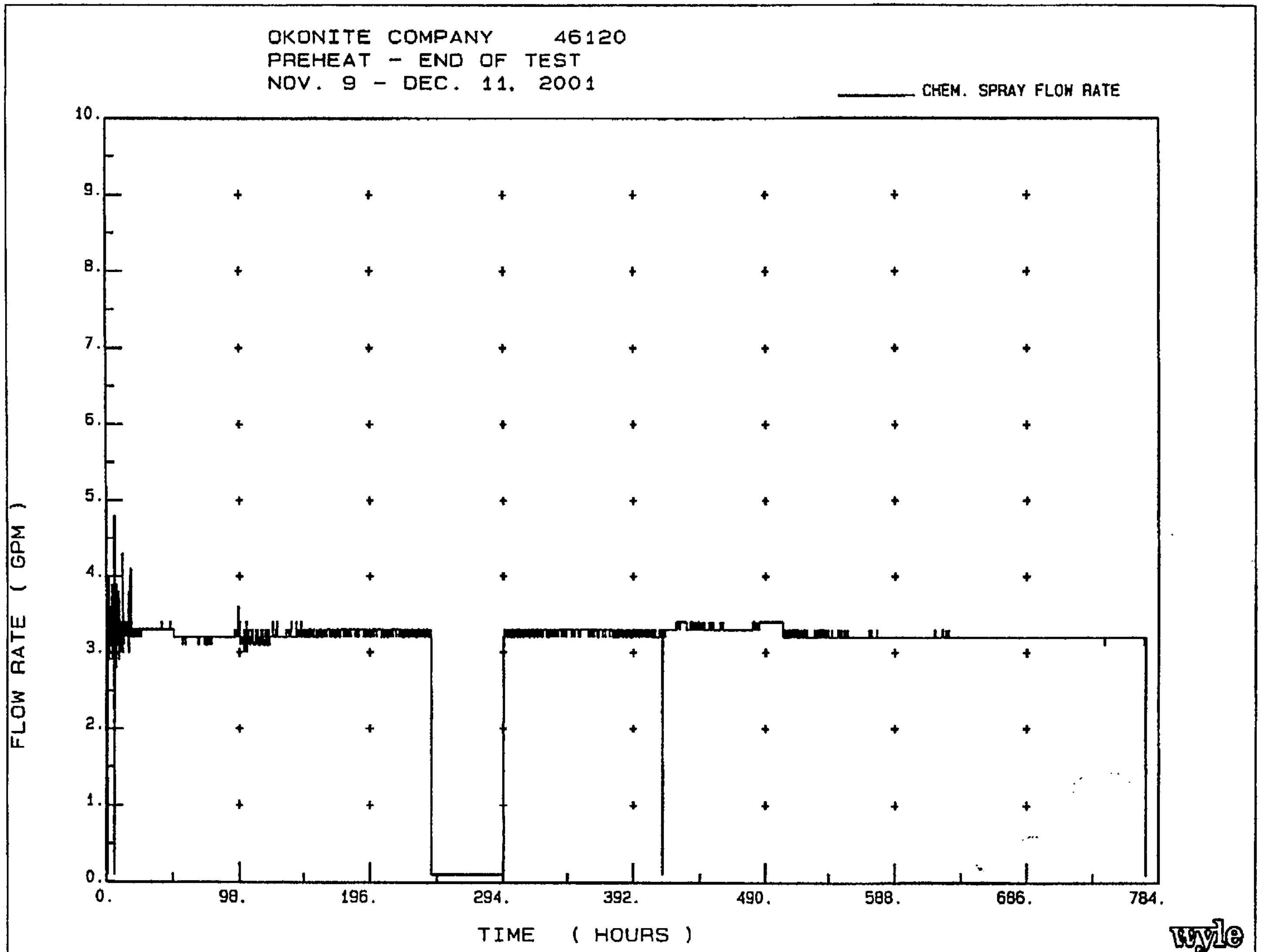

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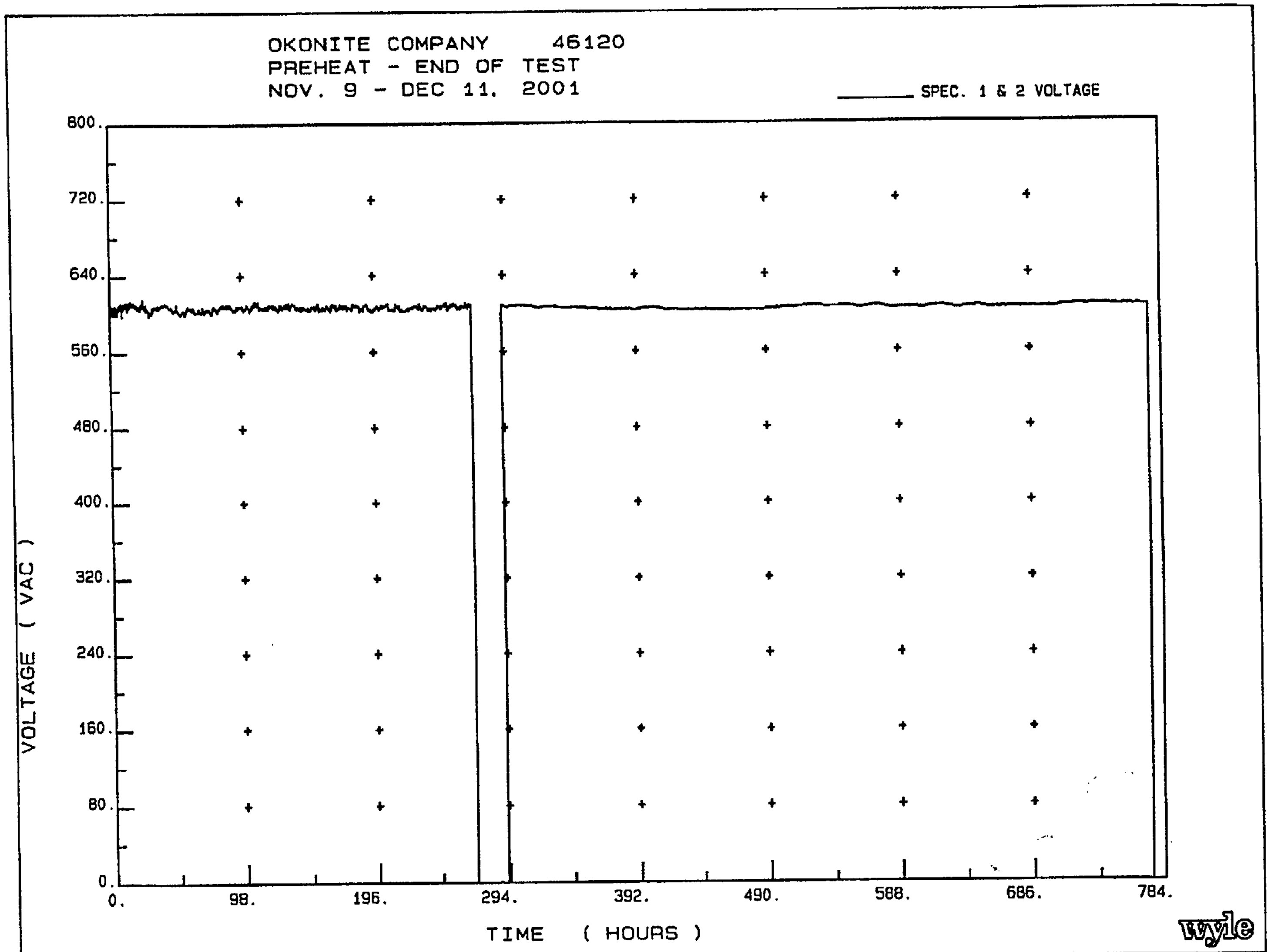

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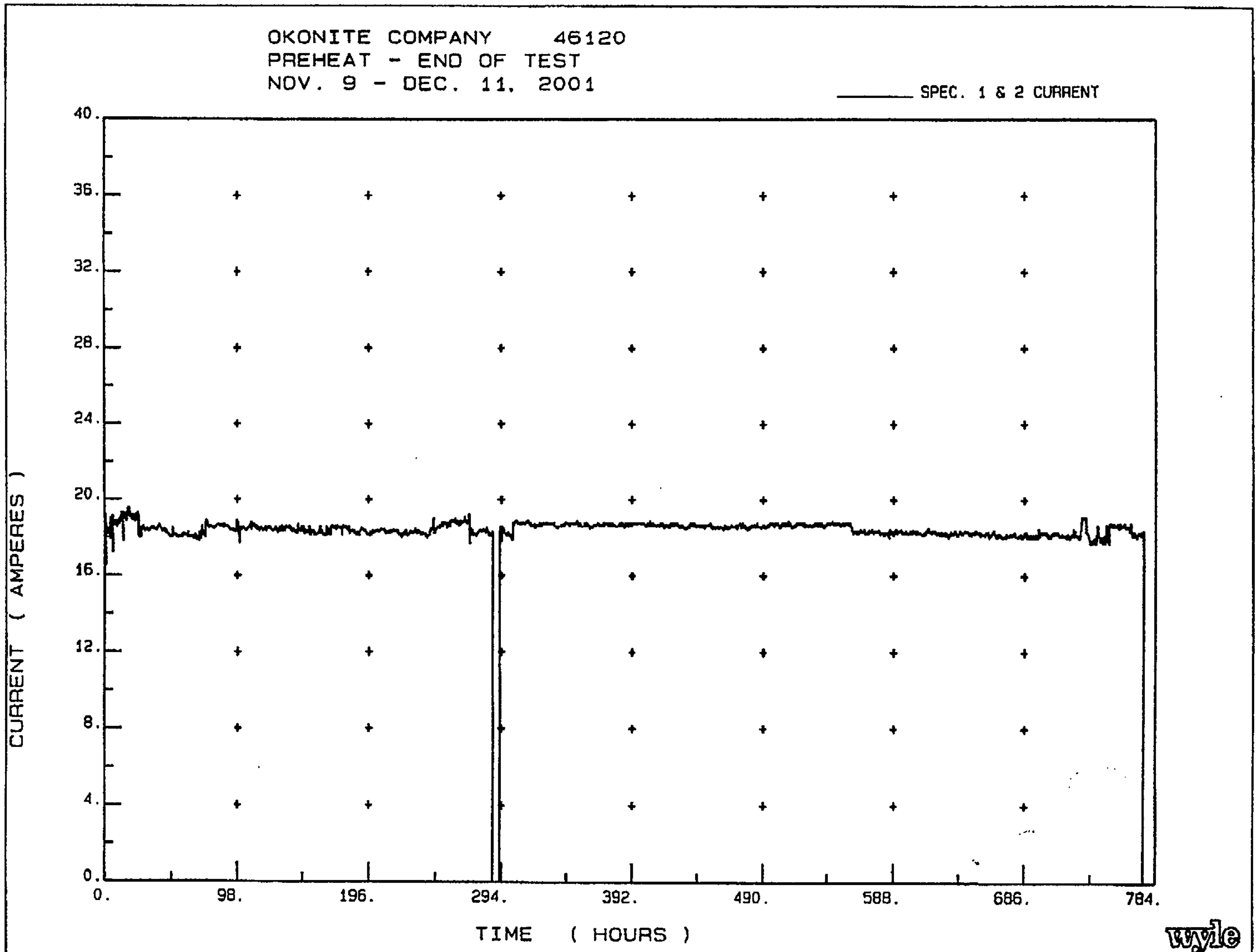

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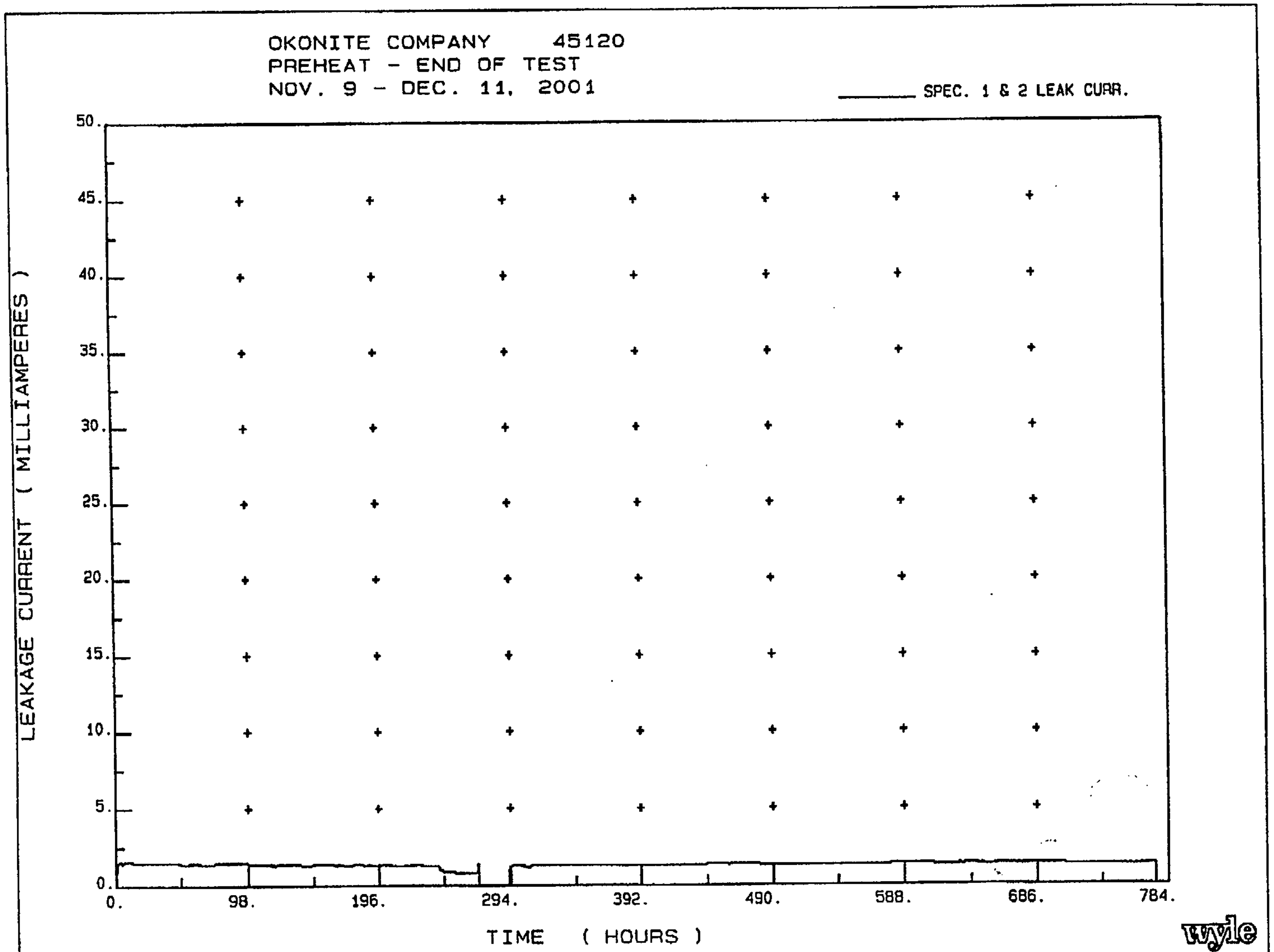

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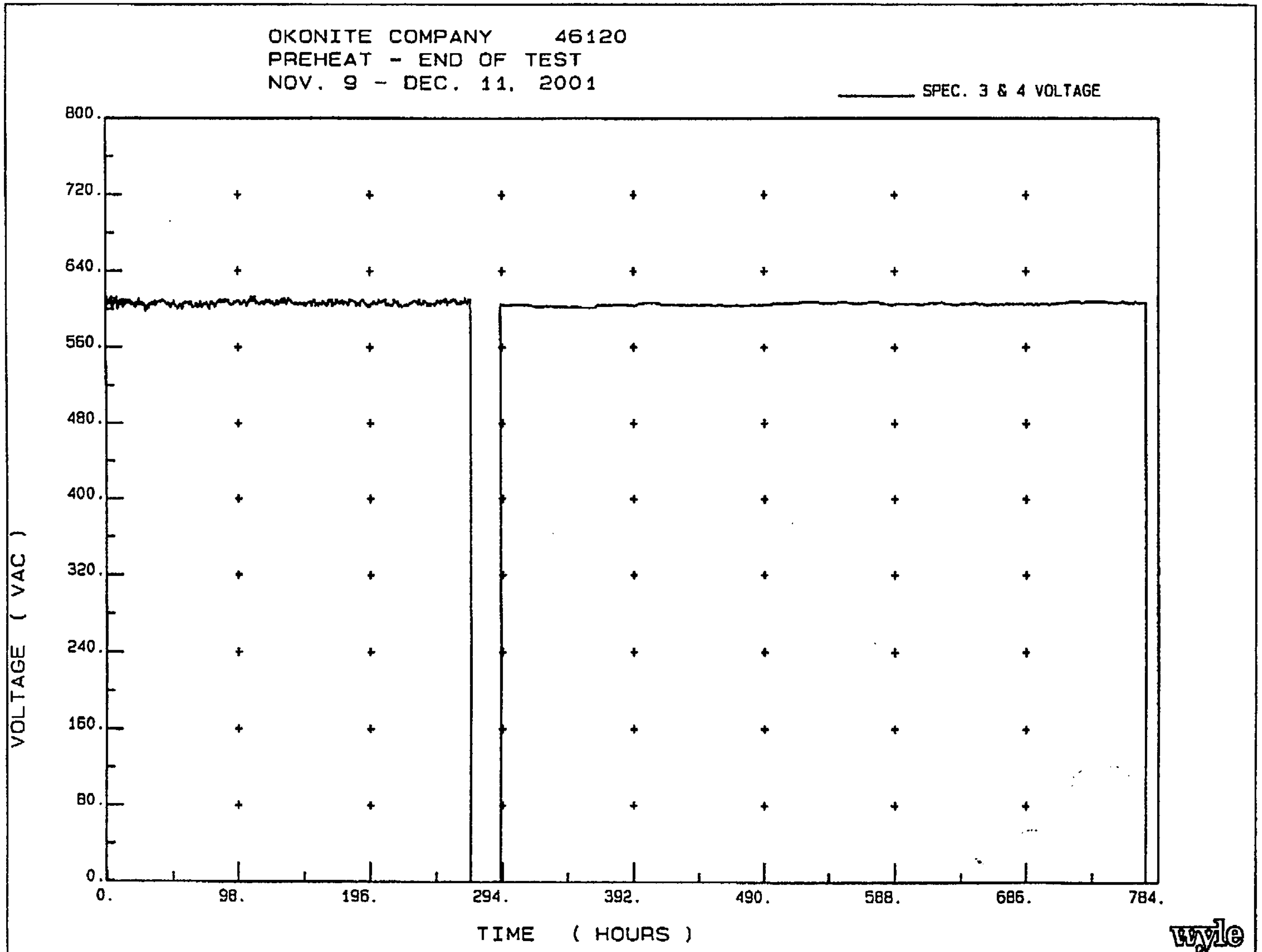

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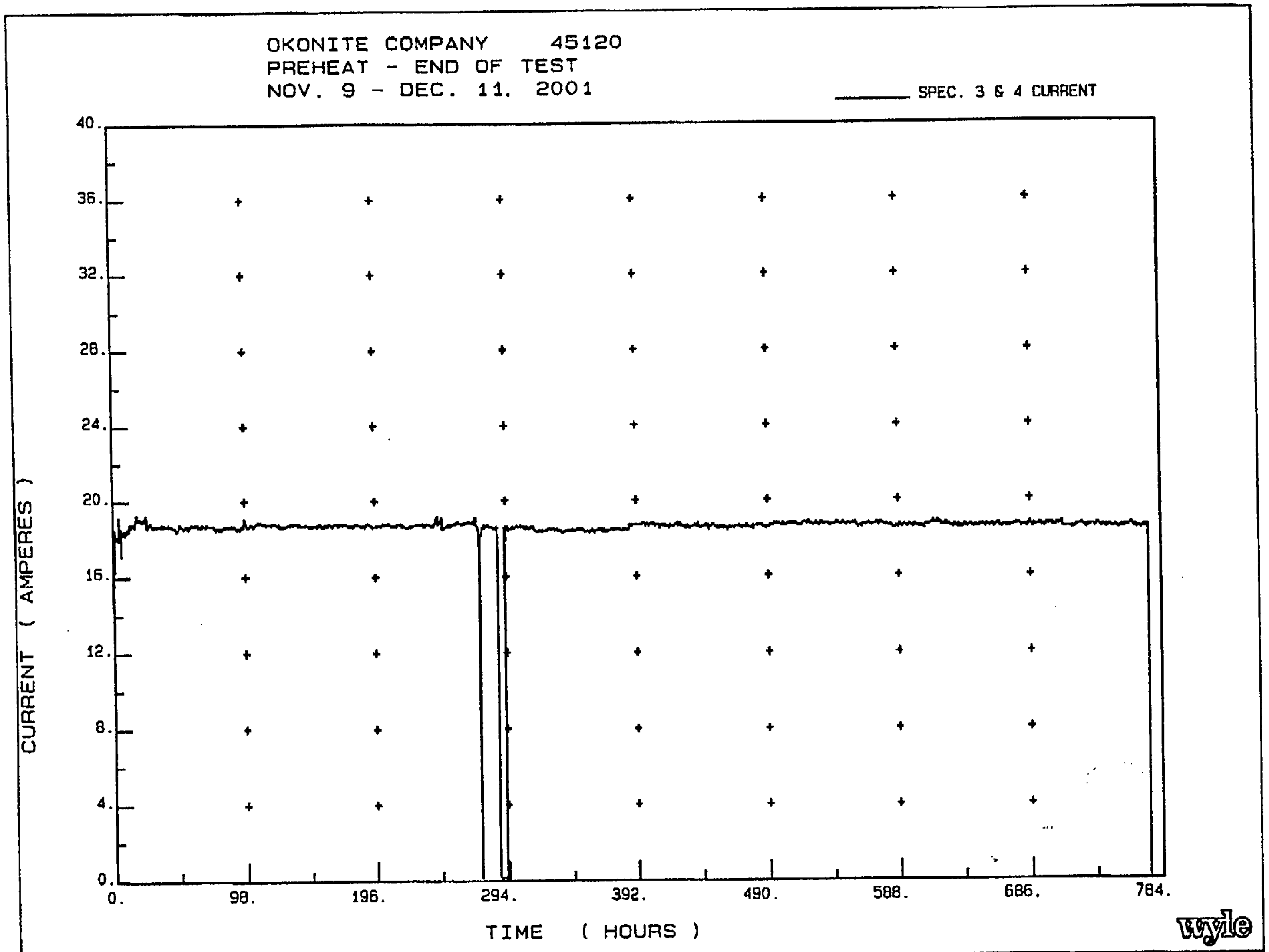

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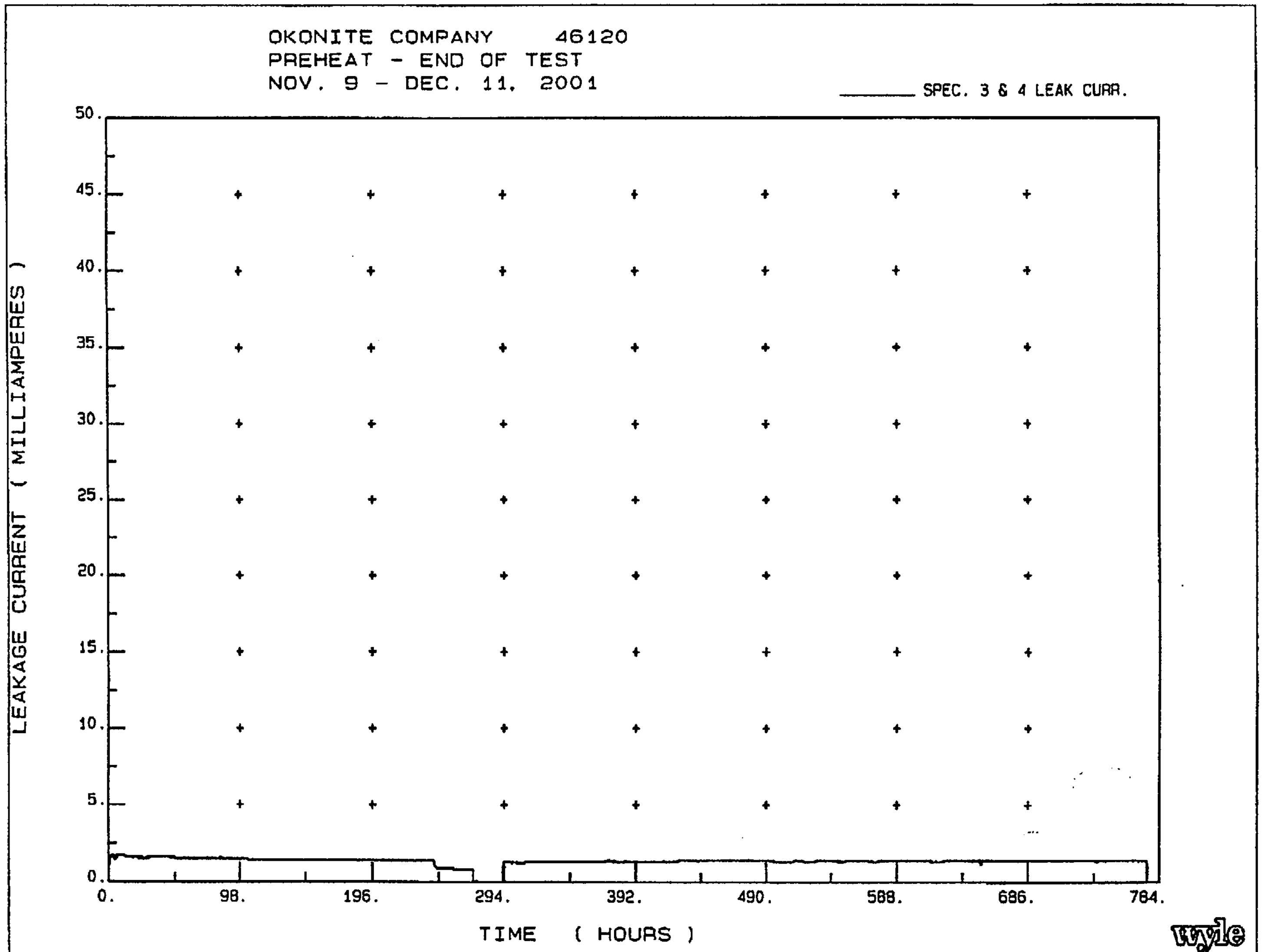

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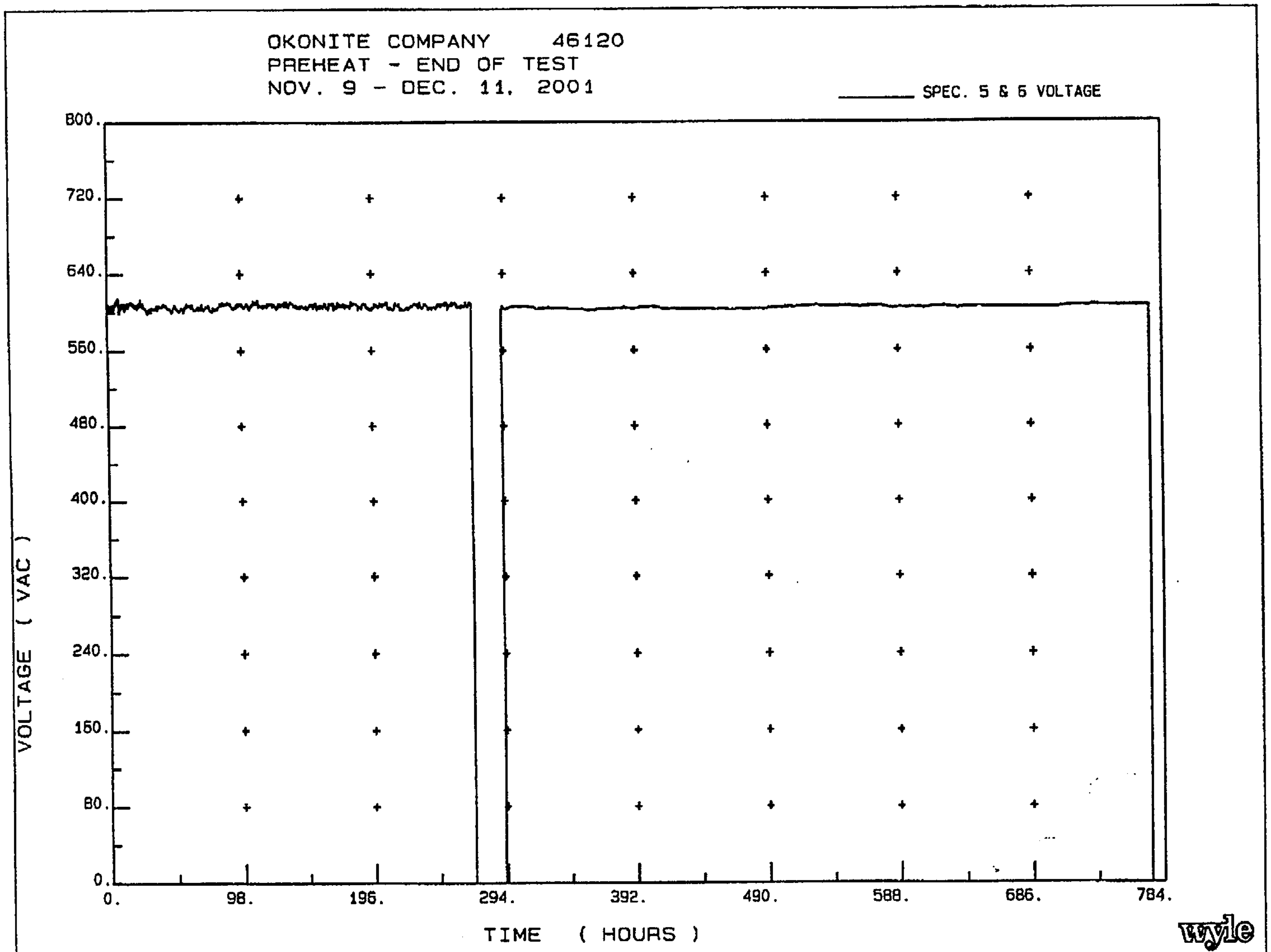

