

HS No.
636878

REPORT NUMBER: 221-MGA-03-002

**SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 221
SCHOOL BUS BODY JOINT STRENGTH**

**American Transportation Corporation
2003 ATC IC3S530 School Bus
NHTSA No.: C30902**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**




Final Report Date: October 2, 2003

FINAL REPORT

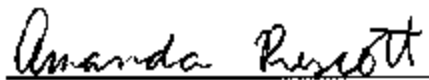
**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW, ROOM 5115 (NVS-220)
WASHINGTON, D.C. 20590**

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Prepared by:  Date: October 2, 2003
John Roberts, Project Engineer

Reviewed by:  Date: October 2, 2003
Michael Janovicz, Program Manager

FINAL REPORT ACCEPTED BY:



10/8/03
Date of Acceptance

Technical Report Documentation Page

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		15. Supplementary Notes			
16. Abstract Compliance tests were conducted on the subject 2003 American Transportation Corp IC3S530 School Bus, NHTSA No. C30902 in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-221-02 for the determination of FMVSS 221 compliance. TEST FAILURES: 2 Test failures ALSCME587BAV and ALSCMI685BSV failed to meet the minimum load requirements					
17. Key Words Compliance Testing Safety Engineering FMVSS 221		18. Distribution Statement Copies of this report are available from: NHTSA Technical Information Services (TIS) Room 5108, (NPO-230) 400 Seventh Street, S.W. Washington, D.C. 20590 (202) 366-4946			
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SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on a MY2003 American Transportation Corp IC3S530 School Bus, NHTSA No. C30902, in accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test Procedures TP-221-02 to determine compliance to the requirements of Federal Motor Vehicle Safety Standards (FMVSS) 221, "School Bus Body Joint Strength".

This program is sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-02-D-01057.

SECTION 2 TEST PROCEDURE

The MY2003 American Transportation Corp IC3S530 School Bus, NHTSA No. C30902, was subjected to FMVSS 221 testing on August 15, 2003.

The joint samples were selected in conjunction with the Contract Officer's Technical Representative (COTR). Six 12 x 48 inch samples were selected. They were removed from the bus using a metal shear and/or SawzAll type of cutter.

After each sample area had been removed from the bus, the sample was cut to the specific dimensions. Each specimen was carefully shaped to the final size using supports as specified in FMVSS 221. Additionally, temperature monitoring stickers were placed at the specified locations of each sample to ensure the sample temperature did not exceed 140°F during the shaping operation.

The samples were tested using the MGA 50,000 pound tensile tester. The force applied was measured directly at the upper clamp. The upper clamp was attached to the load cell and the lower clamp was attached to the load frame.

The gripping devices were fabricated from 3" x 3" angle iron. Slots were milled on the face that mounted to the machine, in order to allow for fore and aft movement of the clamps. This allowed the specimens to be fixtured so that the axis of the test specimen coincided with the centerline axis of the tensile tester heads.

The test specimen was inserted in between the grips, and the grips were then bolted together using 7 size 1/2" bolts. The bolts were inserted through one grip, through the test specimen, and then through the other grip. This prevented any slipping of the test sample in the grips, while fully distributing the clamping force across the entire end width of the test sample. Post test examination of the specimens indicated that no load was applied to the clamp mounting holes.

The rate of load application was 1/4 inch per minute. The force and displacement were recorded and displacement vs. time was plotted to monitor the displacement rate.

SECTION 3
TEST DATA SUMMARY

A total of six samples were tested for this vehicle. The samples were selected from the Right Exterior Side, Right Interior Side, Left Exterior Side, Left Interior Side, Roof Exterior and Roof Interior.

Joint Location	Maximum Load (N)	60% of Material Strength (N)	PASS/FAIL
Right Exterior Side (1)	54,194.0	45,517.5	PASS
Right Interior Side (2)	41,942.0	25,259.1	PASS
Left Exterior Side (3)	65,931.0	45,517.5	PASS
Left Interior Side (4)	33,032.5	25,343.6	PASS
Roof Exterior (5)	21,381.1	28,668.2	FAIL
Roof Interior (6)	21,997.5	25,067.9	FAIL

The maximum forces measured, and the displacement rate used, are provided in Section 7.
The photographs taken from the samples are provided in Sections 6 and 8.

SECTION 4
COMPLIANCE TEST DATA

The following data sheets document the results of FMVSS 221 testing on the MY2003 American Transportation Corp IC3S530 School Bus, NHTSA No. C30902.

**DATA SHEET 1
ADMINISTRATIVE DATA SHEET**

Test Vehicle: **2003 American Transportation Corp IC3S530** NHTSA No.: **C30902**
 School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

INCOMPLETE VEHICLE (IF APPLICABLE)

Manufacturer:	
Model:	
VIN:	
Build Date:	
Certification Date:	

COMPLETED VEHICLE (SCHOOL BUS)

Manufacturer:	American Transportation Corporation
Make/Model:	School Bus/IC3S530
VIN:	4DRBRABN73B955119
NHTSA No.:	C30902
Color:	Yellow
GVWR:	12,474 kg / 27,500 lbs
Build Date:	10/02
Certification Date:	10/02

DATES

Vehicle Receipt:	November 4, 2002
Start of Compliance Test:	August 15, 2003
Completion of Compliance Test:	August 15, 2003

COMPLIANCE TEST:

All tests were performed in accordance with the references outlined in TP-221-02.

Recorded By: *John Walsh*

Approved By: *Michael J. [Signature]*


Date: October 2, 2003

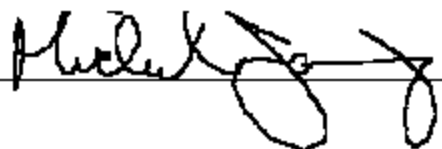
DATA SHEET 2
SUMMARY OF DATA

Test Vehicle: **2003 American Transportation Corp IC3S530** NHTSA No.: **C30902**
School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

Joint Specimen Identification	Joint Location Description and (Number)	Joint Load Reqmt (N) (60%)	Max. Load at Joint Separation (N)	Calculated Material Strength (N)	PASS/FAIL
ALSRME187BAV	Right Exterior Side (1)	45,517.5	54,194.0	75,862.7	PASS
ALSRMI285BSV	Right Interior Side (2)	25,259.1	41,942.7	42,098.7	PASS
ALSLME387BAV	Left Exterior Side (3)	45,517.5	65,931.0	75,862.7	PASS
ALSLMI485BSV	Left Interior Side (4)	25,259.1	33,032.5	42,098.7	PASS
ALSCME587BAV	Roof Exterior (5)	28,668.2	21,381.1	47,780.3	FAIL
ALSCMI685BSV	Roof Interior (6)	25,067.9	21,997.5	41,779.8	FAIL

Comments: NONE

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 3

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: **2003 American Transportation Corp IC3S530** NHTSA No.: **C30902**
 School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

Specimen Description:	Right Exterior Side (1)
Joint Number:	ALSRME187BAV

	Weaker Member	Stronger Member
Material	---	---
Tensile Strength (MPa)	310.2	---
Gage/Thickness (mm)	16 / 1.448	---
Fastener Holes (No./Diameter - mm.)	7 / 4.902	---
Net Area (Sq. mm.)	244.5	---
Material Strength (N)	75,862.7	---
60% of Material Strength (N)	45,517.5	---
Maximum Load From Tensile Test of Joint (N)	54,194.0	---
PASS/FAIL	PASS	---

1. Rivet Spacing Double Row Staggered 50 mm Each Row

Comments: American Transportation Corp. provided material properties but not the specific material type.

Recorded By:

Approved By:

Date: October 2, 2003

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN


Test Vehicle: **2003 American Transportation Corp IC3S530** NHTSA No.: **C30902**
School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

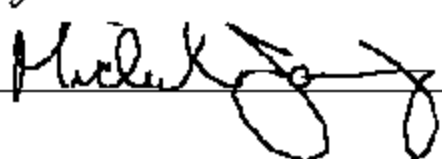
Specimen Description:	Right Interior Side (2)
Joint Number:	ALSRMI285BSV

	Weaker Member	Stronger Member
Material	—	---
Tensile Strength (MPa)	310.2	---
Gage/Thickness (mm)	22 / .759	---
Fastener Holes (No./Diameter – mm.)	6 / 4.089	---
Net Area (Sq. mm.)	135.5	---
Material Strength (N)	42,098.7	---
60% of Material Strength (N)	25,259.1	---
Maximum Load From Tensile Test of Joint (N)	41,942.0	---
PASS/FAIL	PASS	---

1. Screw Spacing 35 mm

Comments: American Transportation Corp. provided material properties but not the specific material type. Joint Number should read ALSRMI286BSV

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

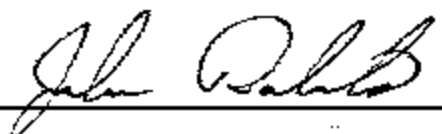
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 School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

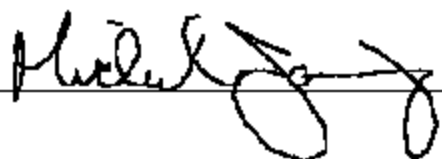
Specimen Description:	Left Exterior Side (3)
Joint Number:	ALSLME387BAV

	Weaker Member	Stronger Member
Material	—	---
Tensile Strength (MPa)	310.2	---
Gage/Thickness (mm)	16 / 1.448	---
Fastener Holes (No./Diameter - mm.)	7 / 4.902	---
Net Area (Sq. mm.)	244.5	---
Material Strength (N)	75,862.7	---
80% of Material Strength (N)	45,517.5	---
Maximum Load From Tensile Test of Joint (N)	65,931.0	---
PASS/FAIL	PASS	---

1. Rivet Spacing Double Row Staggered 50 mm Each Row

Comments: American Transportation Corp. provided material properties but not the specific material type.

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN


Test Vehicle: **2003 American Transportation Corp IC3S630** NHTSA No.: **C30902**
School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

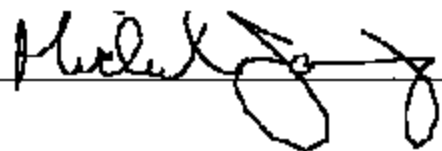
Specimen Description:	Left Interior Side (4)
Joint Number:	ALSMI485BSV

	Weaker Member	Stronger Member
Material	---	---
Tensile Strength (MPa)	310.2	---
Gage/Thickness (mm)	22 / .759	---
Fastener Holes (No./Diameter - mm.)	6 / 4.089	---
Net Area (Sq. mm.)	135.5	---
Material Strength (N)	42,098.7	---
60% of Material Strength (N)	25,259.1	---
Maximum Load From Tensile Test of Joint (N)	33,032.5	---
PASS/FAIL	PASS	---

1. Screw Spacing 35 mm

Comments: American Transportation Corp. provided material properties but not the specific material type. Joint Number Should Read ALSMI486BSV.

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN


Test Vehicle: **2003 American Transportation Corp IC3S530** NHTSA No.: **C30902**
 School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

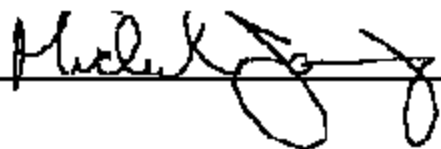
Specimen Description:	Roof Exterior (5)
Joint Number:	ALSCME587BAV

	Weaker Member	Stronger Member
Material	---	---
Tensile Strength (MPa)	310.2	---
Gage/Thickness (mm)	20 / .912	---
Fastener Holes (No./Diameter – mm.)	7 / 4.902	---
Net Area (Sq. mm.)	154	---
Material Strength (N)	47,780.3	---
60% of Material Strength (N)	28,668.2	---
Maximum Load From Tensile Test of Joint (N)	21,381.1	---
PASS/FAIL	FAIL	---

1. Rivet Spacing Double Row Staggered 50 mm Each Row

Comments: American Transportation Corp. provided material properties but not the specific material type.

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: **2003 American Transportation Corp IC3S530** NHTSA No.: **C30902**
 School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

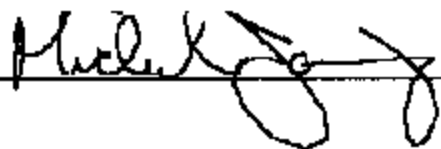
Specimen Description:	Roof Interior (6)
Joint Number:	ALSCM1685BSV

	Weaker Member	Stronger Member
Material	---	---
Tensile Strength (MPa)	310.2	---
Gage/Thickness (mm)	22 / .759	---
Fastener Holes (No./Diameter - mm.)	5 / 4.089	---
Net Area (Sq. mm.)	138.7	---
Material Strength (N)	41,779.8	---
60% of Material Strength (N)	25,067.9	---
Maximum Load From Tensile Test of Joint (N)	21,997.5	---
PASS/FAIL	FAIL	---

1. Screw Spacing 38 mm

Comments: American Transportation Corp. provided material properties but not the specific material type.

Recorded By: 

Approved By: 

Date: October 2, 2003

SECTION 5
INSTRUMENTATION AND EQUIPMENT LIST

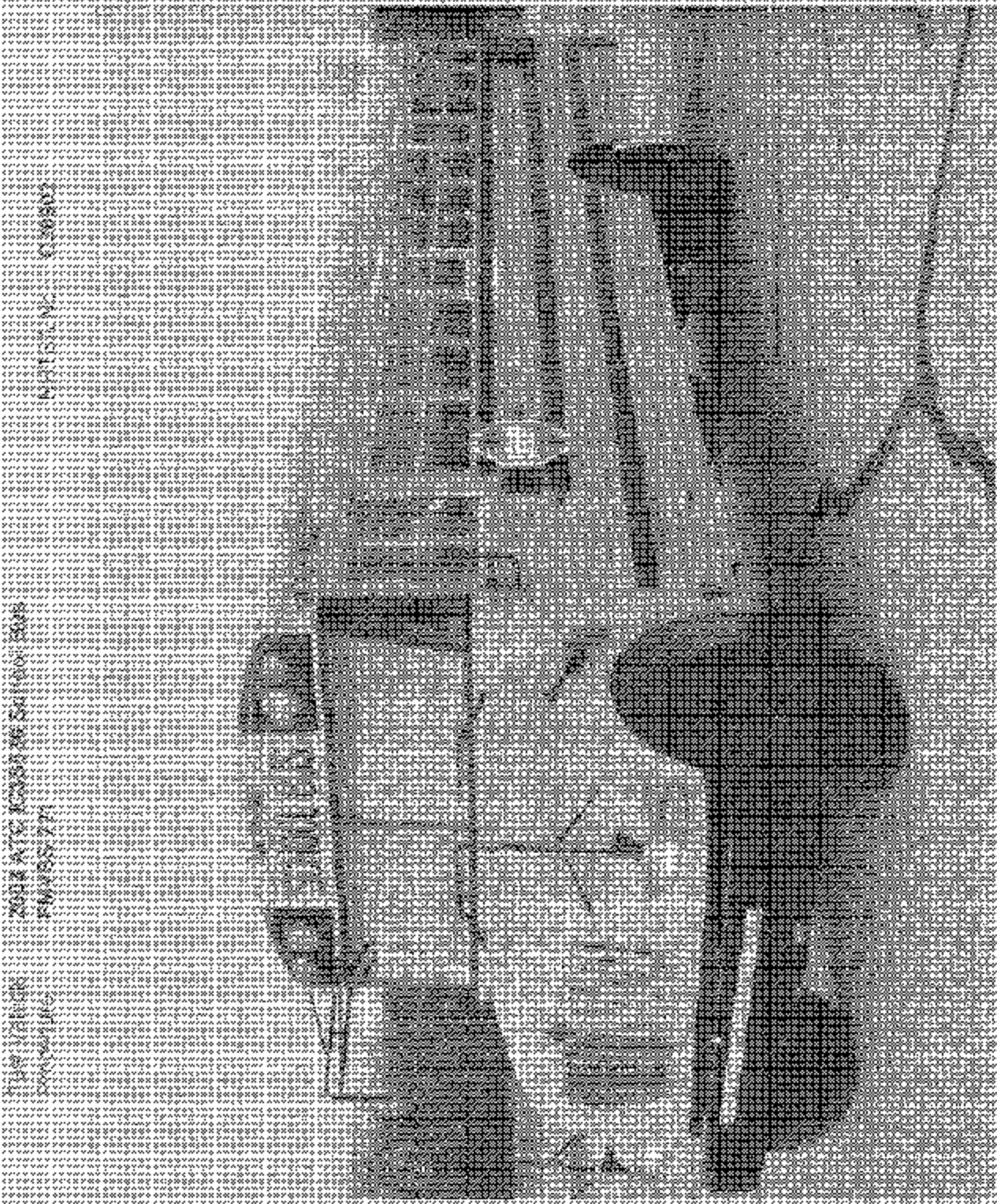
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School Bus
 Test Lab: **MGA Research-Wisconsin Operations** Test Date: **8/15/03**

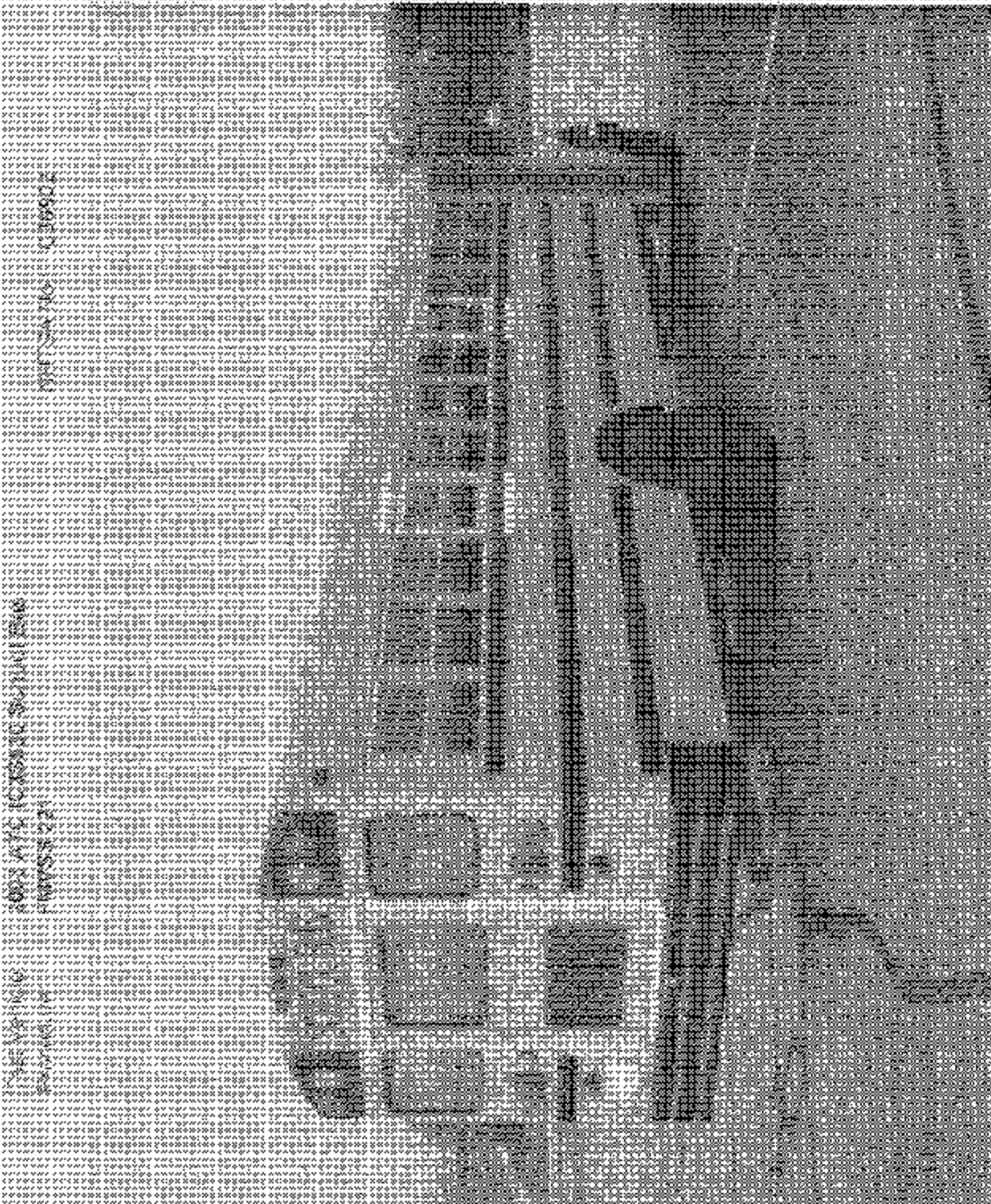
Equipment	Description	Model/Serial No.	Cal. Date	Next Cal. Date
Computer	HP	Vectra / US03263612	—	—
A/D Interface	Metrabyte	DAS-1802	—	—
Load Cell	Interface	138773	6/19/03	12/19/03
Linear Potentiometer	Ametek	17167	8/9/03	2/9/04
Digital Caliper	Mitutoyo	CD-6 ^{GS} / 0004174	10/18/02	10/18/03
Steel Tape	Stanley	Powerlock / 149	5/30/03	11/30/03
Temp. Recorder	Dickson	TR320 / 03039010	2/1/03	2/1/04
Temp. Stickers	McMaster-Carr	60°C 5952K21	One Time Usage	—

