

REPORT NUMBER: 221-MGA-03-003

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

**Liberty Bus
2003 Liberty Freedom School Bus
NHTSA No.: C30901**

**PREPARED BY:
MGA RESEARCH CORPORATION
6000 WARREN ROAD
BURLINGTON, WI 53105**



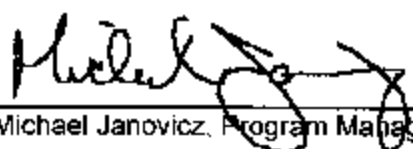
Final Report Date: October 2, 2003

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 6115 (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:



10/02/03
Date of Acceptance

Technical Report Documentation Page

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16. Abstract Compliance tests were conducted on the subject 2003 Liberty Freedom School Bus, NHTSA No. C30901 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: Four (4) Test Failures LSRRME184BRV, LSSRRI285BAV, LSSLRI1387BRV and LSRRRI483BRH failed to meet the minimum load requirements.					
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SECTION 1
PURPOSE OF COMPLIANCE TEST

Tests were conducted on a MY2003 Liberty Freedom School Bus, NHTSA No. C30901, 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 Liberty Freedom School Bus, NHTSA No. C30901, was subjected to FMVSS 221 testing on August 26, 2003.

The joint samples were selected in conjunction with the Contract Officer's Technical Representative (COTR). Four 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 ½" 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 ¼ 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 four samples were tested for this vehicle. The samples were selected from the Roof Right Exterior, Left Rear Interior, Left Side Above Window and Right Roof Interior.

	Maximum Load (N)	60% of Material Strength (N)	PASS/FAIL
Roof Right Exterior (1)	17,118.6	44,307.6	FAIL
Left Rear Interior (2)	15,963.1	24,279.6	FAIL
Left Side Above Window (3)	12,916.5	22,334.9	FAIL
Right Roof Interior (4)	12,758.4	24,929.4	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 Liberty Freedom School Bus, NHTSA No. C30901.

**DATA SHEET 1
ADMINISTRATIVE DATA SHEET**

Test Vehicle: **2003 Liberty Freedom School Bus**
Test Lab: **MGA Research-Wisconsin Operations**

NHTSA No.: **C30901**
Test Date: **8/26/03**

INCOMPLETE VEHICLE (IF APPLICABLE)

Manufacturer:	General Motor Corporation
Model:	Express Commercial Cutaway
VIN:	1GBHG39U831110237
Build Date:	10/02
Certification Date:	10/02

COMPLETED VEHICLE (SCHOOL BUS)

Manufacturer:	Liberty Bus
Make/Model:	School Bus/Freedom
VIN:	1GBHG39U831110237
NHTSA No.:	C30901
Color:	Yellow
GVWR:	4,335 kg / 9,600 lbs
Build Date:	02/03
Certification Date:	02/03

DATES

Vehicle Receipt:	June 11, 2003
Start of Compliance Test:	August 26, 2003
Completion of Compliance Test:	August 26, 2003

COMPLIANCE TEST:

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

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 2
SUMMARY OF DATA

Test Vehicle: **2003 Liberty Freedom School Bus**
Test Lab: **MGA Research-Wisconsin Operations**

NHTSA No.: **C30901**
Test Date: **8/26/03**

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
LSRRME184BRV	Right Roof Exterior (1)	44,307.6	17,118.6	73,854.9	FAIL
LSSRRI285BAV	Left Rear Interior (2)	24,279.6	15,963.1	40,332.5	FAIL
LSSLRI387BRV	Left Side Above Window (3)	22,334.9	12,916.5	37,224.5	FAIL
LSRRRI483BRH	Right Roof Interior (4)	24,927.9	12,758.4	41,546.5	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 Liberty Freedom School Bus
 Test Lab: MGA Research-Wisconsin Operations


NHTSA No.: C30901
 Test Date: 8/26/03

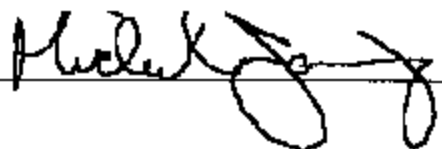
Specimen Description:	Roof Right Exterior (1)
Joint Number:	LSRRME184BRV