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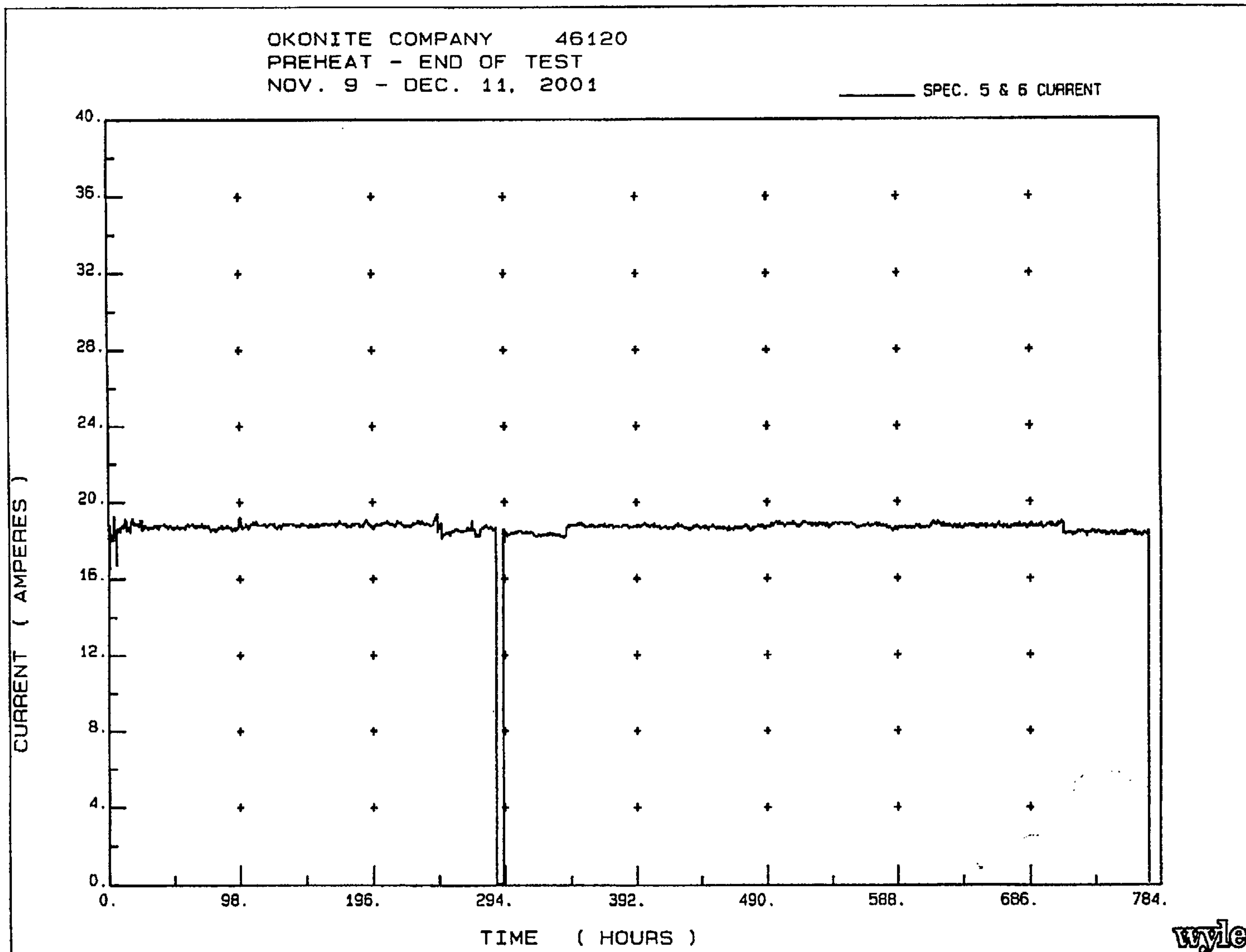
WYLE LABORATORIES
Huntsville Facility



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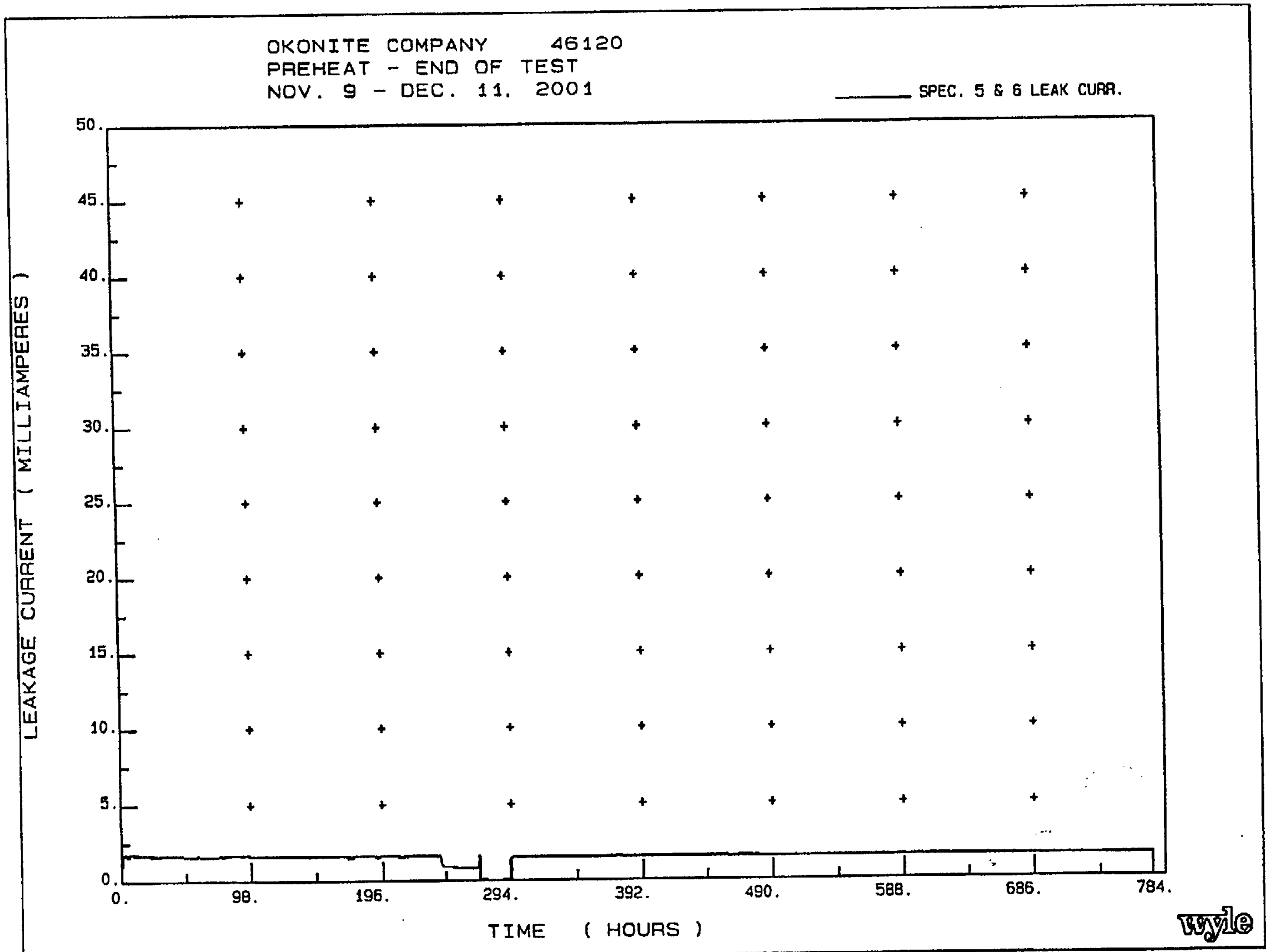

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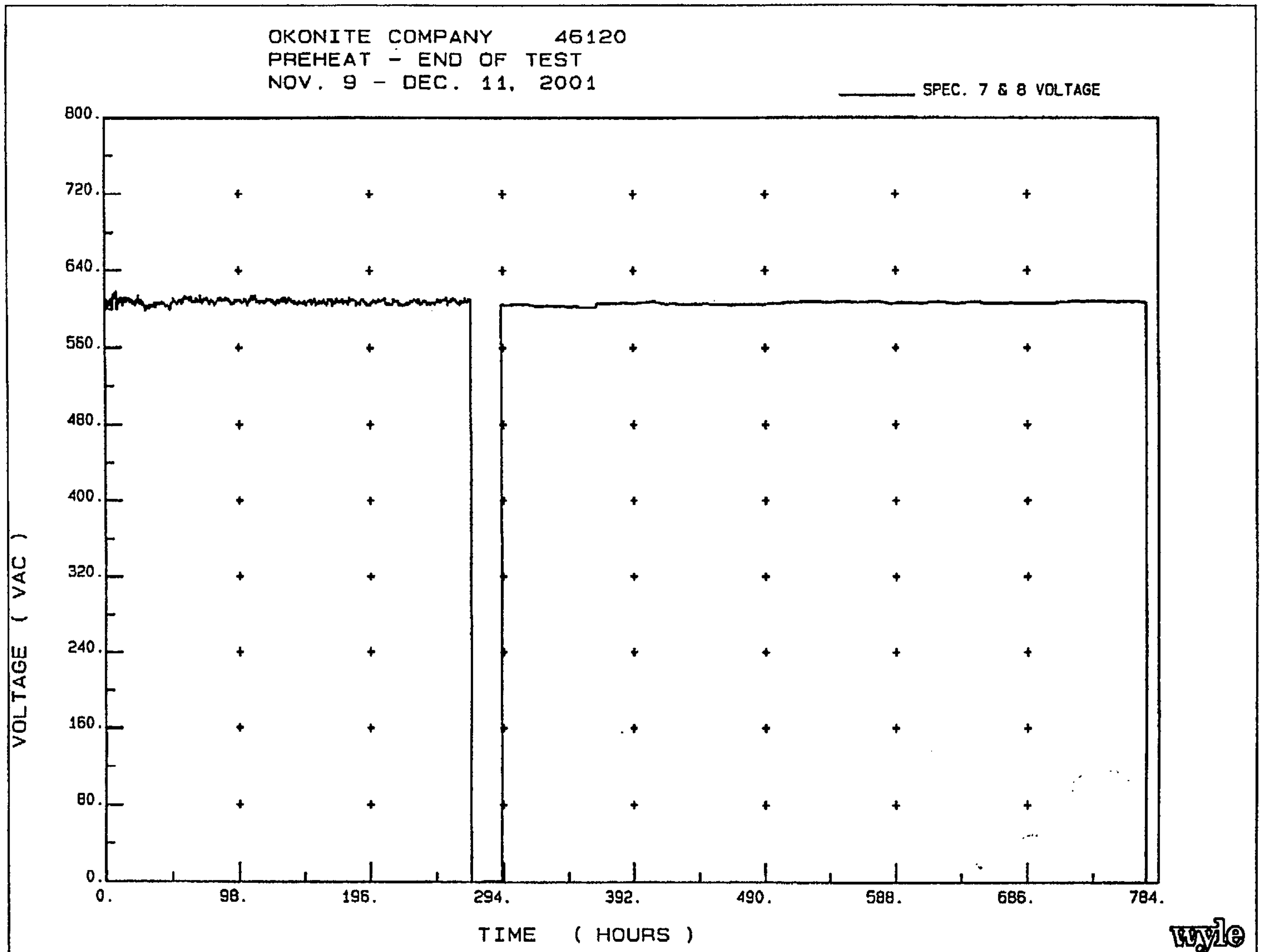

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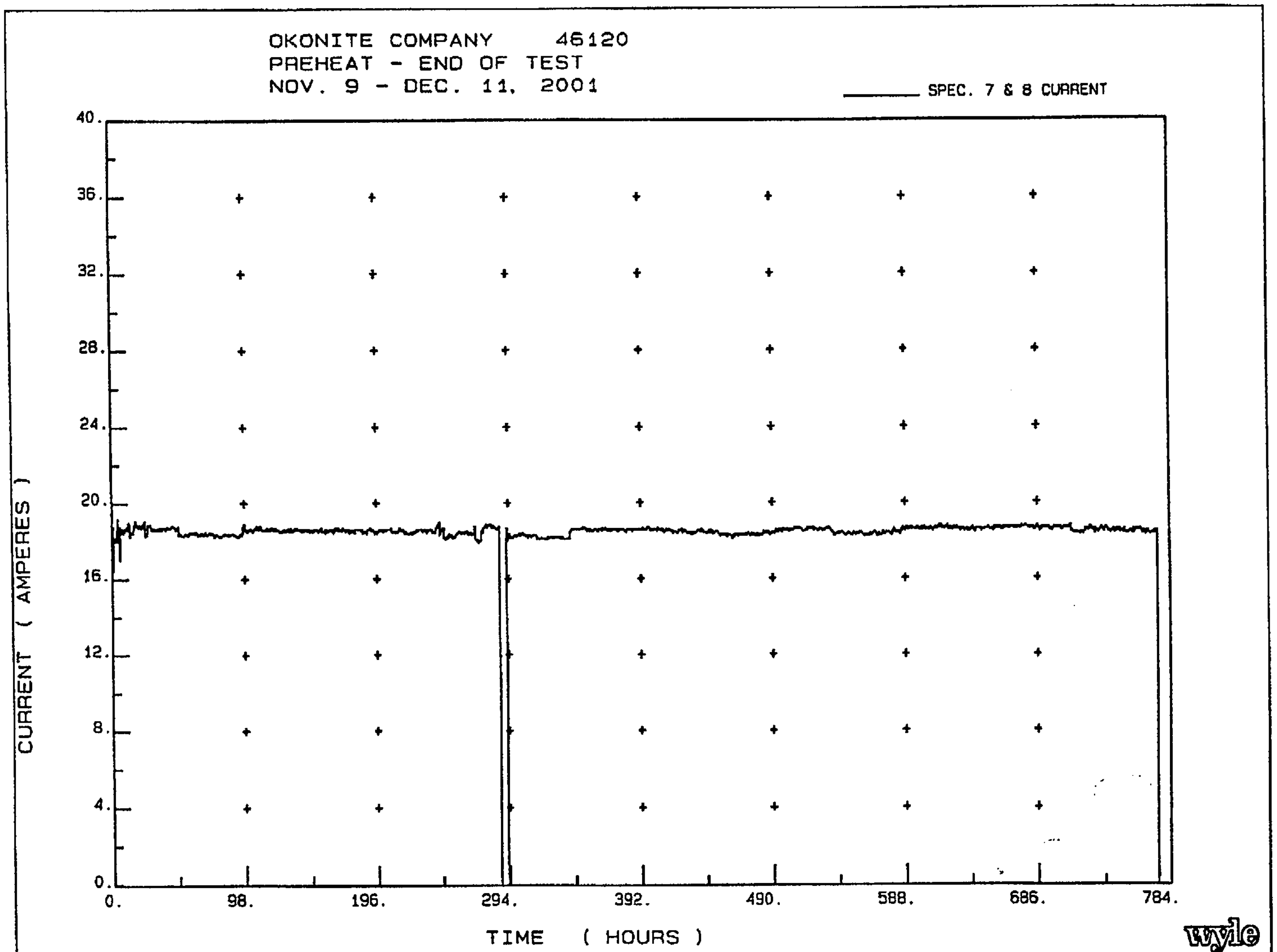

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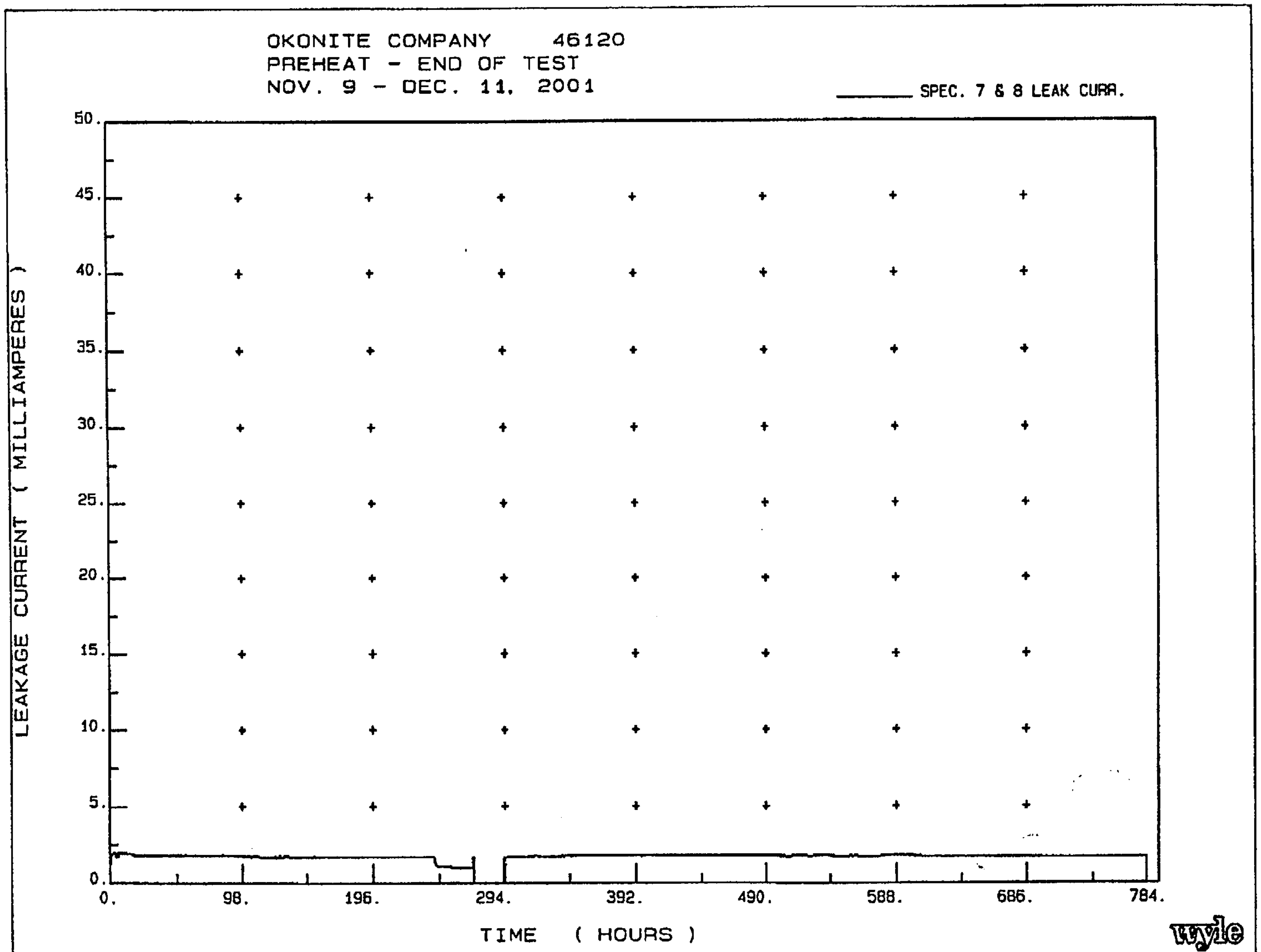

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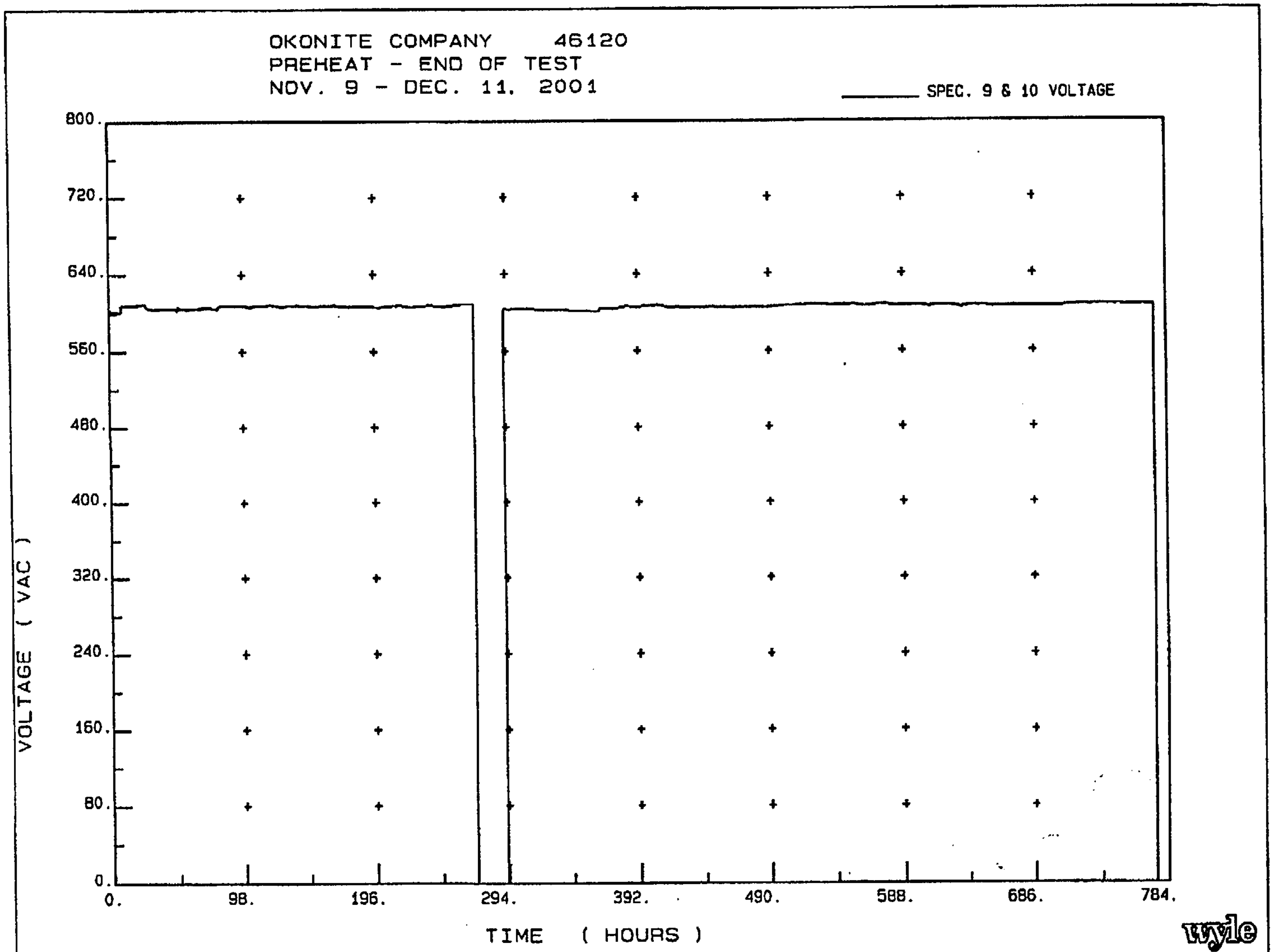

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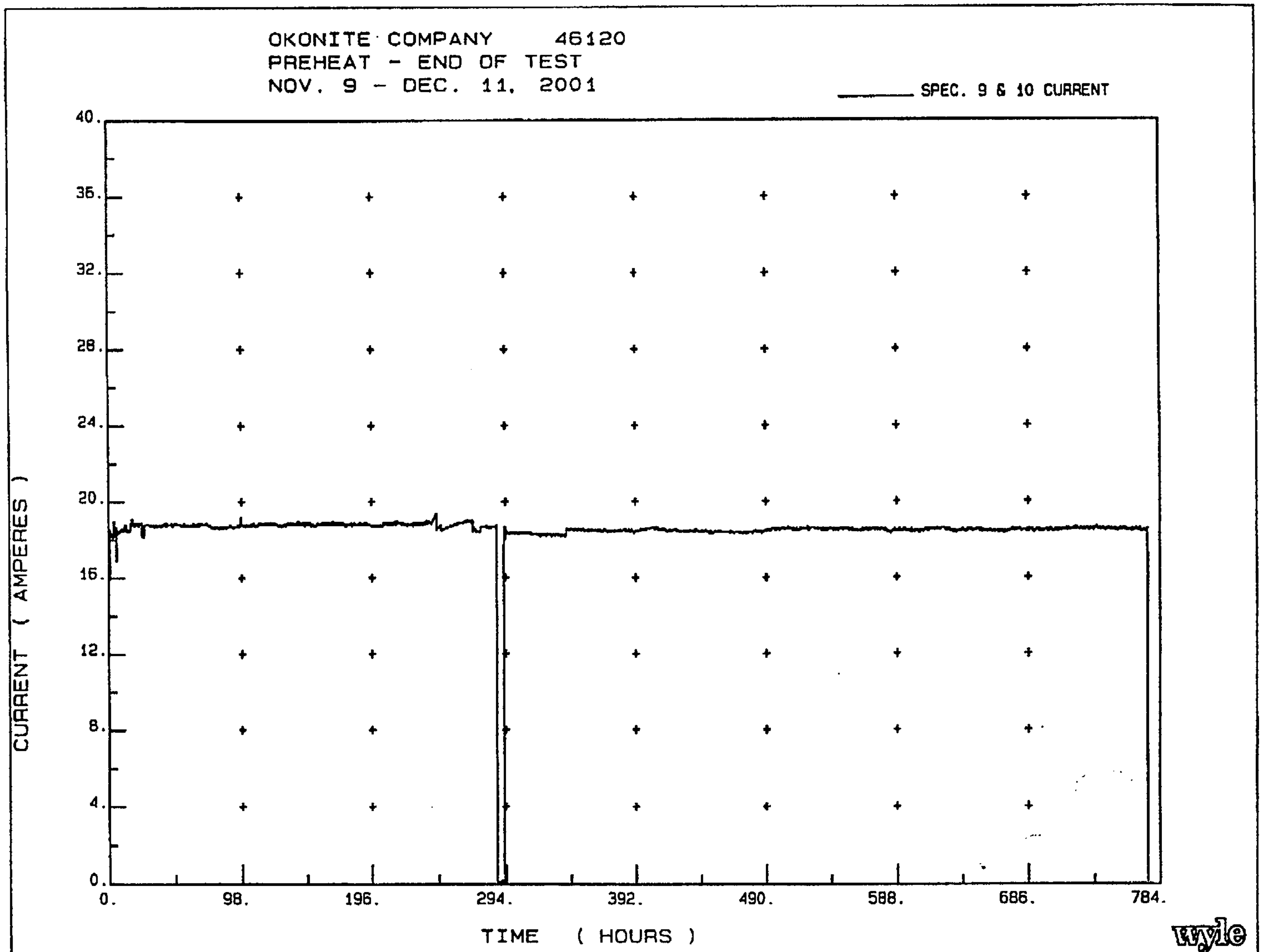

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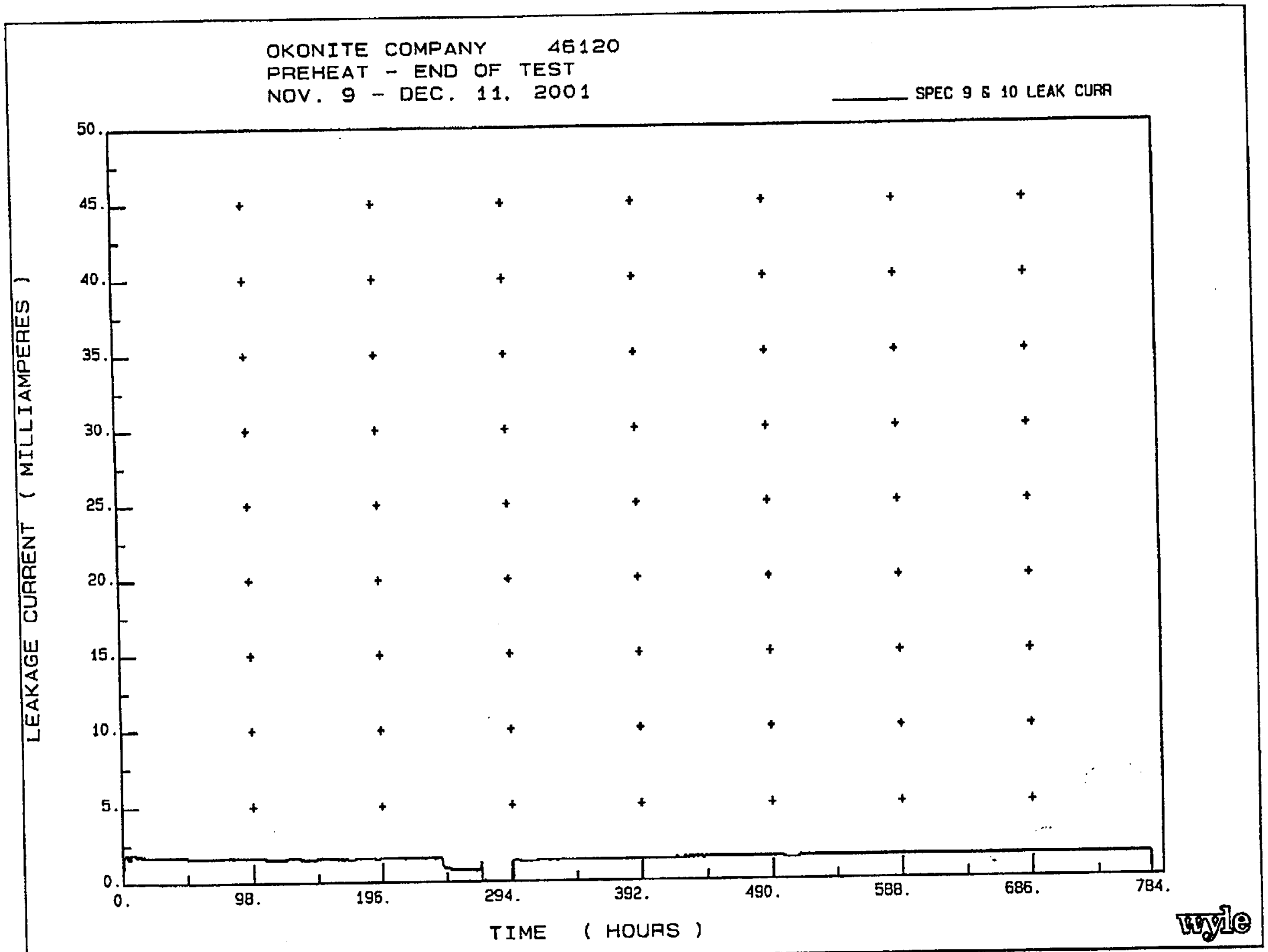

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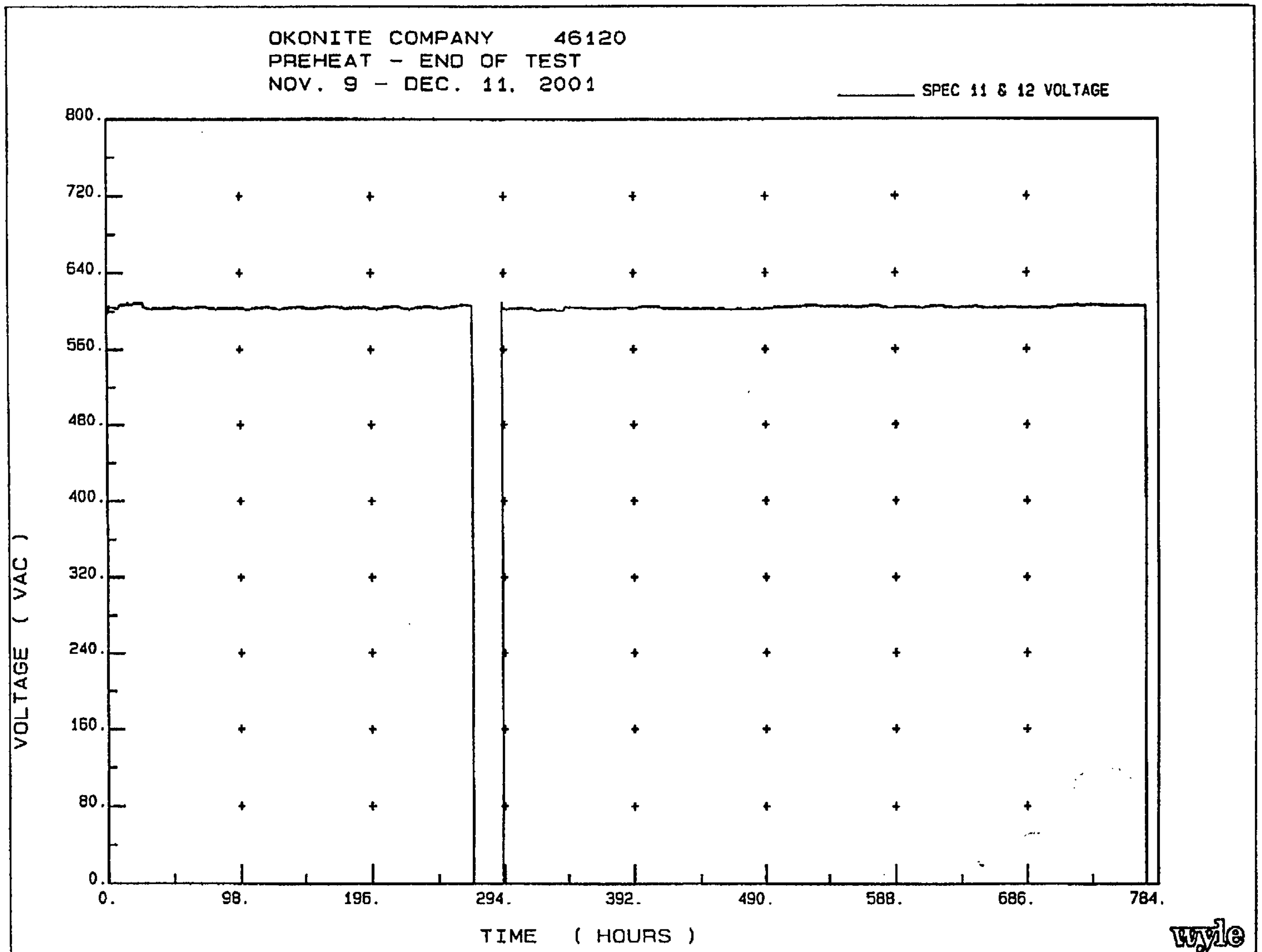