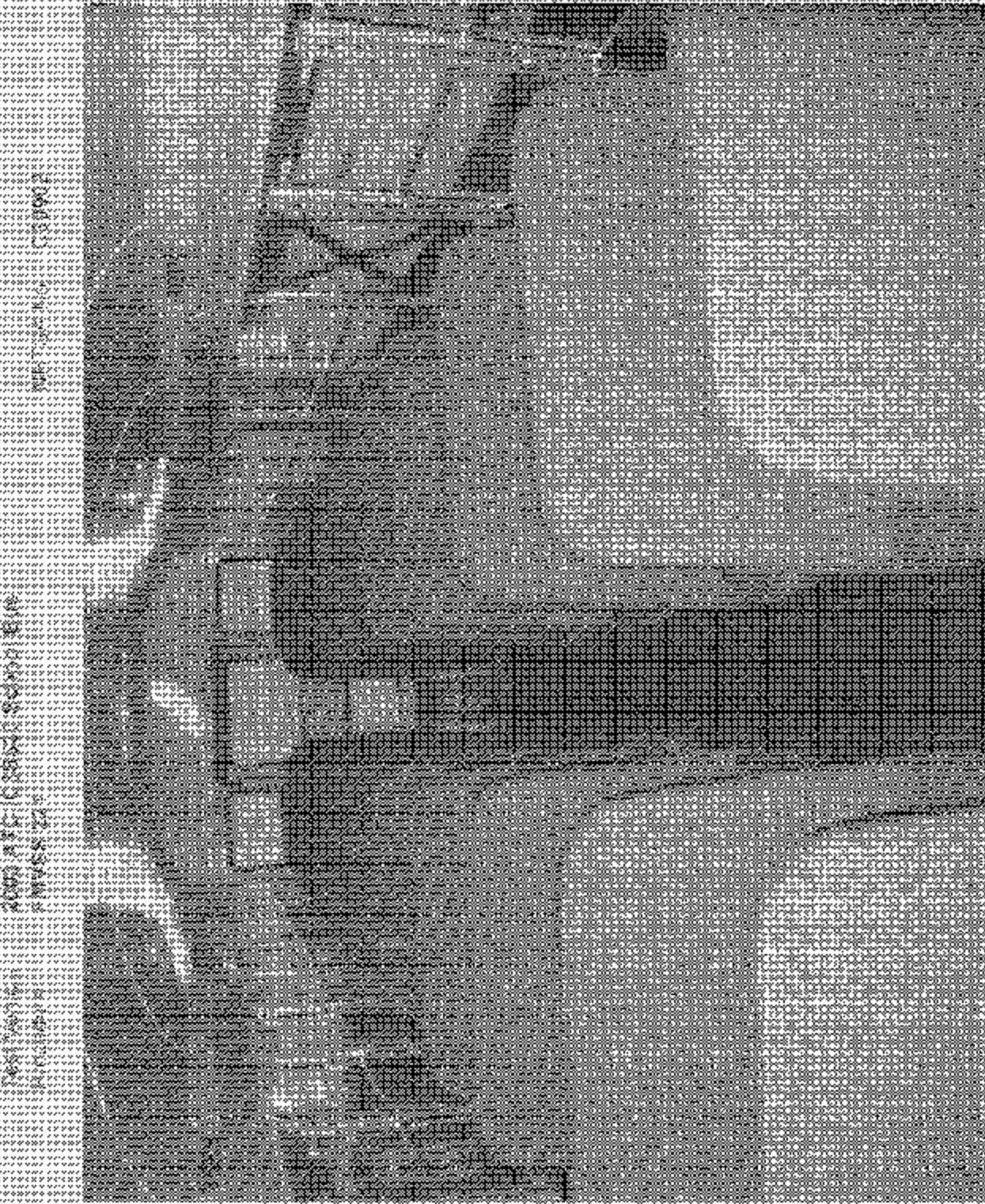
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PHOTOGRAPHS**

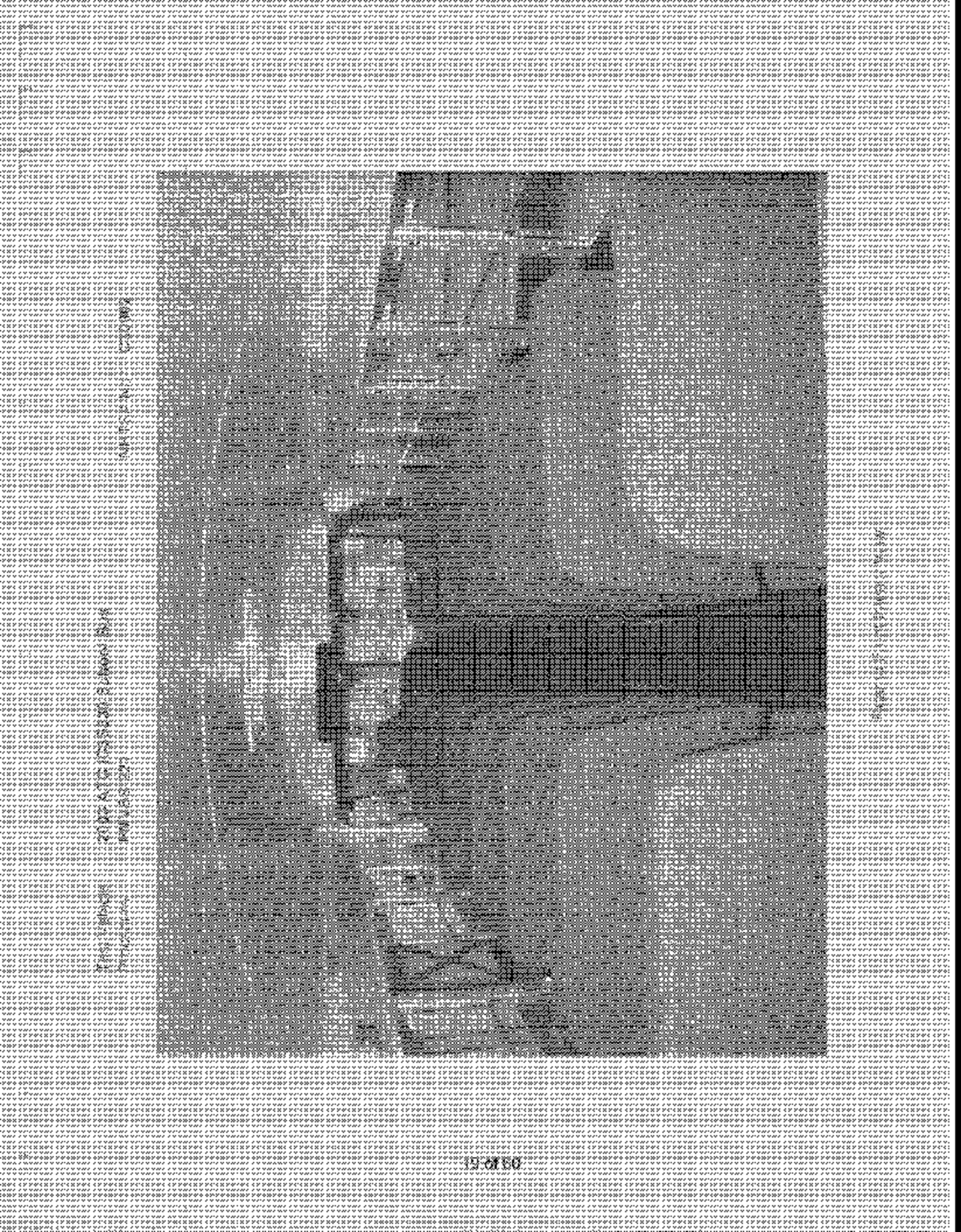
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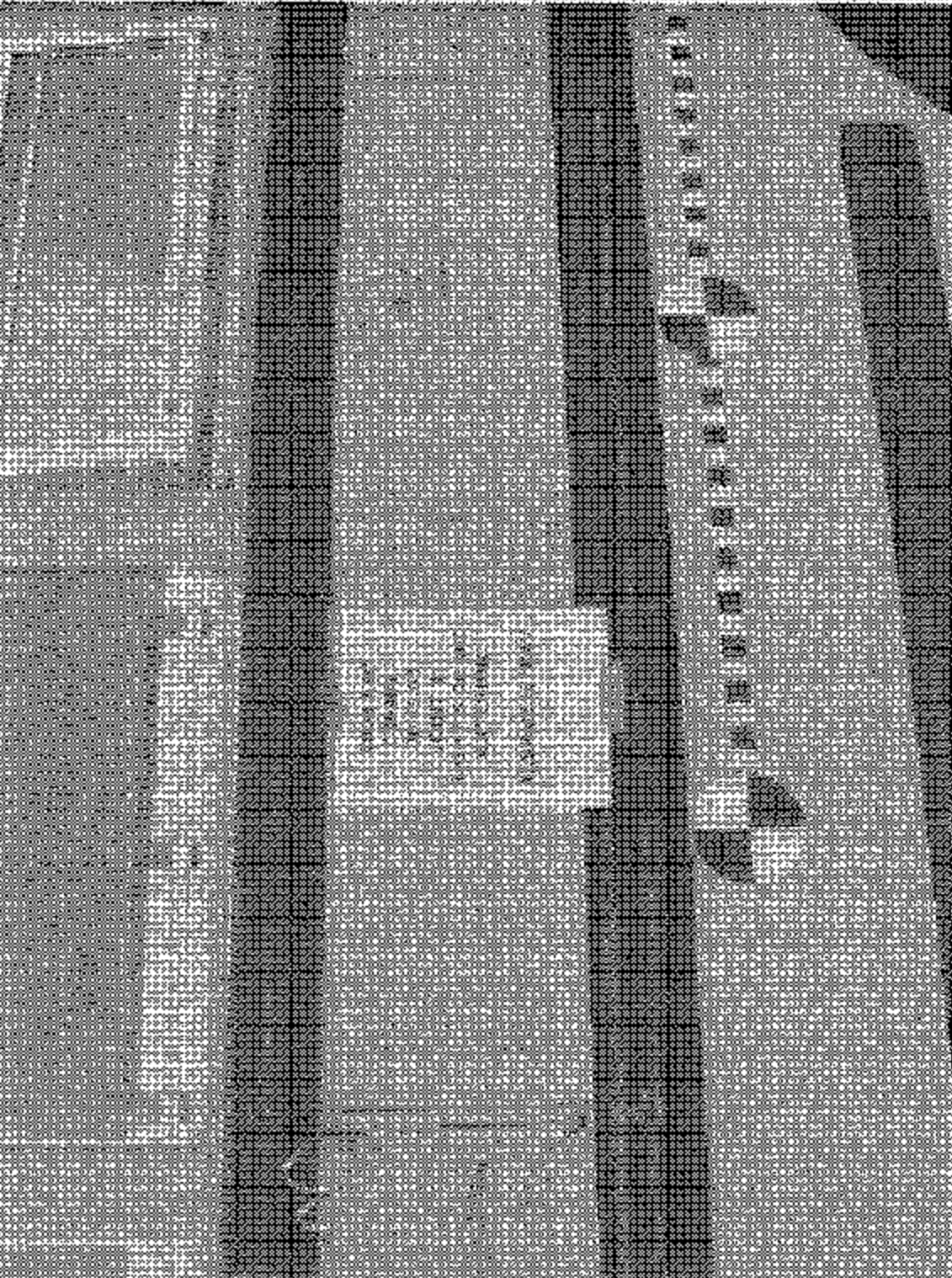