	Weaker Member	Stronger Member
Material	Galvannealed ASTM A525	---
Tensile Strength (MPa)	399.9	--
Gage/Thickness (mm)	20 / 1.006	--
Fastener Holes (No./Diameter - mm)	4 / 4.902	--
Net Area (Sq. mm)	184.64	--
Material Strength (N)	73,854.9	--
60% of Material Strength (N)	44,307.6	--
Maximum Load From Tensile Test of Joint (N)	17,118.6	--
PASS/FAIL	FAIL	---

1. Rivet Spacing 65 mm

Comments: NONE

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: **2003 Liberty Freedom School Bus**
 Test Lab: **MGA Research-Wisconsin Operations**

NHTSA No.: **C30901**
 Test Date: **8/26/03**

Specimen Description:	Left Rear Interior (2)
Joint Number:	LSSRR1285BAV

	Weaker Member	Stronger Member
Material	Galvannealed ASTM A525	--
Tensile Strength (MPa)	399.9	--
Gage/Thickness (mm)	28 / .551	--
Fastener Holes (No./Diameter -mm)	4 / 4.902	--
Net Area (Sq.mm)	101.2	--
Material Strength (N)	40,332.5	--
60% of Material Strength (N)	24,279.6	--
Maximum Load From Tensile Test of Joint (N)	15,963.1	--
PASS/FAIL	FAIL	--

1. Rivet Spacing 45 mm

Comments: NONE

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: 2003 Liberty Freedom School Bus
 Test Lab: MGA Research-Wisconsin Operations


NHTSA No.: C30901
 Test Date: 8/26/03

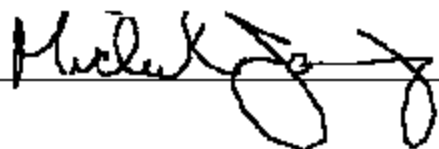
Specimen Description:	Left Side Above Window (3)
Joint Number:	LSSLRI387BRV

	Weaker Member	Stronger Member
Material	Galvannealed ASTM A525	---
Tensile Strength (MPa)	399.9	---
Gage/Thickness (mm)	26 / .551	---
Fastener Holes (No./Diameter - mm)	7 / 4.902	---
Net Area (Sq. mm)	93.1	---
Material Strength (N)	37,224.5	---
60% of Material Strength (N)	22,334.9	---
Maximum Load From Tensile Test of Joint (N)	12,916.5	---
PASS/FAIL	FAIL	---

1. Rivet Spacing 30 mm

Comments: NONE

Recorded By: 

Approved By: 

Date: October 2, 2003

DATA SHEET 3... (Continued)

JOINT STRENGTH WHEN ASTM MATERIAL PROPERTIES ARE KNOWN

Test Vehicle: 2003 Liberty Freedom School Bus
 Test Lab: MGA Research-Wisconsin Operations

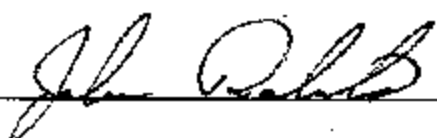
NHTSA No.: C30901
 Test Date: 8/26/03

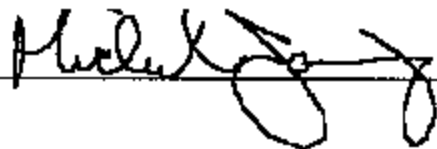
Specimen Description:	Right Roof Interior (4)
Joint Number:	LSRRRI483BRH

	Weaker Member	Stronger Member
Material	Galvannealed ASTM A525	--
Tensile Strength (MPa)	399.9	---
Gage/Thickness (mm)	26 / .551	---
Fastener Holes (No./Diameter - mm)	3 / 4.902	---
Net Area (Sq. mm)	103.9	---
Material Strength (N)	41,549.6	---
60% of Material Strength (N)	24,929.4	---
Maximum Load From Tensile Test of Joint (N)	12,758.4	---
PASS/FAIL	FAIL	---

1. Rivet Spacing 75 mm

Comments: Joint Number Should Read LSRRRI483BAH

Recorded By: 