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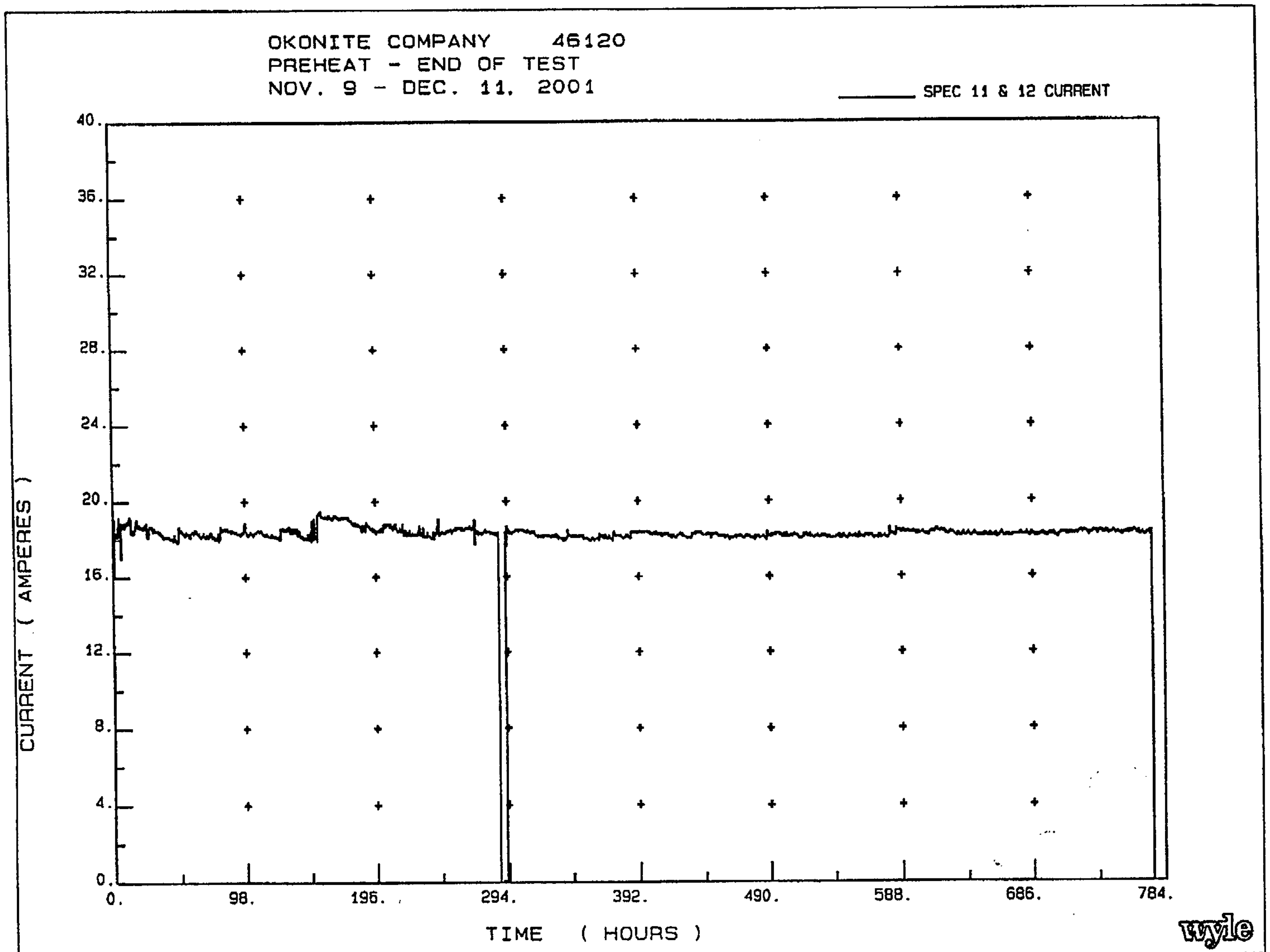

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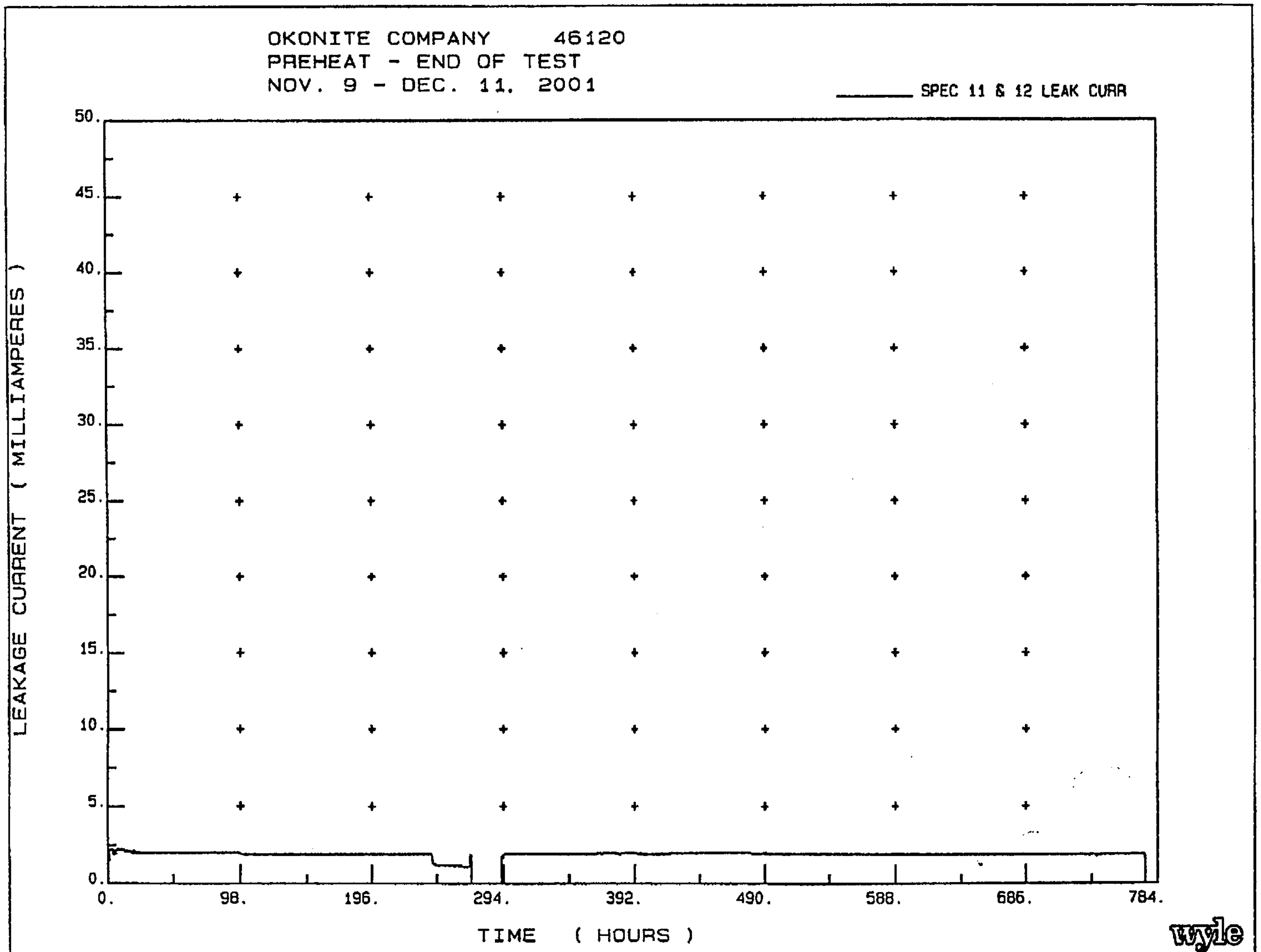

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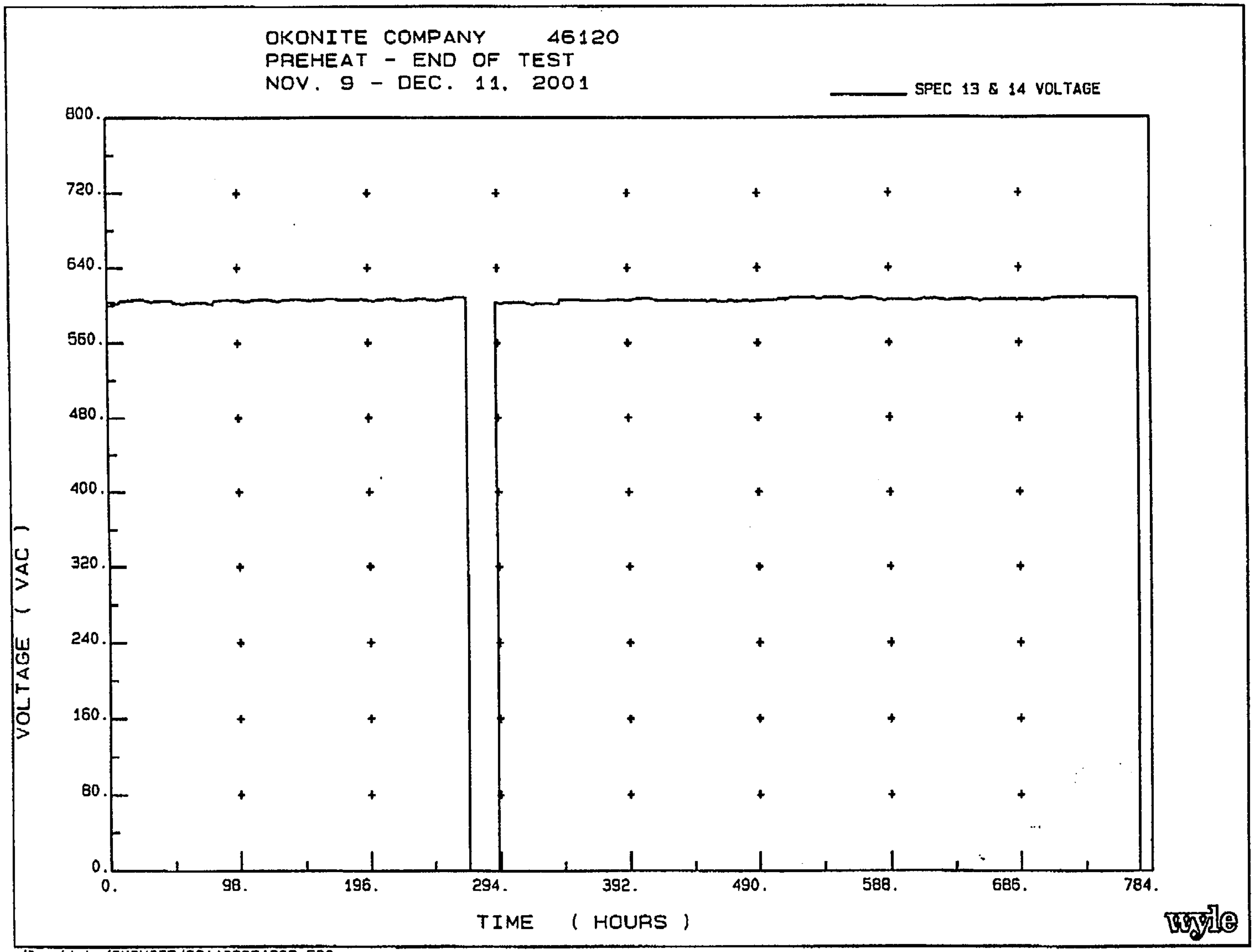

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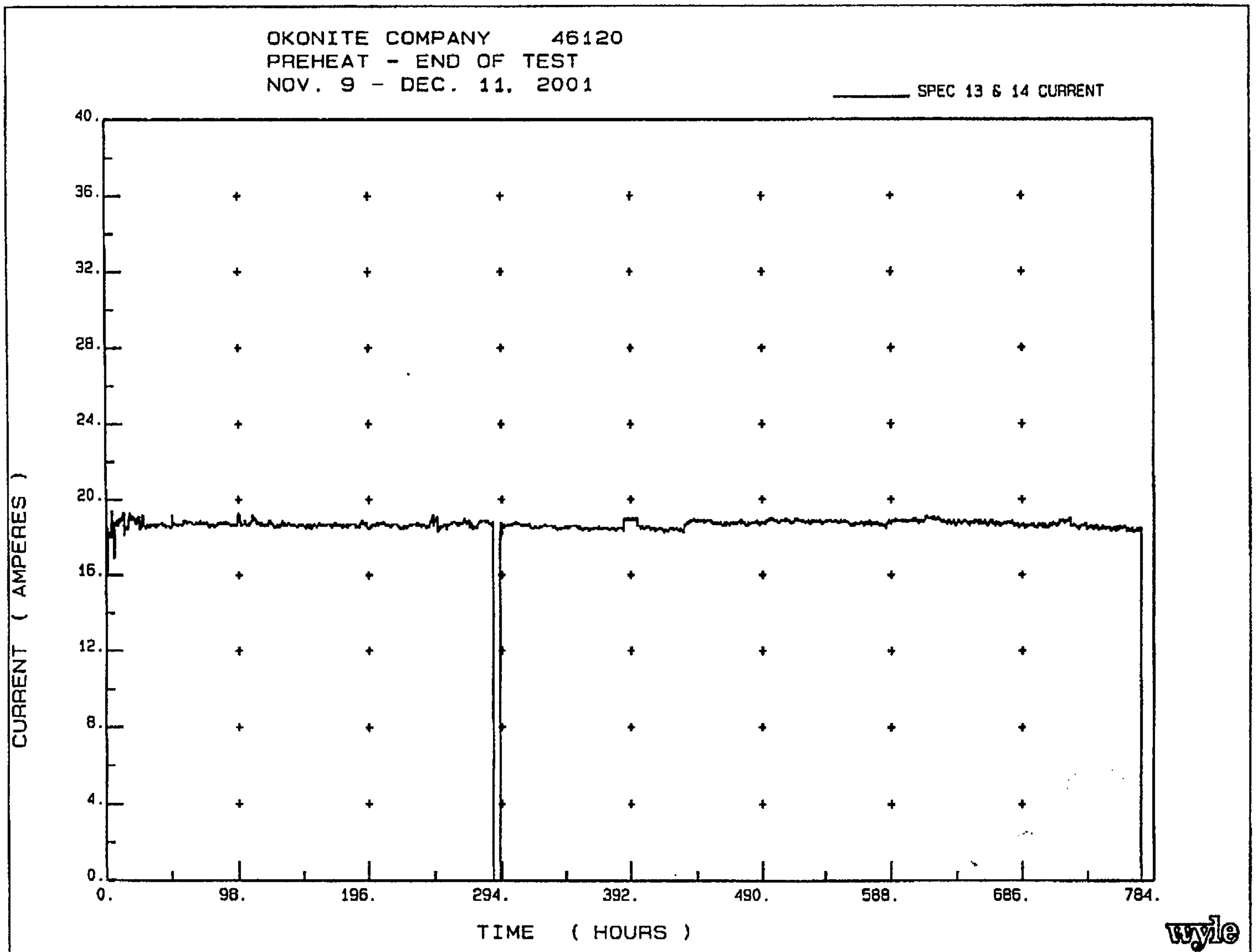

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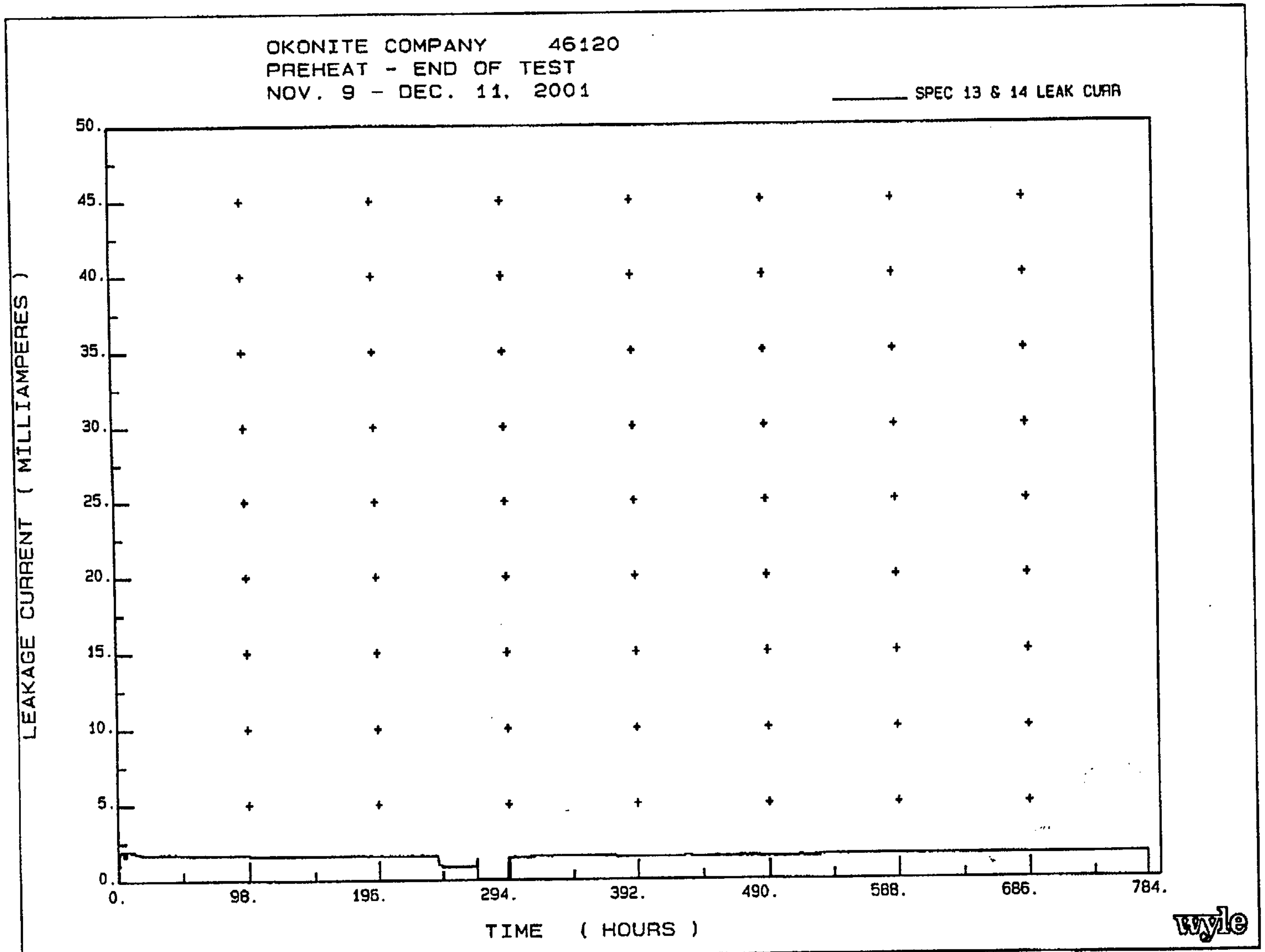

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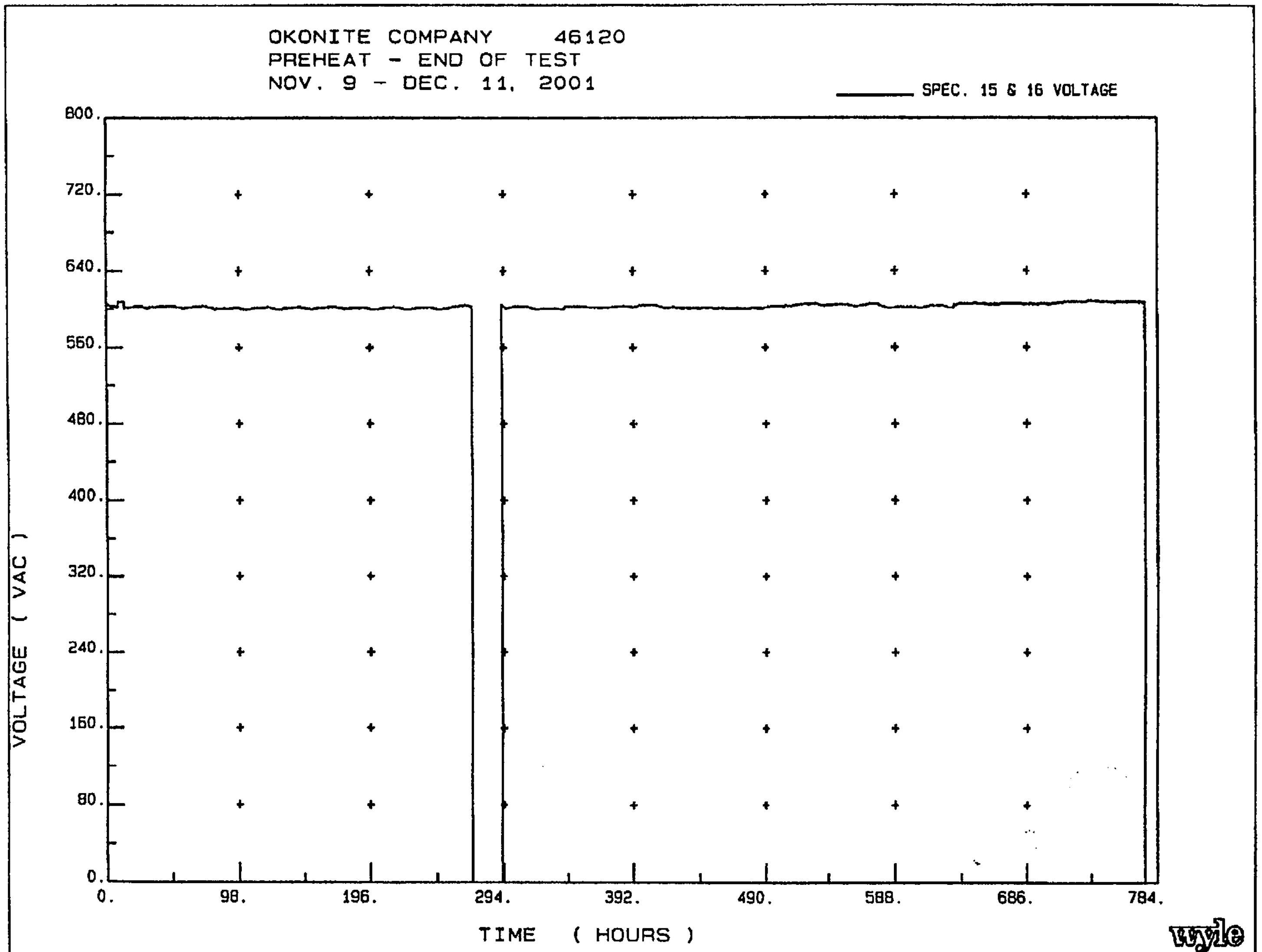
WYLE LABORATORIES
Huntsville Facility



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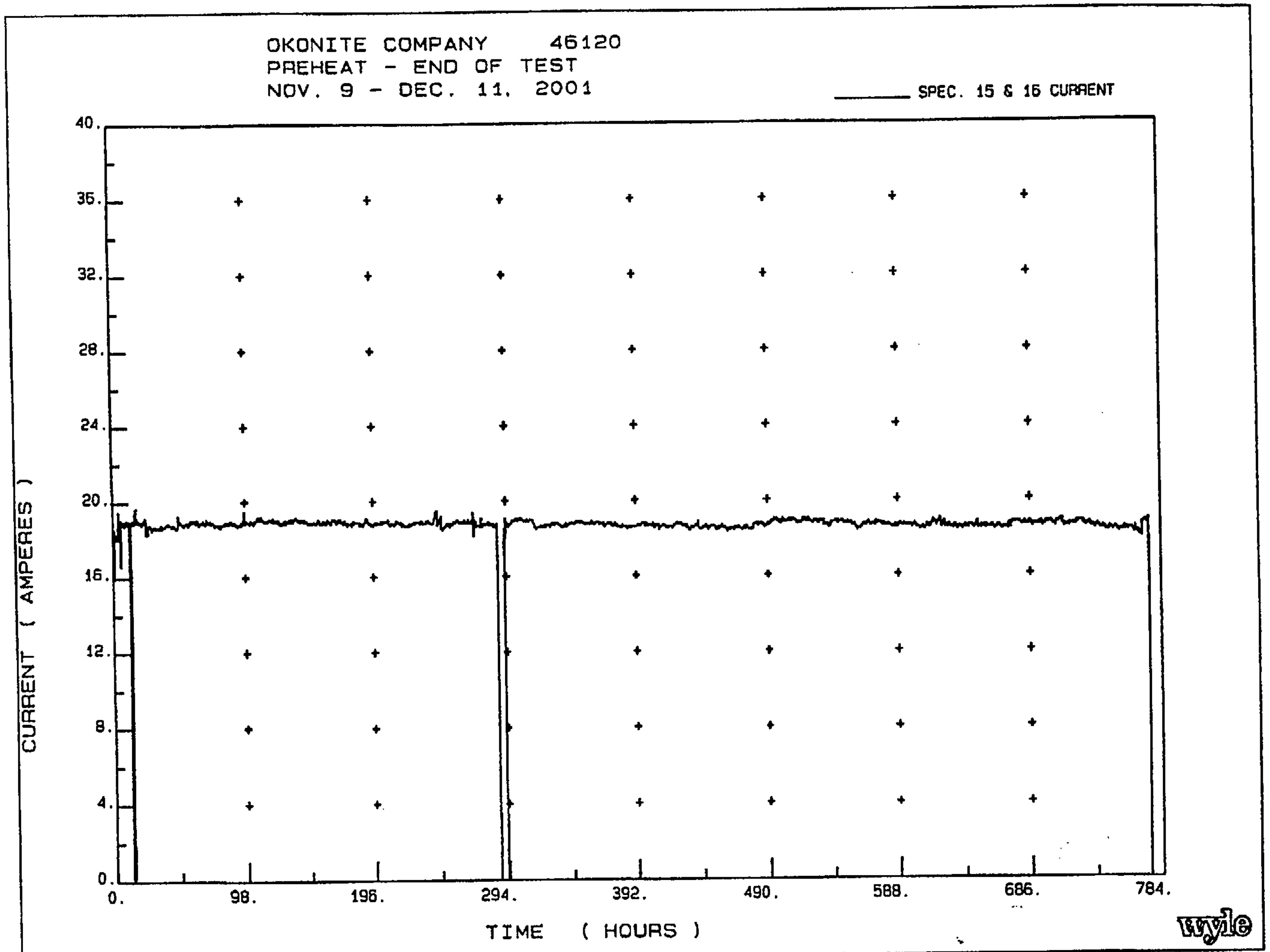

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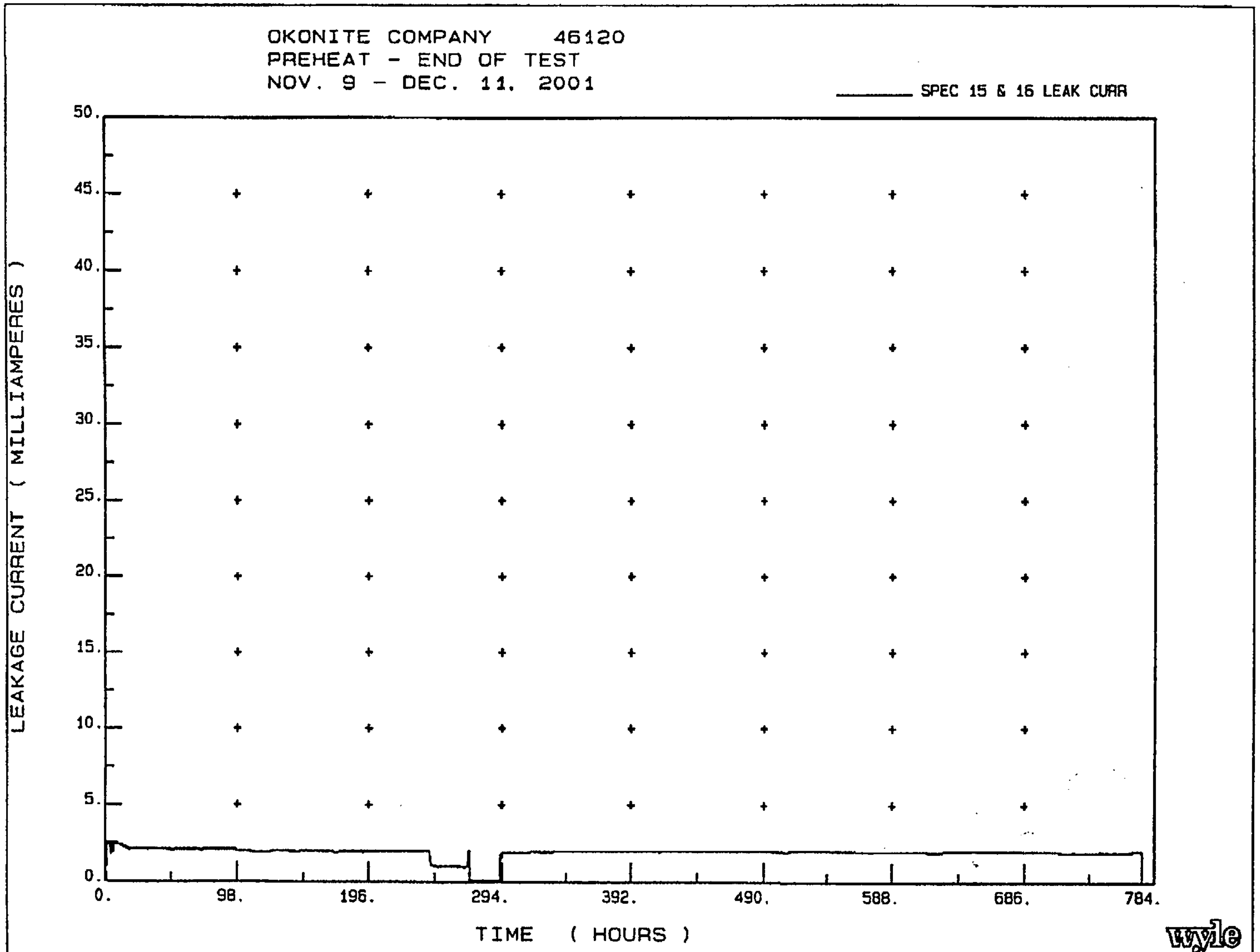