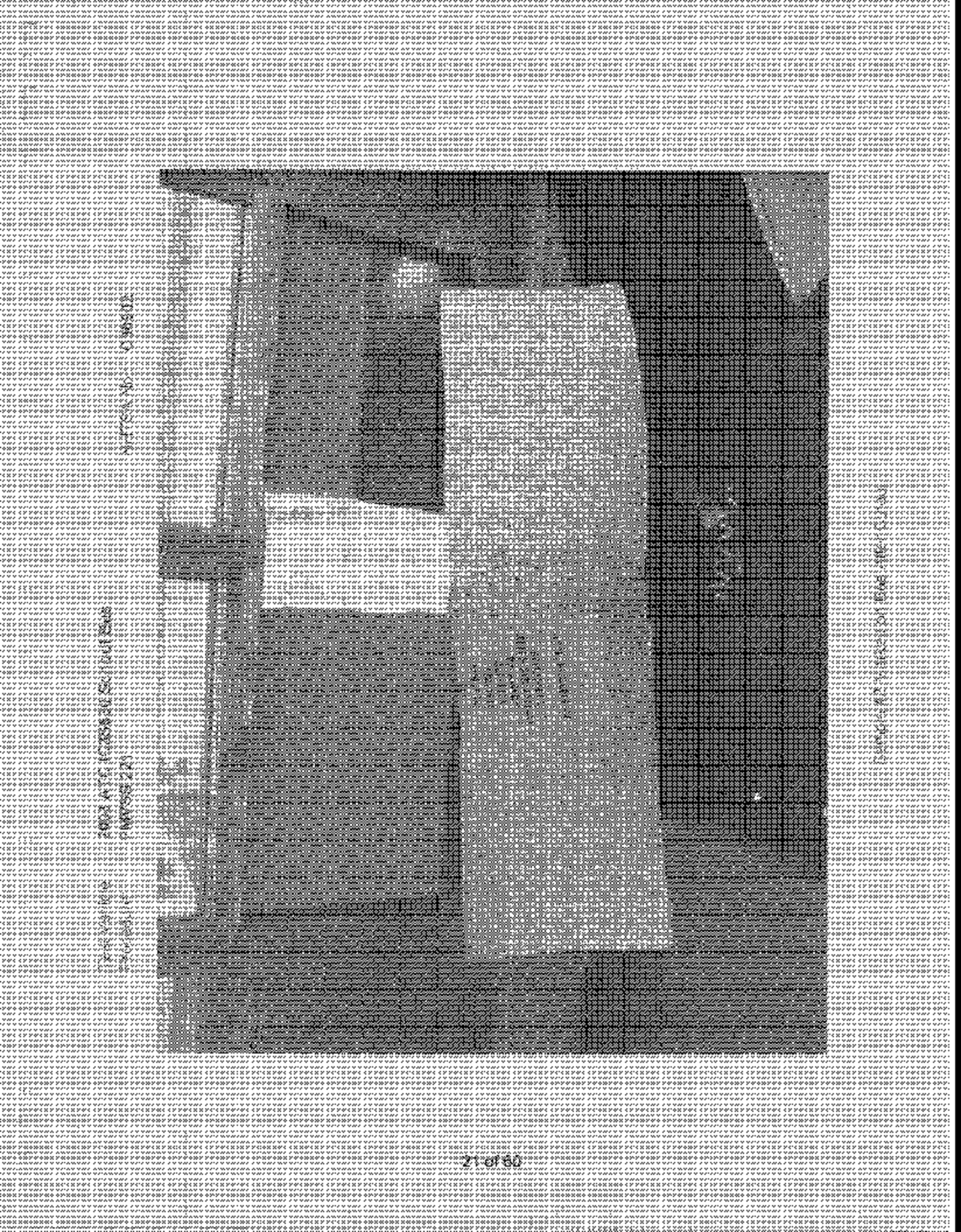


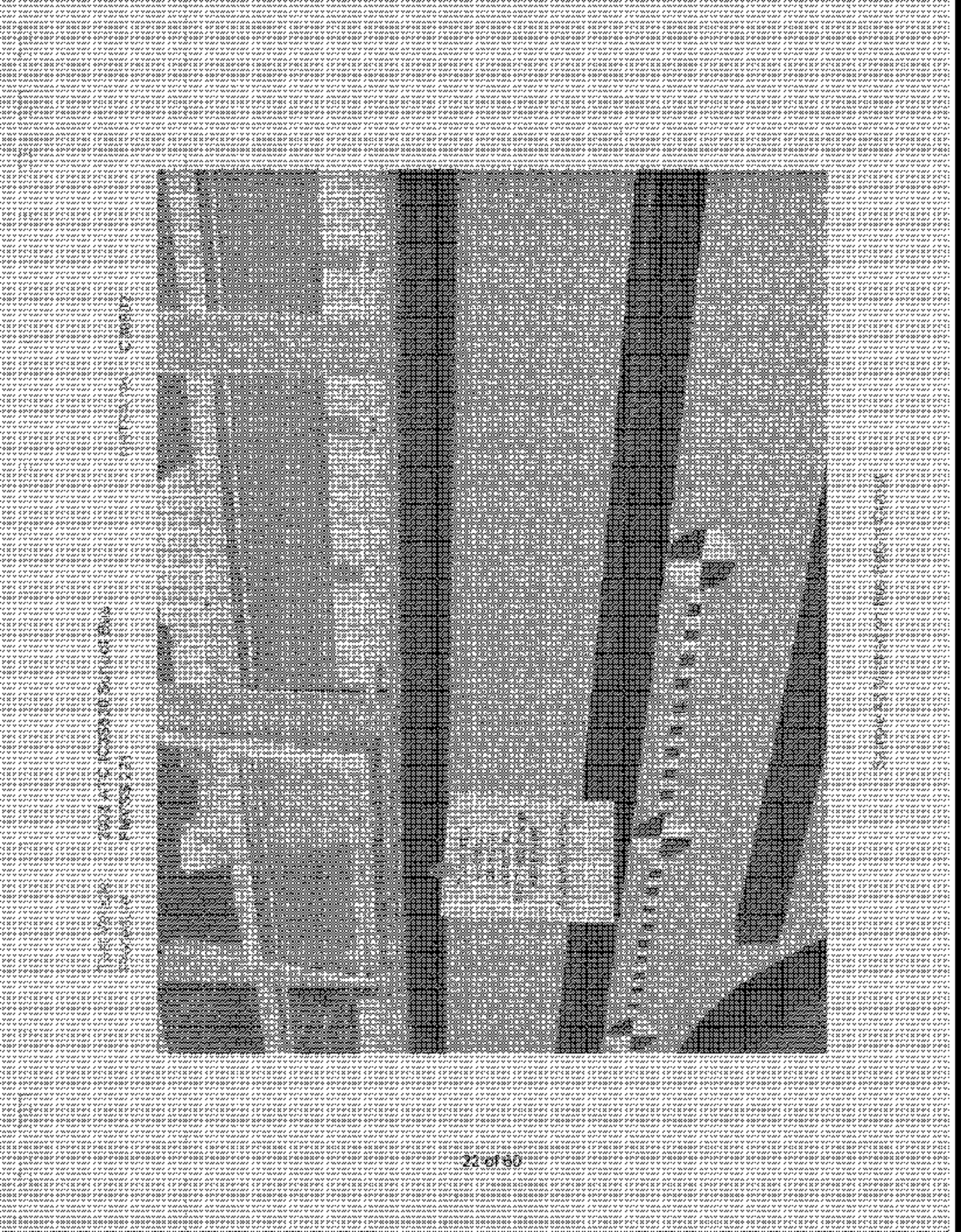


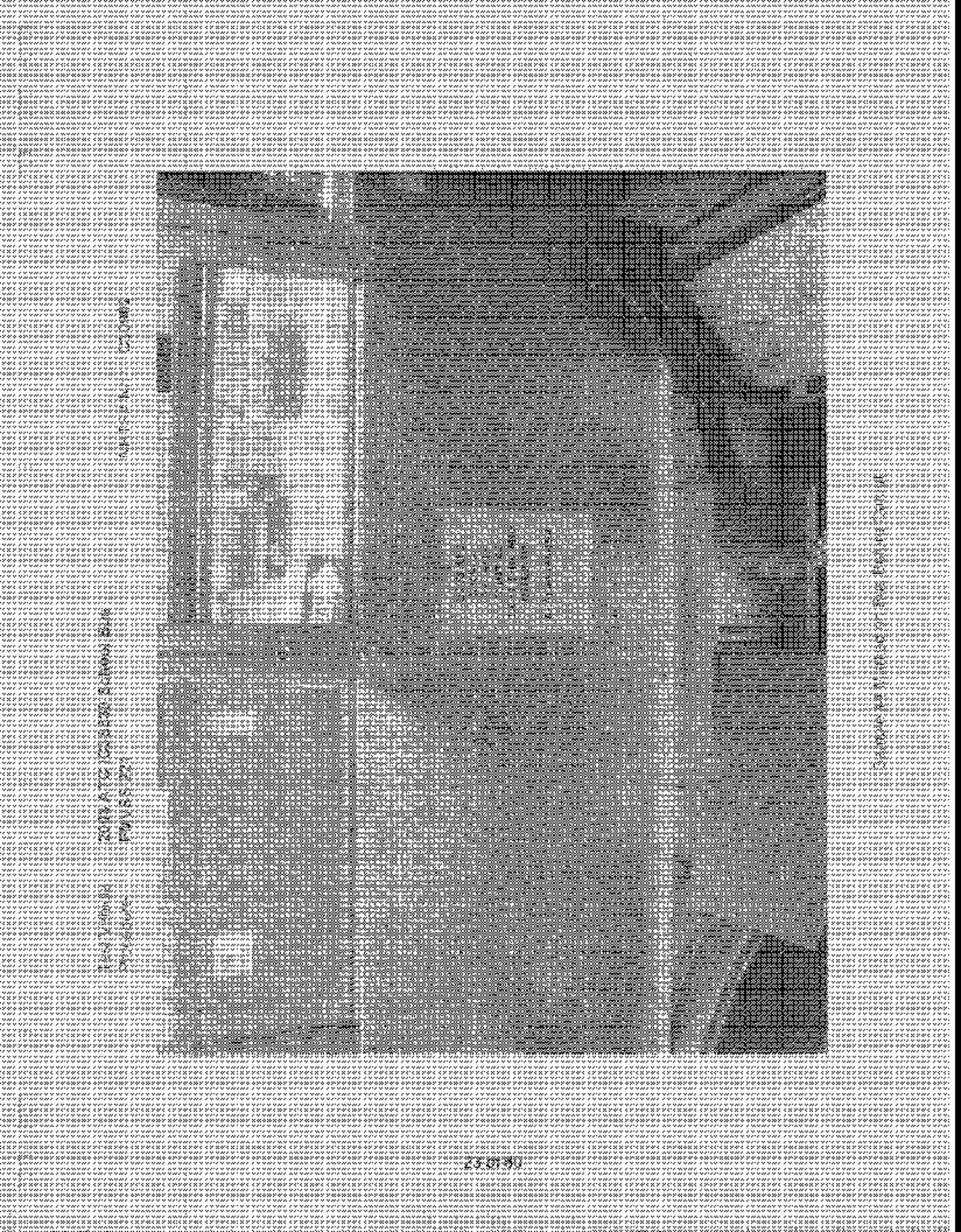


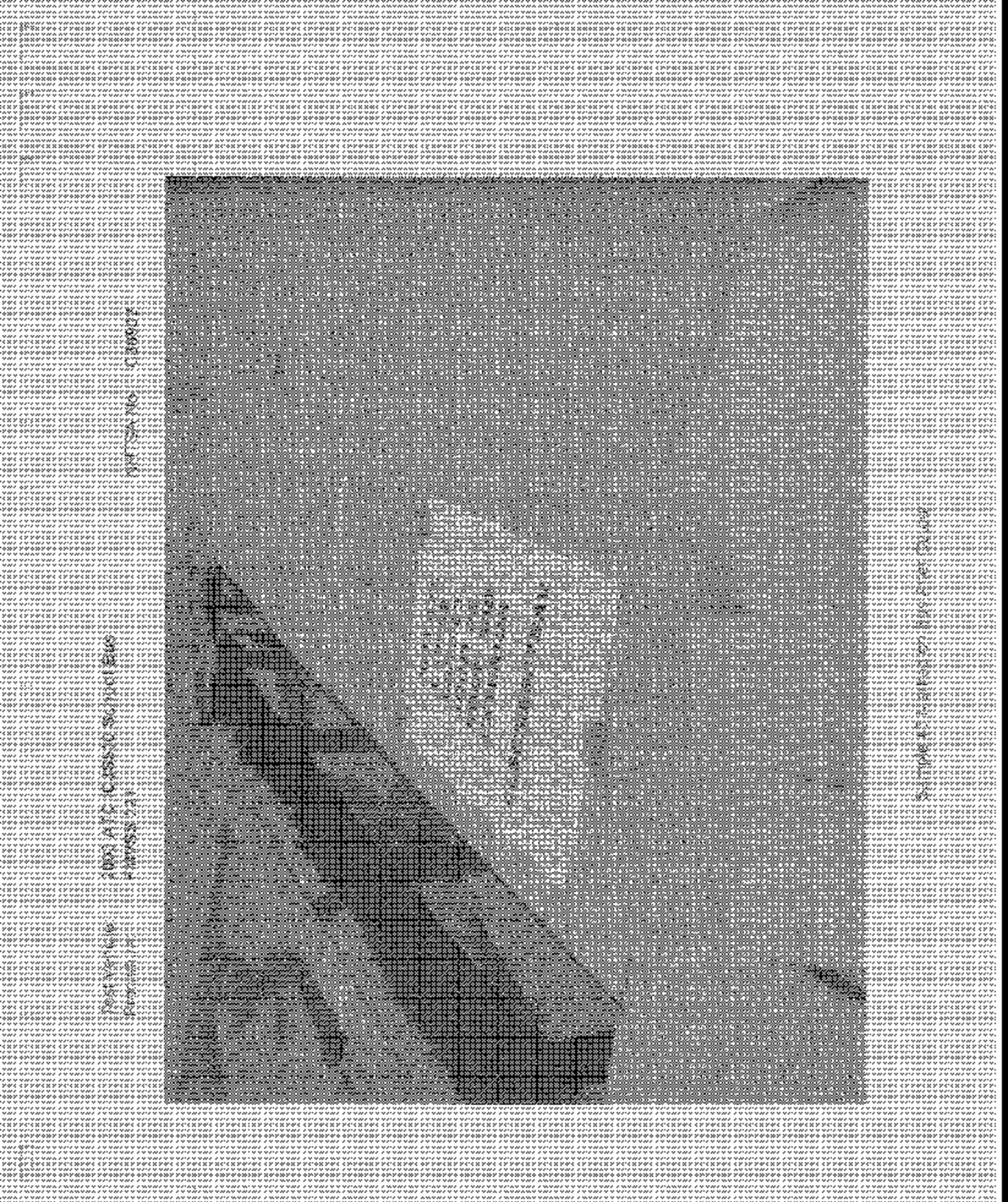
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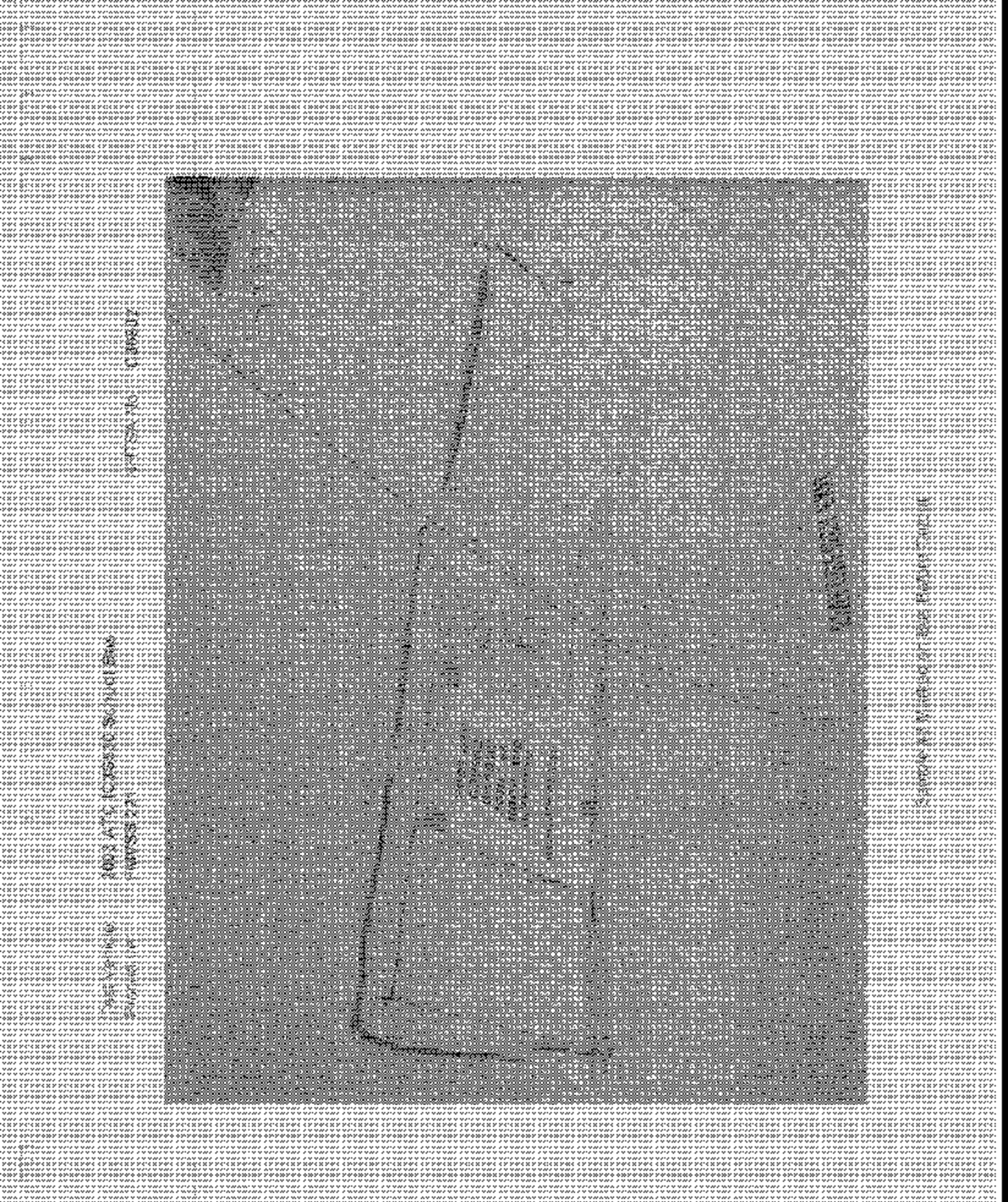