Approved By: 

Date: October 2, 2003

SECTION 5
INSTRUMENTATION AND EQUIPMENT LIST

Test Vehicle: **2003 Liberty Freedom School Bus**
Test Lab: **MGA Research-Wisconsin Operations**

NHTSA No.: **C30901**
Test Date: **8/26/03**

Equipment	Description	Model/Serial No.	Cal. Date	Next Cal. Date
Computer	HP	Vectra / US03263612	—	—
A/D Interface	Metrabyte	DAS-1602	---	—
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	---

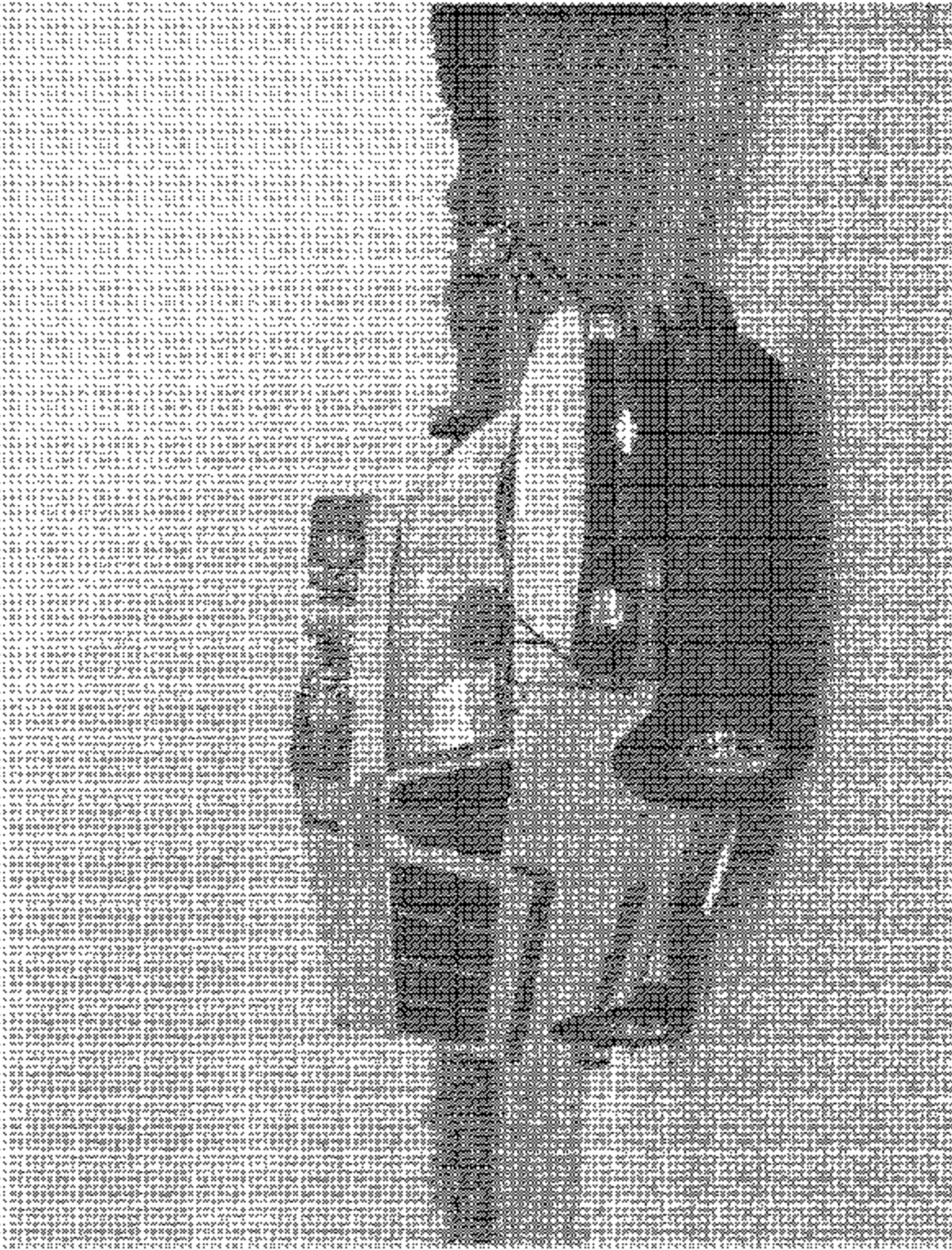
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Seat Number: 2003 Liberty Freedom School Bus
Mfg. Code: FMVSS 201