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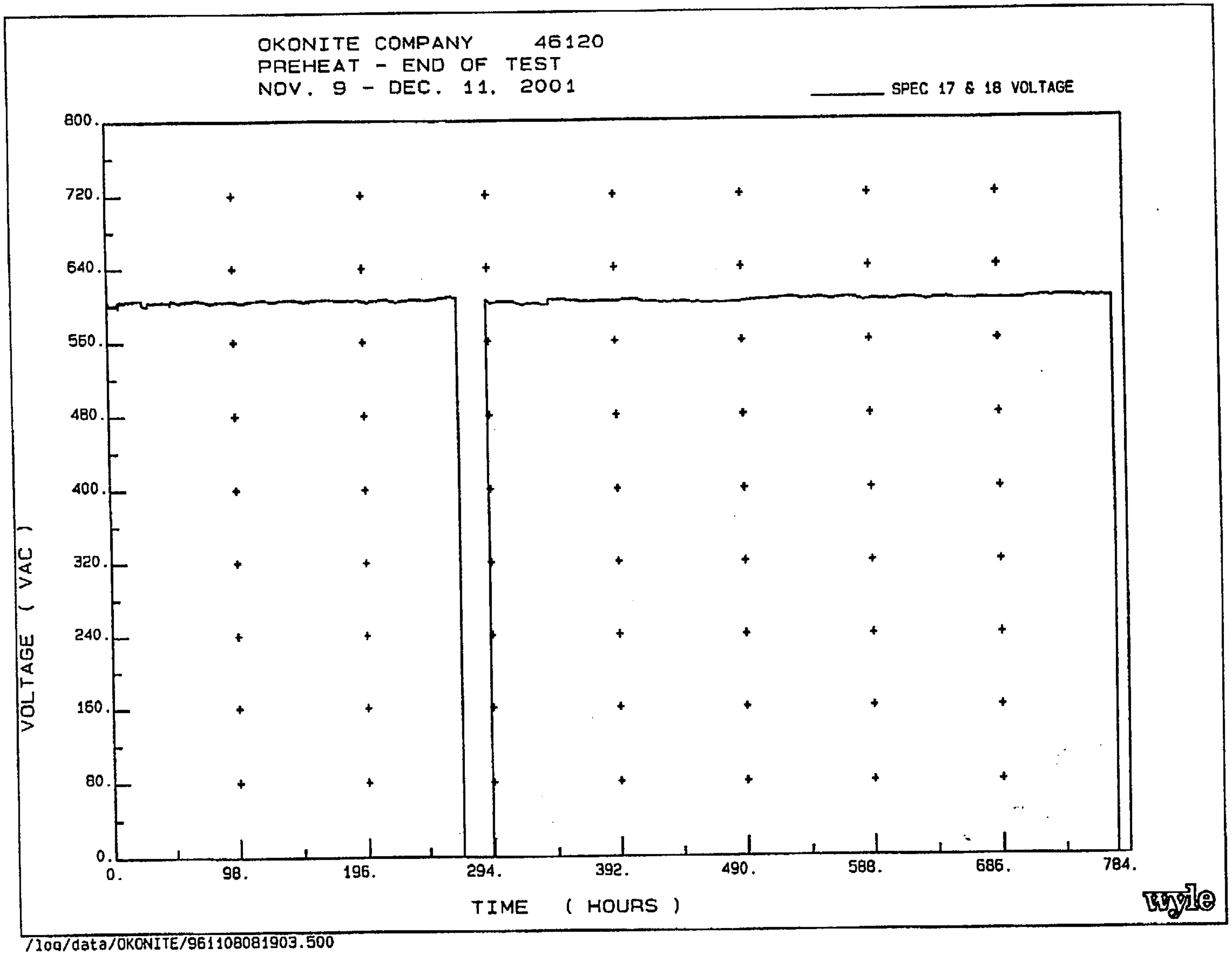
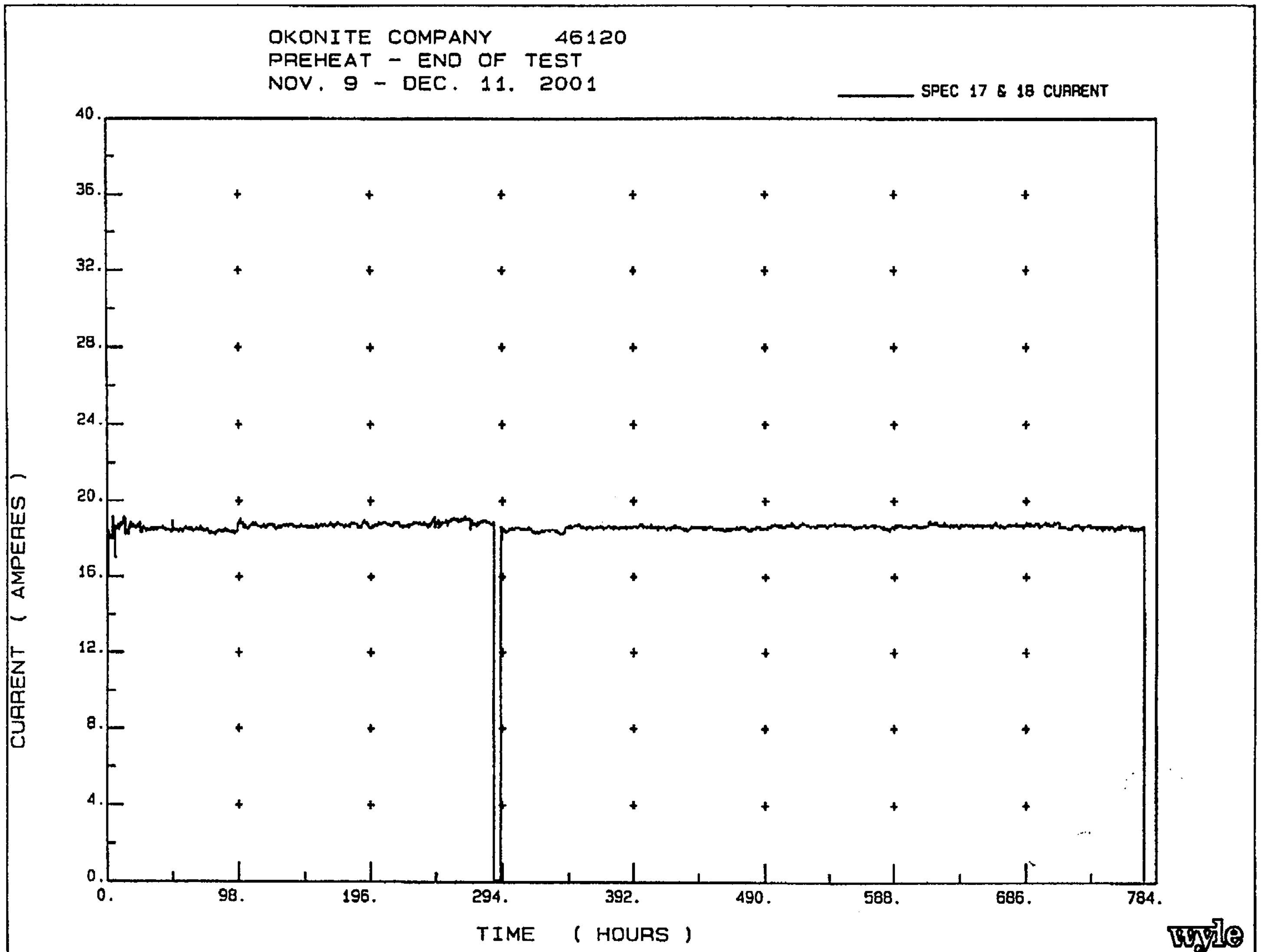
WYLE LABORATORIES
Huntsville Facility





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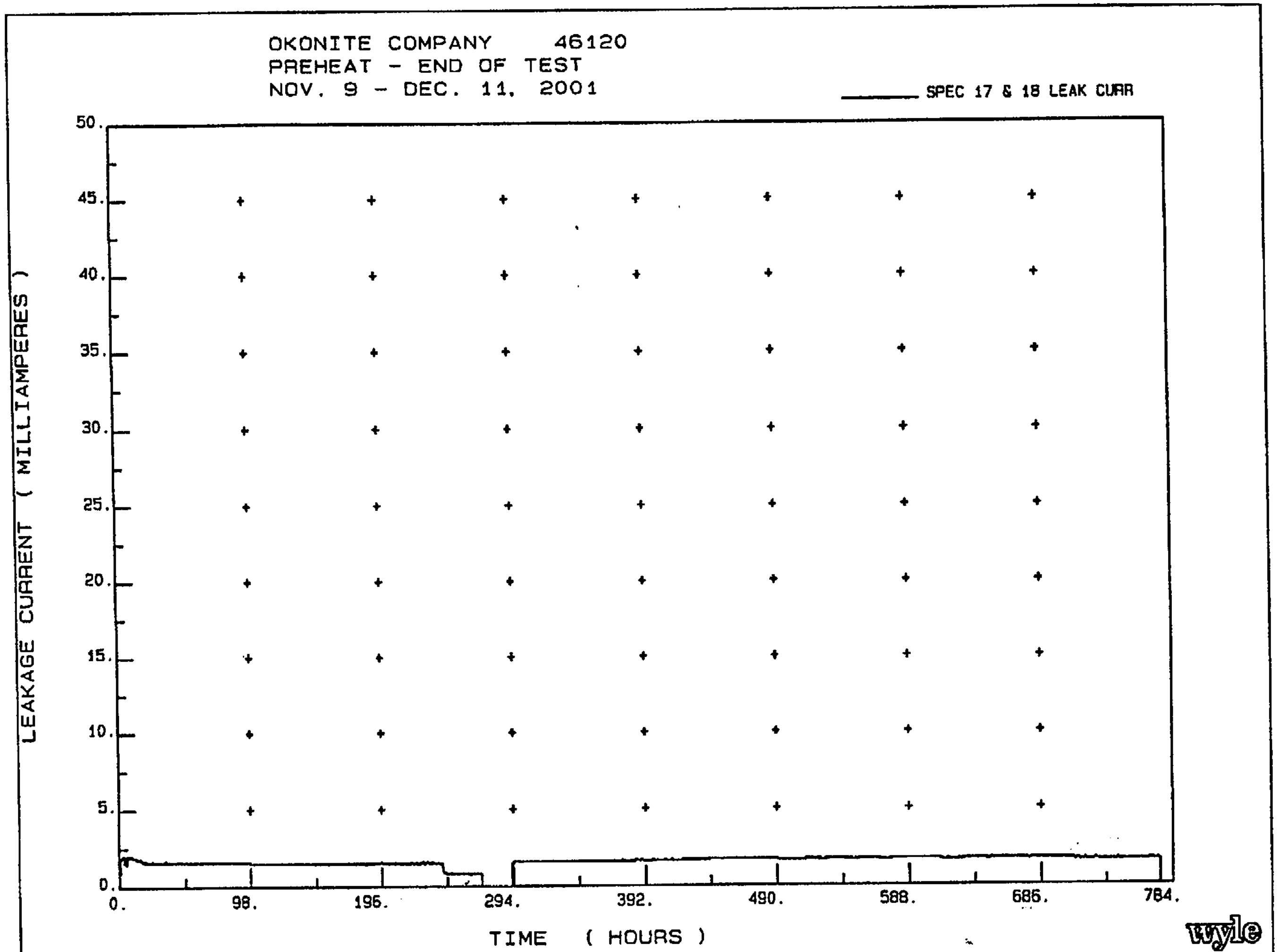

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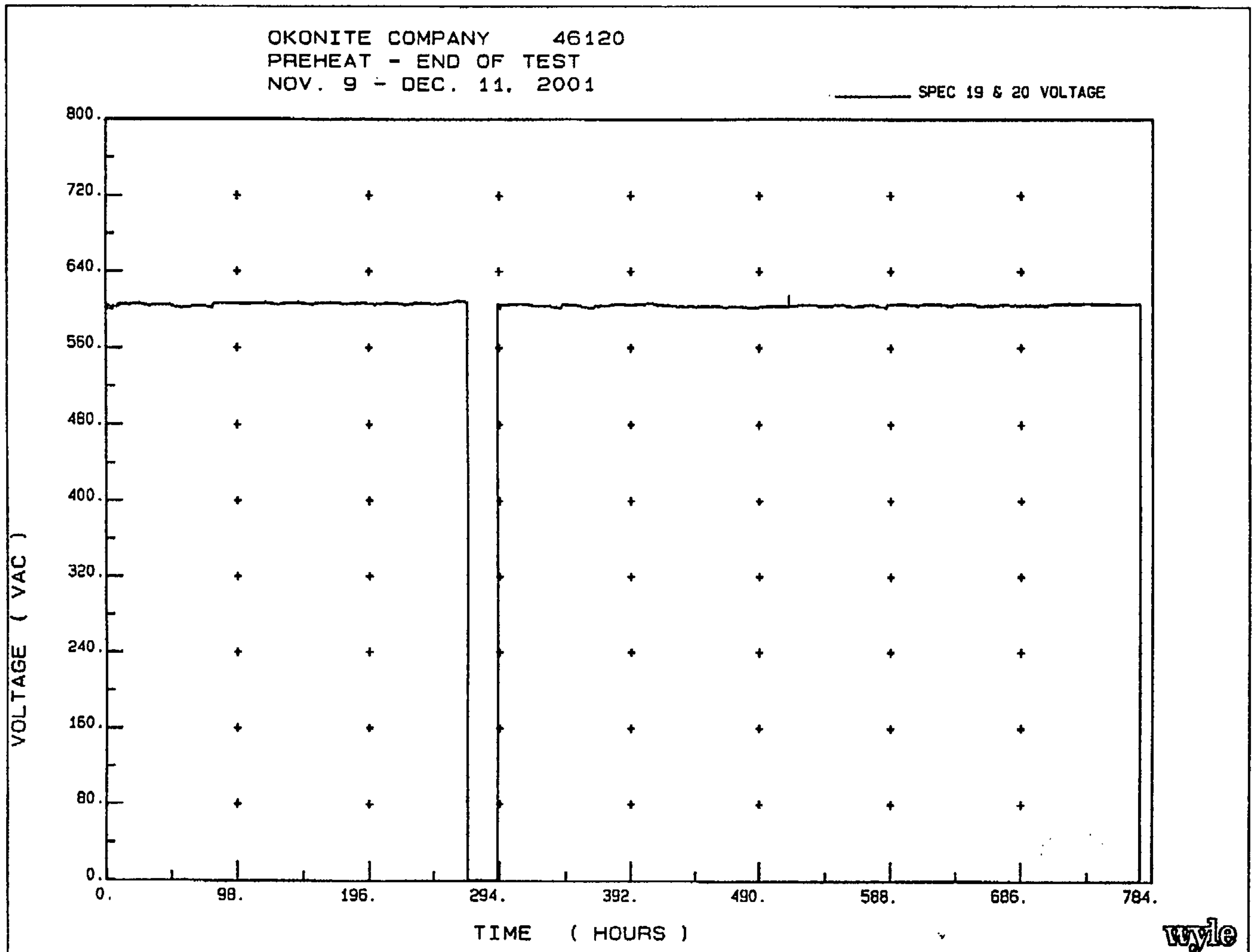

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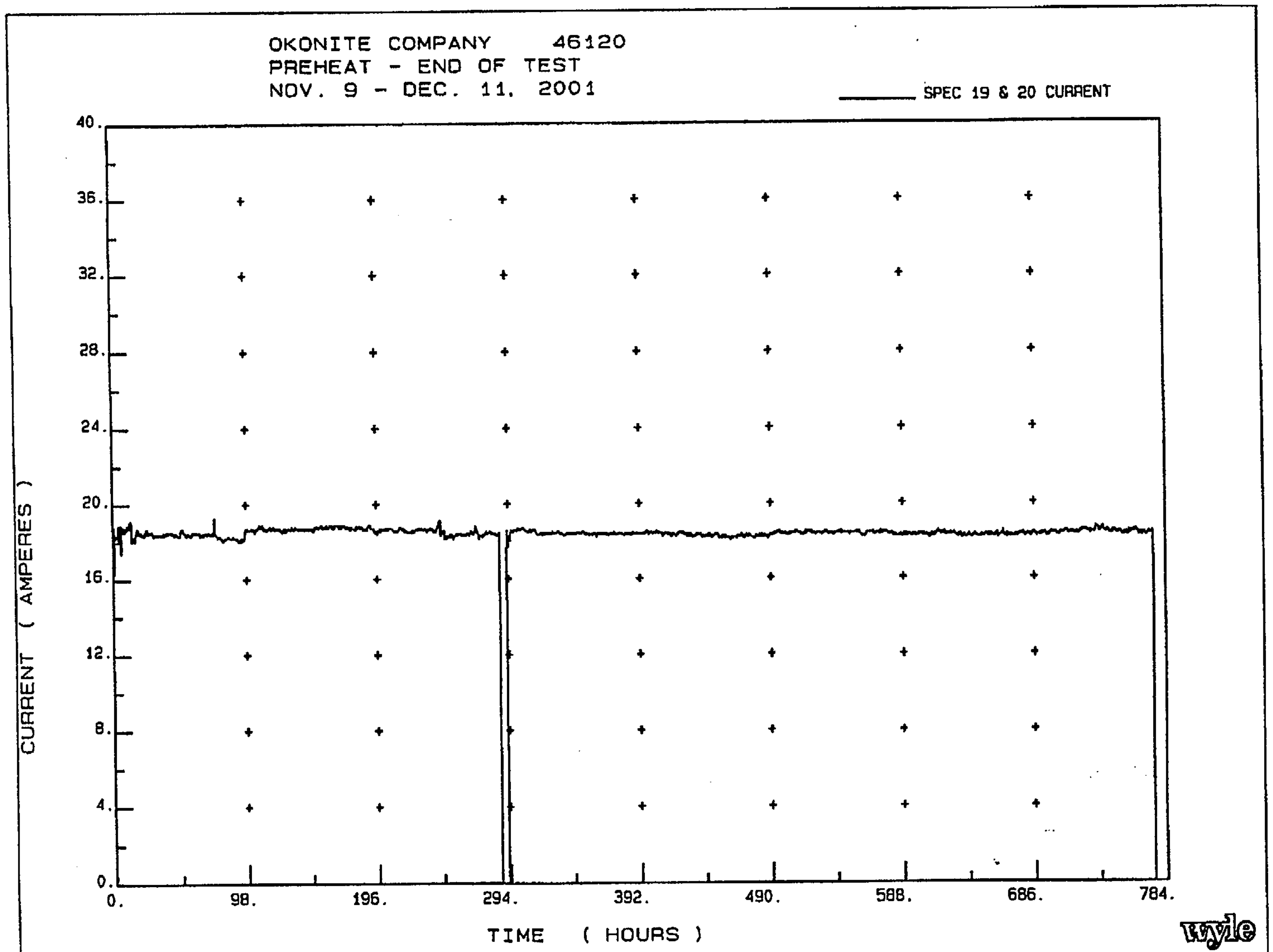

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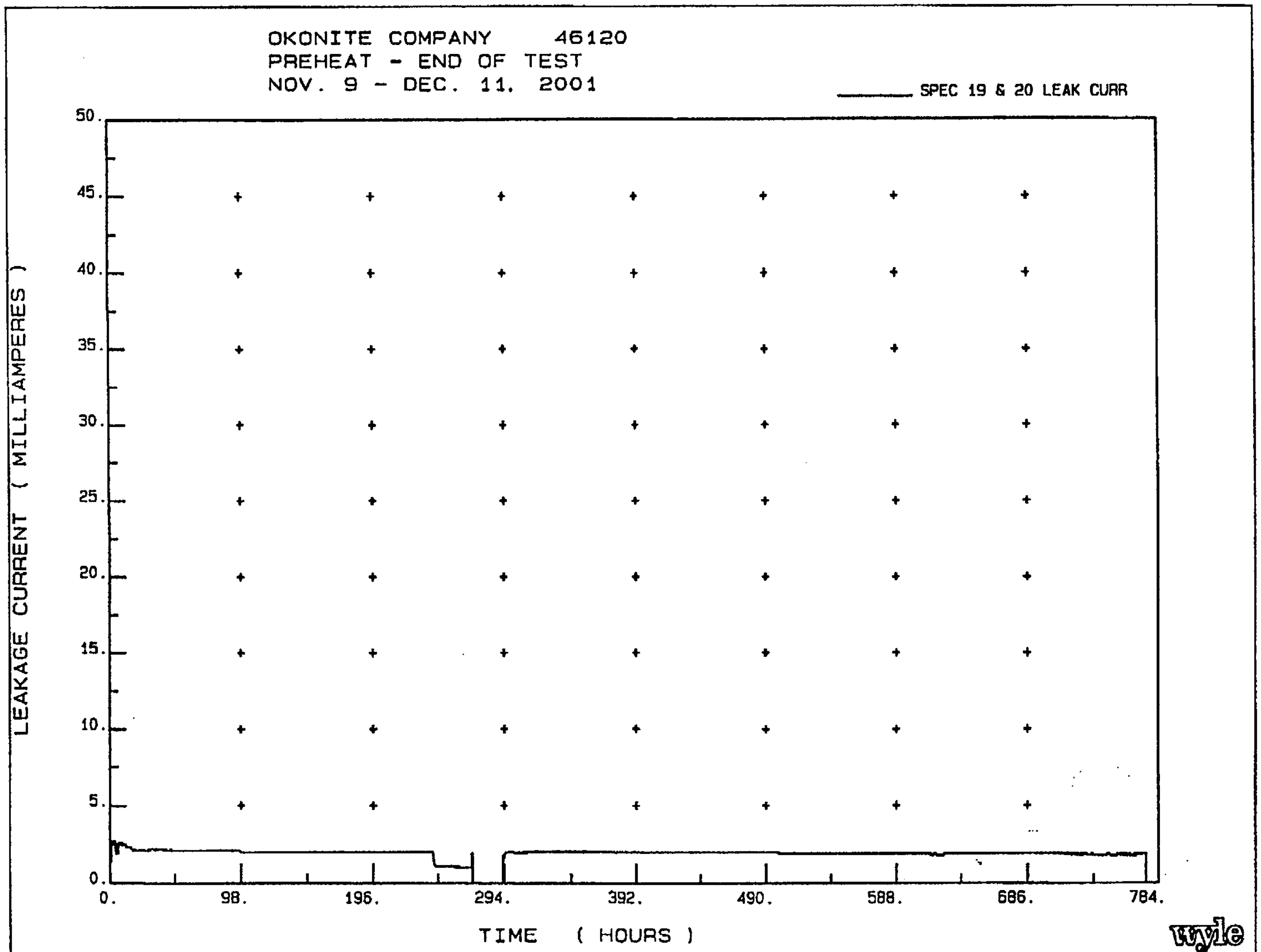

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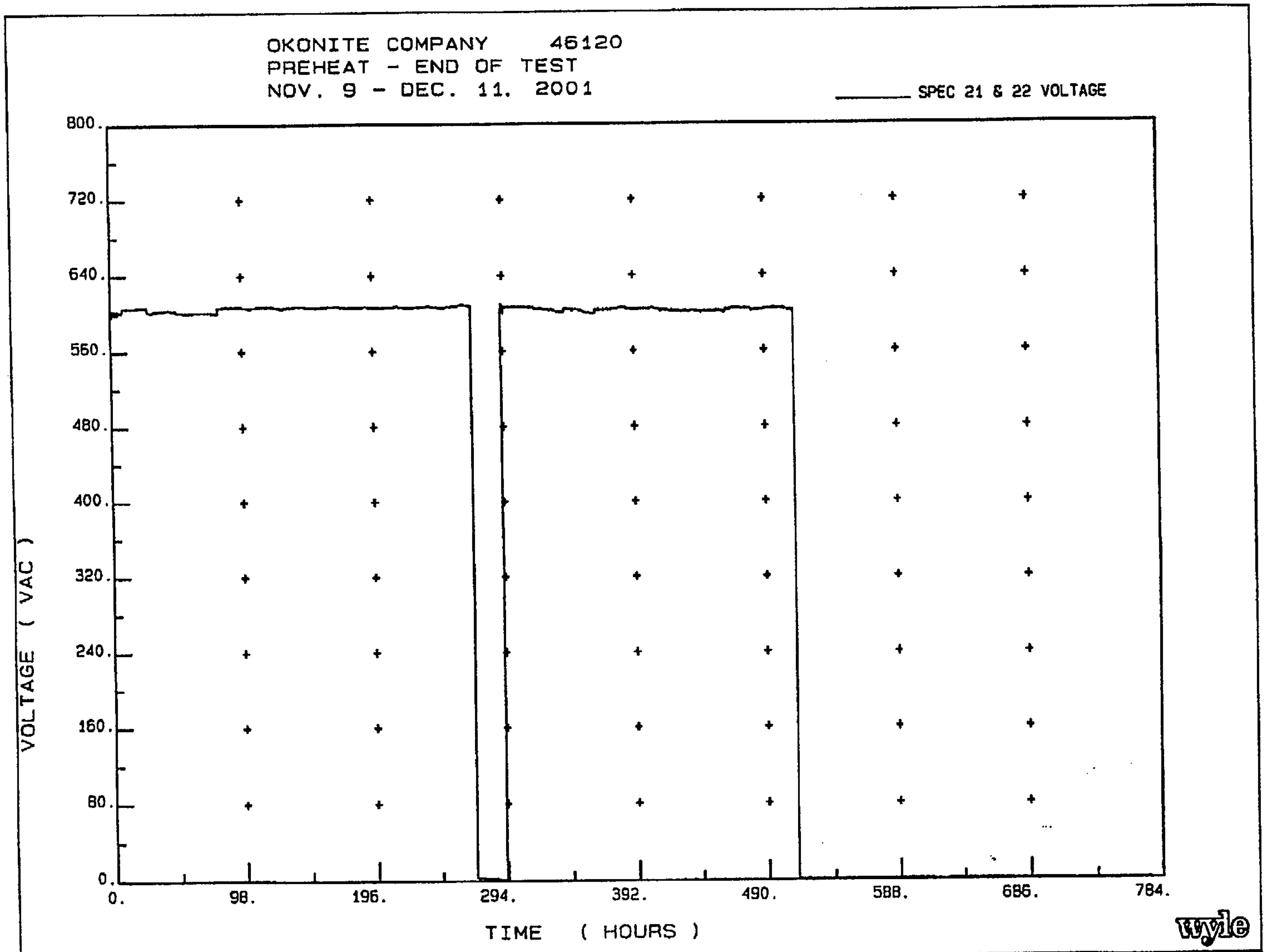

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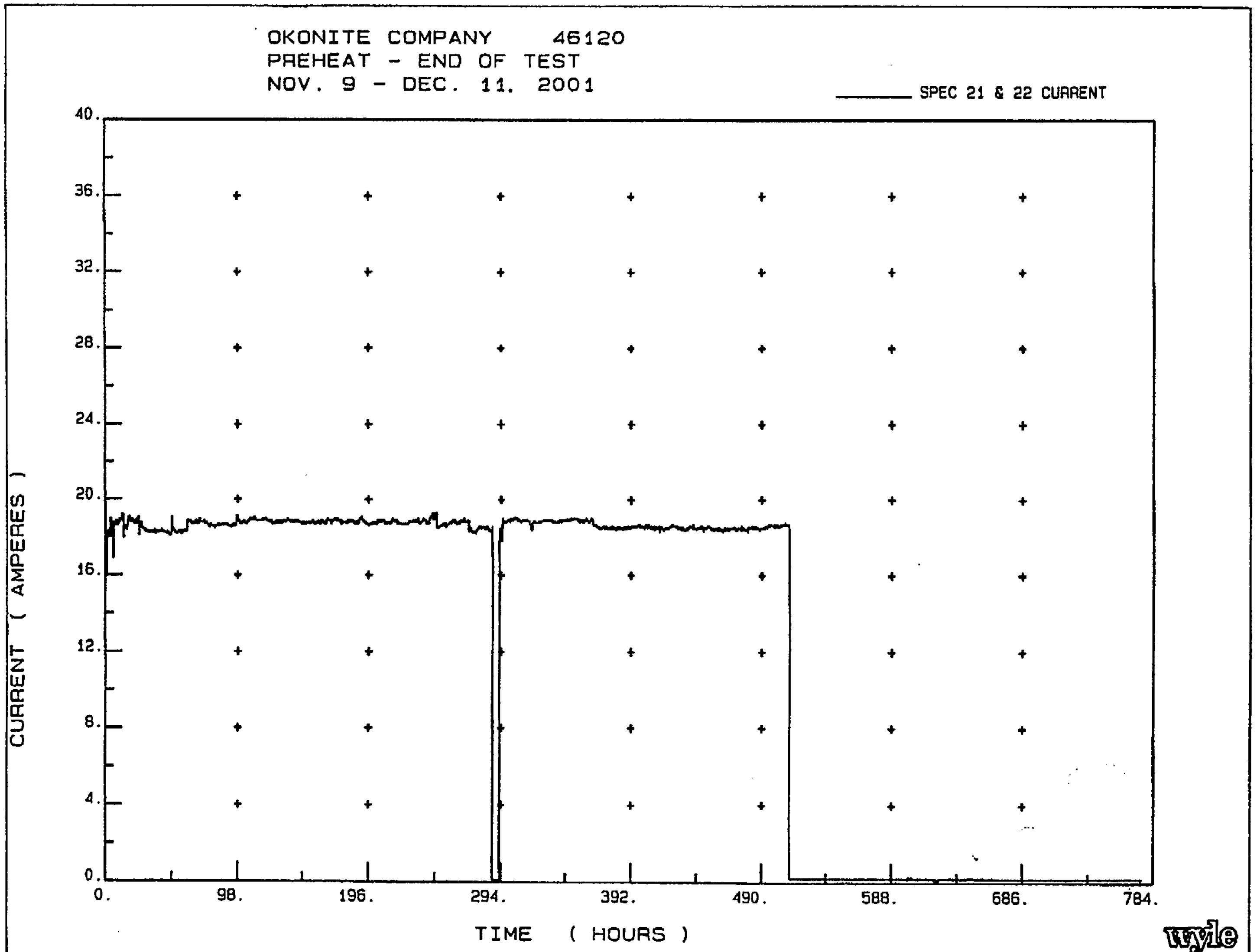