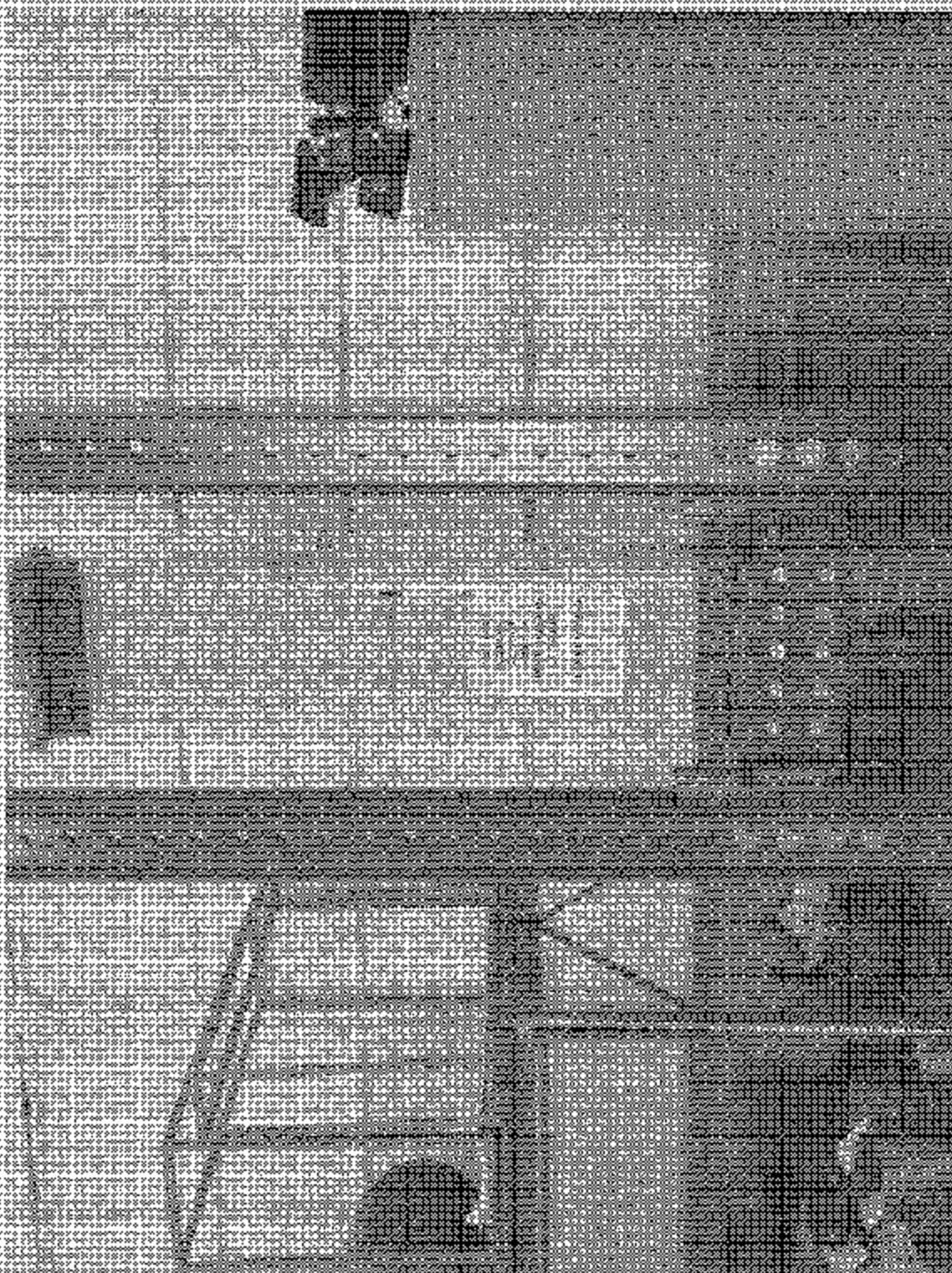


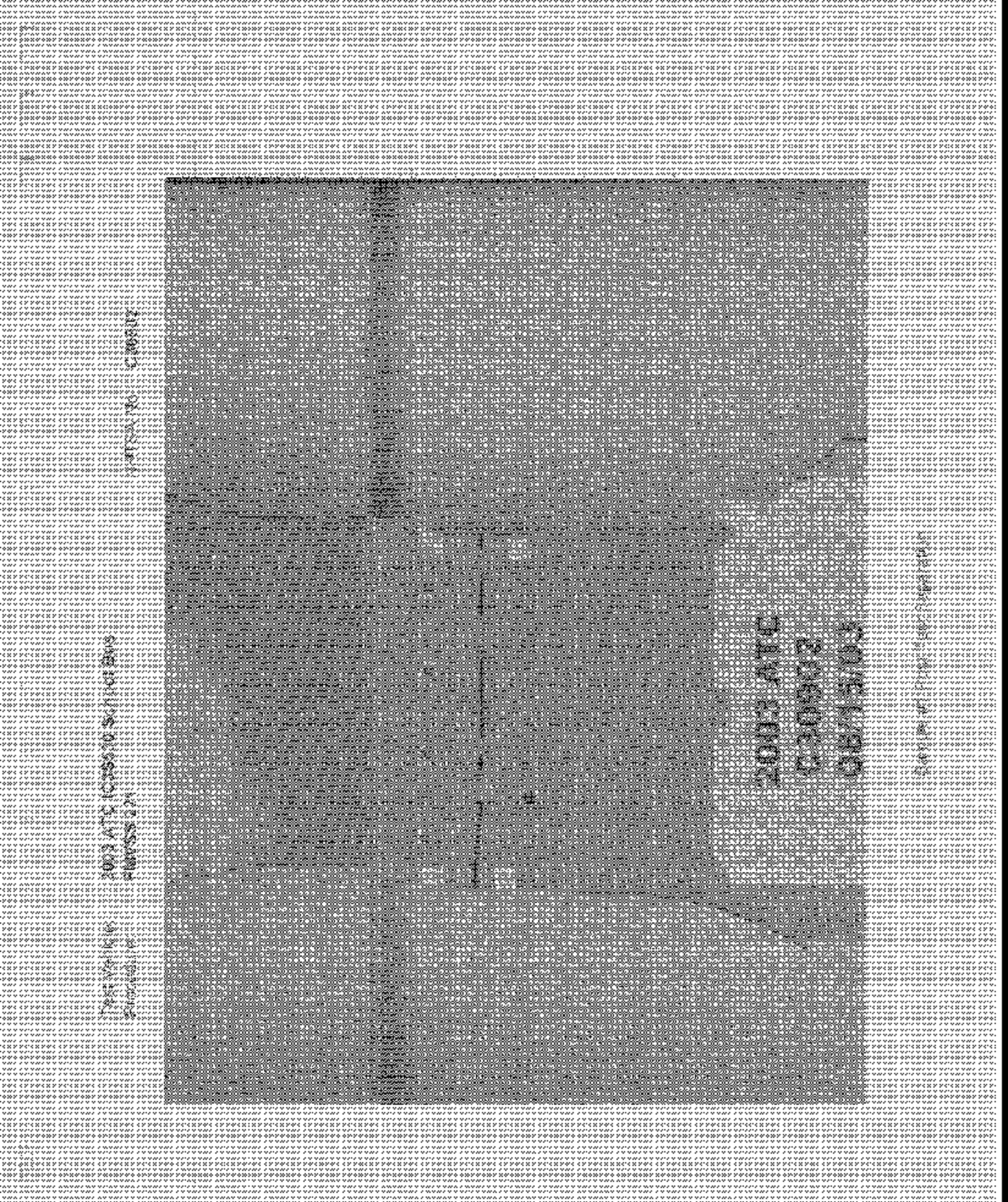


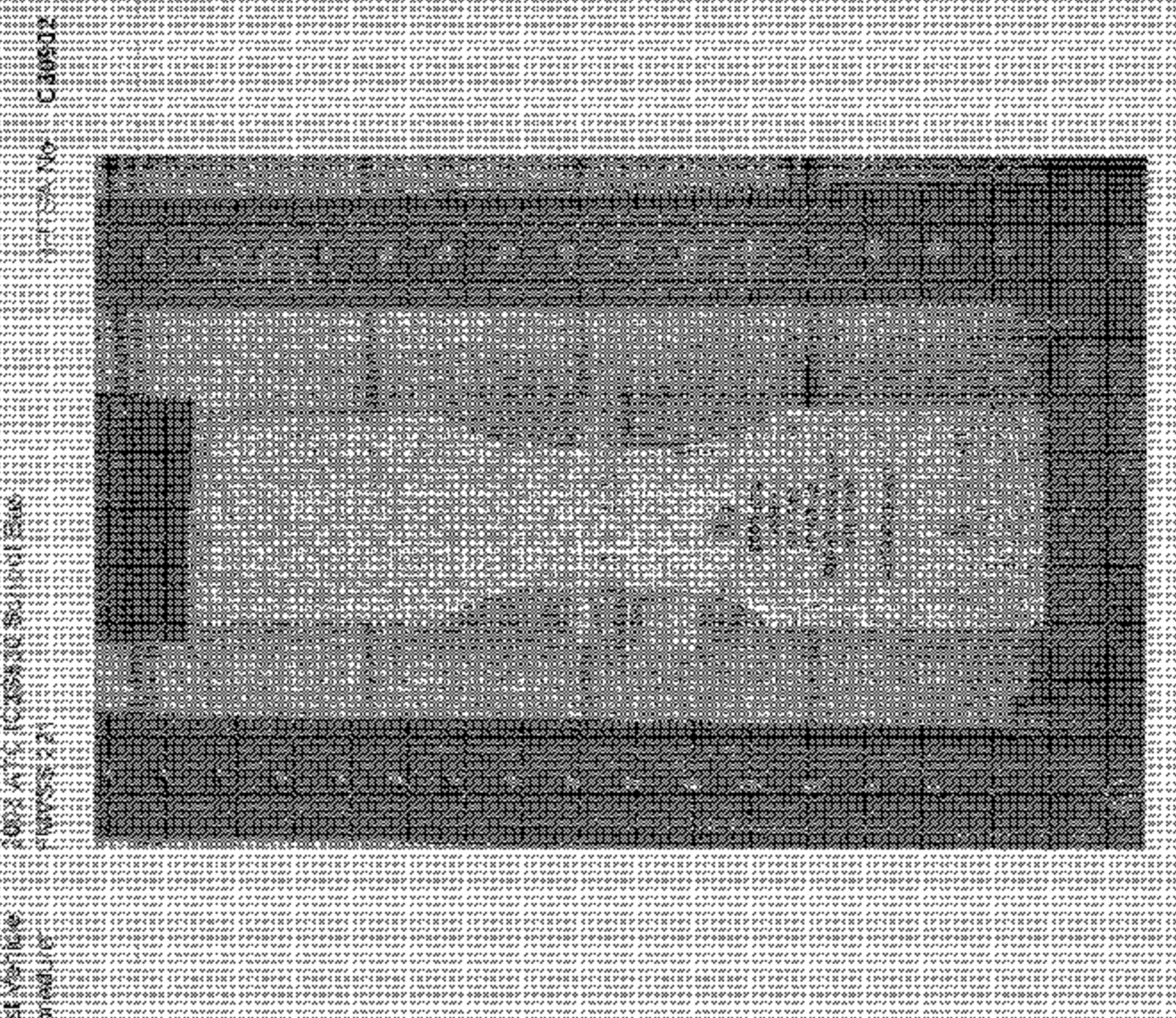








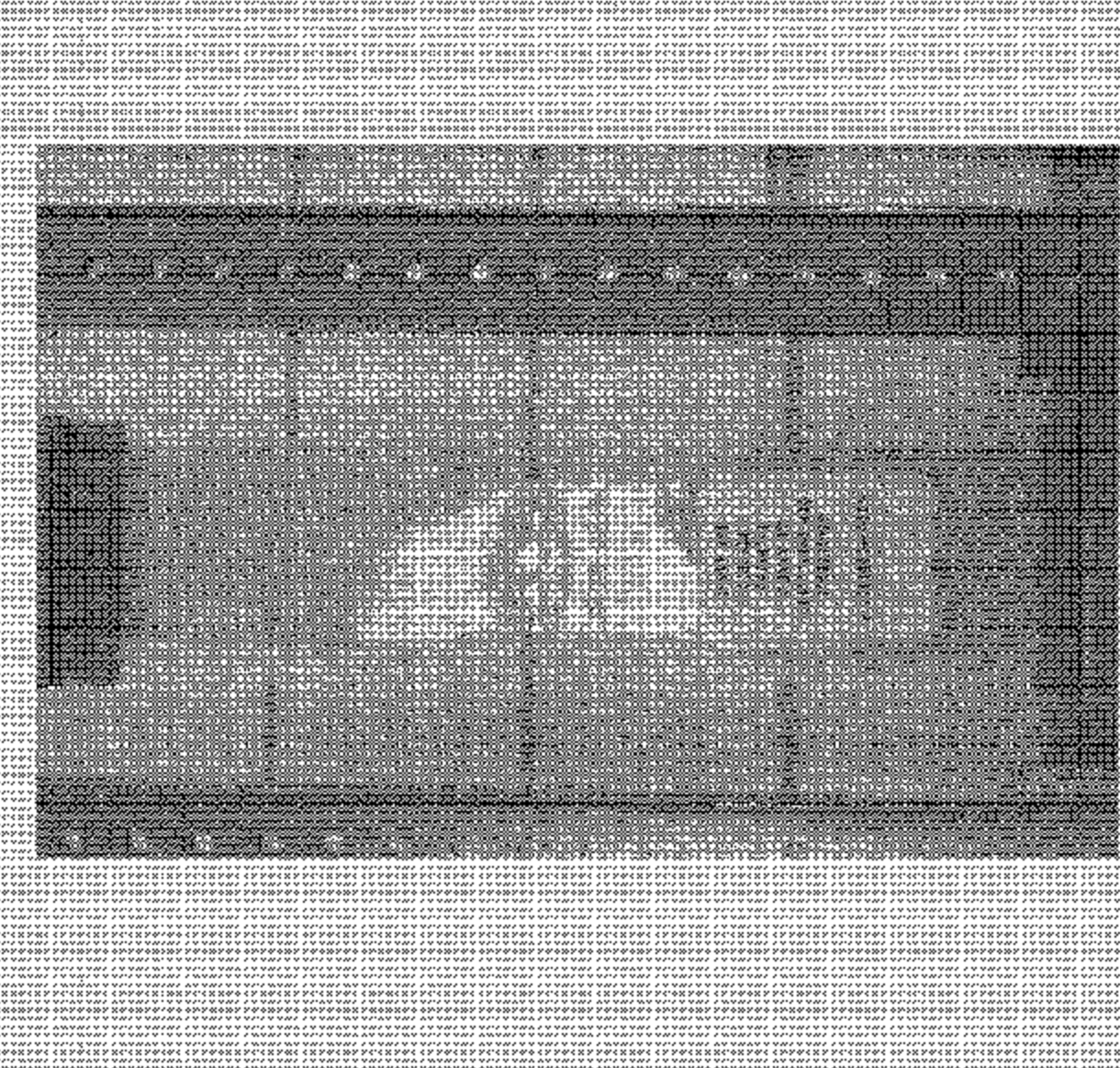




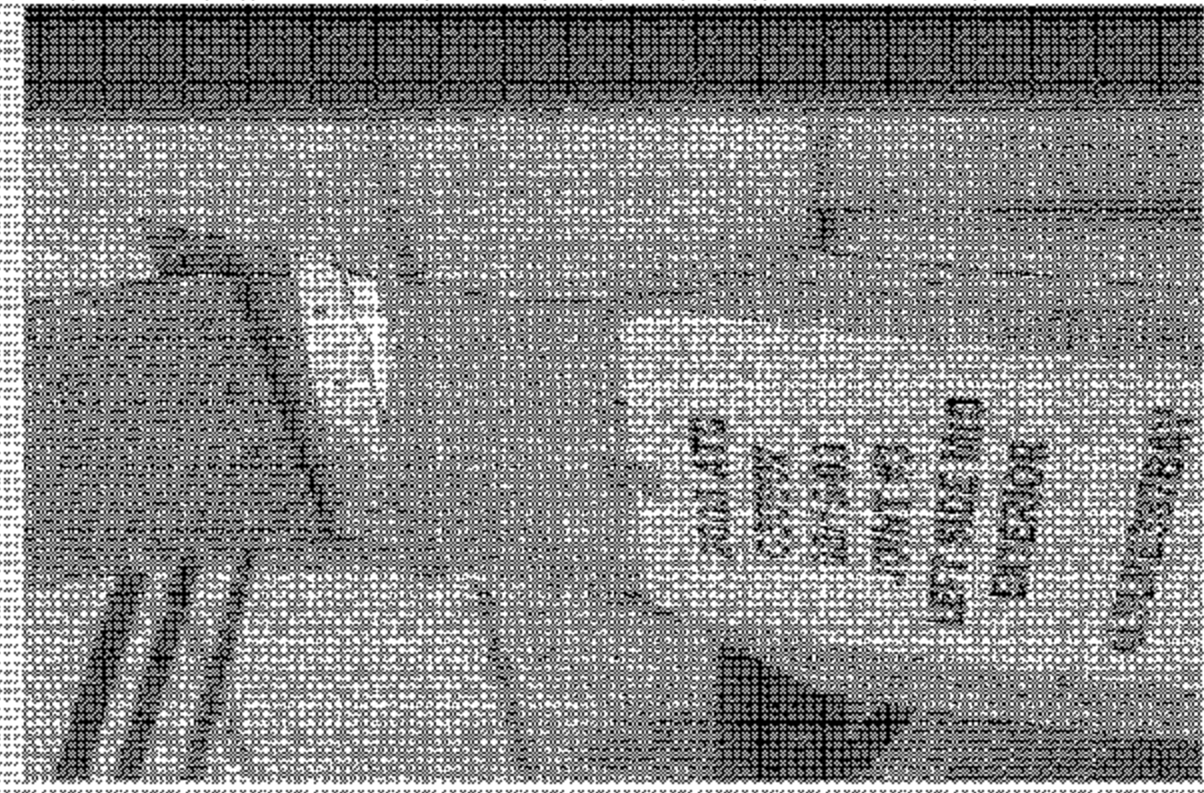
POSTAL SERVICE RECEIPTS



THE
SPEAKERS
OF
THE
SPEAKERS

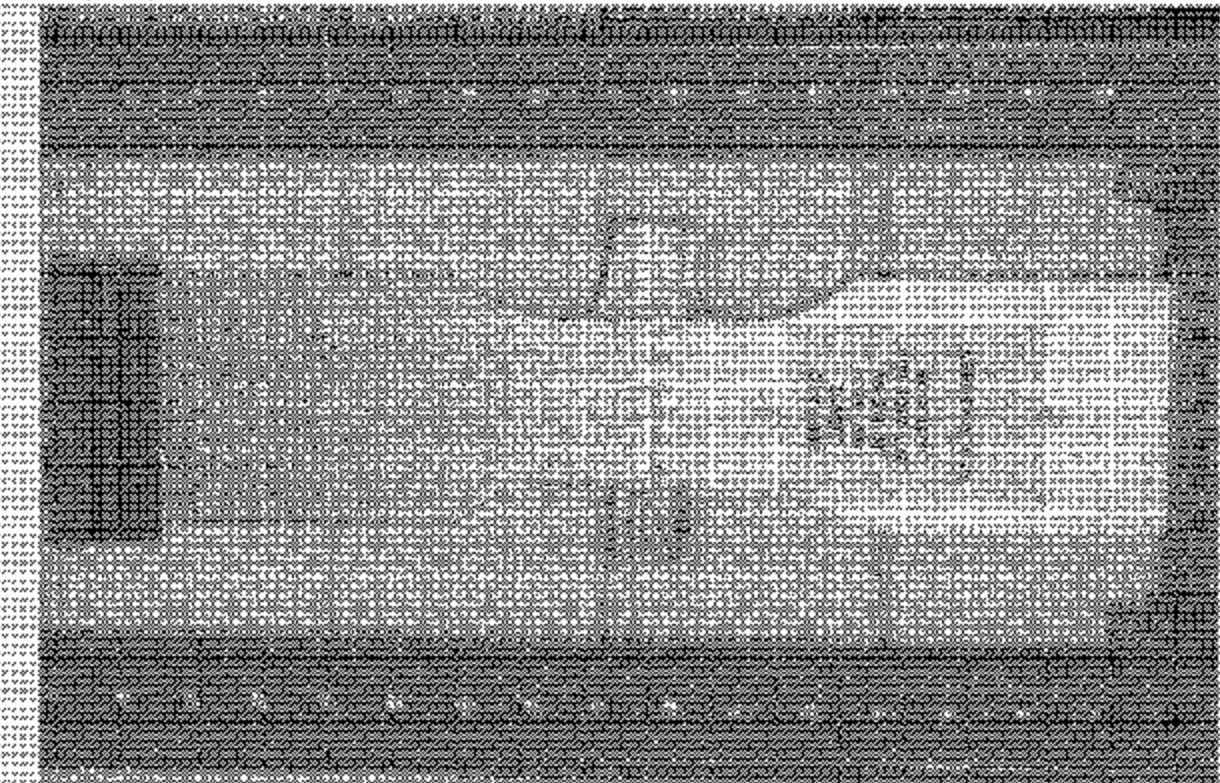


Test Results of Various Processes

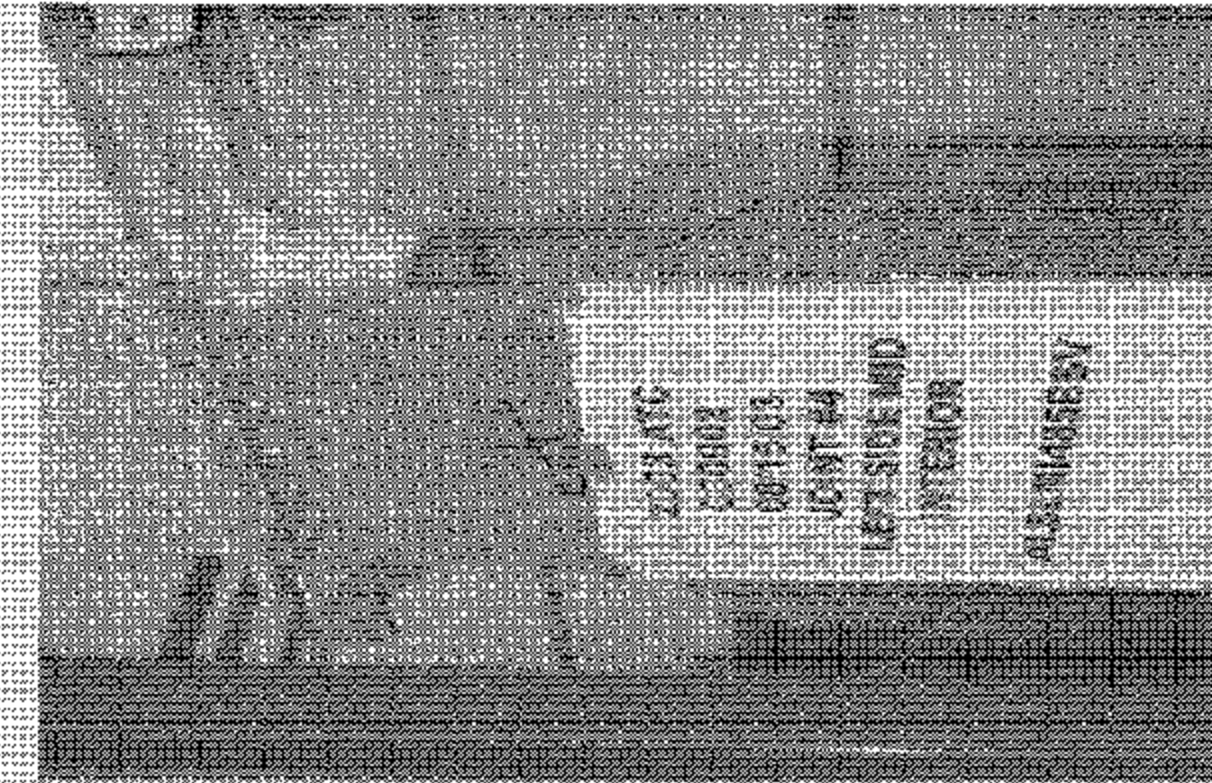


11-11-68

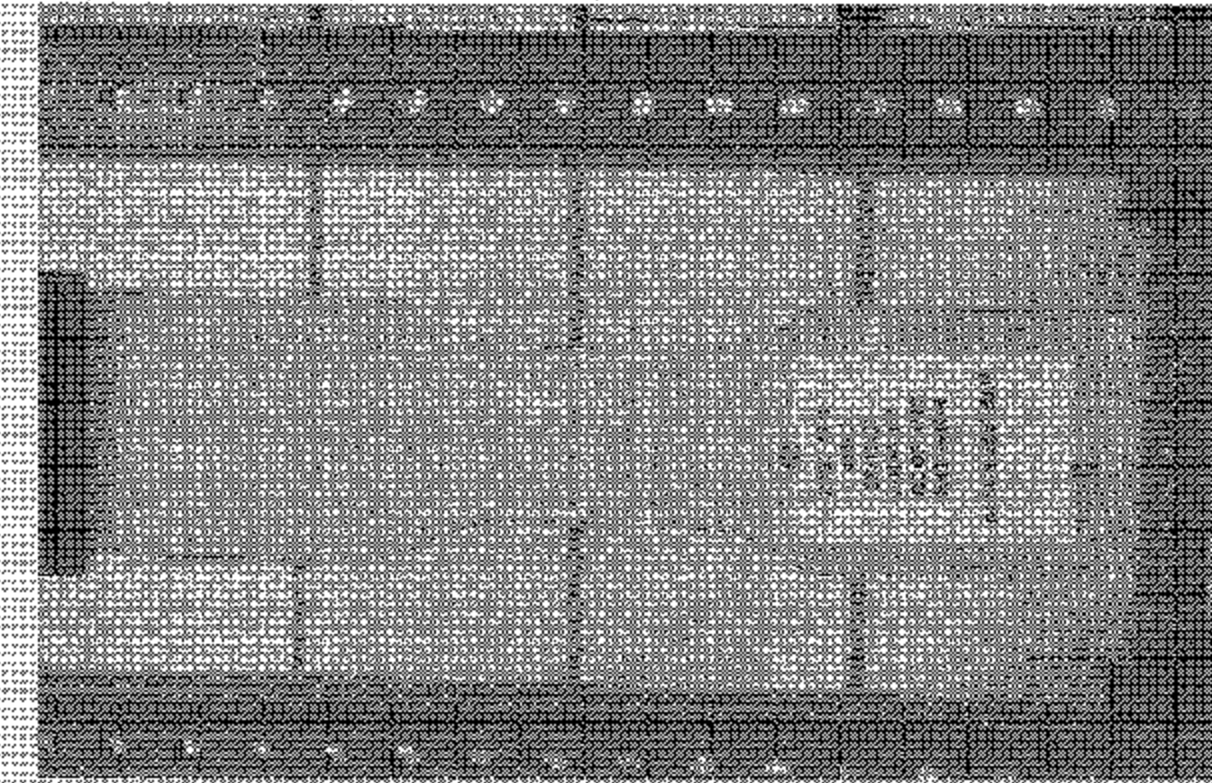
11-11-68



Rest Area for Drivers and Passengers



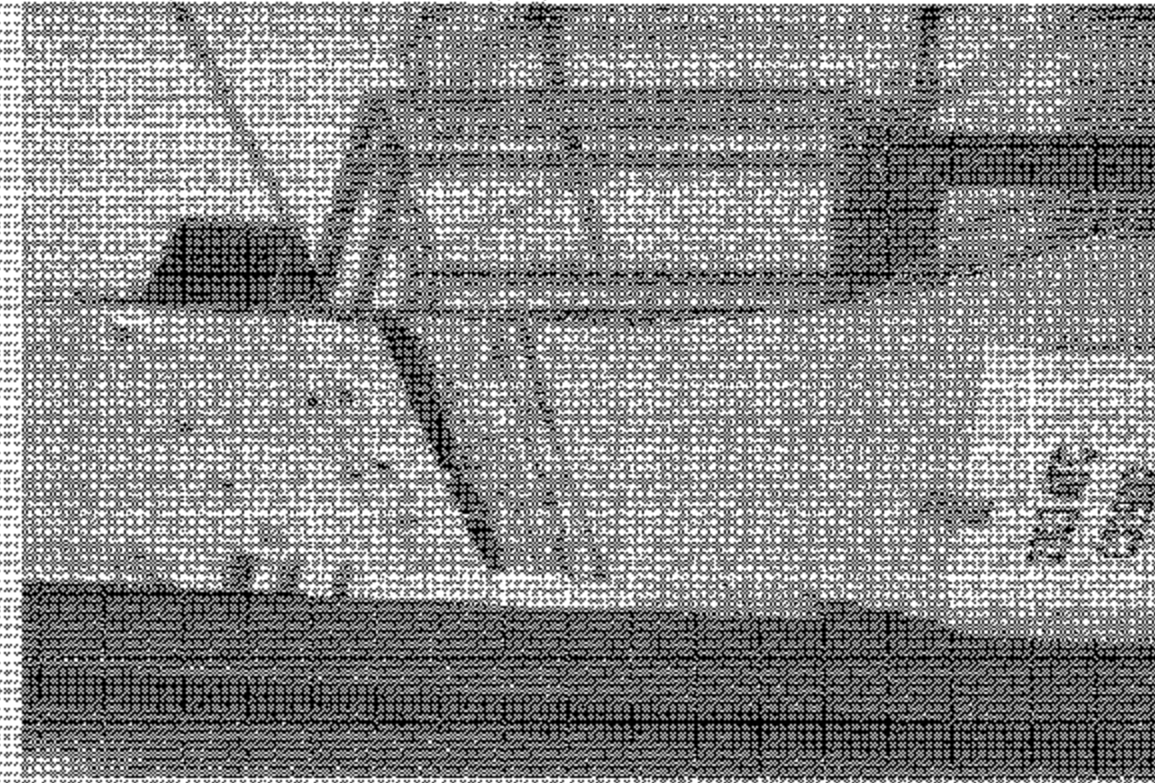
View of exhibits from the "The World's Most Colorful" exhibit at the Science Center, featuring a large display of colorful objects.