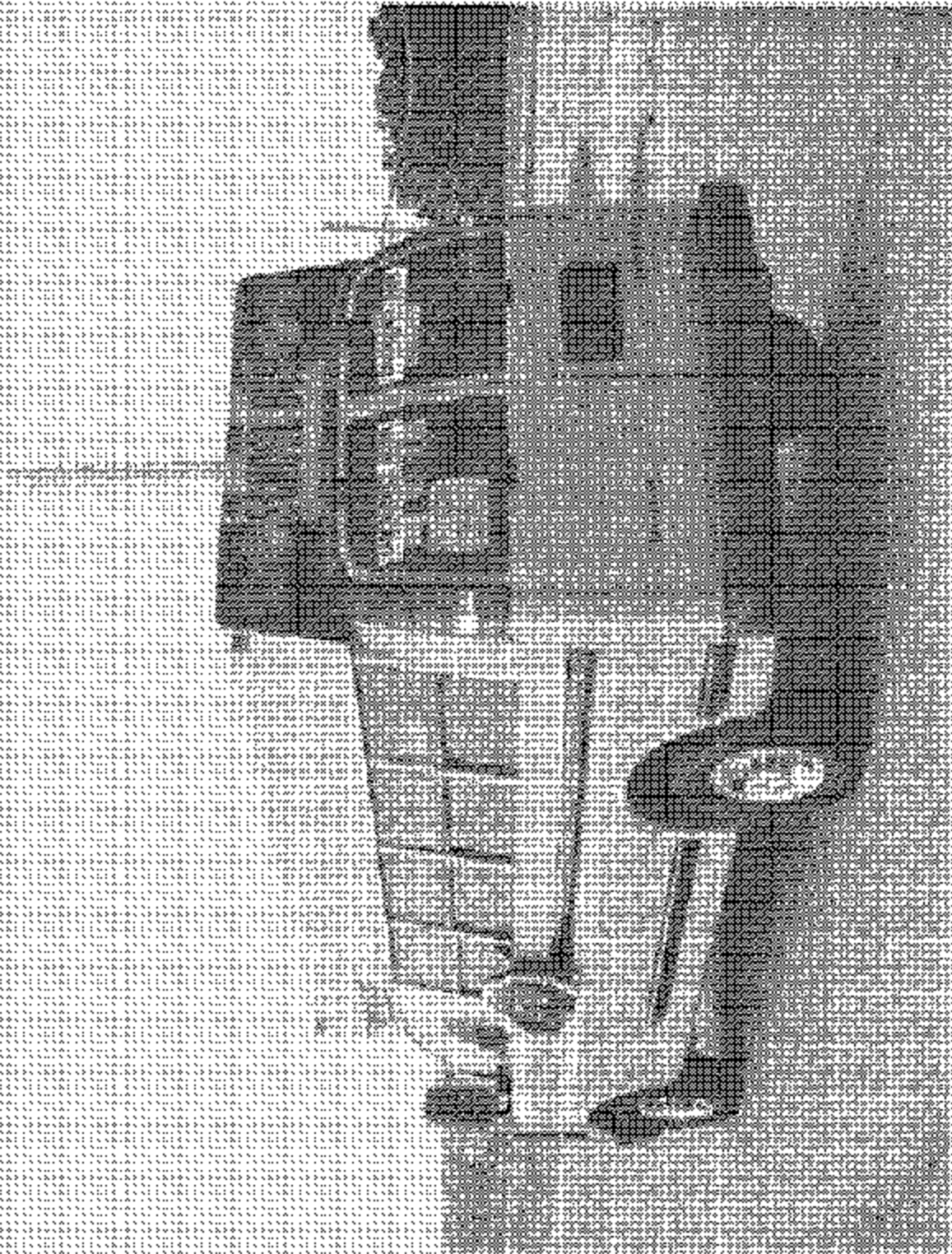
NET WT: 13,000 LBS



LIBERTY FREEDOM SCHOOL BUS

Tab: Vehicle - 2002 Liberty Firebox School Bus