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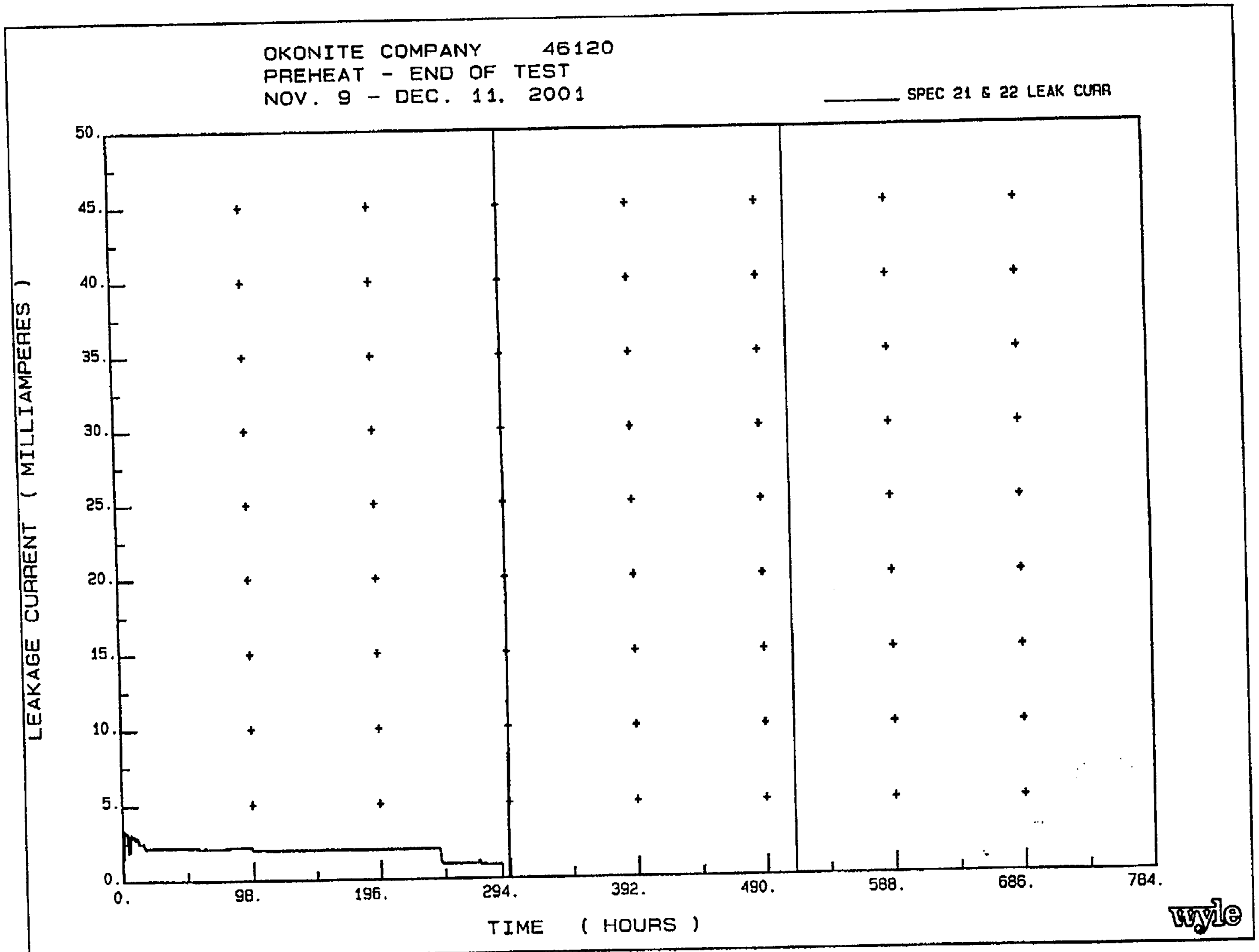

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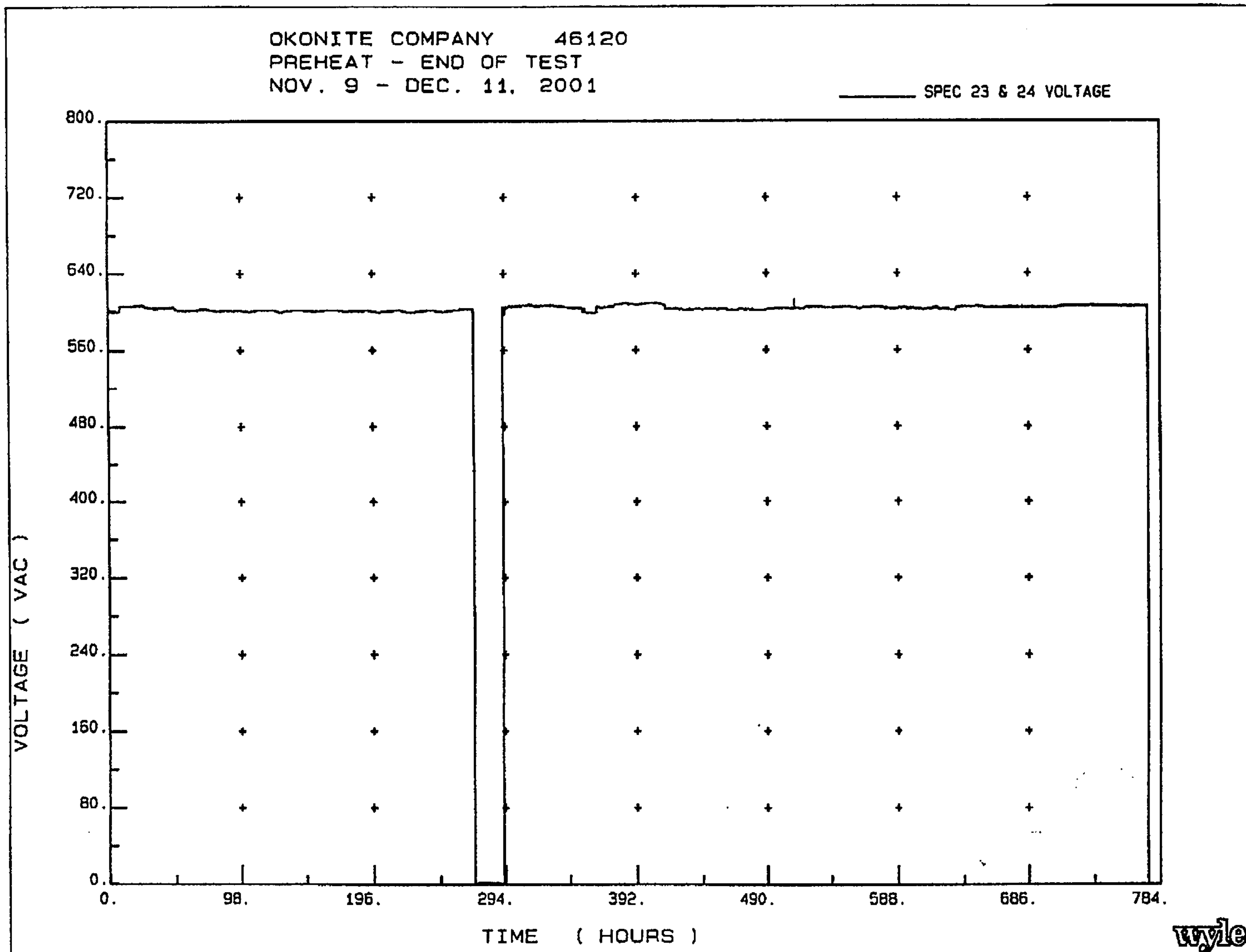

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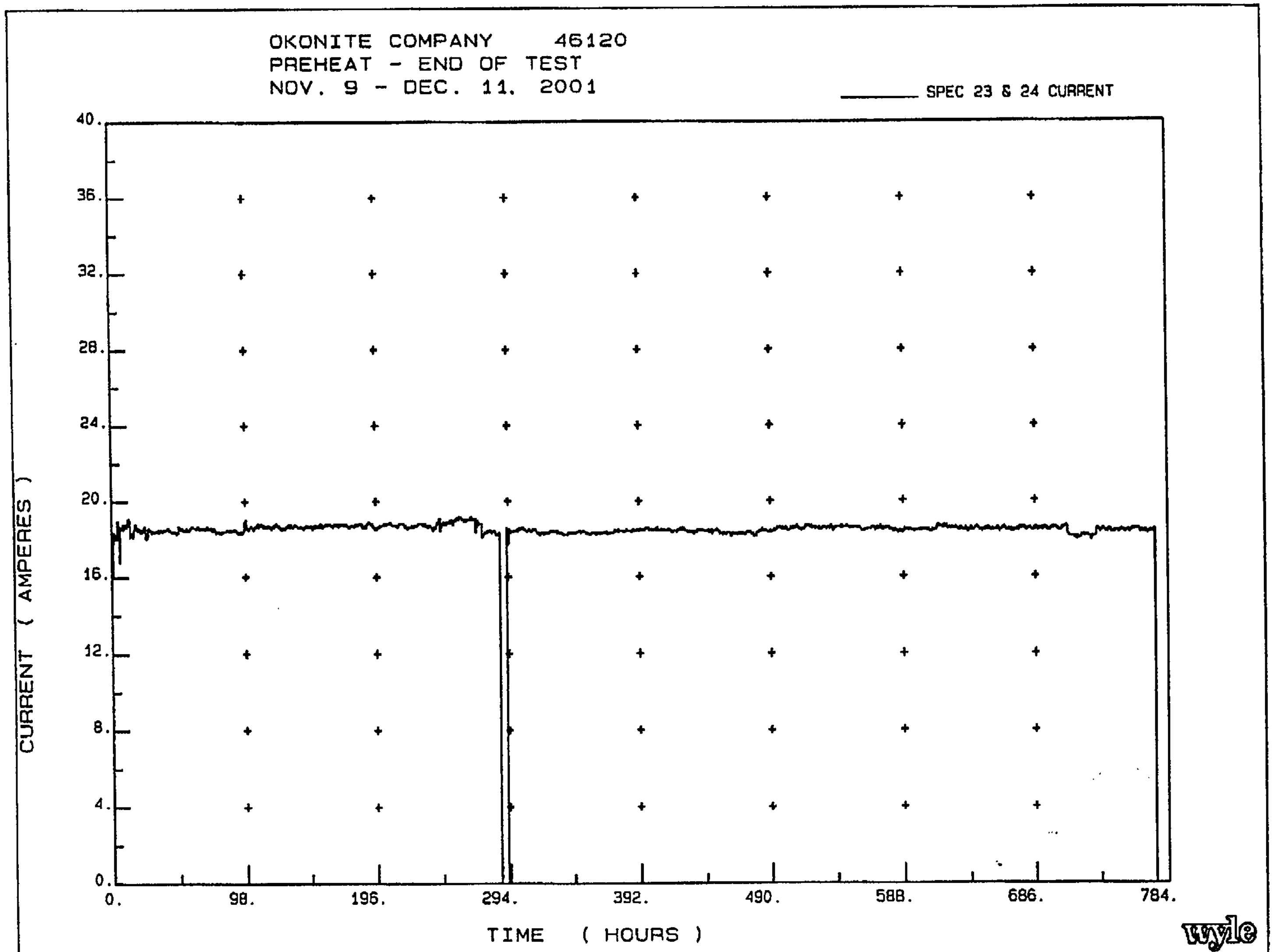

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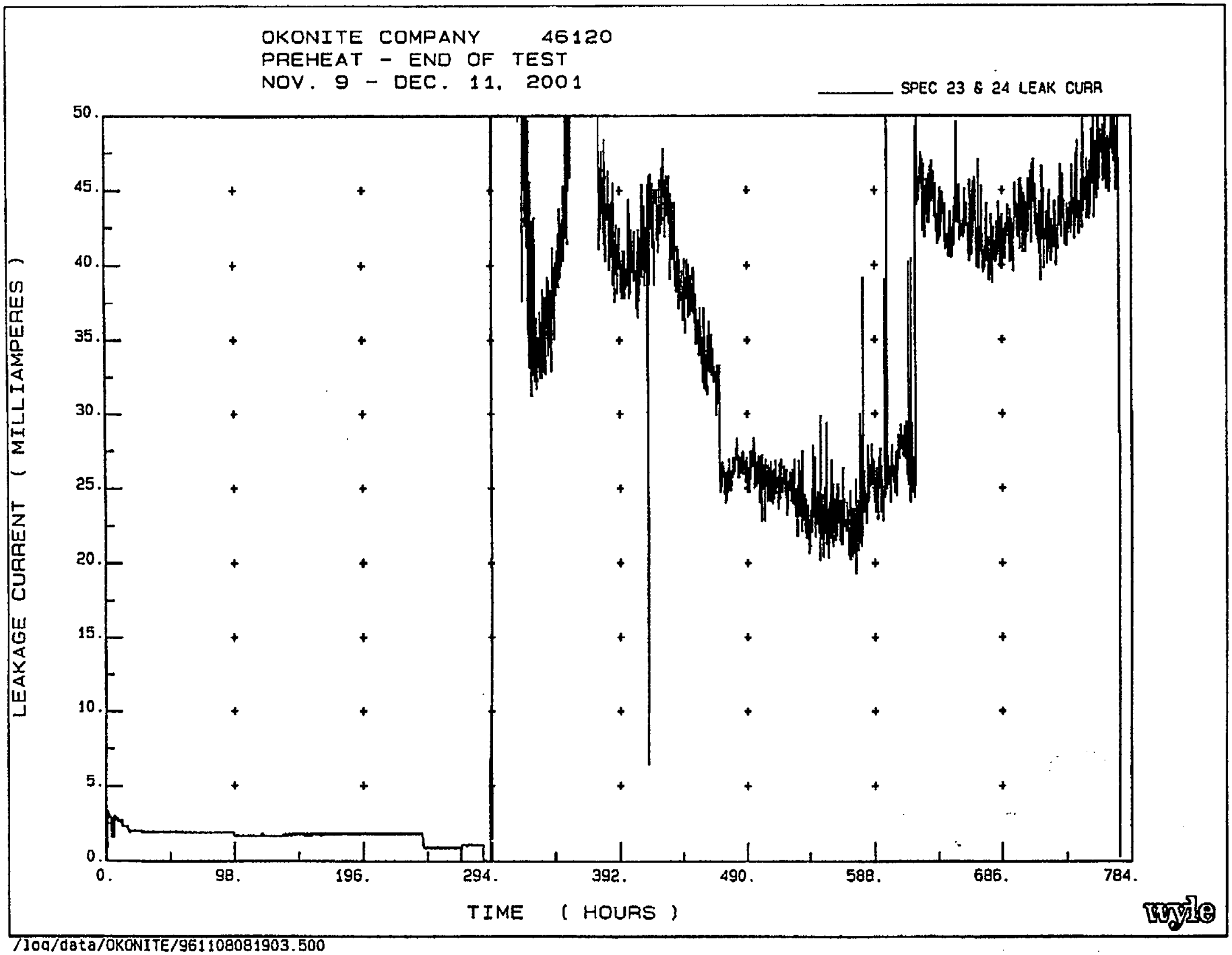
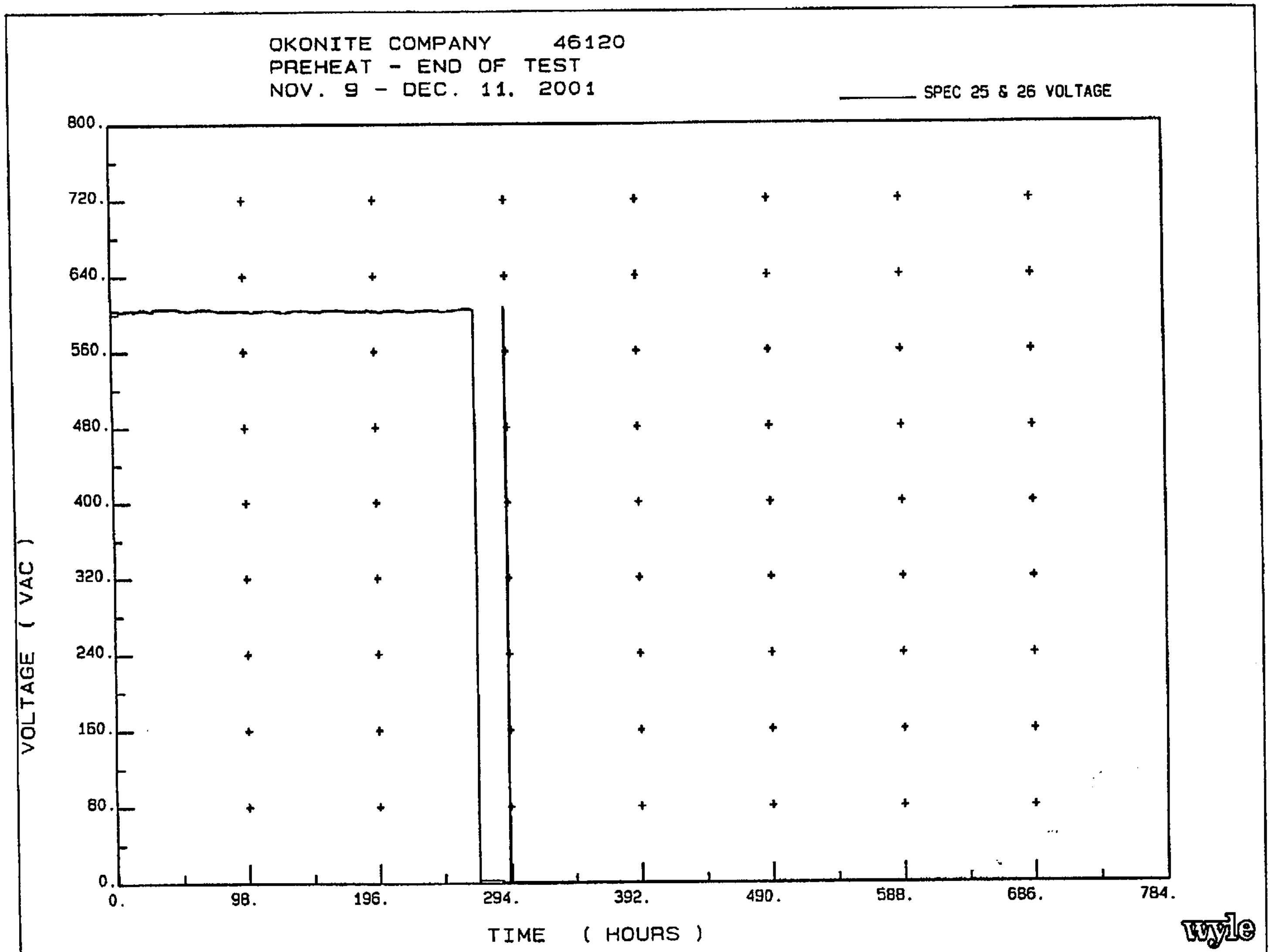

OKONITE COMPANY 46120
PREHEAT - END OF TEST
NOV. 9 - DEC. 11, 2001
SPEC 23 & 24 LEAK CURR
LEAKAGE CURRENT (MILLIAMPERES)
50.
45.
40.
35.
30.
25.
20.
15.
10.
5.
0.
0.
98.
196.
294.
392.
490.
588.
686.
784.
TIME (HOURS)
/log/data/OKONITE/961108081903.500

WYLE LABORATORIES
Huntsville Facility



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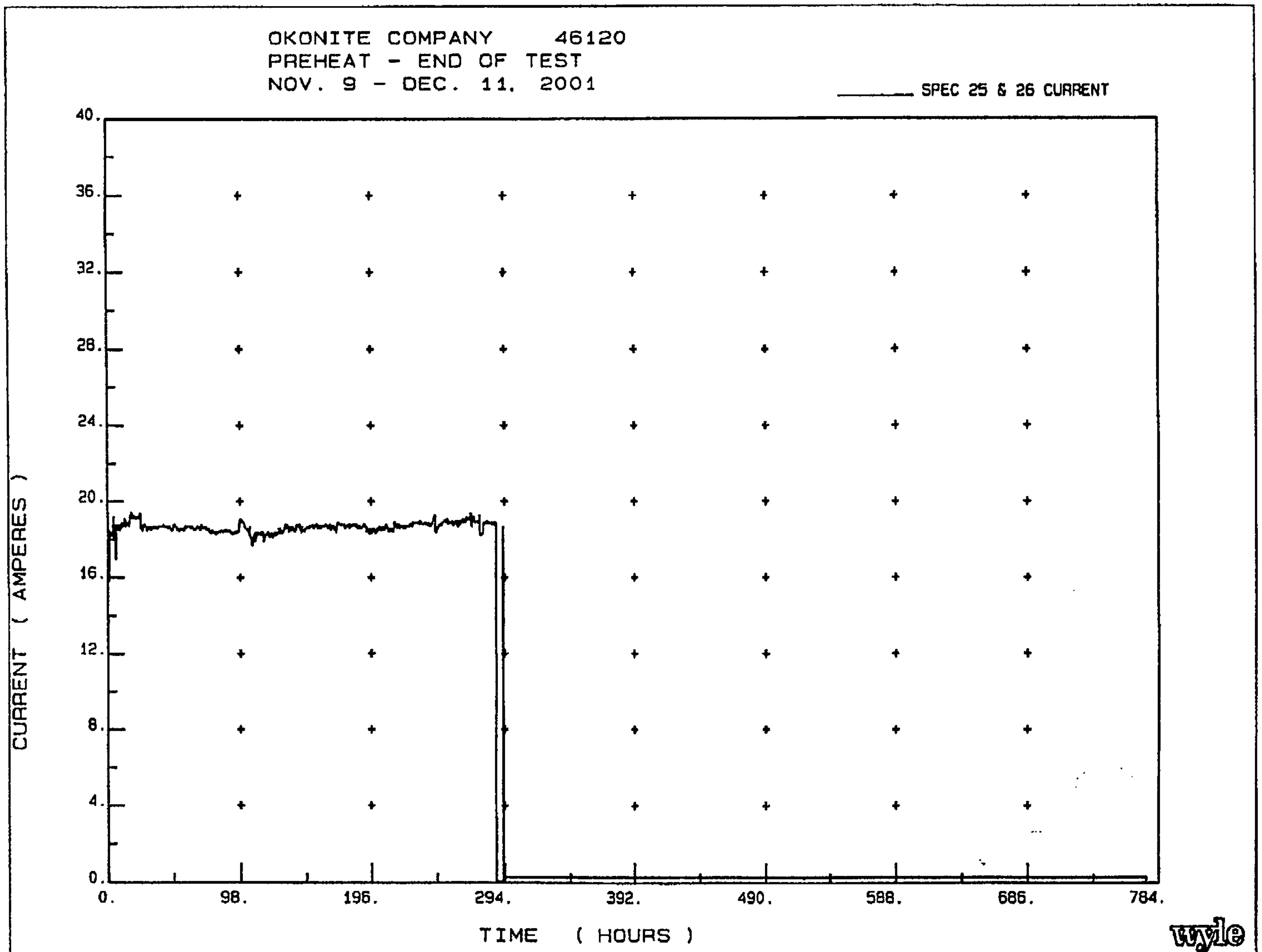

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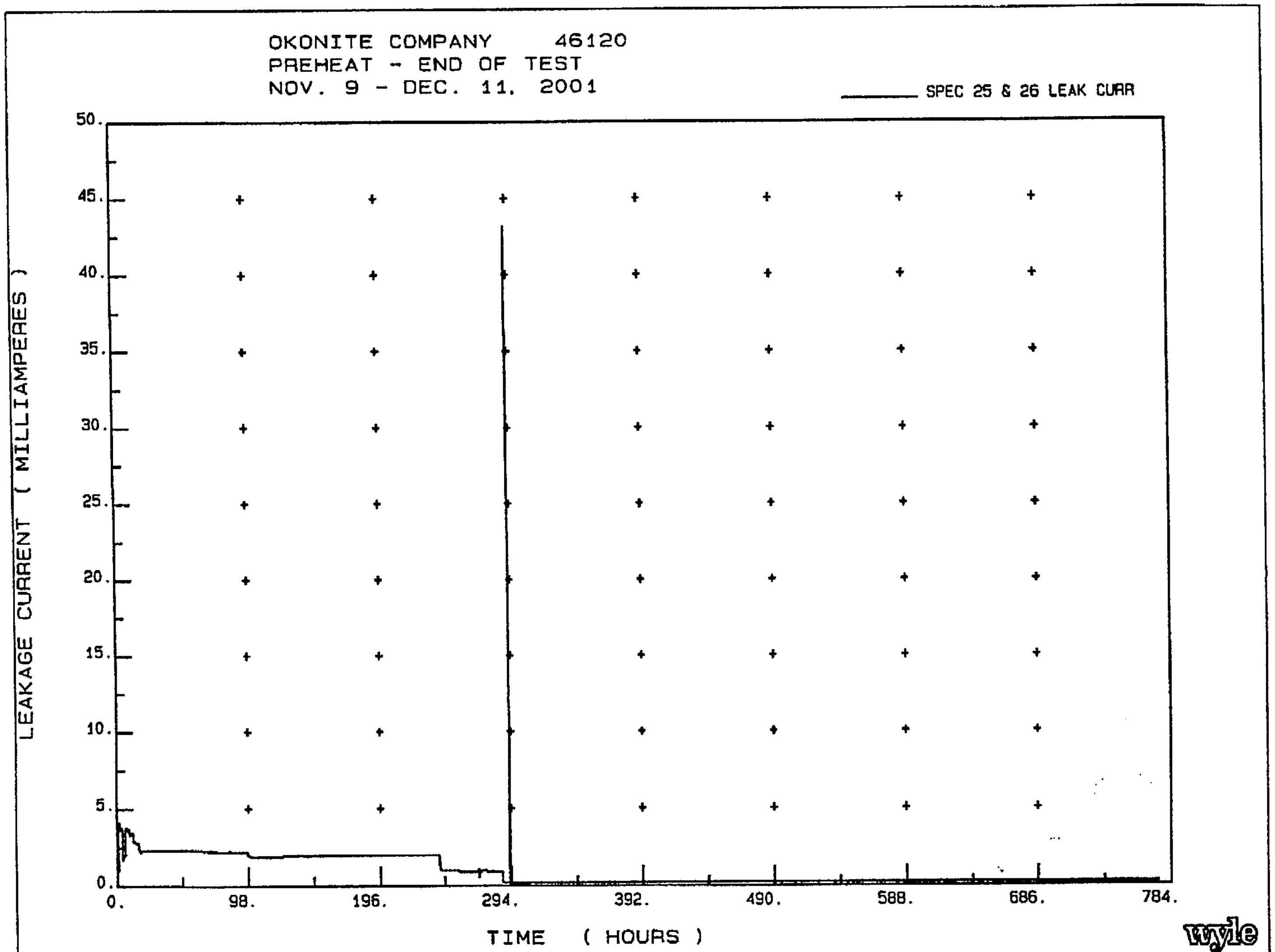

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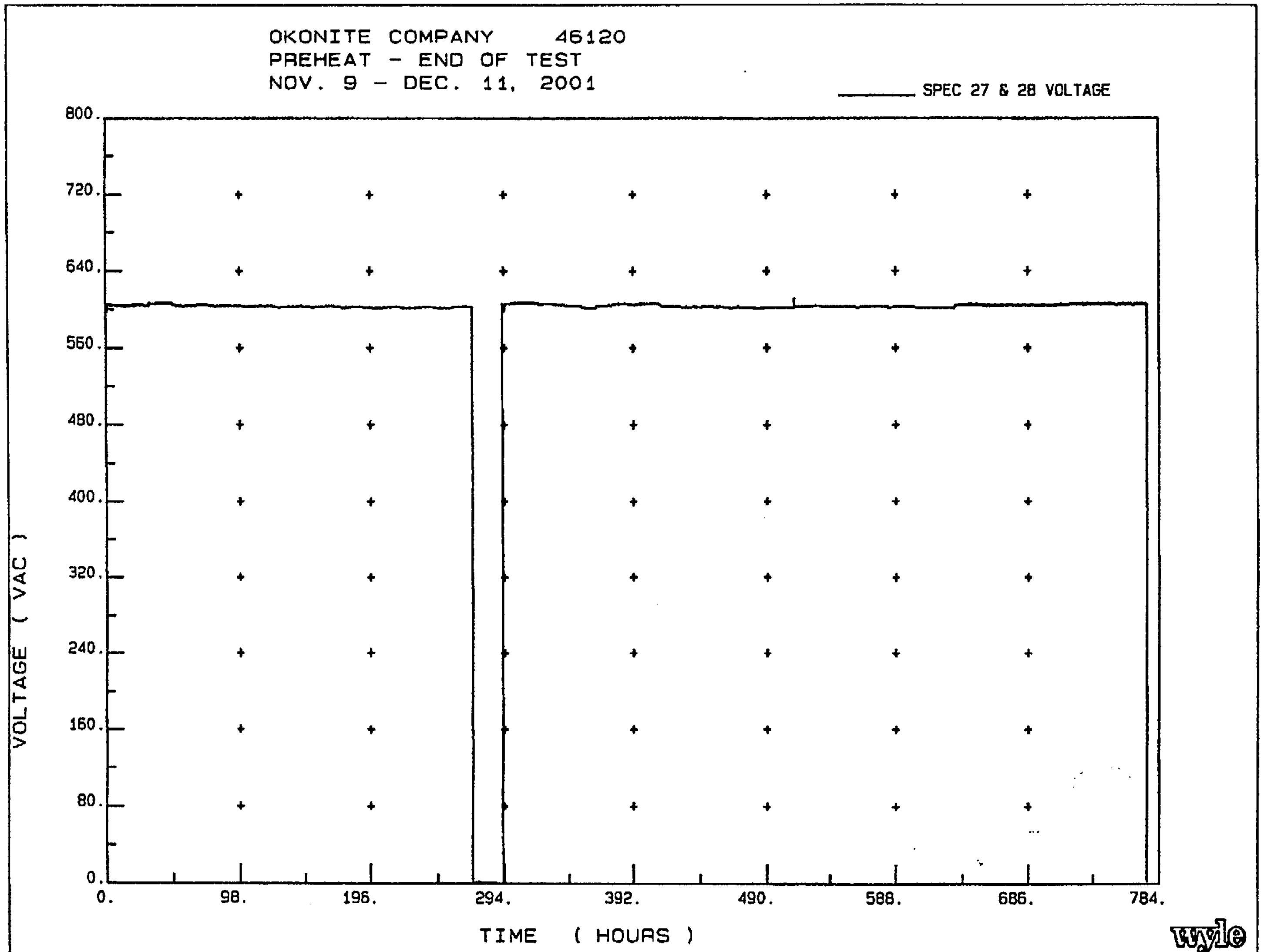