Case No. 100-1000000

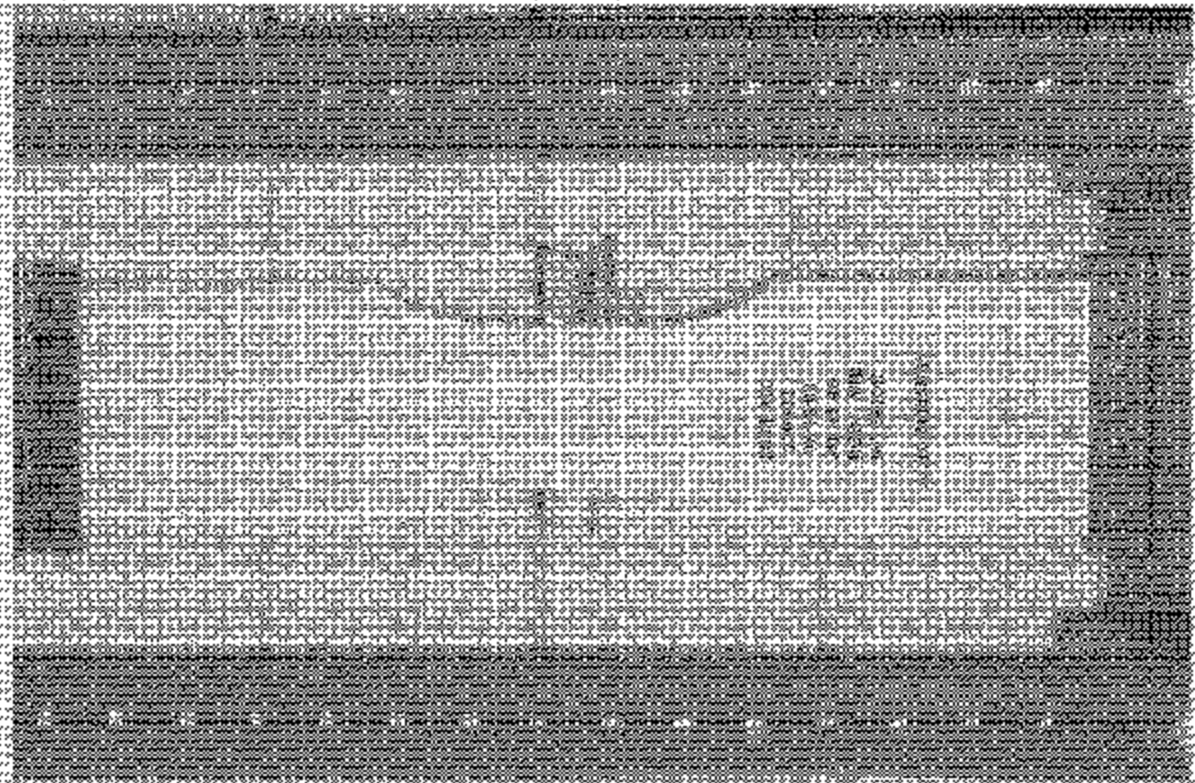
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Case No. 100-1000000



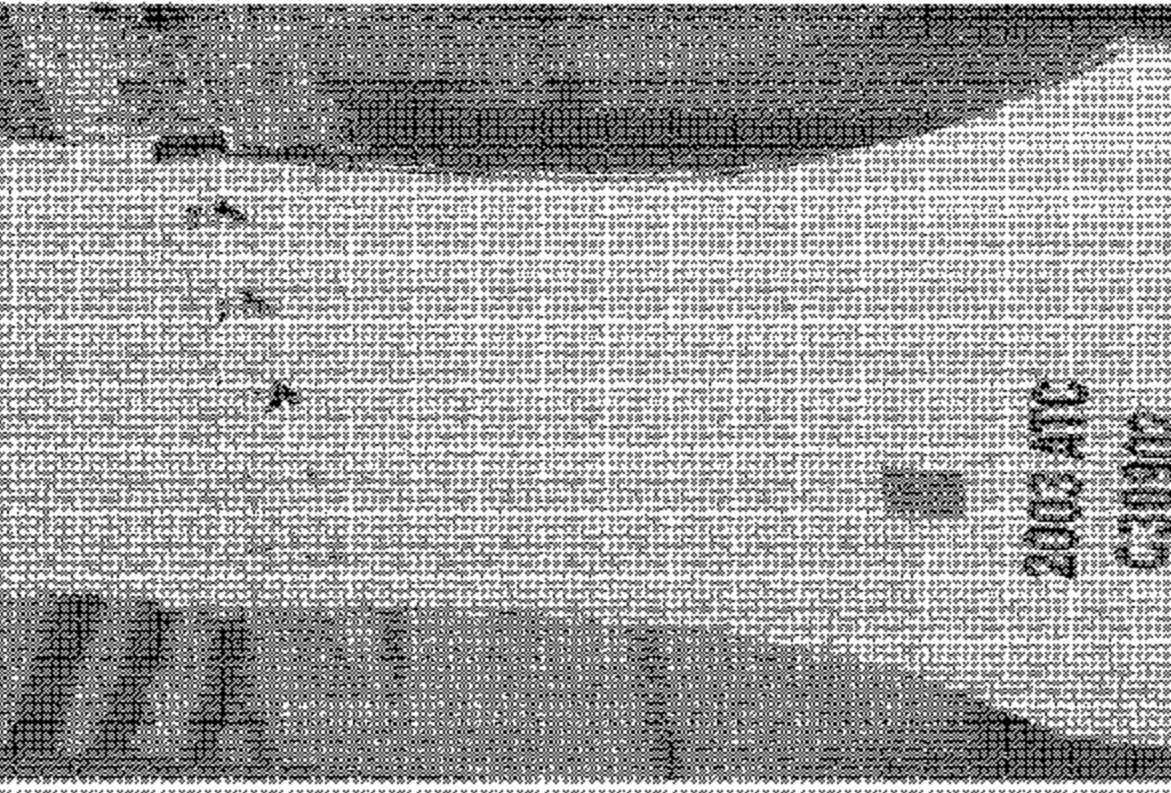
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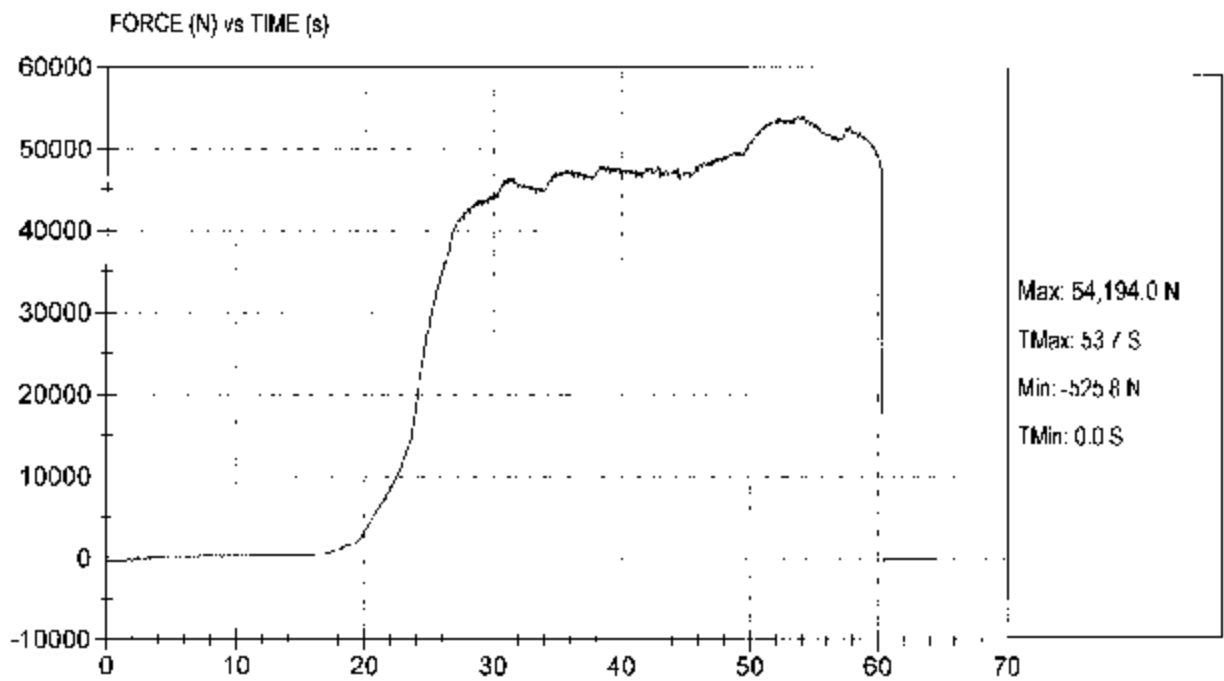
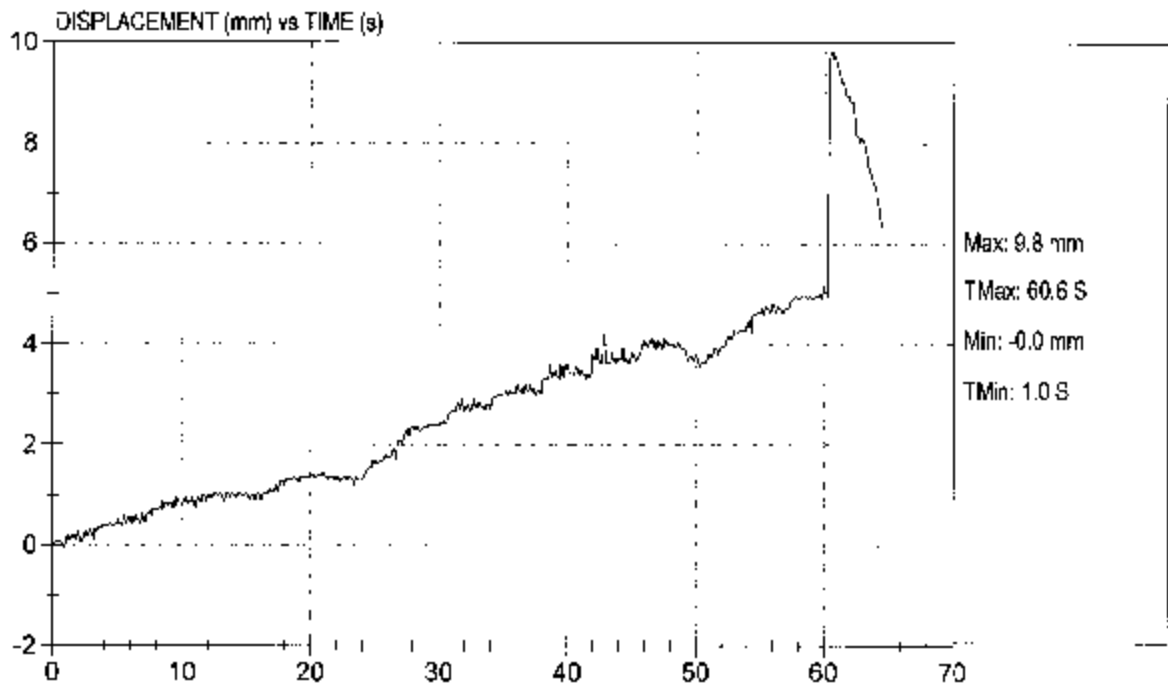


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**SECTION 7
TEST PLOTS**

TABLE OF TEST PLOTS

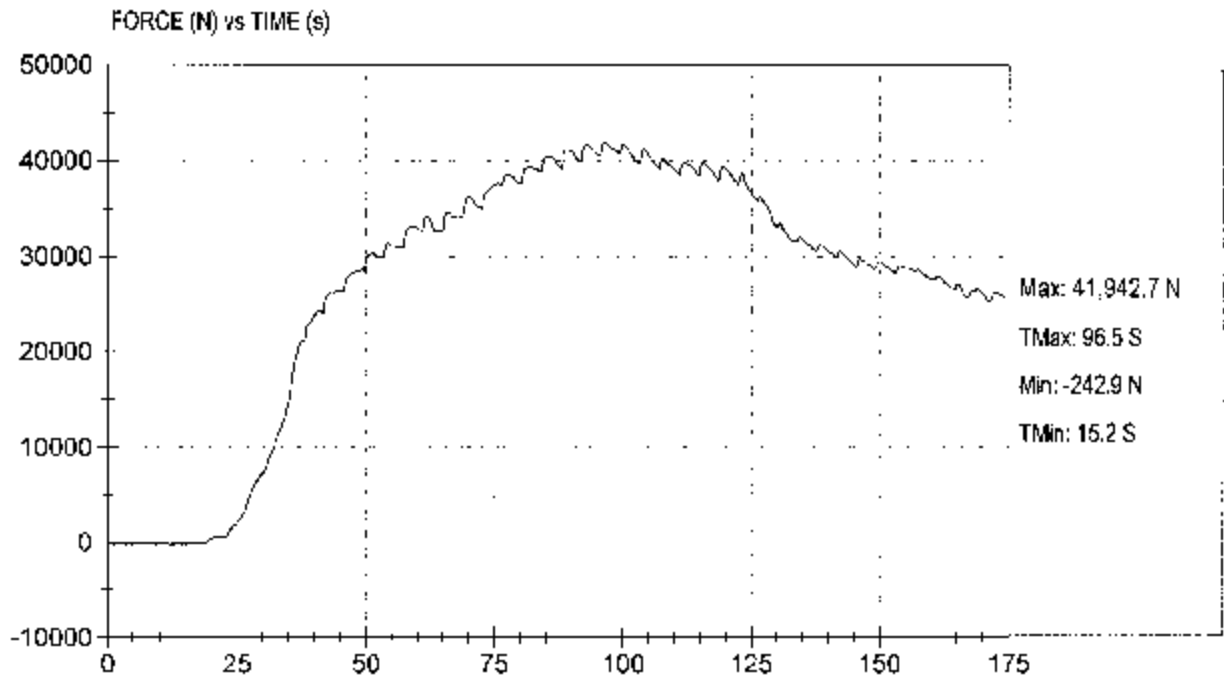
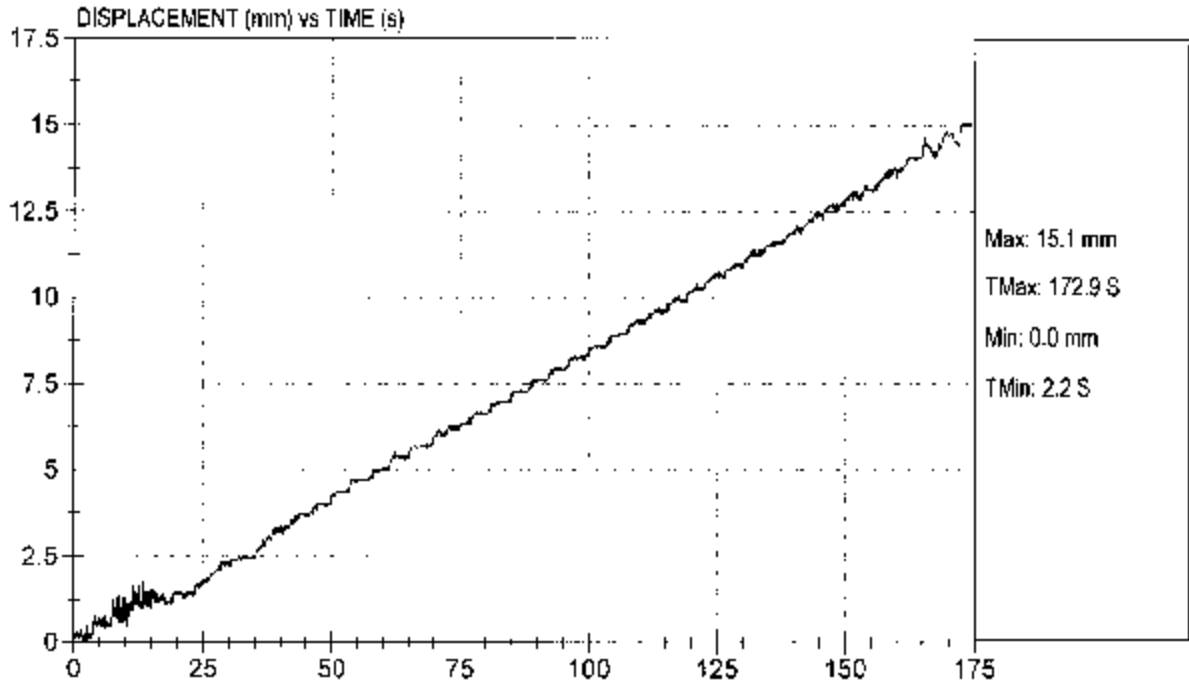
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Test Desc: ALSRM1287BSV (Right Int. Side) (2)
Component ID: ATC