APR 2008 271

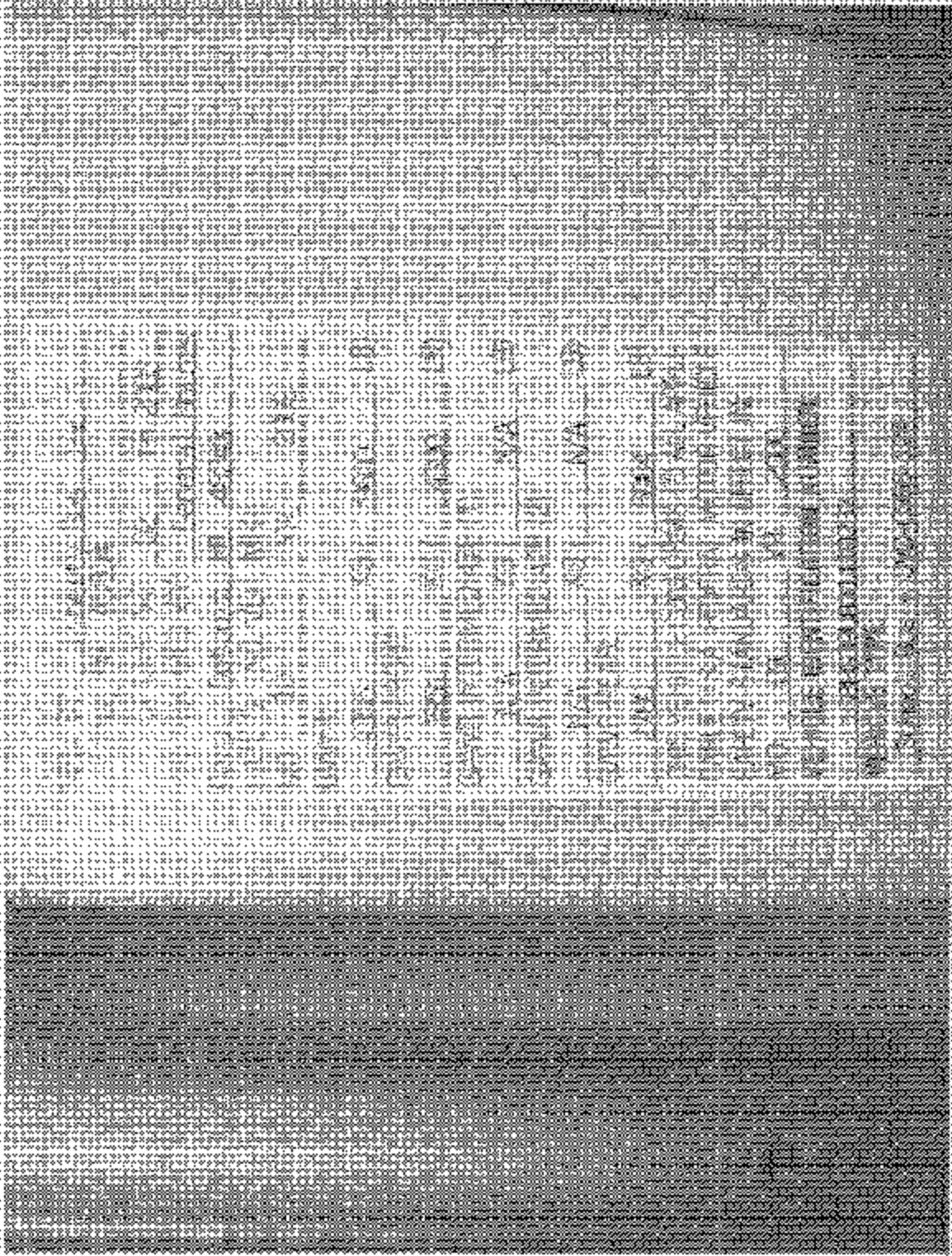
WHTSV MI - 030994



West River School of Boston, Mass.