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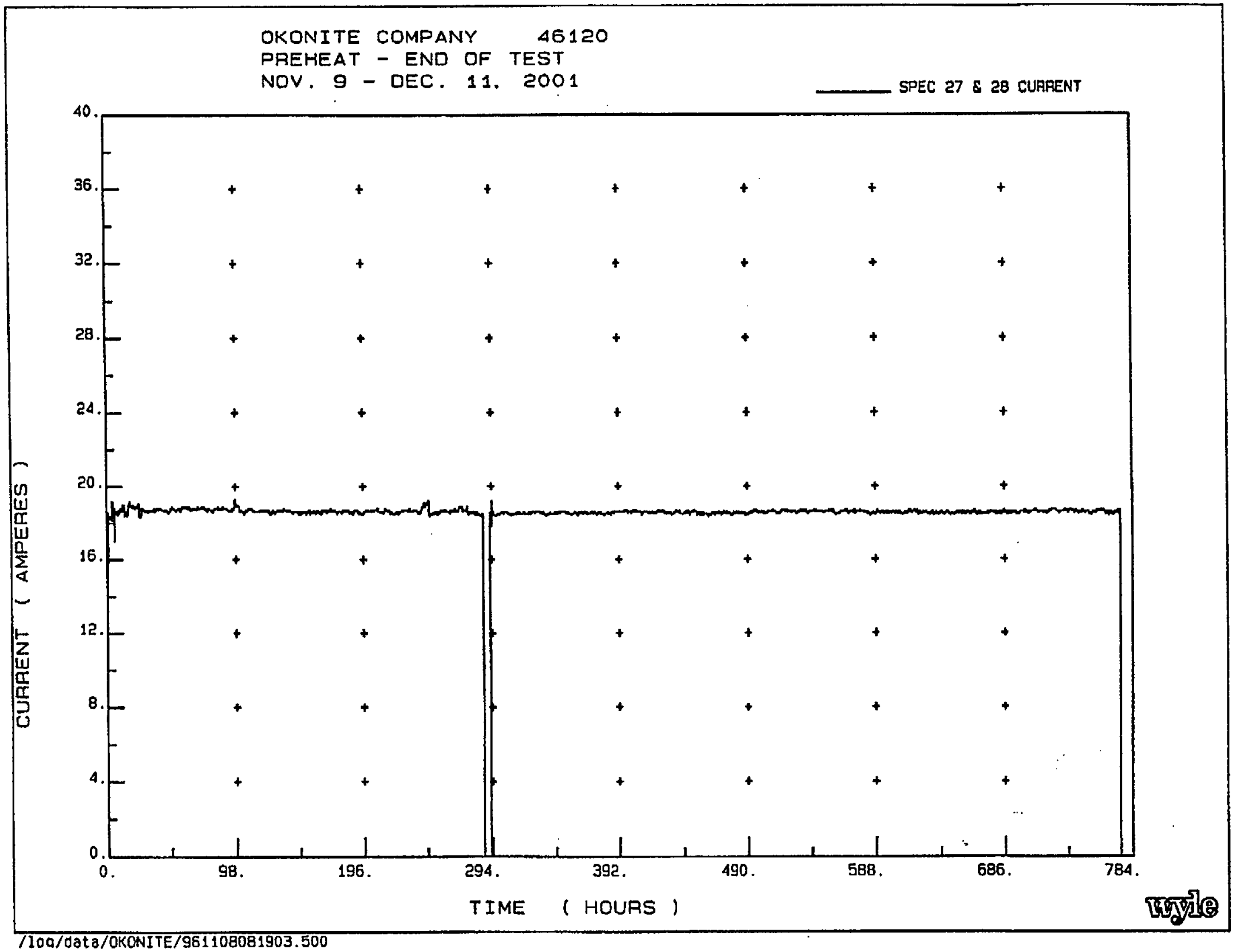
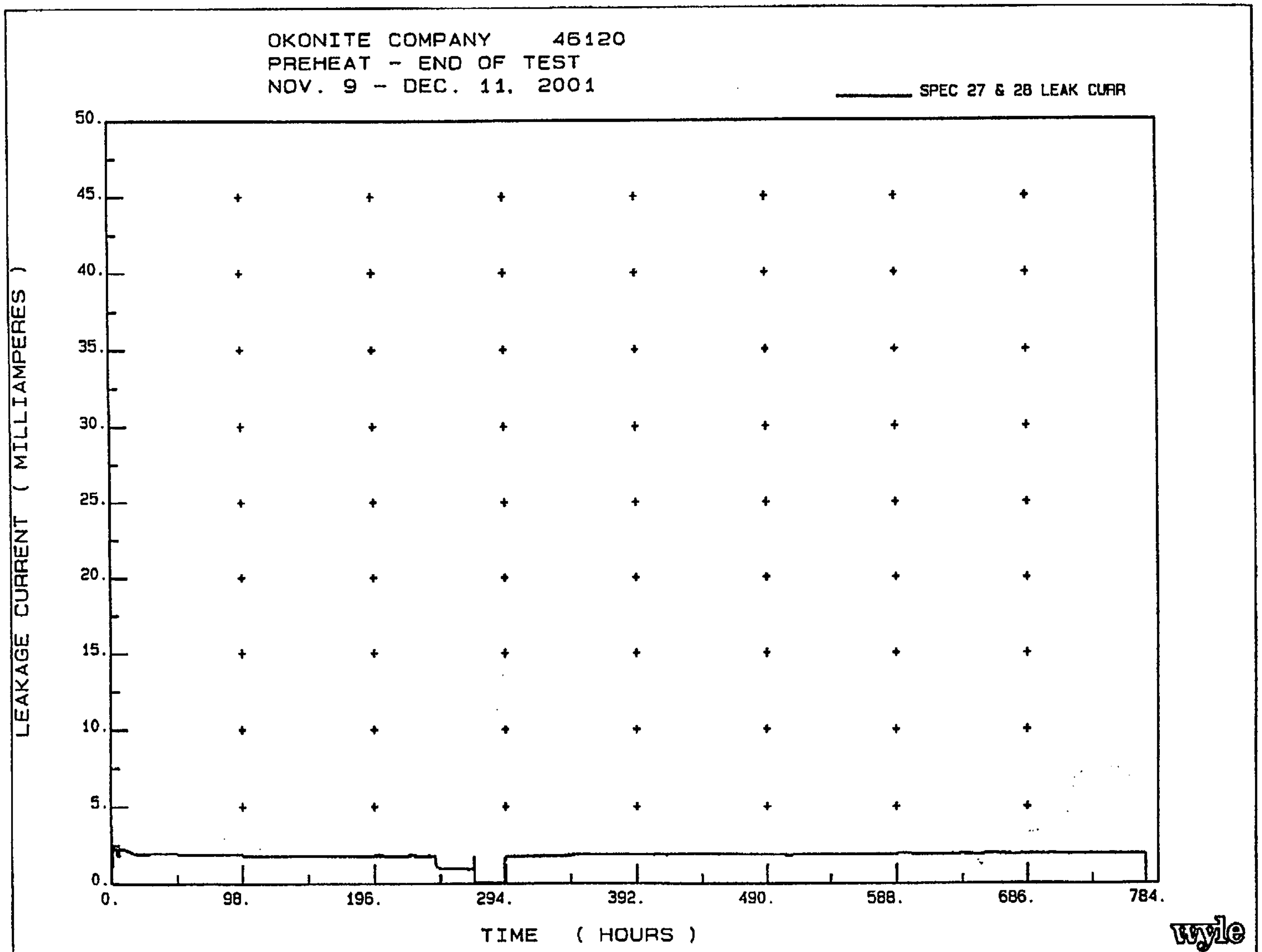

OKONITE COMPANY 46120
PREHEAT - END OF TEST
NOV. 9 - DEC. 11, 2001
SPEC 27 & 28 CURRENT
CURRENT (AMPERES)
40.
36.
32.
28.
24.
20.
16.
12.
8.
4.
0.
0.
98.
196.
294.
392.
490.
588.
686.
784.
TIME (HOURS)
/log/data/OKONITE/961108081903.500



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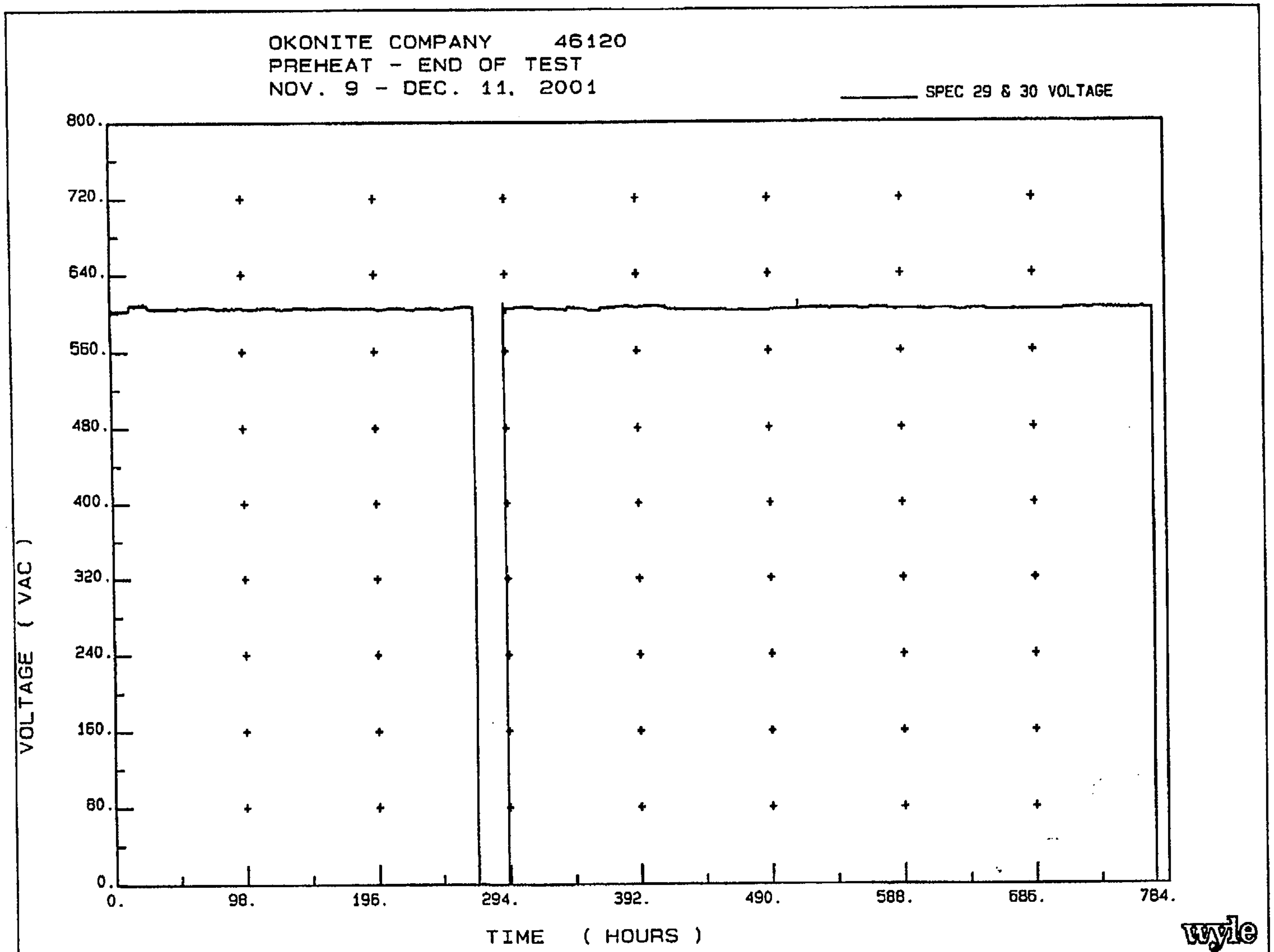

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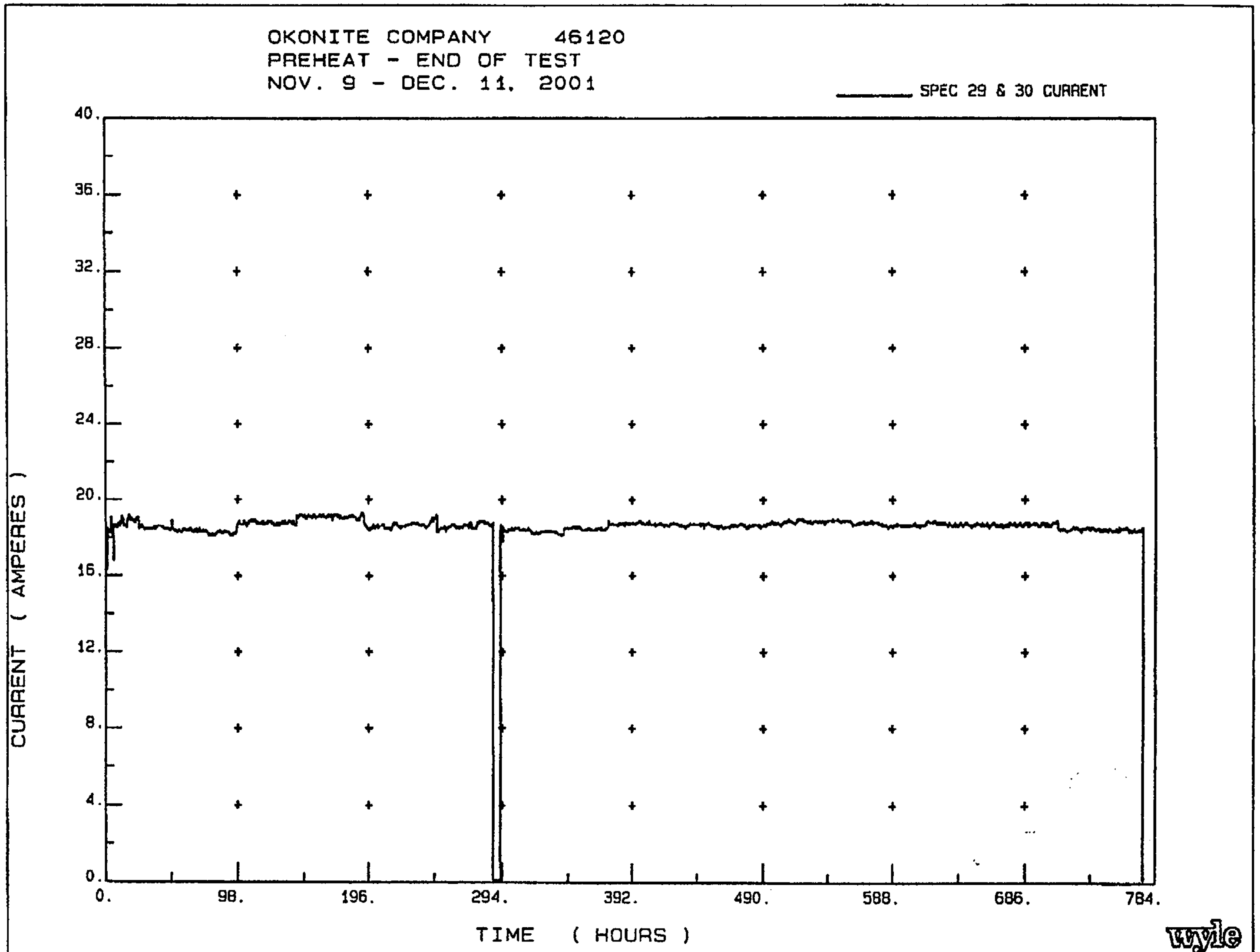

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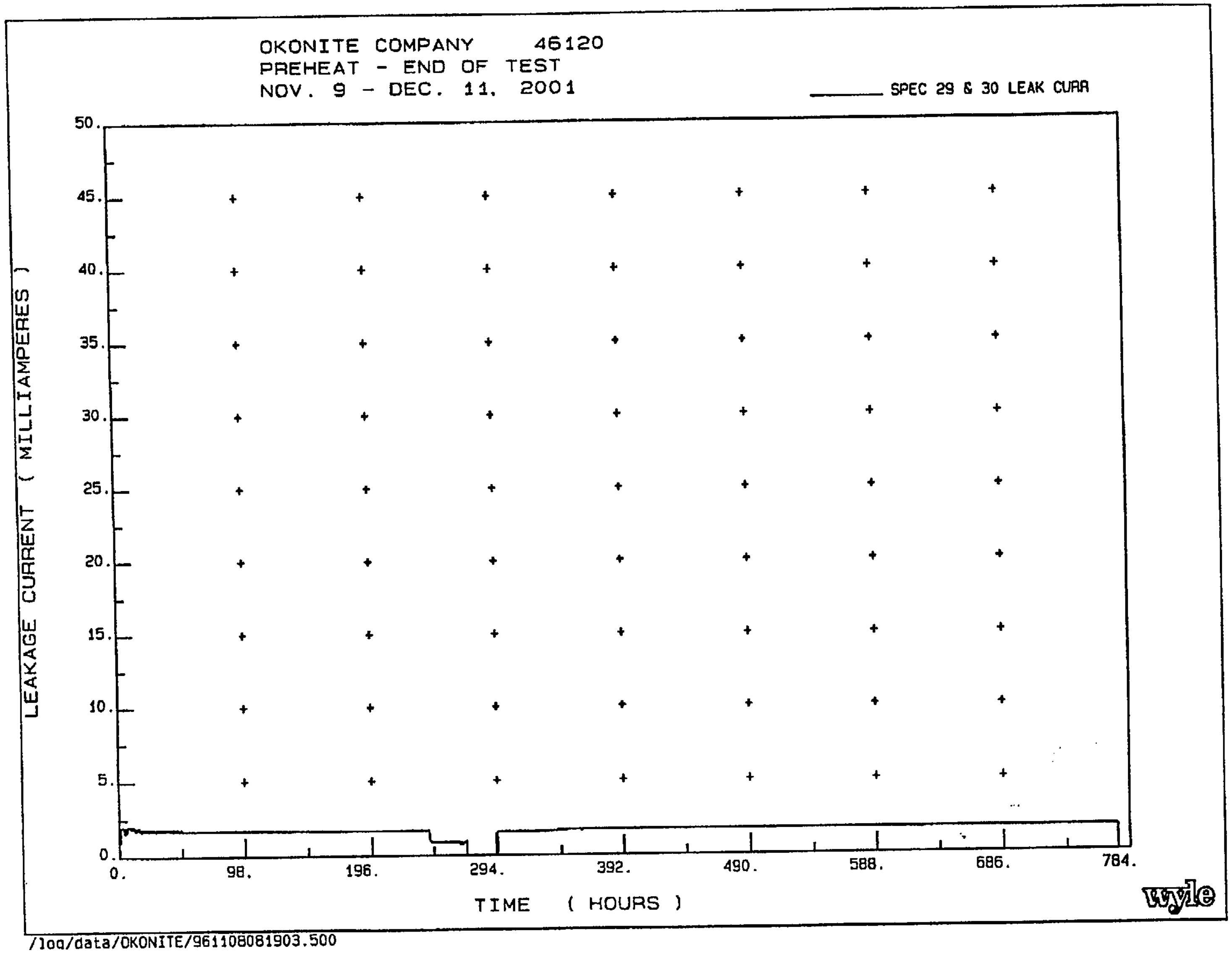
OKONITE COMPANY 46120
PREHEAT - END OF TEST
NOV. 9 - DEC. 11, 2001
SPEC 29 & 30 LEAK CURR
LEAKAGE CURRENT (MILLIAMPERES)
50.
45.
40.
35.
30.
25.
20.
15.
10.
5.
0.
0.
98.
196.
294.
392.
490.
588.
686.
784.
TIME (HOURS)
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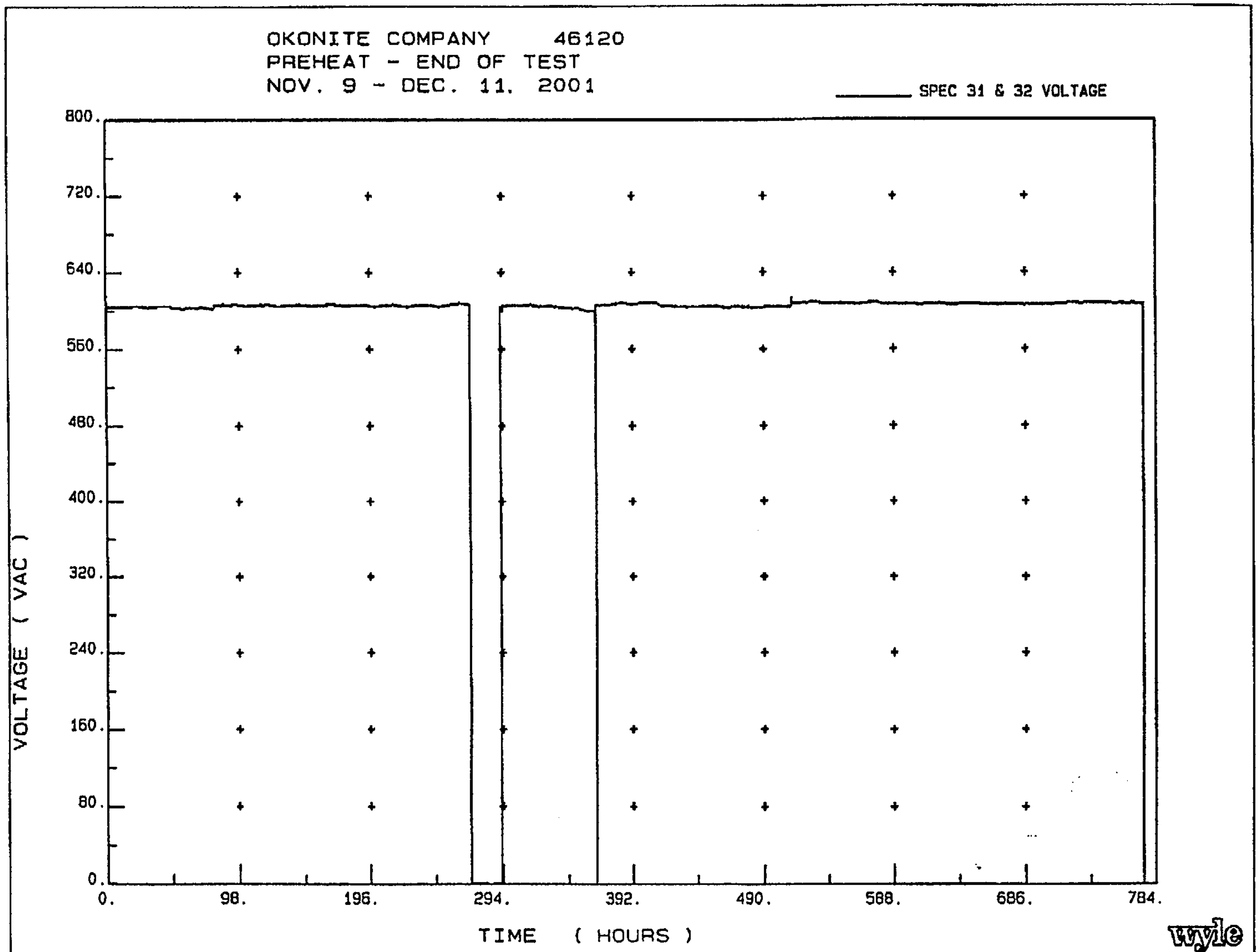

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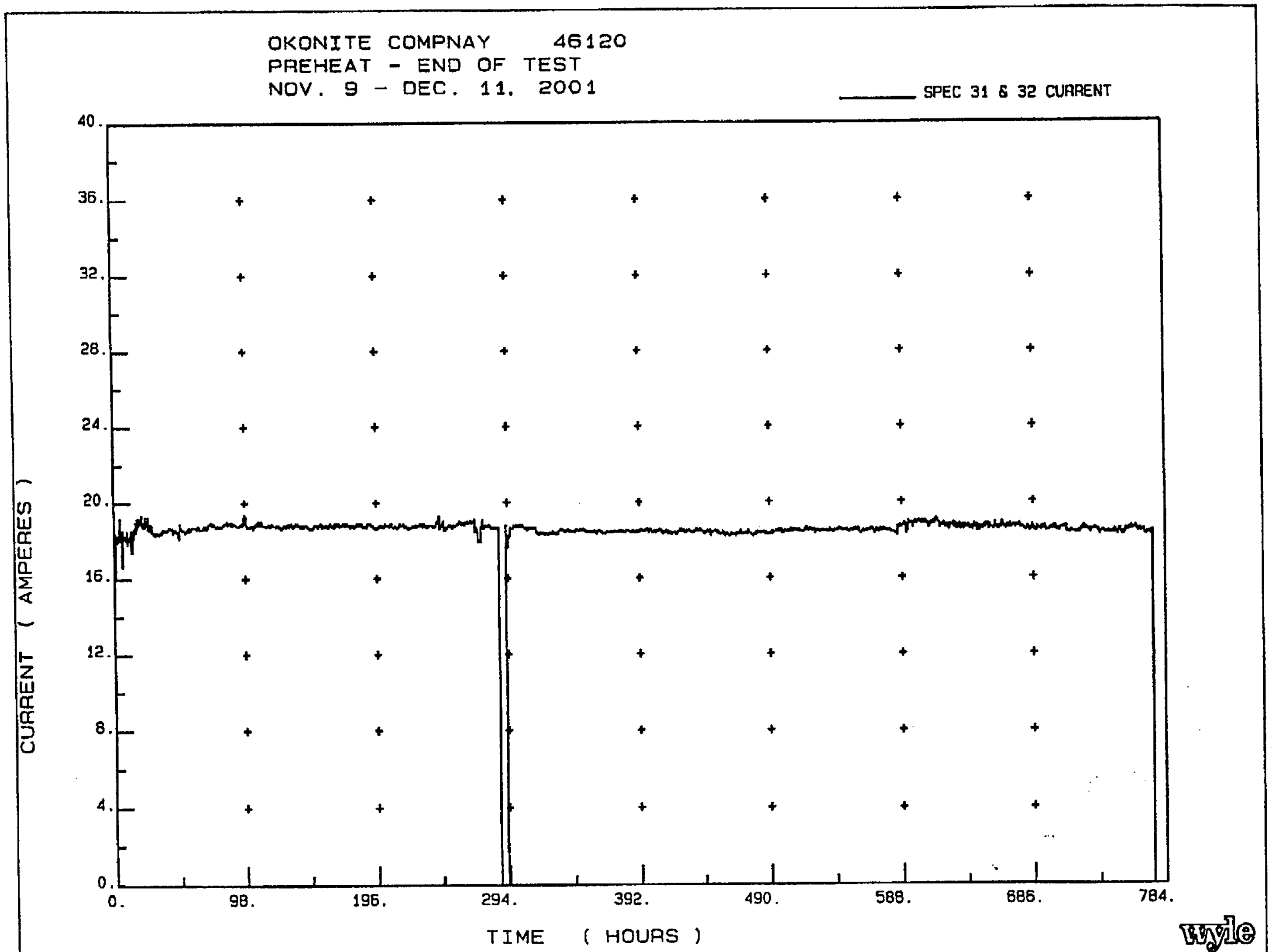

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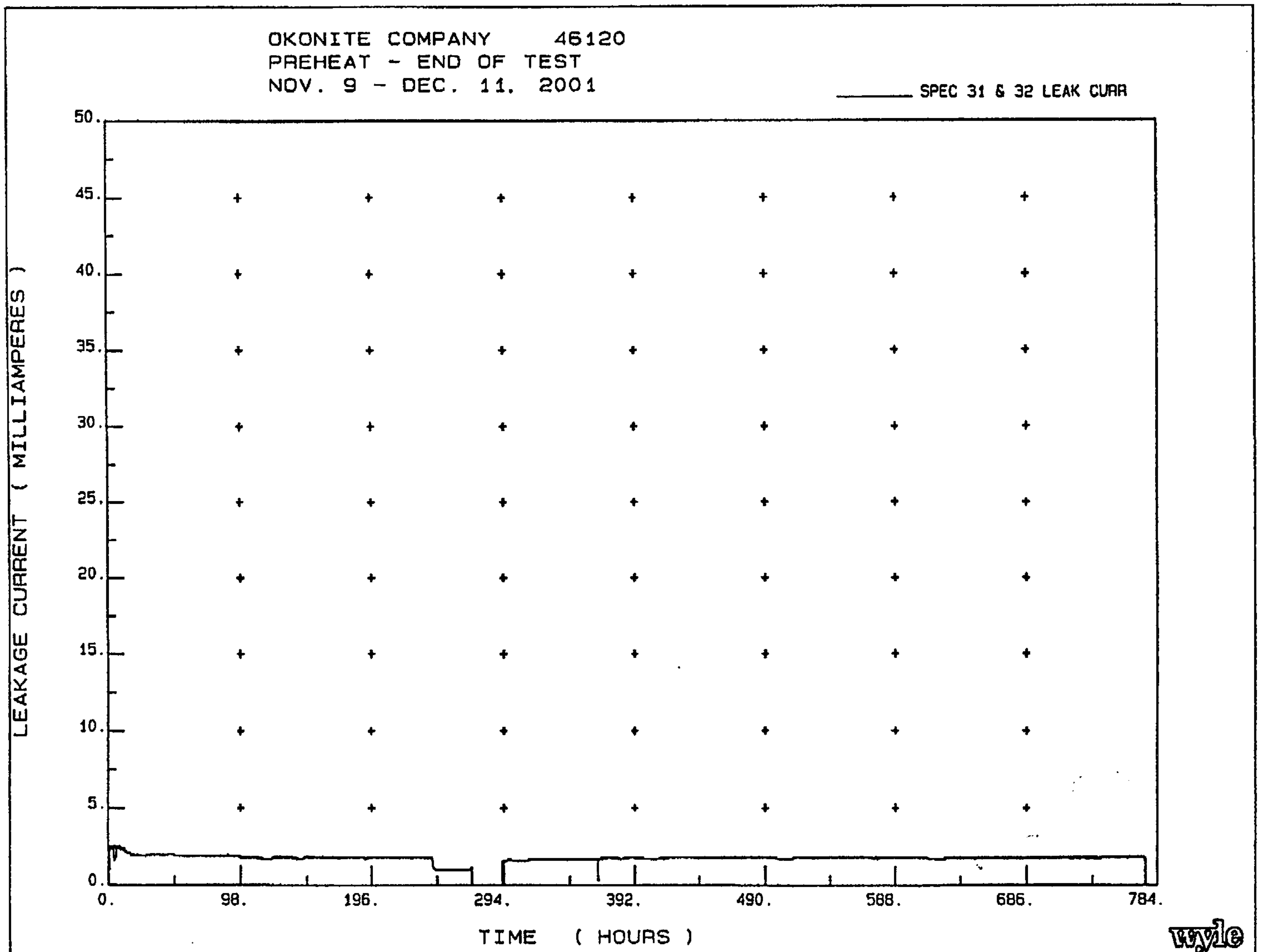