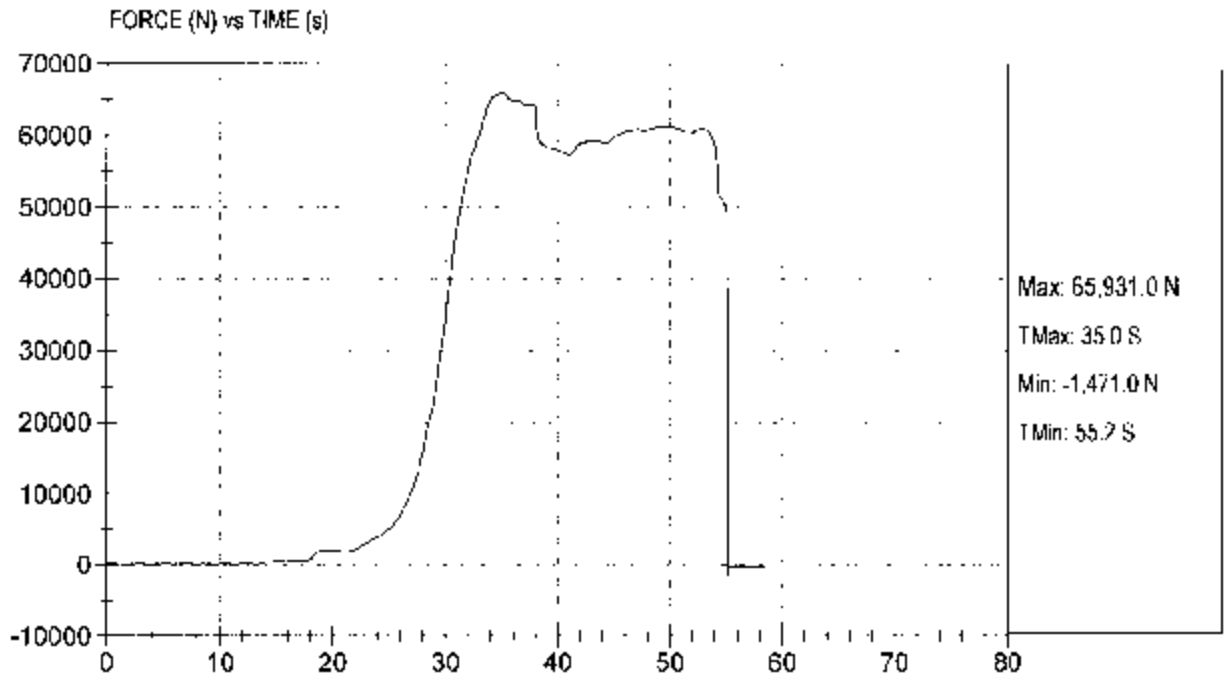
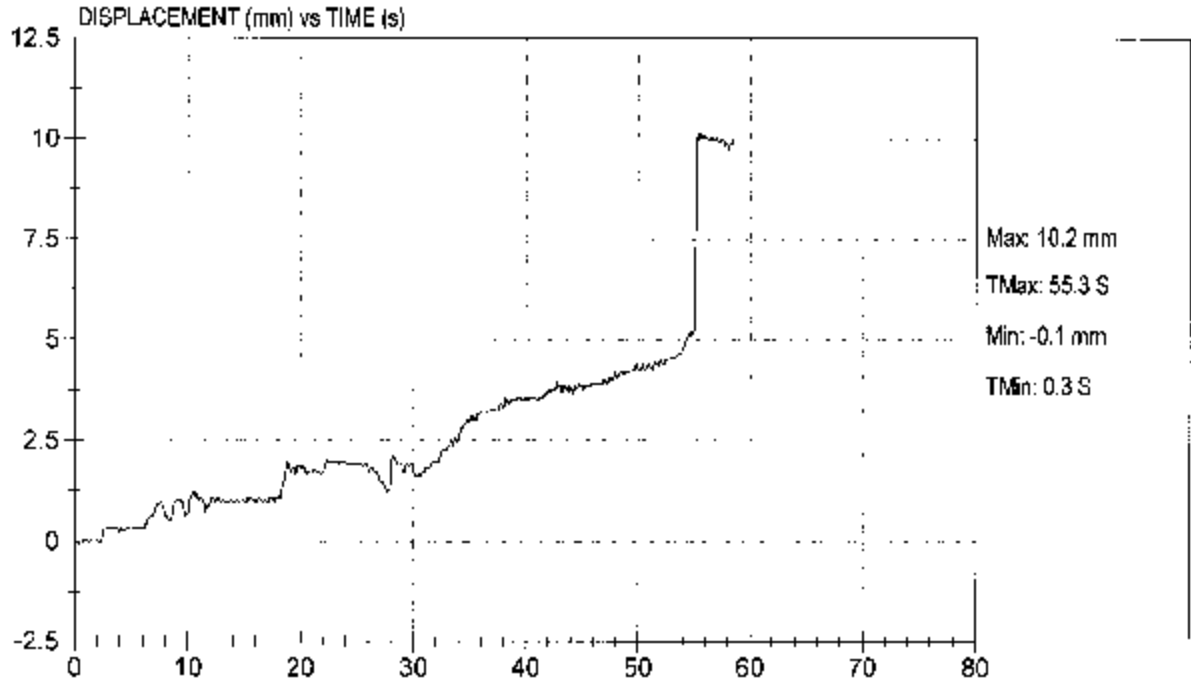
Test Date: 8/15/03
NHTSA #: C30902





Test Desc: ALSME387BAV (Left Ext.Side) (3)
Component ID: ATC

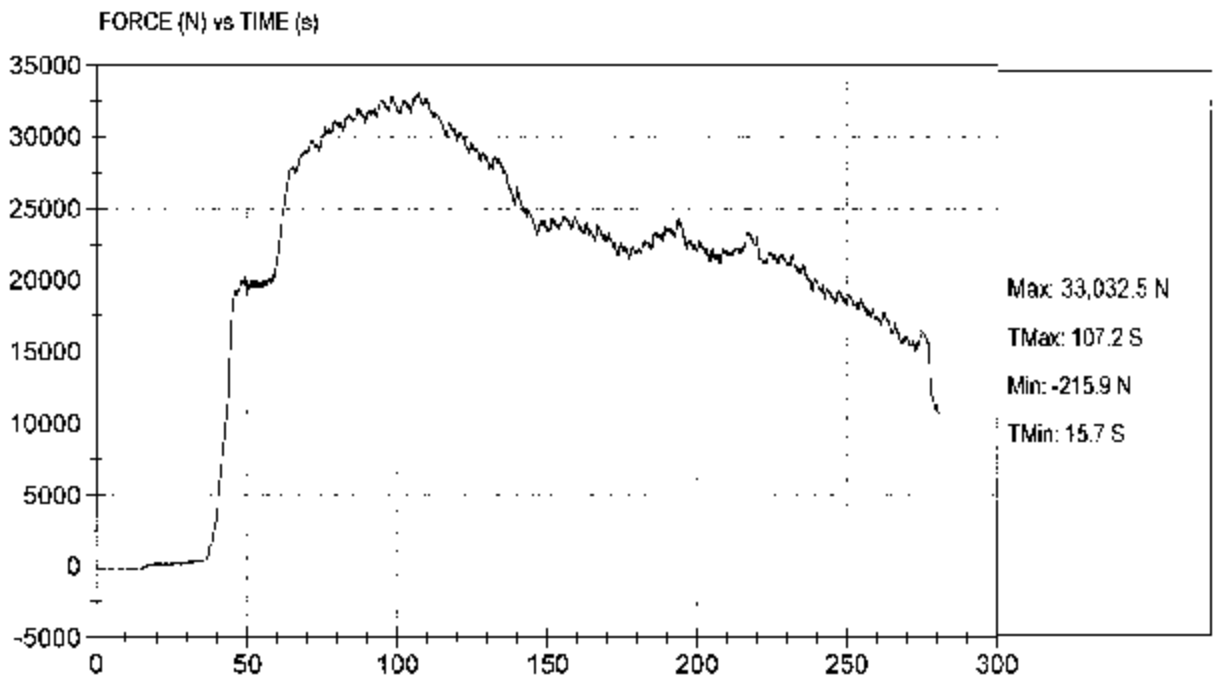
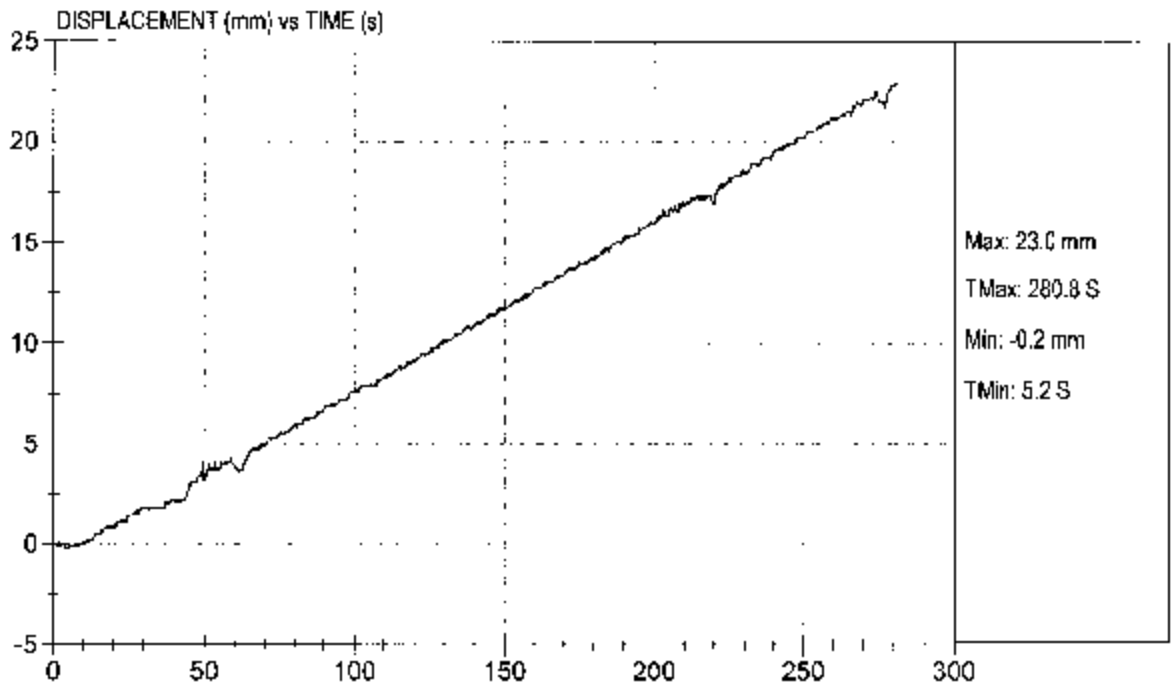
Test Date: 8/15/03
NHTSA #: C30902





Test Desc: ALSM1485BSV (Left Int Side) (4)
Component ID: ATC

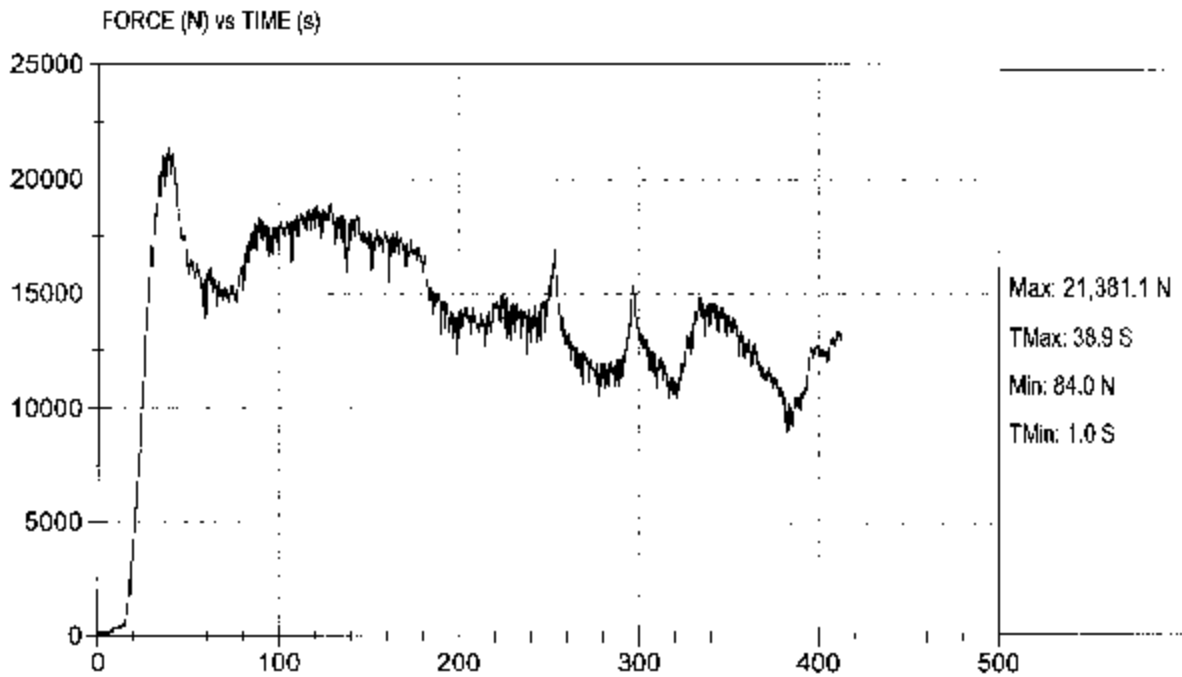
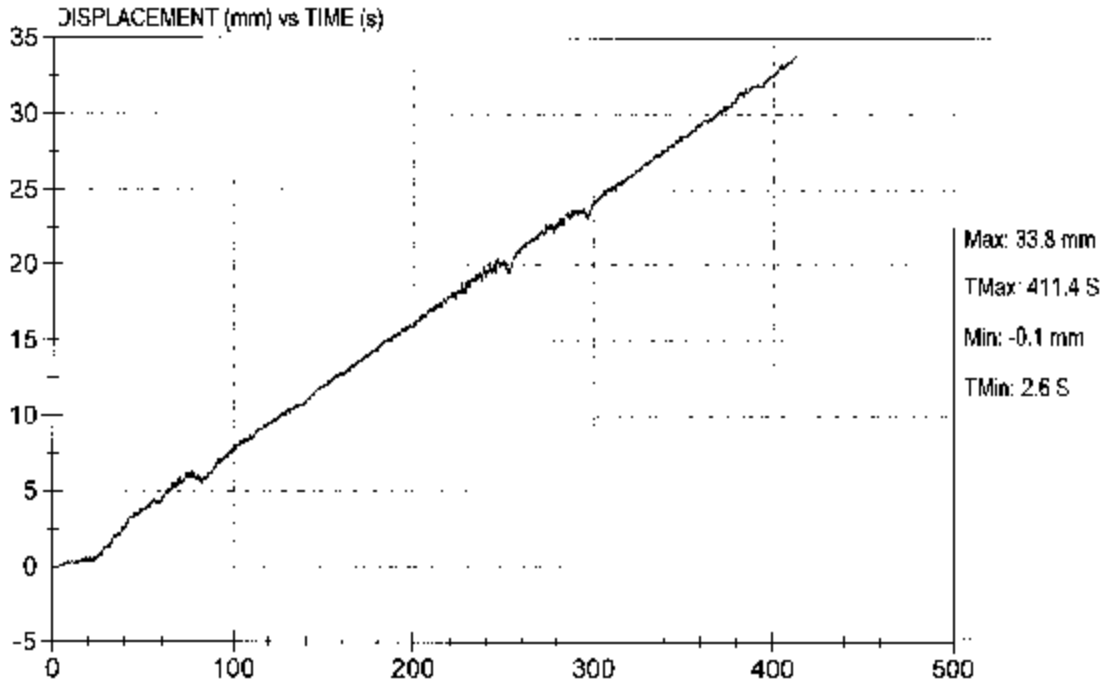
Test Date: 8/15/03
NHTSA #: C30902





Test Desc: ALSCM587BAV (Roof Ext) (5)
Component ID: ATC

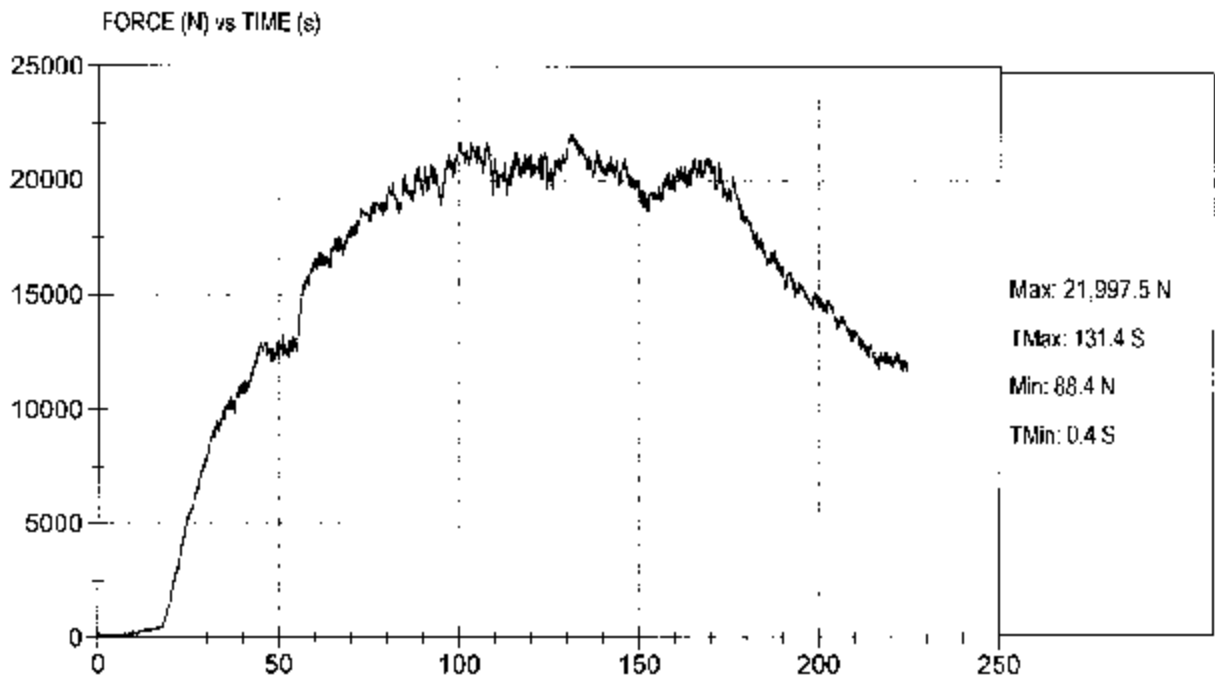
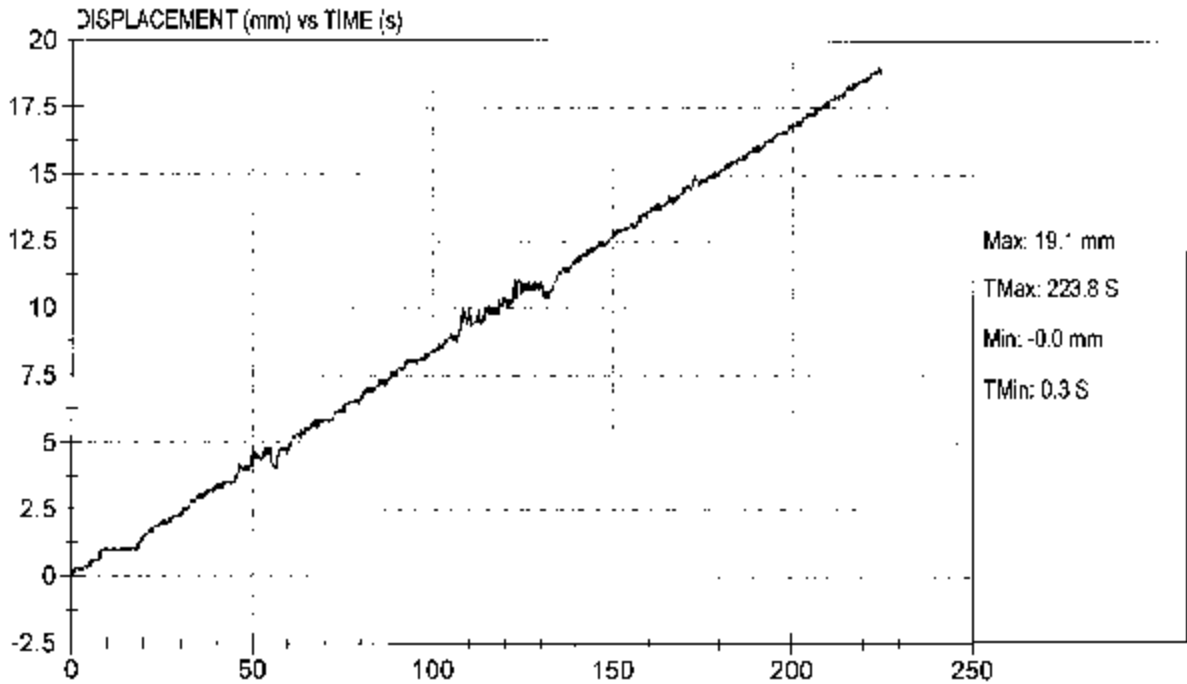
Test Date: 8/15/03
NHTSA #: C30902





Test Desc: ALSC1685BSV (Roof Int) (6)
Component ID: ATC

Test Date: 8/15/03
NHTSA #: C30902



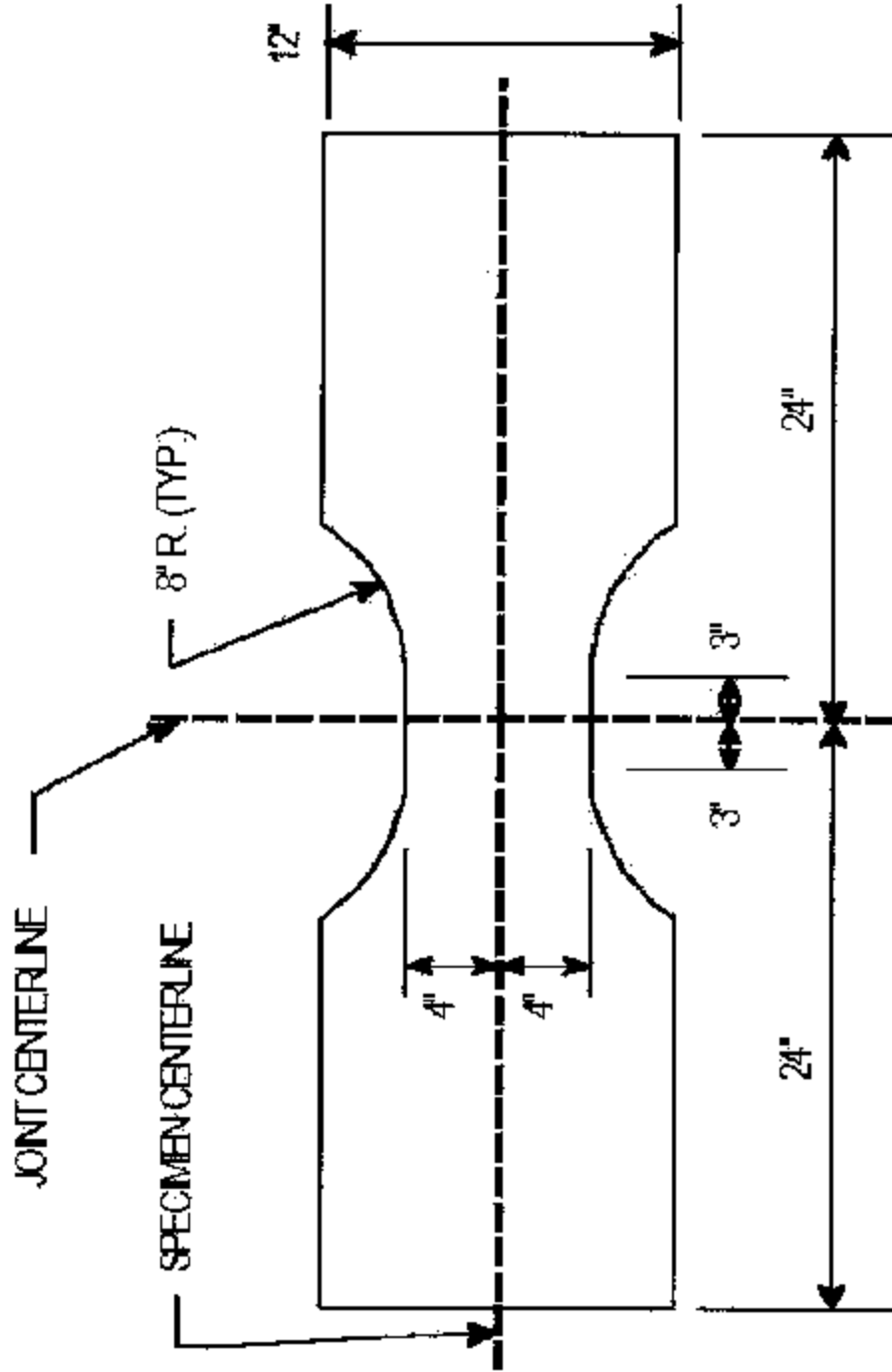
SECTION 8
JOINT CONFIGURATIONS

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Test Vehicle: 2003 ATC IC3S530 School Bus
Procedure: FMVSS 221

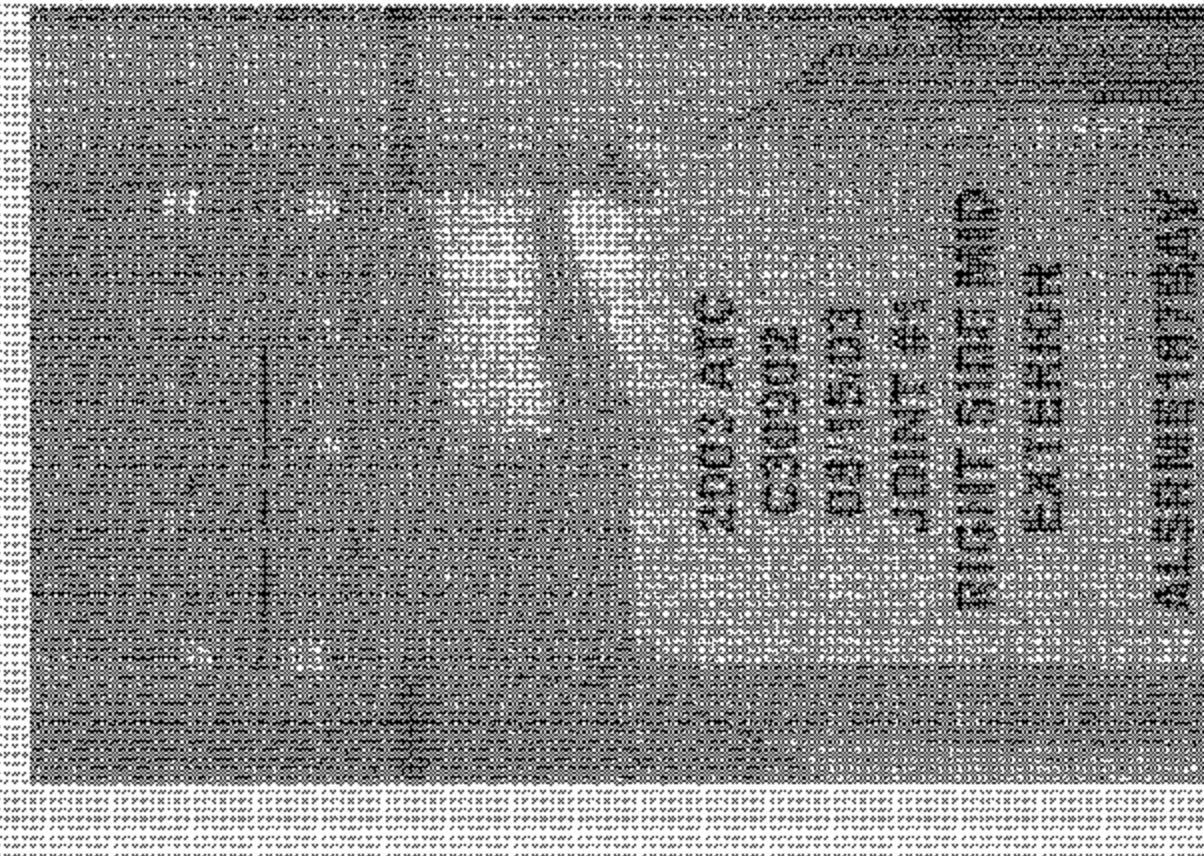
NHTSA No.: C30902

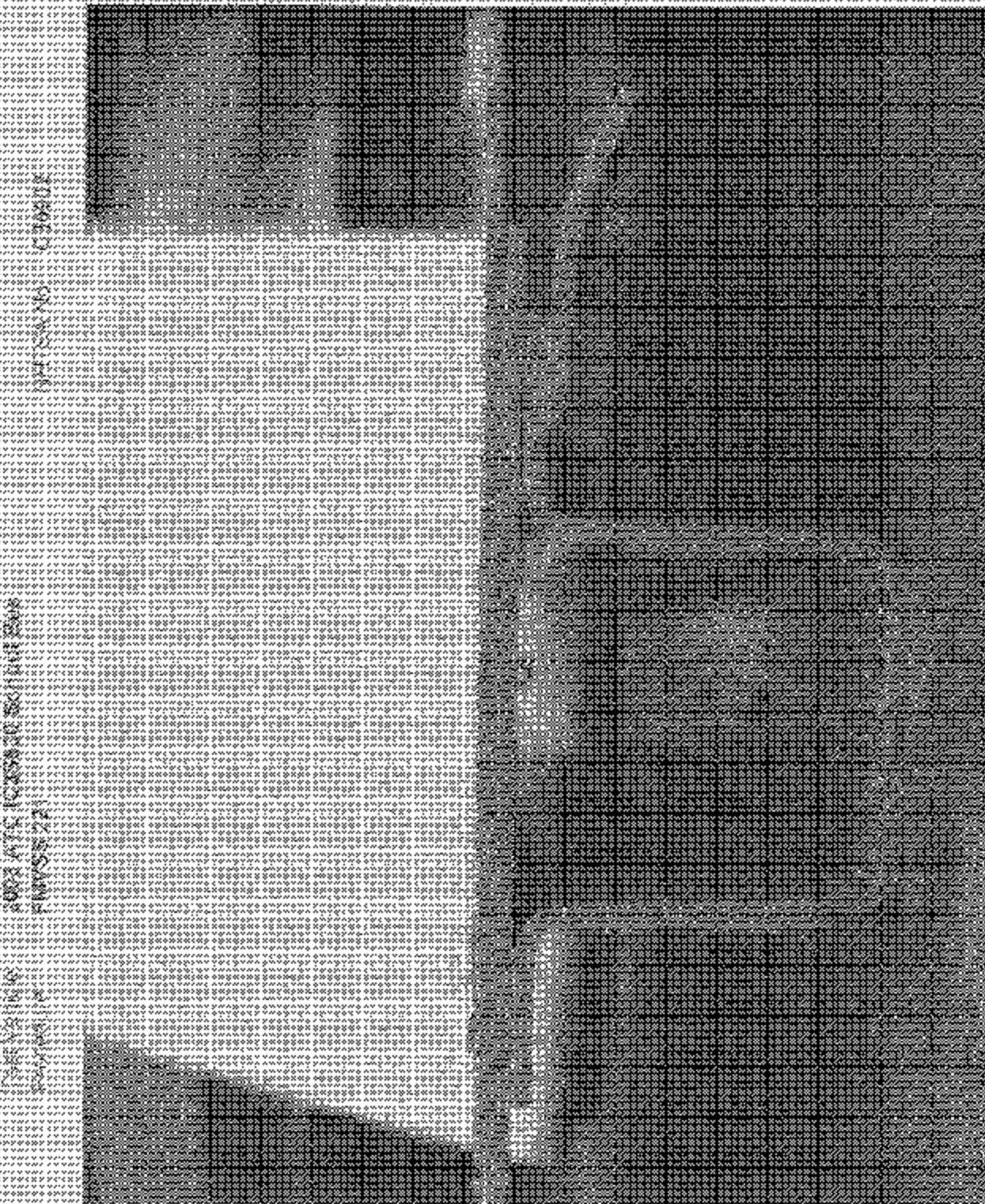
**DIMENSION REQUIREMENTS OF BODY PANEL SPECIMEN
WHOSE JOINT SEGMENT IS 8 INCHES LONG**



Basic Vehicle
Procedure

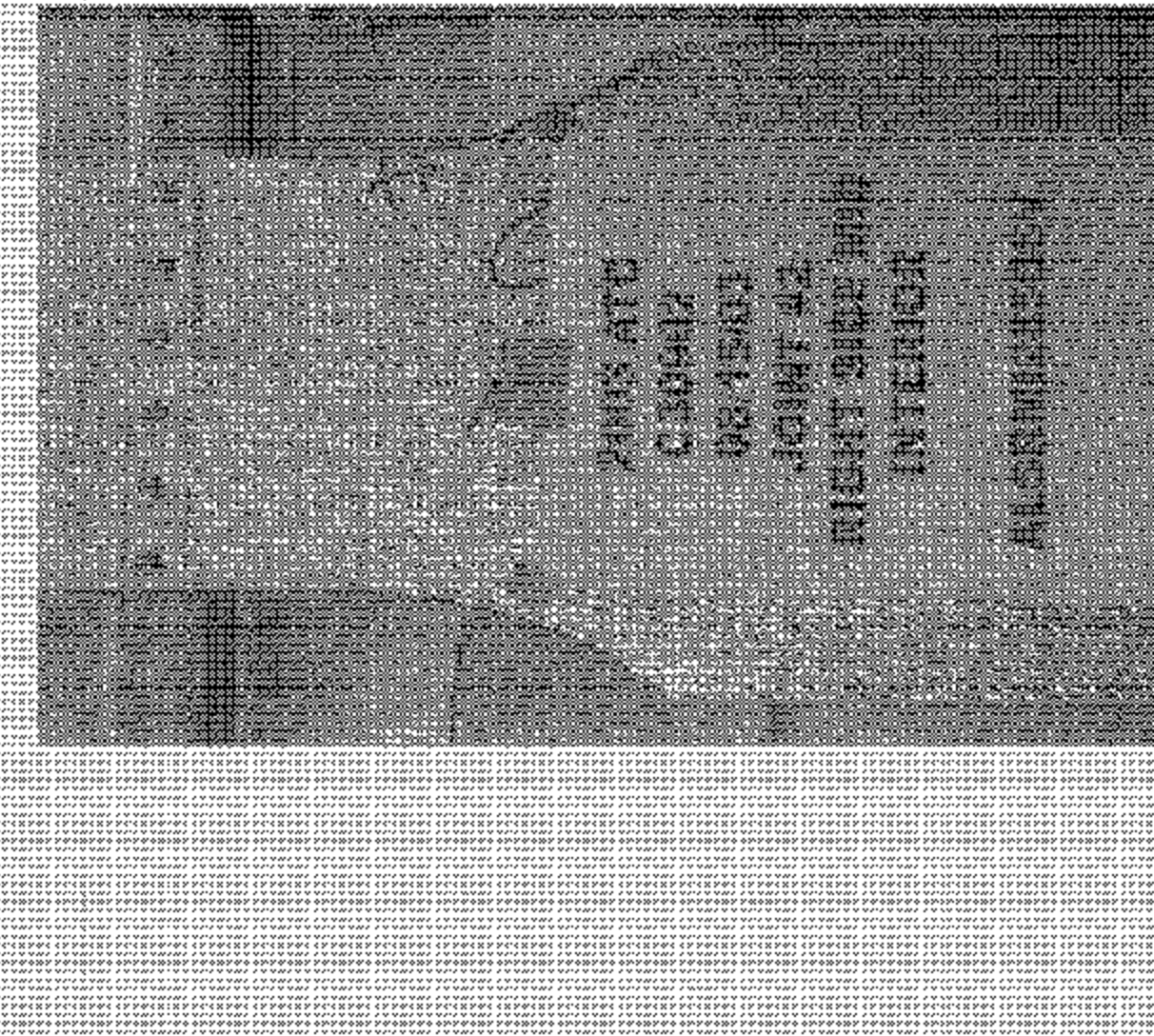
11/15/10





Casey

Best Vehicle
Proposed to



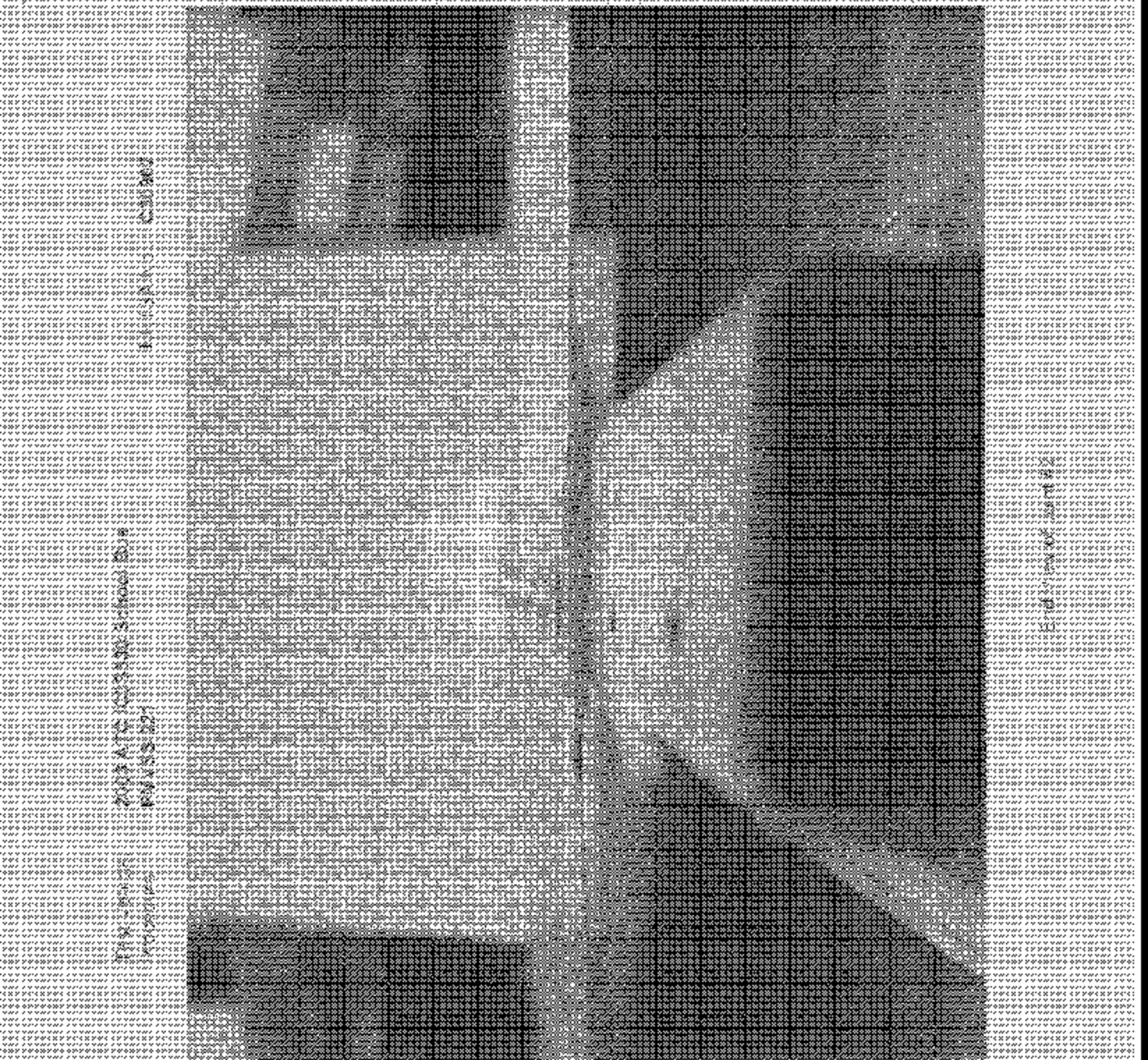
1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods used to collect and analyze data. It includes a detailed description of the sampling process and the statistical techniques employed to ensure the reliability of the results.