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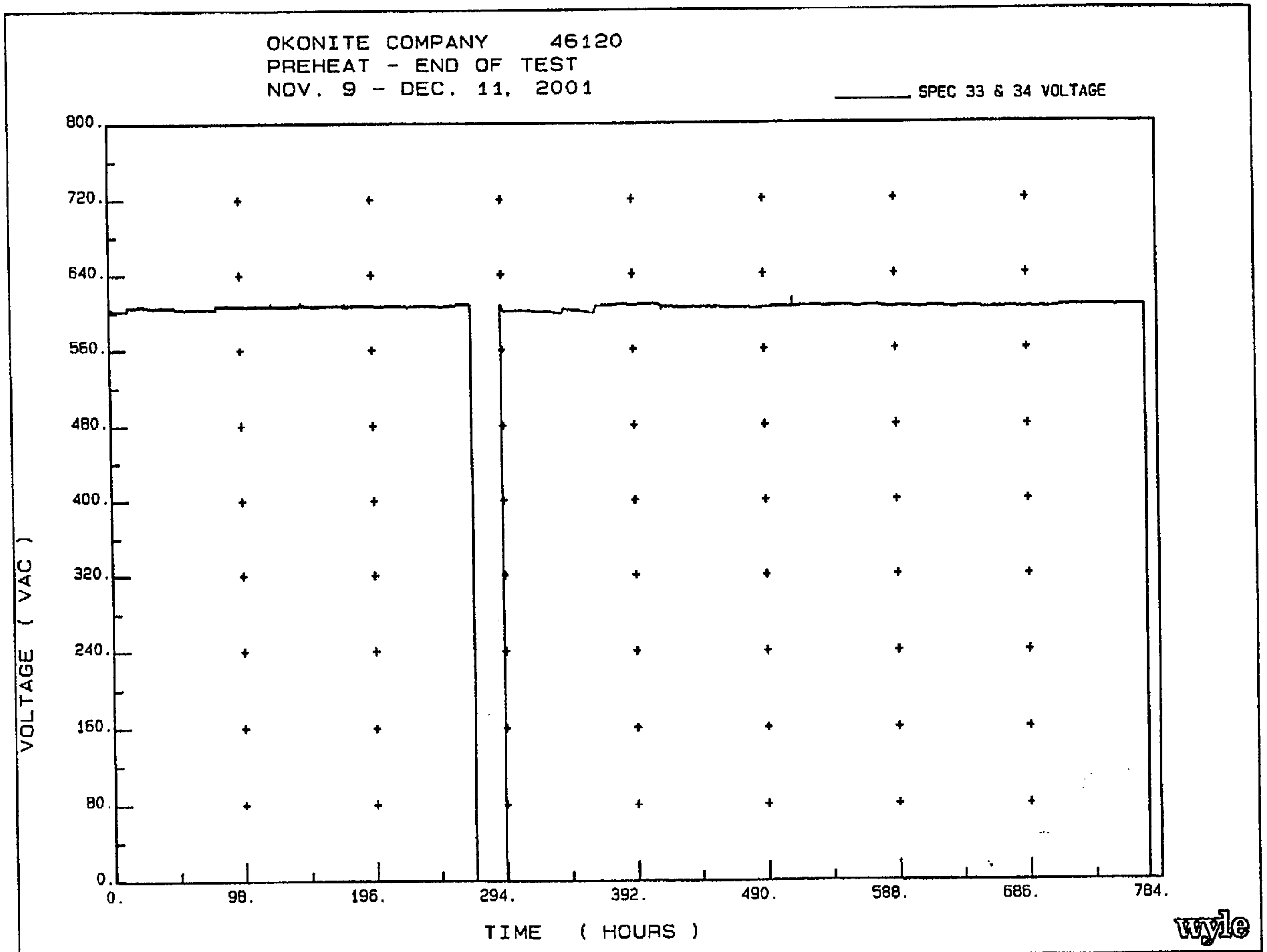

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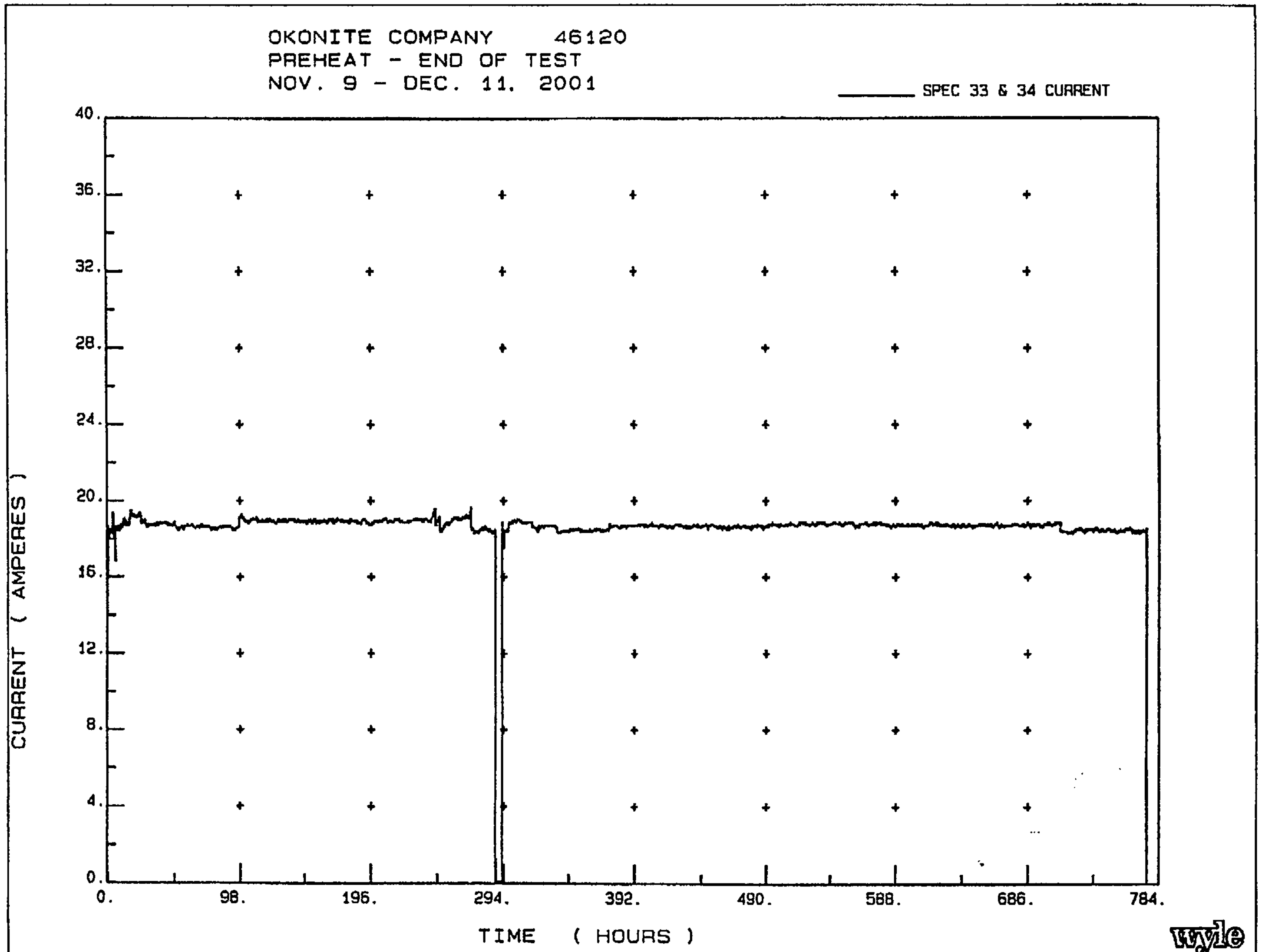

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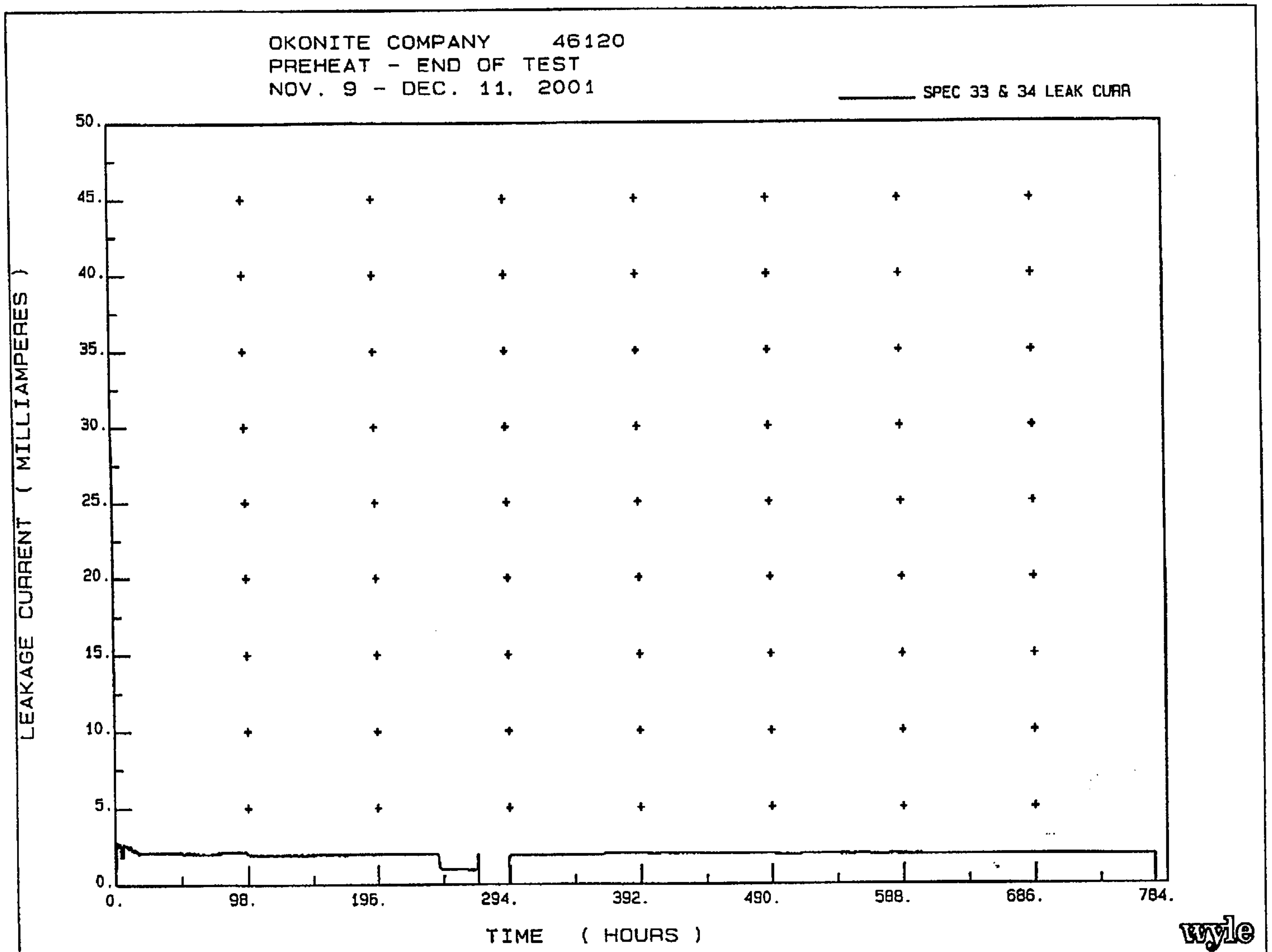

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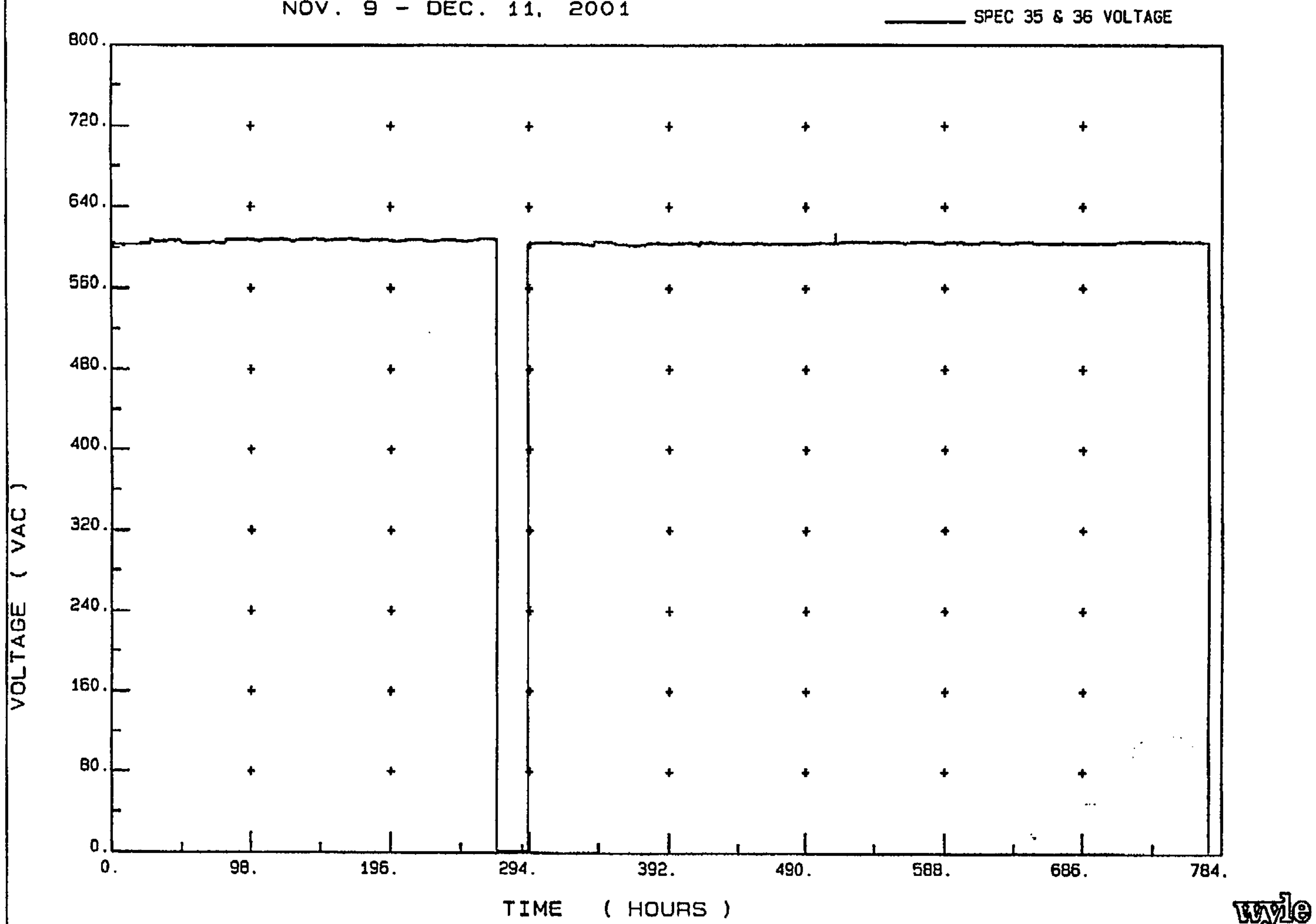
OKONITE COMPANY 46120
PREHEAT - END OF TEST
NOV. 9 - DEC. 11, 2001



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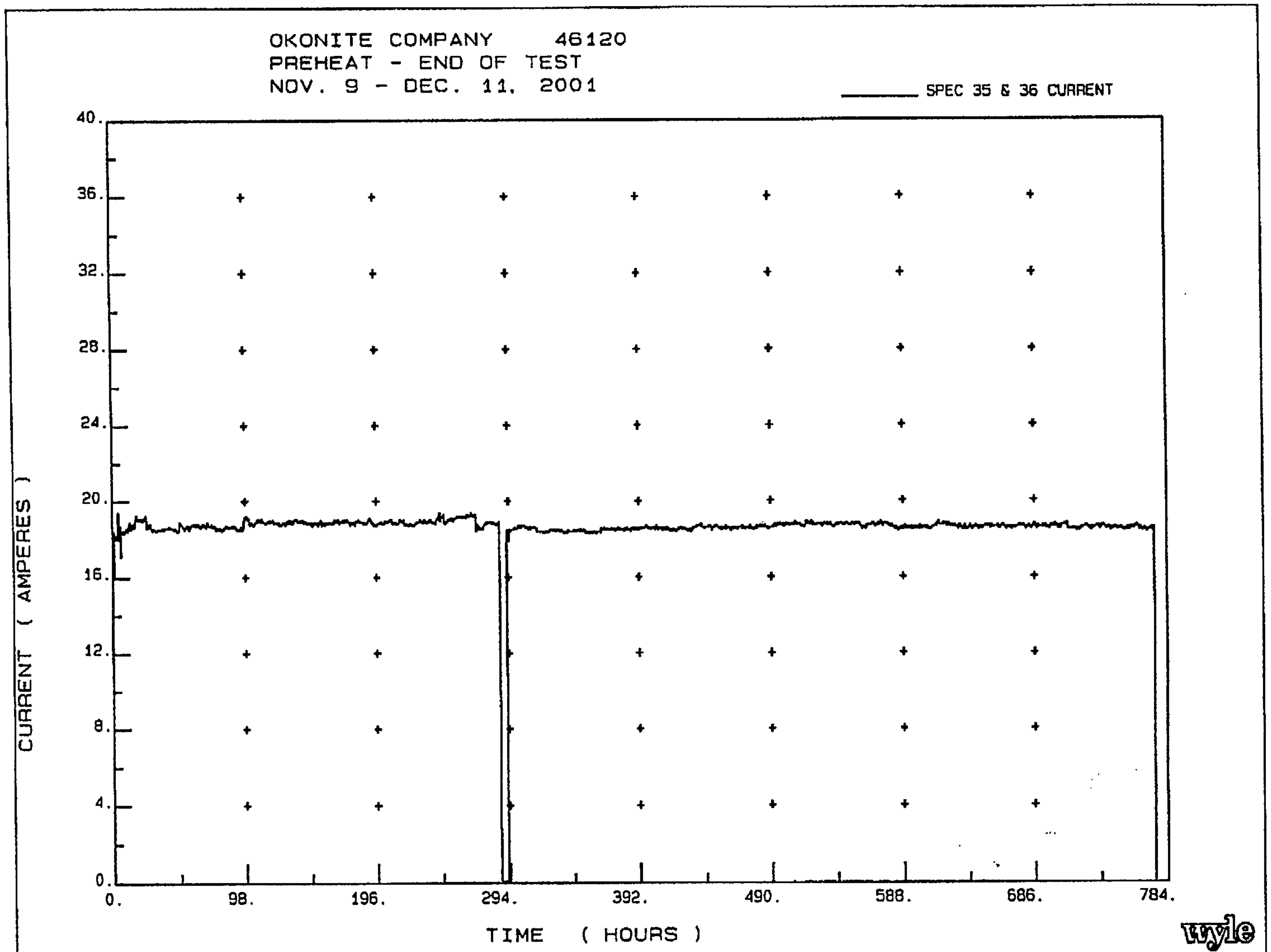
WYLE LABORATORIES
Huntsville Facility



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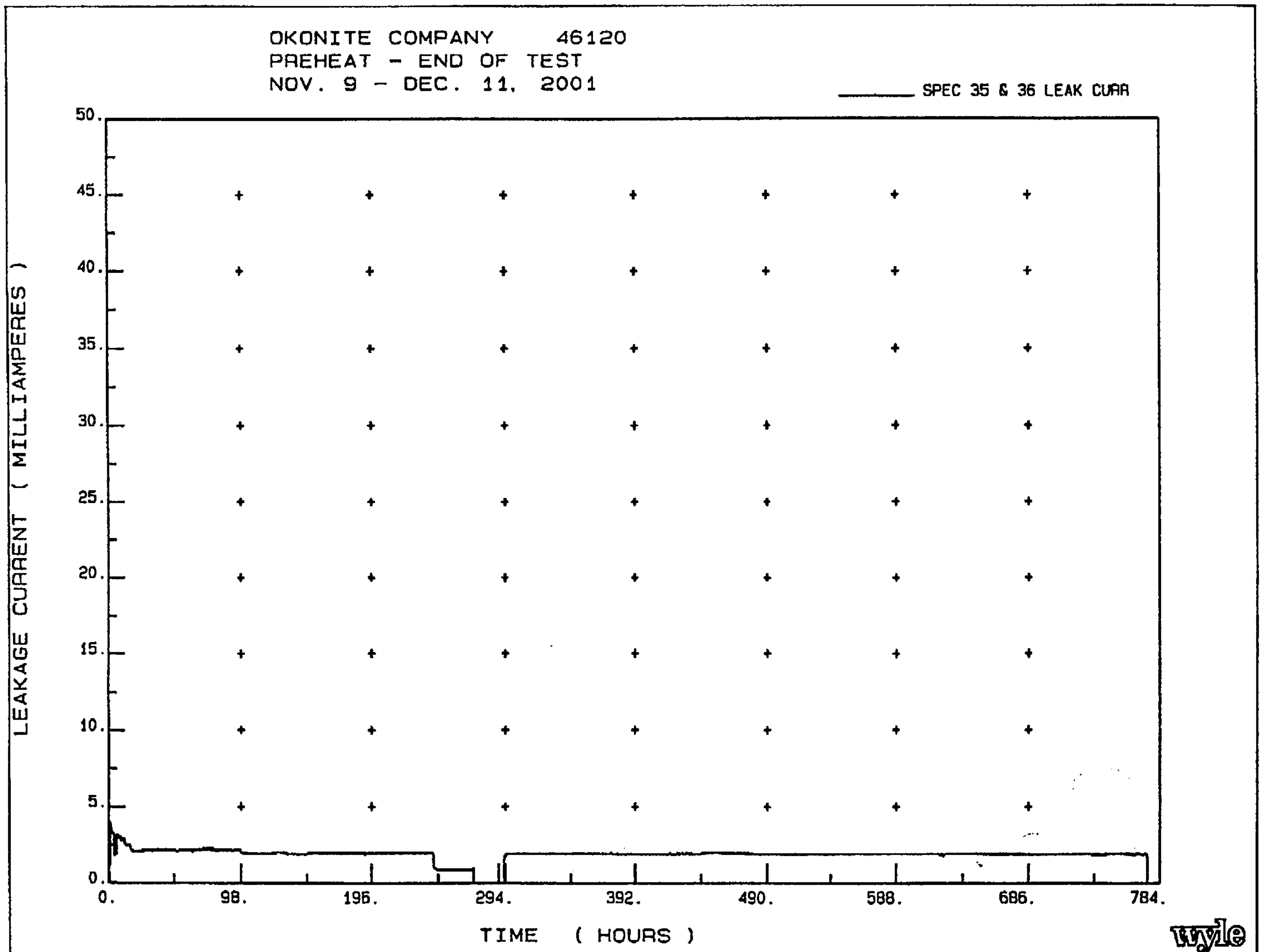

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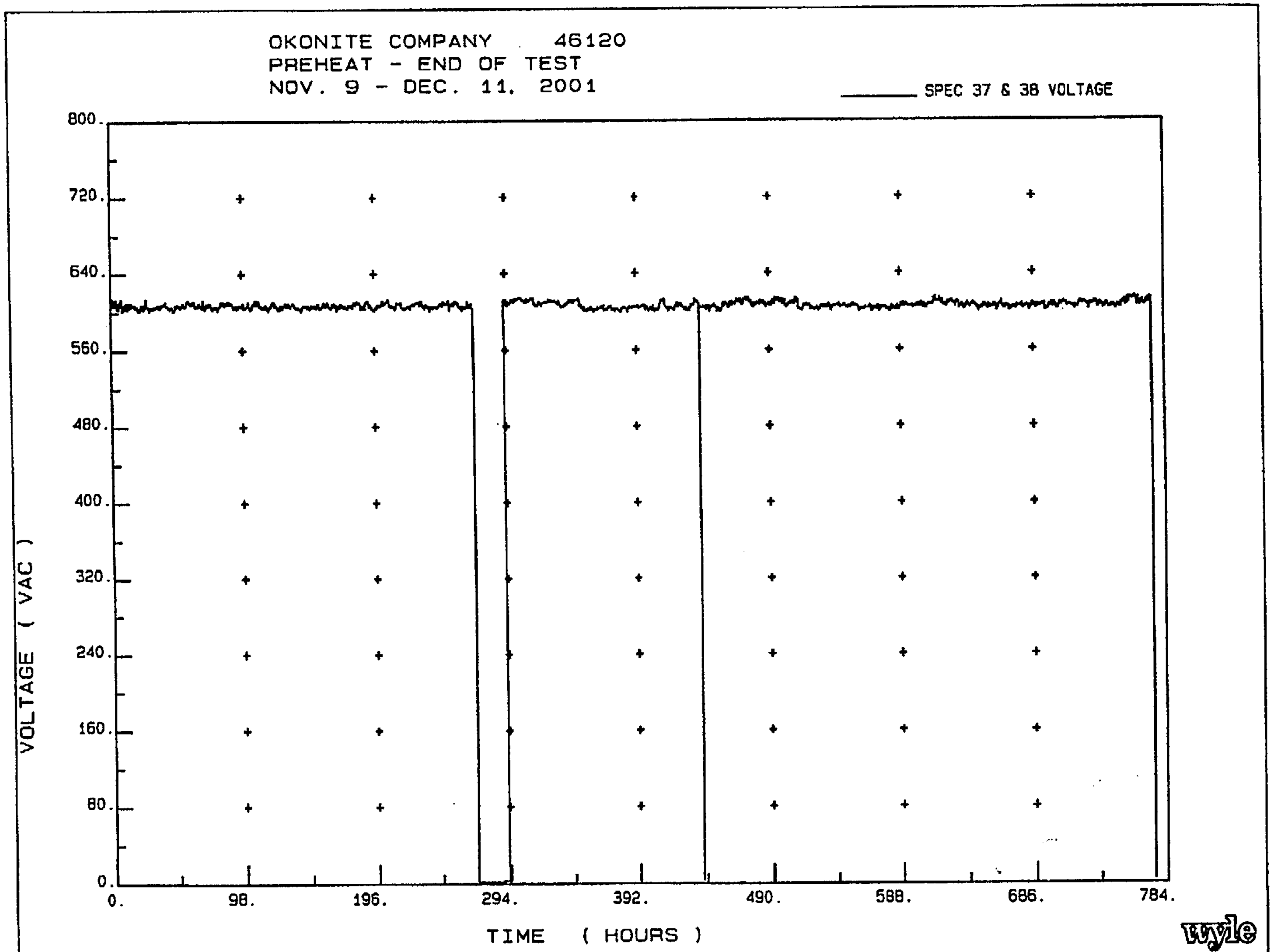

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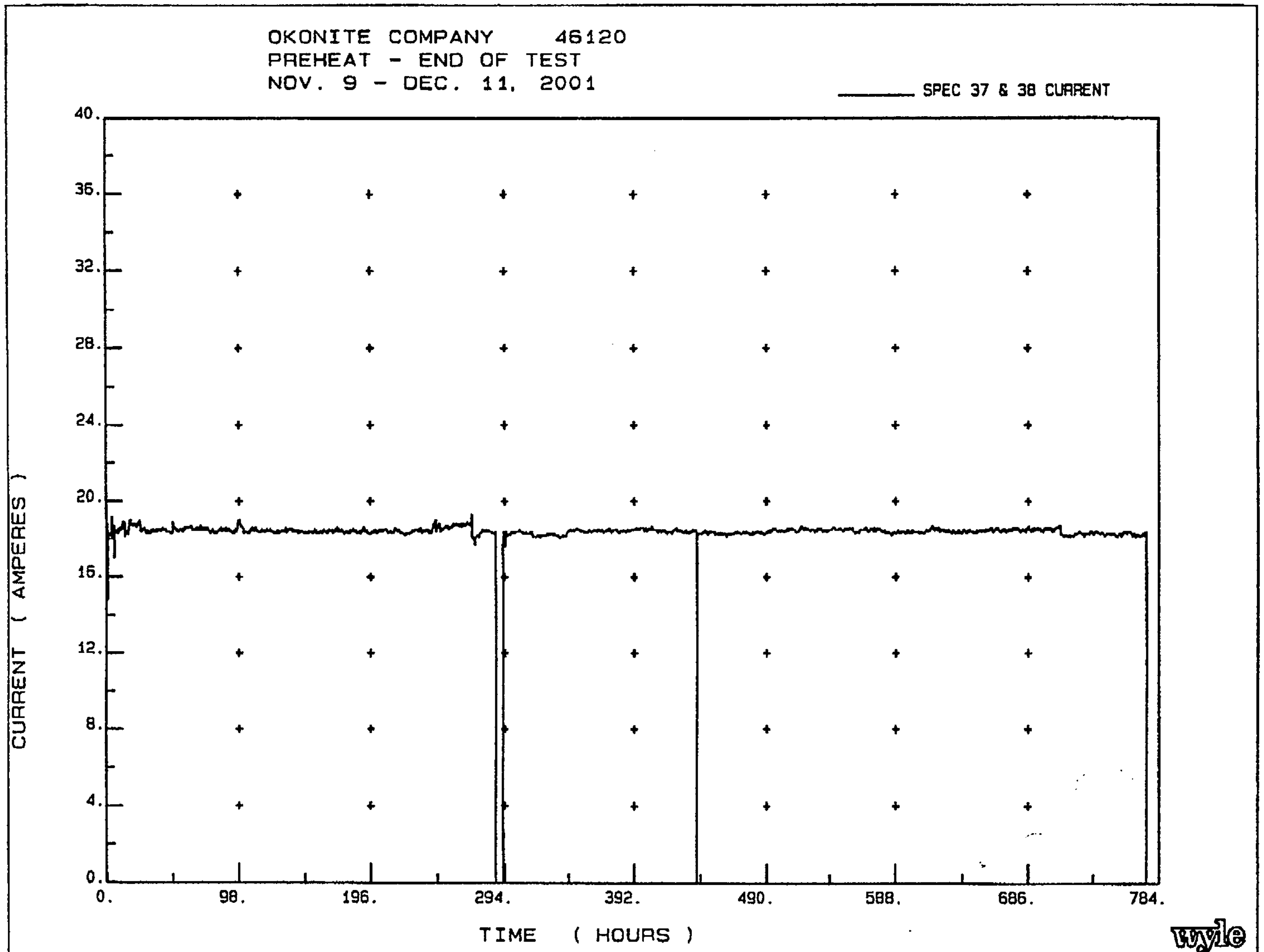

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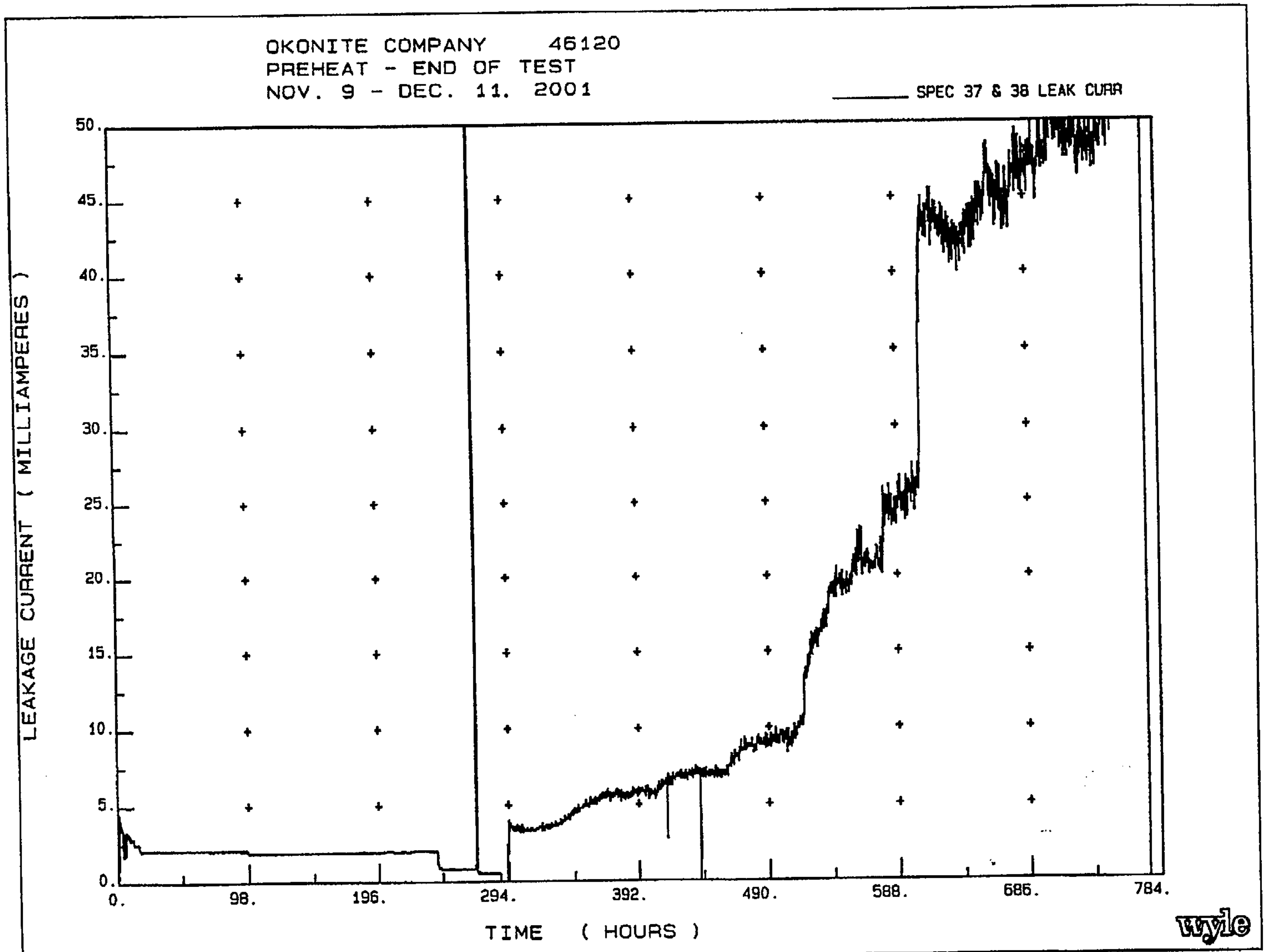

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APPENDIX X

WYLE LABORATORIES TEST PROCEDURE 46120, REVISION E

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TEST PROCEDURE

wyle laboratories
Huntsville, Alabama 35806
FAX (256) 830-2109, Phone (256) 837-4411

TEST PROCEDURE NO. 46120

DATE August 1, 2001

Revision A - August 8, 2001
Revision B - August 9, 2001
Revision C – September 27, 2001
Revision D – October 26, 2001
Revision E – December 7, 2001

NUCLEAR ENVIRONMENTAL QUALIFICATION TEST PROCEDURE

FOR

OKONITE OKOLON CABLES

A

For
The Okonite Company
Paterson, NJ

APPROVED BY: ____________________
FOR: ____________________

APPROVED BY: ____________________
FOR: ____________________

APPROVED BY: ____________________
FOR: ____________________

APPROVED BY PROJECT MANAGER: Don Smith 8/2/01
Don Smith

APPROVED BY QUALITY ENGINEER: T R Hamilton 8/2/2001
T. R. Hamilton

PREPARED BY PROJECT ENGINEER: Bobby Hardy 8/1/01
Bobby Hardy

REVISIONS

REV. NO.	DATE	PAGES AFFECTED	BY	APP'L.	DESCRIPTION OF CHANGES
A	8/8/01	3 through 6	RDH RDH 8/8/01	DS 8/8/01 TRH 8/8/01	Revised per customer comments
B	8/11/01	2 through 14	RDH RDH 8/16/01	DS 8/14/01 TRH 8/16/01	Revised per customer comments
C	9/27/01	7, 14, and 15	RDH RDH 9/27/01	DS 9/28/01 TRH 9/28/01	Revised per customer comments and adjusted pages to accommodate
D	10/26/01	6, 7, and 14	RDH RDH 10/26/01	DS 10/26/01 BM 10/26/01	Revised per customer comments
E	12/07/01	Page No. 8	RDH RDH 12/14/01	DS 12/17/01 TRH 12/17/01	Revised per customer comments

(rdh)

TABLE OF CONTENTS

1.0 SCOPE

This document has been prepared by Wyle Laboratories for the Okonite Company to present the procedures for subjecting the cables described in Paragraph 1.1, hereinafter referred to as the specimens, to a Nuclear Environmental Qualification Test Program in accordance with the standards, specifications, and other documents listed in Paragraph 1.2.

1.1 Specimen Description

The specimens for the test program consist of two production runs of 1-conductor, 12 AWG, Okonite Okolon-insulated and jacketed wire. Each production run will be represented by 19 long specimens (38 specimens total) and 150 short specimens in 50 baskets (300 short specimens total). Each of the baskets will contain six, 6-inch samples (3 of each production run). Production Run Numbers are FO-07-85810 and FO-07-7839. Note that the FO-07-7839 Production Run can be differentiated by the protruding ridge in the Okolon jacket that runs the length of the cable. A

1.2 Qualification Standards, Specifications, and Documents

- Okonite Purchase Order No. 9-01-429
- Okonite "Description of Nuclear Environmental Qualification Testing of Okonite Okolon Cables"
- IEEE Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"
- IEEE Standard 383-1987, "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations"
- Wyle Laboratories Quote No. 543/010620-R1/JS
- 10CFR21, "Reporting of Defects and Non-compliance"
- 10CFR50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants"
- Wyle Laboratories' (Eastern Operations) Quality Assurance Program Manual

2.0 QUALITY ASSURANCE

All work on this test program shall be performed in accordance with Wyle Laboratories' Quality Assurance Program, which complies with the applicable requirements of 10 CFR 50 Appendix B, ANSI N45.2, and Regulatory Guides.

3.0 TEST EQUIPMENT AND INSTRUMENTATION

All instrumentation, measuring and test equipment used in the performance of this test program were calibrated in accordance with Wyle Laboratories' Quality Assurance Program which complies with the requirements of ANSI/NCSL Z540-1, ISO 10012-1, and Military Specification MIL-STD-45662A. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

4.0 TEST REQUIREMENTS

The test program shall be performed in the sequence shown below. The tests are described in Paragraphs 4.1 through 4.8.

1. Specimen Mounting
2. Baseline Functional
3. Thermal Aging and Functional Tests
4. Radiation Exposure and Functional Tests
5. Accident (LOCA) Test and Functional Tests
6. Post-Test Functional

4.1 Specimen Mounting

The 38 long specimens shall be lightly coiled (to allow for differences in thermal expansion between the rubber layer and the metal mandrel) around stainless steel mandrels. The diameter of each mandrel shall be 13.5". Each cable will be attached to its mandrel by placing stainless steel safety wire through holes drilled on either side of the coiled cable and tying the specimen to the mandrel. High temperature glass cloth electrical tape (Scotch™ 69) shall be folded several times to make a cushion to be placed between the safety wire, from mandrel hole to mandrel hole, and the specimen cable. Each mandrel shall be equipped with a support arm for purposes of securely attaching the cable as it exits the mandrel. A similar method will be used to attach and cushion the cable to the support arm. The first support on the arm will be located to provide a smooth transition from the mandrel to the arm. Each specimen shall be identified with the appropriate specimen number (as shown in Table I) by attaching a stainless steel identification tag. The tag will be positioned so that it does not contact the specimen cable. Additionally, each mandrel shall be marked with a paint pen to identify the specimens attached. Each mandrel shall contain two long specimens, one from each production run. Each production run shall be staggered as to location on the mandrel (top or bottom) so that placement of the production runs will encompass both locations. In all handling and testing, the mandrels shall be oriented in the same direction (support arm at the bottom). A

The center point of each long specimen shall located and marked with chalk. Seven feet from the center mark, in both directions, shall be located and marked in the same manner. This center 14 feet of each specimen shall then be coiled around the mandrel (approximately 4 coils). The remaining 22 feet (11 feet on each end) shall then exit the mandrel via the support arm. Digital photographs of each specimen secured to its appropriate fixture shall be taken. A copy of the photos, via computer disk, shall be provided to Okonite. A

Fifty (50) 6" x 6" x 0.5" stainless steel baskets will be prepared by Okonite. Each of the baskets will contain six (6) short specimens (approximately 6"), three of each production run, for Condition Monitoring purposes. Each basket shall be identified by Wyle with a unique identifier which indicates the basket number and the point of testing at which the basket will be removed from the program and returned to Okonite for Condition Monitoring tests. Digital photographs of each basket shall be taken. A copy of the photos, via computer disk, shall be provided to Okonite.

4.0 TEST REQUIREMENTS (continued)

4.2 Baseline Functional Testing

4.2.1 Insulation Resistance

Insulation resistance (IR) of individual long specimens shall be measured at room ambient conditions (ambient temperature to be recorded) with the mandrel submerged in tap water for a minimum of 5 minutes prior to testing using a General Radio Model 1864 megohmmeter or equivalent instrument. A 500 VDC potential shall be applied between each specimen and its mandrel and IR measured and recorded one minute following voltage application. In the event the IR reading is below scale at 500 VDC, lower voltages may be used. IR readings will be obtained using the highest voltage possible to obtain an on-scale reading. Following each measurement, the specimen conductor shall be grounded for one minute to remove the space charge. B

4.2.2 Dielectric Withstand

High-potential tests shall be performed by applying voltage between each specimen and the mandrel while the mandrel is submerged in room-temperature tap water for a minimum of 5 minutes prior to testing. The voltage shall be increased to the full value rapidly, but not to exceed 500 volts per mil per second. Full voltage shall be maintained for 1 minute and then reduced to one-quarter value in not more than 15 seconds. The circuit breaker of the dielectric tester shall interrupt the test if leakage current exceeds 10 milliamps. Leakage current shall be recorded. The high potential test voltage for the baseline tests shall be 80 VAC/mil of insulation. Per Okonite, each cable has 30 mils of insulation resulting in a test voltage of 2400 VAC. A

4.3 Thermal Aging

The specimens that are to be thermally-aged shall be placed in a Wyle Thermal Aging Chamber and aged in air at 302°F (+7/-0°F) and for the duration specified in Table I for each specimen. The specified thermal aging duration shall be kept within +2, -0% of the specified value, not to exceed one hour. At the specified time, the specimens shall be removed from the thermal aging chamber. During the Thermal Aging process, a circular chart recorder which monitors chamber temperature as a function of time shall be used to record the chamber temperature. Each circular chart shall be capable of recording 24 hours minimum and will be used to document temperature exposure of the specimens. Additionally, one thermocouple shall be mounted on each mandrel, and the indicated temperature shall be recorded. The aging chamber shall have a redundant controller that is capable of terminating the chamber heat should the primary controller malfunction. The redundant controller shall be set no higher than 10°F above the required aging temperature. Valid calibration certificates shall be available for the aging chamber instrumentation. The specimens shall not be energized for thermal aging. B

For the mandrel specimens identified in Table I, each support arm extending off the mandrel will be placed through a penetration in the oven to prevent exposure of the wires exiting the arm to the elevated temperature inside the oven.

Special care will be used during handling of the specimens (during installation or removal from chamber) to prevent any damage. The cables shall not be handled directly. When it is necessary to transport any specimen, it will be handled by the support arm, mandrel, or basket, depending on the configuration. No items are to be laid upon or placed directly adjacent to any specimen that might come in contact with the specimen and cause damage.

4.0 TEST REQUIREMENTS (continued) Revision D

4.4 **Post-Thermal Aging Functional Test**

The Insulation Resistance testing, as described in Paragraph 4.2.1, shall be repeated on the specimens following the completion of Thermal Aging. B

4.5 **Radiation Exposure**

The specimens which are to be exposed to radiation aging will be shipped by a dedicated shipper or Wyle personnel to and from the irradiation vendor for radiation aging. B

The specimens detailed in Table I (while still mounted to the appropriate fixtures) shall be carefully packaged and delivered to the Georgia Institute of Technology, Neely Nuclear Research Center in Atlanta, Georgia. There, the specimens will be exposed to a Cobalt 60 radiation source. The specified radiation dose shall be controlled to the specified value within +5/-0%. D

For the mandrel specimens, each segment of cable end extending off the mandrel via the support arm will be shielded from the radiation to the extent possible to mitigate embrittlement. The specimens shall not be energized for radiation exposure. B

4.6 **Post-Radiation Exposure Functional Test**

The Insulation Resistance testing, as described in Paragraph 4.2.1, shall be repeated on the specimens following the completion of Radiation Exposure. B

4.7 **Accident (LOCA) Test**

4.7.1 <u>Test Setup</u>

The mandrel and appropriate basket specimens shall be placed inside a LOCA test chamber. The unaged portion of each specimen, exiting the support arm, shall be routed through a chamber penetration. Each penetration shall then be potted following standard Wyle practices. Nineteen penetrations shall be used, one for each mandrel. The specimens shall be placed to prevent direct steam impingement. Following installation in the test chamber, an Insulation Resistance Test shall be performed to ensure no damage was caused during installation. D

4.7.2 <u>Electrical Powering and Loading</u>

The mandrel specimens shall be powered and loaded as detailed in Figure 2. Each mandrel shall be powered with a separate power source. D

The basket specimens require no electrical powering or loading since they are for condition monitoring purposes only. B

4.7.3 <u>Monitoring</u>

Each of the mandrels shall be individually monitored for applied voltage, circuit current, and leakage current throughout the duration of the LOCA simulation test. Figure 2 details the electrical circuits to be used in electrically monitoring the specimens. D

4.7 Accident (LOCA) Test (continued)

4.7.3 Monitoring (continued)

Three thermocouples shall be placed at points around and within two inches of the specimen fixture. The average of these thermocouples shall be used to control the test chamber temperature. The test chamber temperature shall be recorded throughout the duration of the test.

The test chamber pressure shall be monitored and recorded throughout the duration of the test by means of a pressure transducer connected to the test chamber.

The chemical spray flow rate shall be monitored and recorded throughout the duration of the test by means of a flowmeter mounted inline with the spray discharge line. B

Temperature versus time plots shall be provided for all thermocouples. Additionally, average chamber temperature versus time, chamber pressure versus time, and chemical spray flow rate plots shall be provided. The data sample rate for all monitored channels shall be no less than 1 sample per second during the environmental ramps, and then no less than 1 sample per 15 minutes during the remainder of the Accident Simulation.

4.7.4 Accident Test

The test chamber temperature shall be increased to approximately 120°F (or as directed by Okonite) using saturated steam and held for a minimum of 30 minutes prior to the application of steam to simulate the accident profile shown in Figure 1. The specimens shall be energized during the pre-heat period. The transient shall be performed on a best-effort basis holding as close to the required temperature as possible to achieve the conditions described in Table A2 of IEEE 323-1974. The transient shall be continued until the peak conditions are achieved. The temperature shall then envelop the Accident Test Profile. D

Starting approximately six minutes after reaching stability of the first plateau (due to test equipment limitations), chemical spray shall be initiated inside the test chamber. The chemical spray shall be continued for the duration of the Accident Test. The chemical spray shall consist of deionized water with 0.28 molar H_3BO_3 (3000 ppm boron), 0.064 molar $Na_2S_2O_3$, and NaOH to make a pH of between 9 and 11 at 77°F. The chemical spray shall be captured and recirculated throughout the test. The pH of the chemical spray shall be gradually lowered due to steam condensate. The chemical spray flow rate shall be 0.15 gpm/sq. ft. C

The chamber shall be heated using steam throughout the duration of the test. The required test profile shall be controlled via temperature controllers and the internal chamber pressure shall be a result of the saturated steam temperature. The depressurization rate from transients shall not exceed 1 psig/minute. D

At the 10-day point of the Accident Test, the temperature of the test chamber shall be allowed to naturally decrease to laboratory ambient conditions. When there, the test chamber shall be flooded with tap water to submerge the test specimens. Once the chamber is flooded, a Dielectric Withstand Test as detailed in Paragraph 4.2.2 shall be performed on each specimen. When completed, the water shall be drained and the temperature of the test chamber slowly returned to 212°F for the remainder of the test. C

4.8 **Post-Accident Test Functional Test**

The following steps shall be taken (in order) following completion of the Accident Test

- The temperature of the test chamber shall be allowed to naturally decrease to laboratory ambient conditions over night
- The door of the chamber shall be removed allowing access to the specimens
- The leads shall be cut from the specimens leaving the aged portion of the specimens on the mandrels
- One at a time, the specimens shall be removed from their mandrels, while still coiled, marked with an appropriate specimen marker, and submerged in room-temperature tap water for storage E
- Each specimen, in turn, shall be removed from the water, straightened, and recoiled on a metal mandrel approximately 40 times the diameter of the cable (approximately 8")
- Each specimen, while still coiled on the 8" mandrel, shall be submerged in room-temperature tap water and subjected to the Dielectric Withstand Test as detailed in Paragraph 4.2.2 with the exception that the full voltage shall be maintained for 5 minutes
- The specimens will then be removed from the mandrel, carefully packed, and returned to Okonite

5.0 **TEST REPORT**

Two bound copies, and one unbound reproducible copy, of a test report describing the test requirements, procedures, and results shall be issued. The test report shall contain Notices of Anomaly, if any anomalies occur during the test program; tables, data sheets, sketches, etc. to document test setups, tests performed, and results; photographs of test setups including instrumentation locations, the test specimen at various stages of the test program, and any structural failures or degradation. Raw test data such as tapes of accelerometer data, chart recorder records, and computer printouts shall be provided to Okonite. A

APPENDIX I

TABLE

TABLE I

SPECIMEN DETAILS

MANDREL SPECIMENS						
Specimen No.	Mandrel No.	Production Run No.	Thermal Aging Time (hours)	Thermal Aging Temperature (°F)	Radiation Dose (rads)	Radiation Dose Rate (rads/hour)
1	1	FO-07-85810	Unaged	N/A	2.0E8	<1.0E6
2	**1**	**FO-07-7839**	**Unaged**	**N/A**	**2.0E8**	<1.0E6
3	2	FO-07-85810	50	302	2.0E8	<1.0E6
4	**2**	**FO-07-7839**	**50**	**302**	**2.0E8**	<1.0E6
5	3	FO-07-85810	70	302	2.0E8	<1.0E6
6	**3**	**FO-07-7839**	**70**	**302**	**2.0E8**	<1.0E6
7	4	FO-07-85810	90	302	2.0E8	<1.0E6
8	**4**	**FO-07-7839**	**90**	**302**	**2.0E8**	<1.0E6
9	5	FO-07-85810	110	302	2.0E8	<1.0E6
10	**5**	**FO-07-7839**	**110**	**302**	**2.0E8**	<1.0E6
11	6	FO-07-85810	130	302	2.0E8	<1.0E6
12	**6**	**FO-07-7839**	**130**	**302**	**2.0E8**	<1.0E6
13	7	FO-07-85810	150	302	2.0E8	<1.0E6
14	**7**	**FO-07-7839**	**150**	**302**	**2.0E8**	<1.0E6
15	8	FO-07-85810	175	302	2.0E8	<1.0E6
16	**8**	**FO-07-7839**	**175**	**302**	**2.0E8**	<1.0E6
17	9	FO-07-85810	200	302	2.0E8	<1.0E6
18	**9**	**FO-07-7839**	**200**	**302**	**2.0E8**	<1.0E6
19	10	FO-07-85810	225	302	2.0E8	<1.0E6
20	**10**	**FO-07-7839**	**225**	**302**	**2.0E8**	<1.0E6
21	11	FO-07-85810	250	302	2.0E8	<1.0E6
22	**11**	**FO-07-7839**	**250**	**302**	**2.0E8**	<1.0E6
23	12	FO-07-85810	275	302	2.0E8	<1.0E6
24	**12**	**FO-07-7839**	**275**	**302**	**2.0E8**	<1.0E6
25	13	FO-07-85810	300	302	2.0E8	<1.0E6
26	**13**	**FO-07-7839**	**300**	**302**	**2.0E8**	<1.0E6
27	14	FO-07-85810	150	302	1.0E8	<1.0E6
28	**14**	**FO-07-7839**	**150**	**302**	**1.0E8**	<1.0E6
29	15	FO-07-85810	175	302	1.0E8	<1.0E6
30	**15**	**FO-07-7839**	**175**	**302**	**1.0E8**	<1.0E6
31	16	FO-07-85810	200	302	1.0E8	<1.0E6
32	**16**	**FO-07-7839**	**200**	**302**	**1.0E8**	<1.0E6
33	17	FO-07-85810	250	302	1.0E8	<1.0E6
34	**17**	**FO-07-7839**	**250**	**302**	**1.0E8**	<1.0E6
35	18	FO-07-85810	300	302	1.0E8	<1.0E6
36	**18**	**FO-07-7839**	**300**	**302**	**1.0E8**	<1.0E6
37	19	FO-07-85810	350	302	1.0E8	<1.0E6
38	**19**	**FO-07-7839**	**350**	**302**	**1.0E8**	<1.0E6

TABLE I (continued)

SPECIMEN DETAILS

BASKET SPECIMENS					
Basket No.	Thermal Aging Time (hours)	Thermal Aging Temperature (°F)	Radiation Dose (rads)	Radiation Dose Rate (rads/hour)	Return Basket to Okonite following:
1	Unaged	N/A	2.0E8	<1.0E6	radiation
2	Unaged	N/A	2.0E8	<1.0E6	LOCA
3	50	302	N/A	N/A	thermal aging
4	50	302	2.0E8	<1.0E6	radiation
5	50	302	2.0E8	<1.0E6	LOCA
6	70	302	N/A	N/A	thermal aging
7	70	302	2.0E8	<1.0E6	radiation
8	70	302	2.0E8	<1.0E6	LOCA
9	90	302	N/A	N/A	thermal aging
10	90	302	2.0E8	<1.0E6	radiation
11	90	302	2.0E8	<1.0E6	LOCA
12	110	302	N/A	N/A	thermal aging
13	110	302	2.0E8	<1.0E6	radiation
14	110	302	2.0E8	<1.0E6	LOCA
15	130	302	N/A	N/A	thermal aging
16	130	302	2.0E8	<1.0E6	radiation
17	130	302	2.0E8	<1.0E6	LOCA
18	150	302	N/A	N/A	thermal aging
19	150	302	2.0E8	<1.0E6	radiation
20	150	302	2.0E8	<1.0E6	LOCA
21	175	302	N/A	N/A	thermal aging
22	175	302	2.0E8	<1.0E6	radiation
23	175	302	2.0E8	<1.0E6	LOCA
24	200	302	N/A	N/A	thermal aging
25	200	302	2.0E8	<1.0E6	radiation

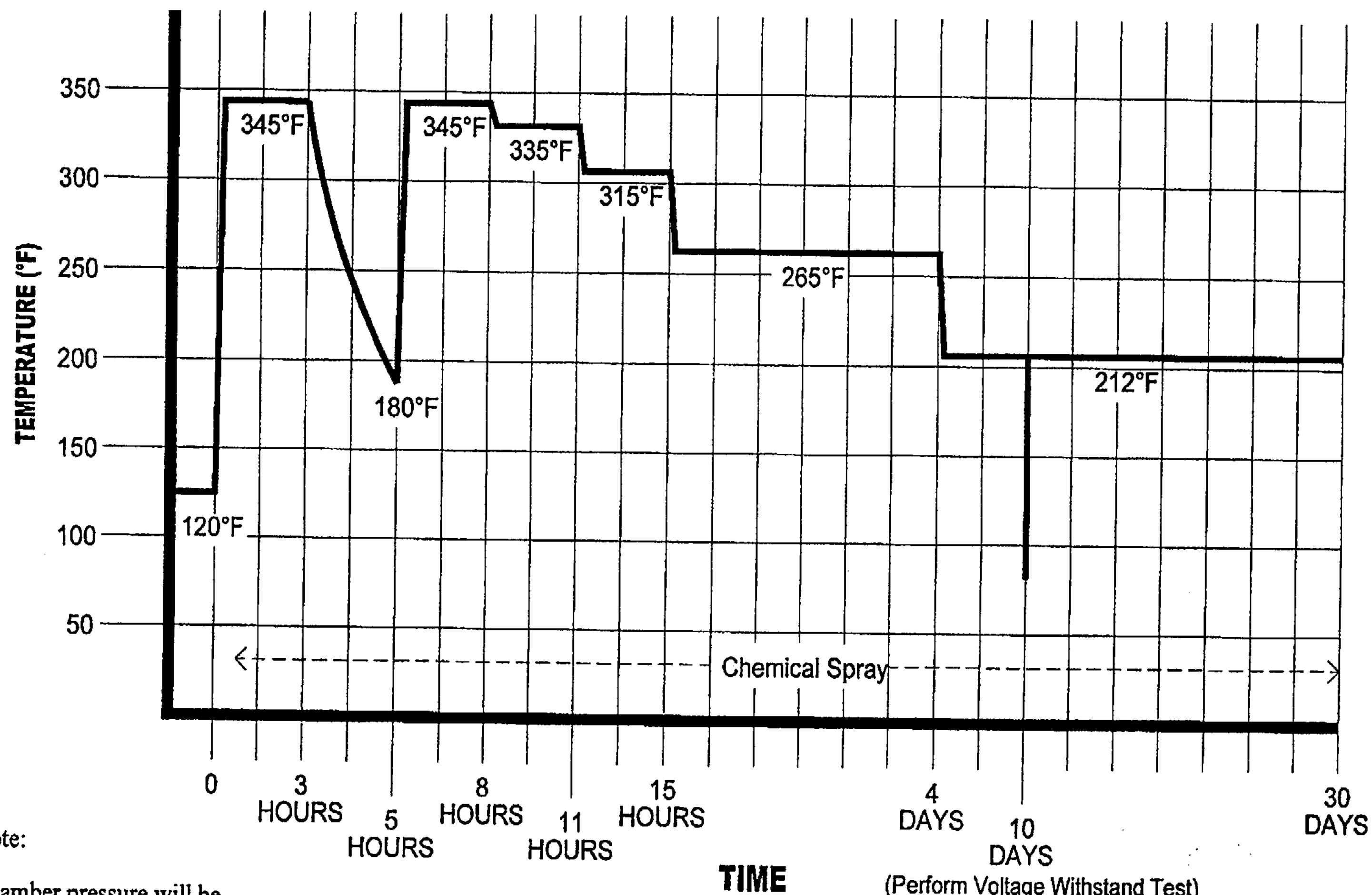
TABLE I (continued)

SPECIMEN DETAILS

BASKET SPECIMENS					
Basket No.	**Thermal Aging Time (hours)**	**Thermal Aging Temperature (°F)**	**Radiation Dose (rads)**	**Radiation Dose Rate (rads/hour)**	**Return Basket to Okonite following:**
26	200	302	2.0E8	<1.0E6	LOCA
27	225	302	N/A	N/A	thermal aging
28	225	302	2.0E8	<1.0E6	radiation
29	225	302	2.0E8	<1.0E6	LOCA
30	250	302	N/A	N/A	thermal aging
31	250	302	2.0E8	<1.0E6	radiation
32	250	302	2.0E8	<1.0E6	LOCA
33	275	302	N/A	N/A	thermal aging
34	275	302	2.0E8	<1.0E6	radiation
35	275	302	2.0E8	<1.0E6	LOCA
36	300	302	N/A	N/A	thermal aging
37	300	302	2.0E8	<1.0E6	radiation
38	300	302	2.0E8	<1.0E6	LOCA
39	150	302	1.0E8	<1.0E6	radiation
40	150	302	1.0E8	<1.0E6	LOCA
41	175	302	1.0E8	<1.0E6	radiation
42	175	302	1.0E8	<1.0E6	LOCA
43	200	302	1.0E8	<1.0E6	radiation
44	200	302	1.0E8	<1.0E6	LOCA
45	250	302	1.0E8	<1.0E6	radiation
46	250	302	1.0E8	<1.0E6	LOCA
47	300	302	1.0E8	<1.0E6	radiation
48	300	302	1.0E8	<1.0E6	LOCA
49	350	302	1.0E8	<1.0E6	radiation
50	350	302	1.0E8	<1.0E6	LOCA

APPENDIX II

FIGURES



Note:

Chamber pressure will be based on saturated conditions.

FIGURE 1

ACCIDENT SIMULATION ENVIRONMENTAL PROFILE

okonite2.skd

Revision C

OKONITE LOCA SIMULATION ELECTRICAL SETUP

18-AMP CIRCUIT (19 CIRCUITS TOTAL)

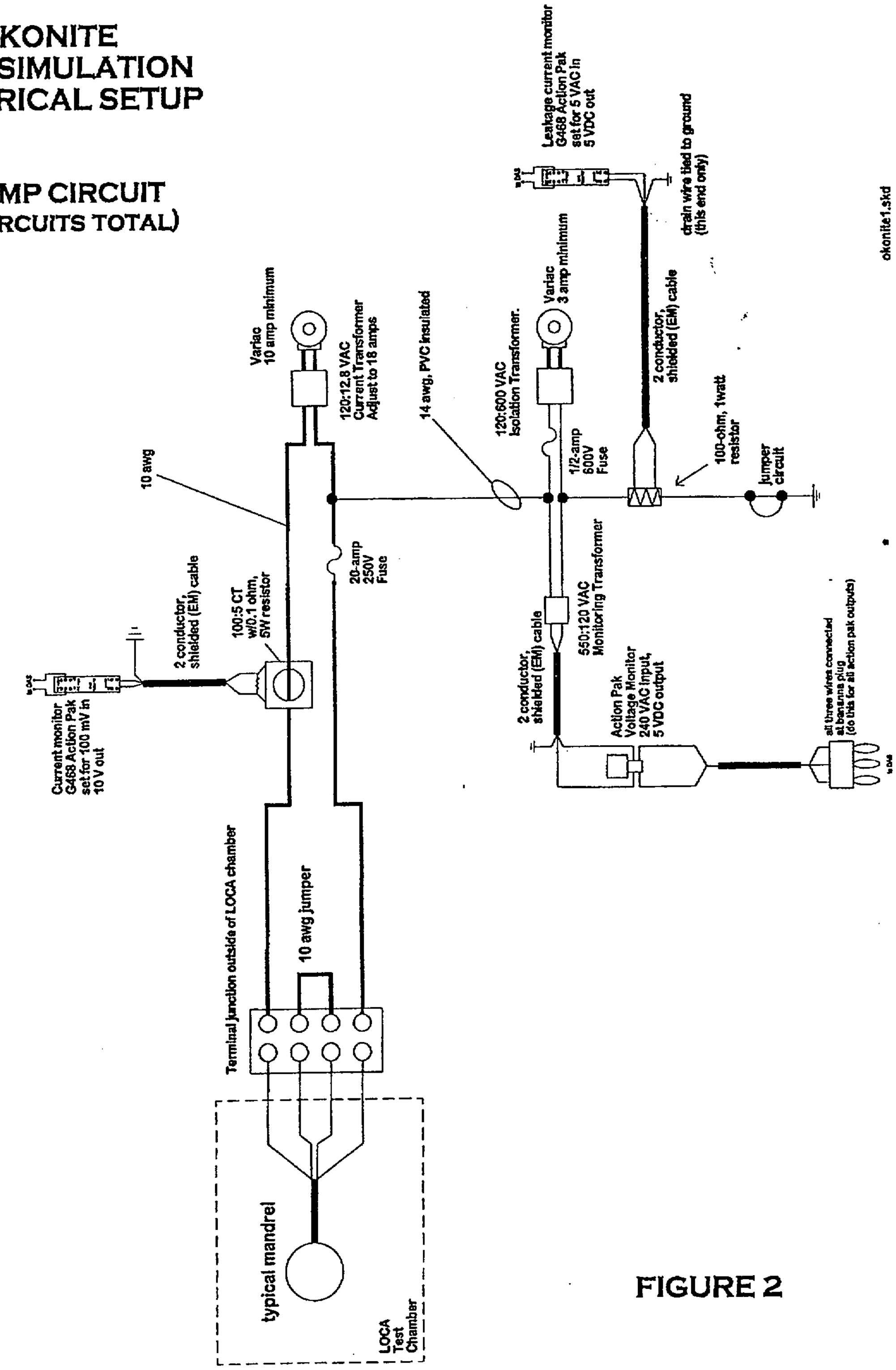


FIGURE 2

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