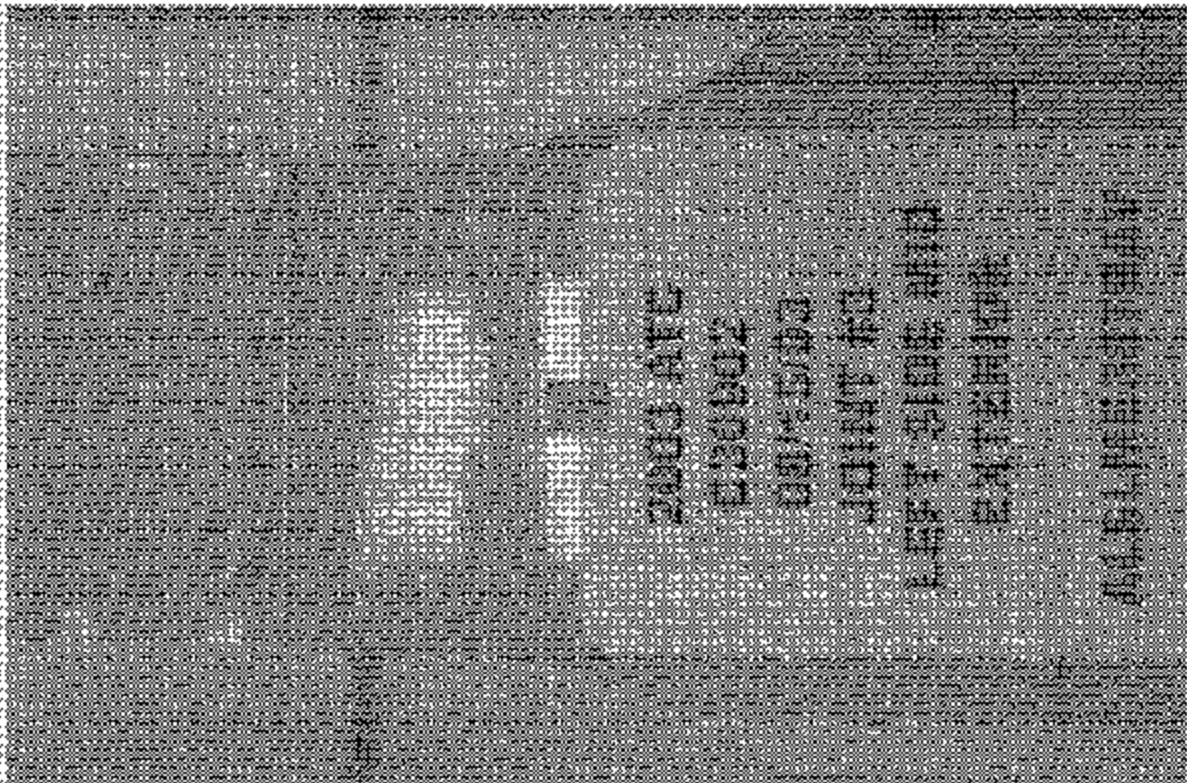
3. The third part of the document presents the findings of the study. It shows that there is a significant correlation between the variables being studied, and that the results are consistent across different groups and time periods.

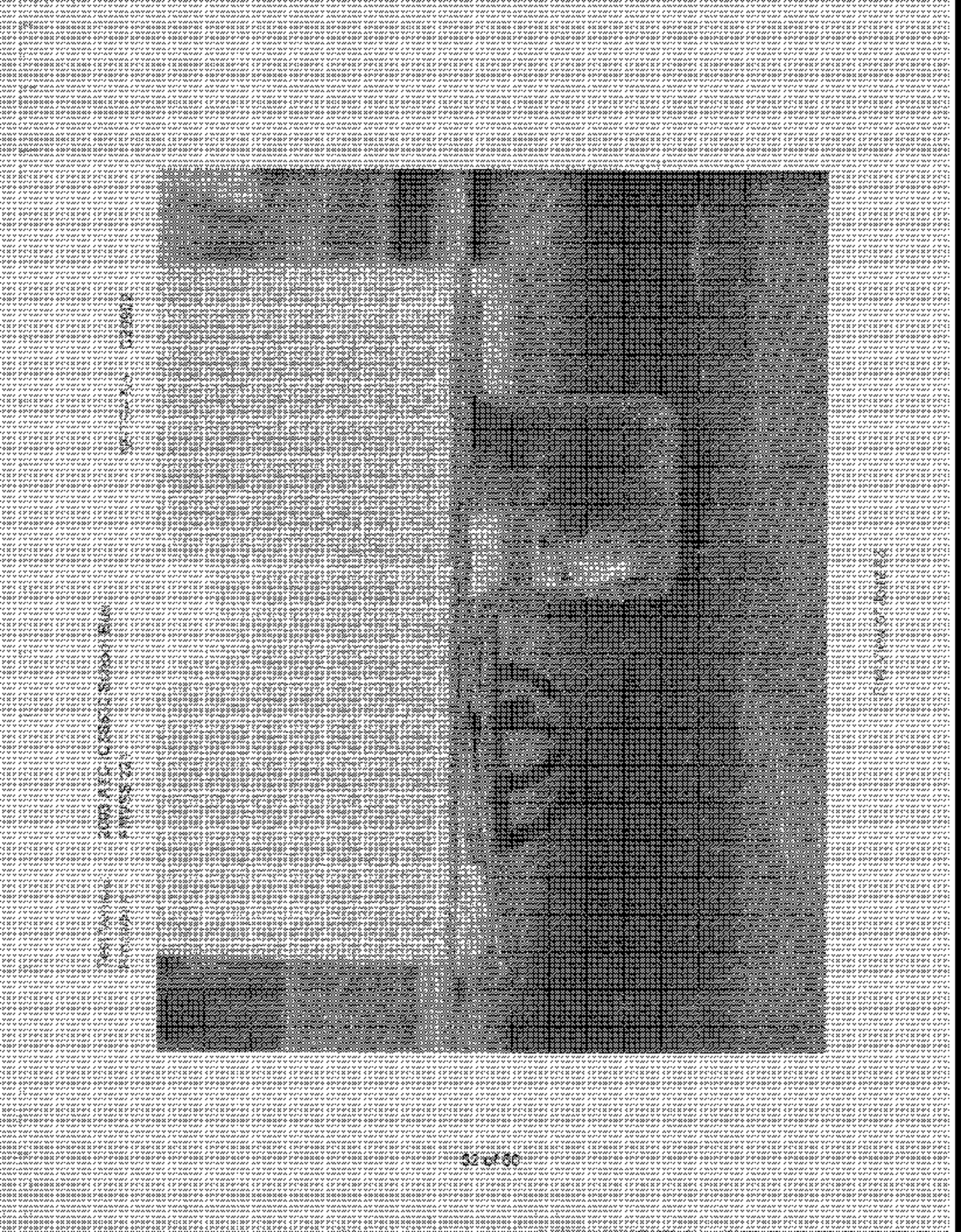
4. The fourth part of the document discusses the implications of the findings and provides recommendations for future research. It suggests that further studies should be conducted to explore the underlying causes of the observed trends and to develop effective strategies to address them.

5. The fifth part of the document concludes the report and expresses the authors' appreciation for the support and assistance provided by the relevant authorities and institutions.

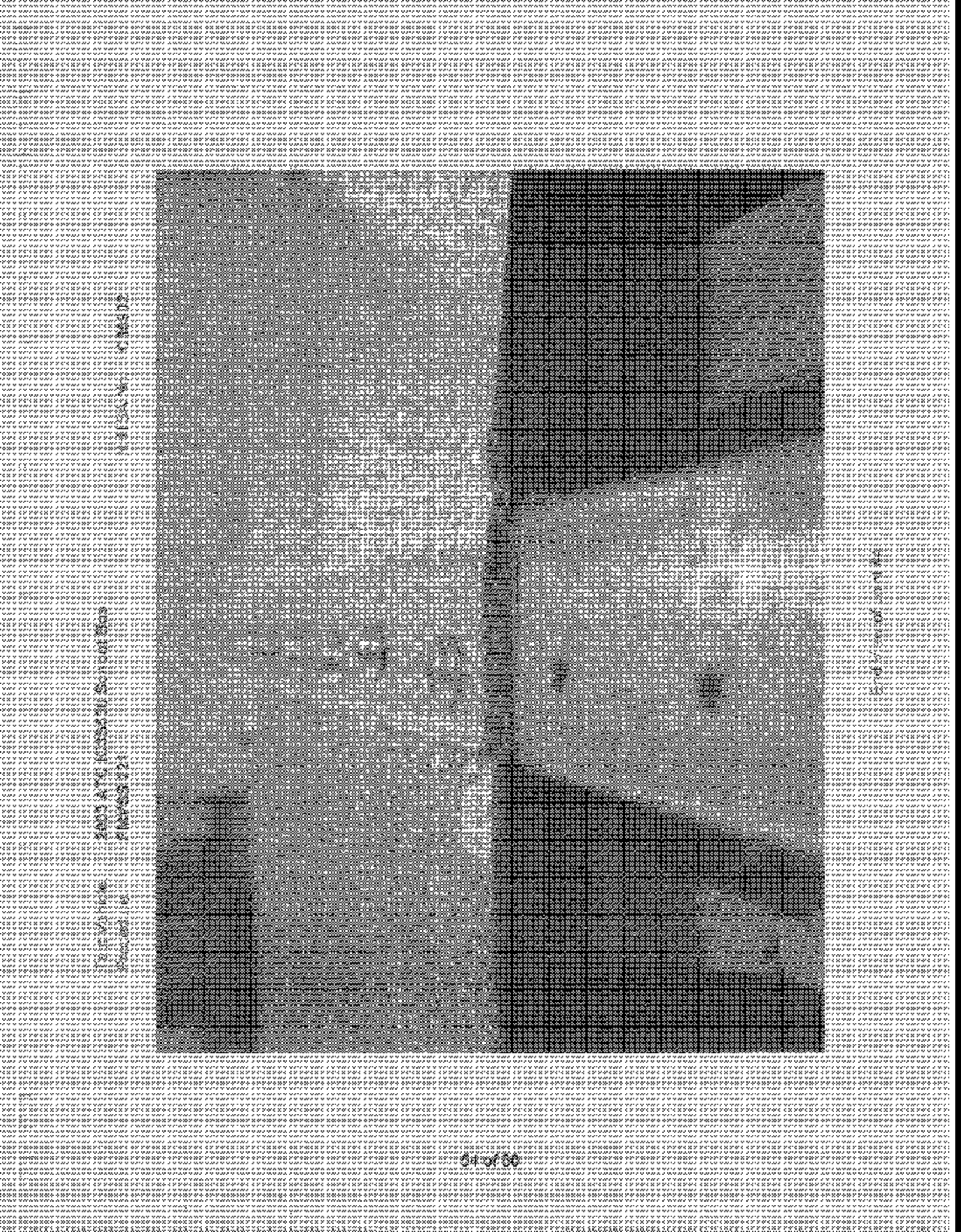


THE WALKER
FLOODES
CROSS

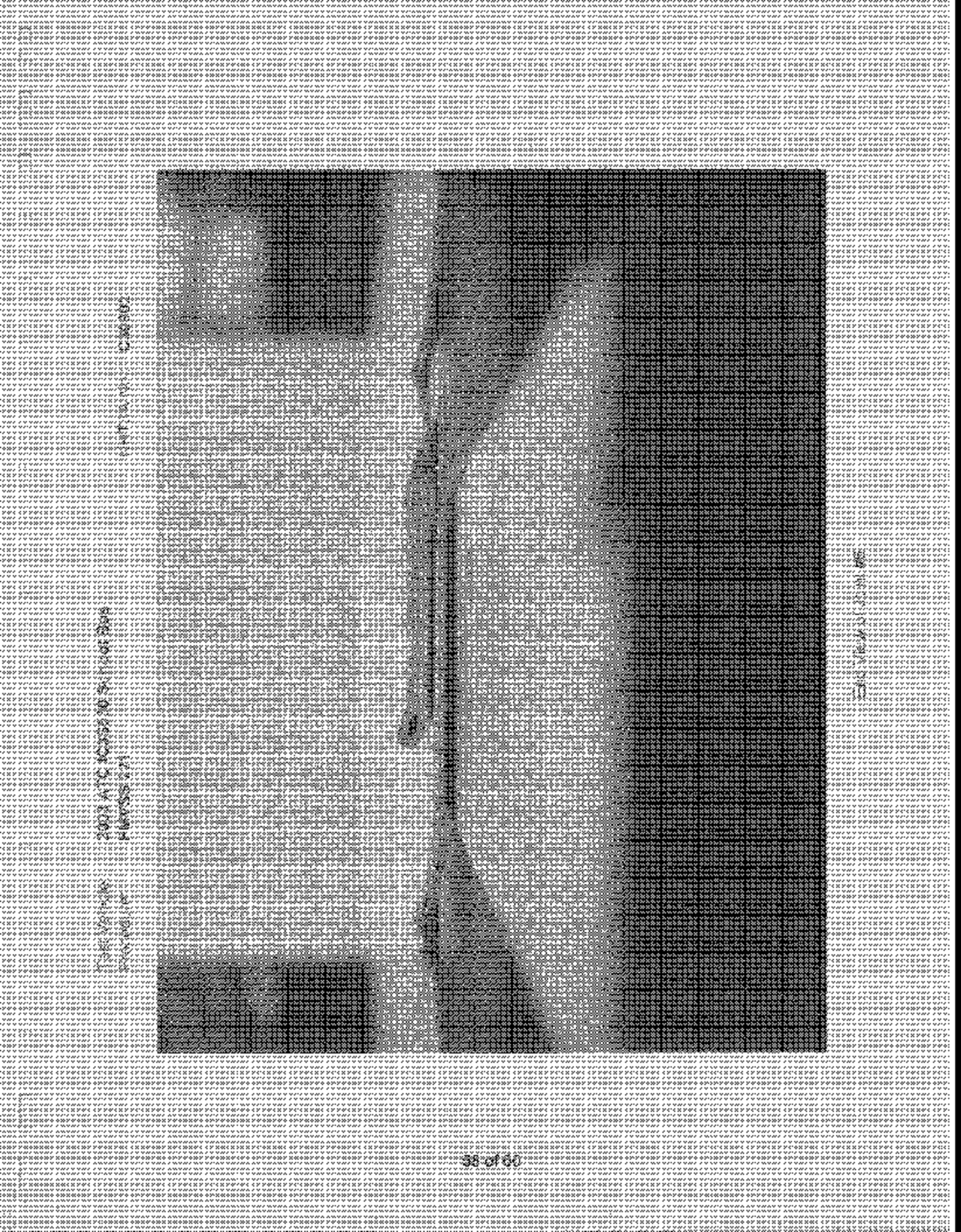




SECRET



THE UNIVERSITY OF CHICAGO PRESS



SECTION 9
LABORATORY NOTICE OF TEST FAILURE TO OVSC



mga research corp.

Test Procedure:	FMVSS 221	Test Date:	August 15, 2003
Test Vehicle:	2003 ATC	Test Lab:	MGA Research Corp.
NHTSA No.:	C30902	Project Engineer:	Michael Janovicz
Contract No.:	DTNH22-02-D-01057	Delivery Order No.:	Contract
MFR.:	ATC	VIN:	4DRBRABN73B955119
Build Date:	12/02		

TEST FAILURE DESCRIPTION

Roof panel ALSCME587BAV failed to meet load requirement of 28,668 newtons when tensile tested as described in 49 CFR 571.221. Actual load was 21,382 newtons.

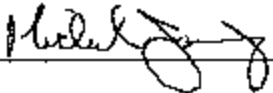
FMVSS REQUIREMENTS DESCRIPTION

Paragraph S.5: "When tested in accordance with the procedure of S6, each body panel joint shall be capable of holding the body panel to the member to which it is joined when subjected to a force of 60% of the tensile strength of the weakest joined body panel determined pursuant to S6.2."

Remarks: No remarks.

Notification to NHTSA (COTR): Amanda Prescott

Date: August 15, 2003

By:  _____



Engineering & Research

LABORATORY NOTICE OF TEST FAILURE TO OVSC

Test Procedure:	FMVSS 221	Test Date:	August 15, 2003
Test Vehicle:	2003 ATC	Test Lab:	MGA Research Corp.
NHTSA No.:	C30902	Project Engineer:	Michael Janovicz
Contract No.:	DTNH22-02-D-01057	Delivery Order No.:	Contract
MFR.:	ATC	VIN:	4DRBRABN73B955119
Build Date:	12/02		

TEST FAILURE DESCRIPTION

Roof panel ALSCMI685BSV failed to meet load requirement of 25067.9 newtons when tensile tested as described in 49 CFR 571.221.

FMVSS REQUIREMENTS DESCRIPTION

Paragraph S.5: "When tested in accordance with the procedure of S6, each body panel joint shall be capable of holding the body panel to the member to which it is joined when subjected to a force of 60% of the tensile strength of the weakest joined body panel determined pursuant to S6.2."

Remarks: No remarks.

Notification to NHTSA (COTR): Amanda Prescott

Date: August 15, 2003

By: 