7-11-2014 10:05 AM 2000 Liberty Fishhook School Bus
REVISED 2/1

KHFSX No. 030903



Confidential Data

Full Details: 2003 Liberty Freedom School Bus
Photos: FMVSS 201

CHAPTER 16: C30501

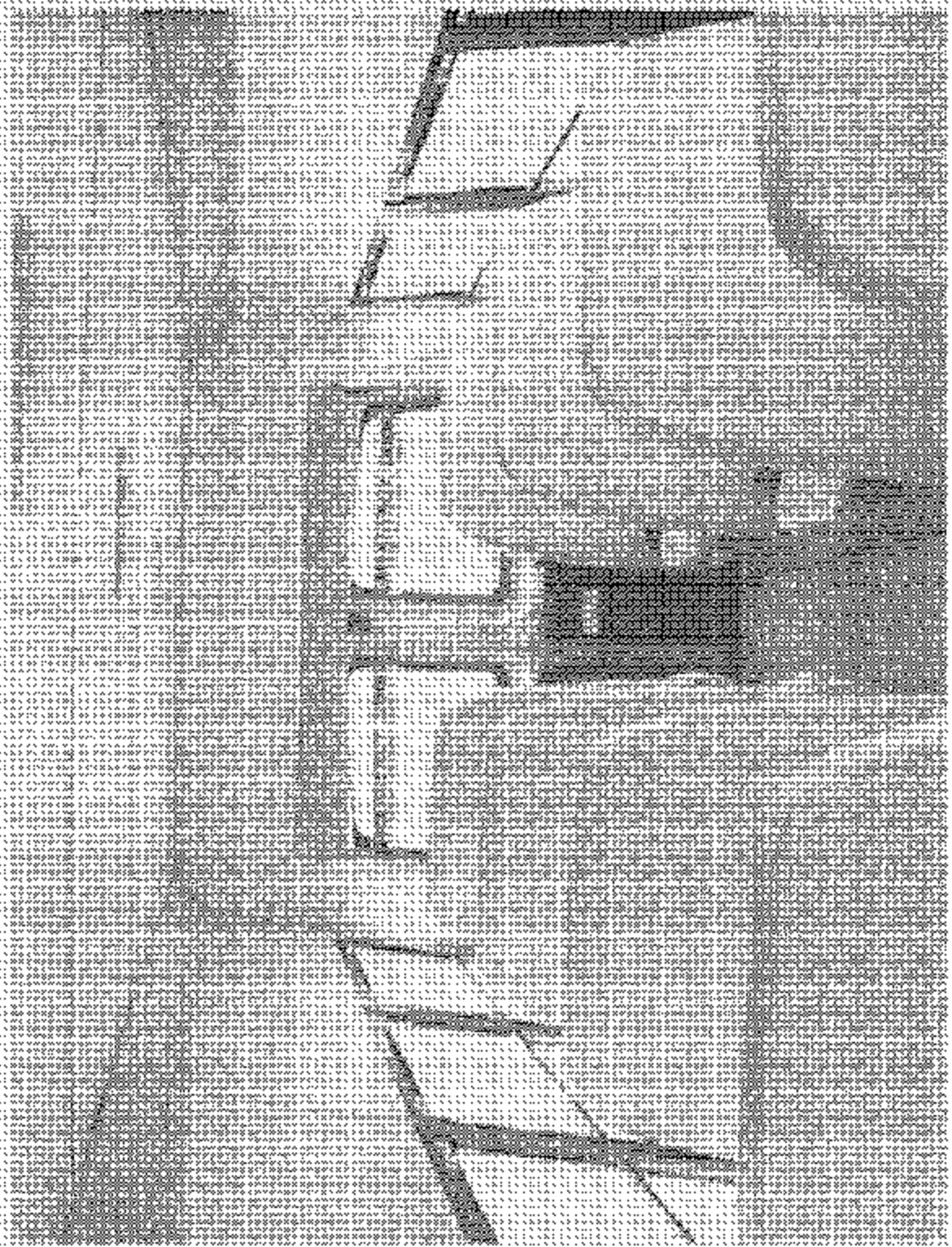
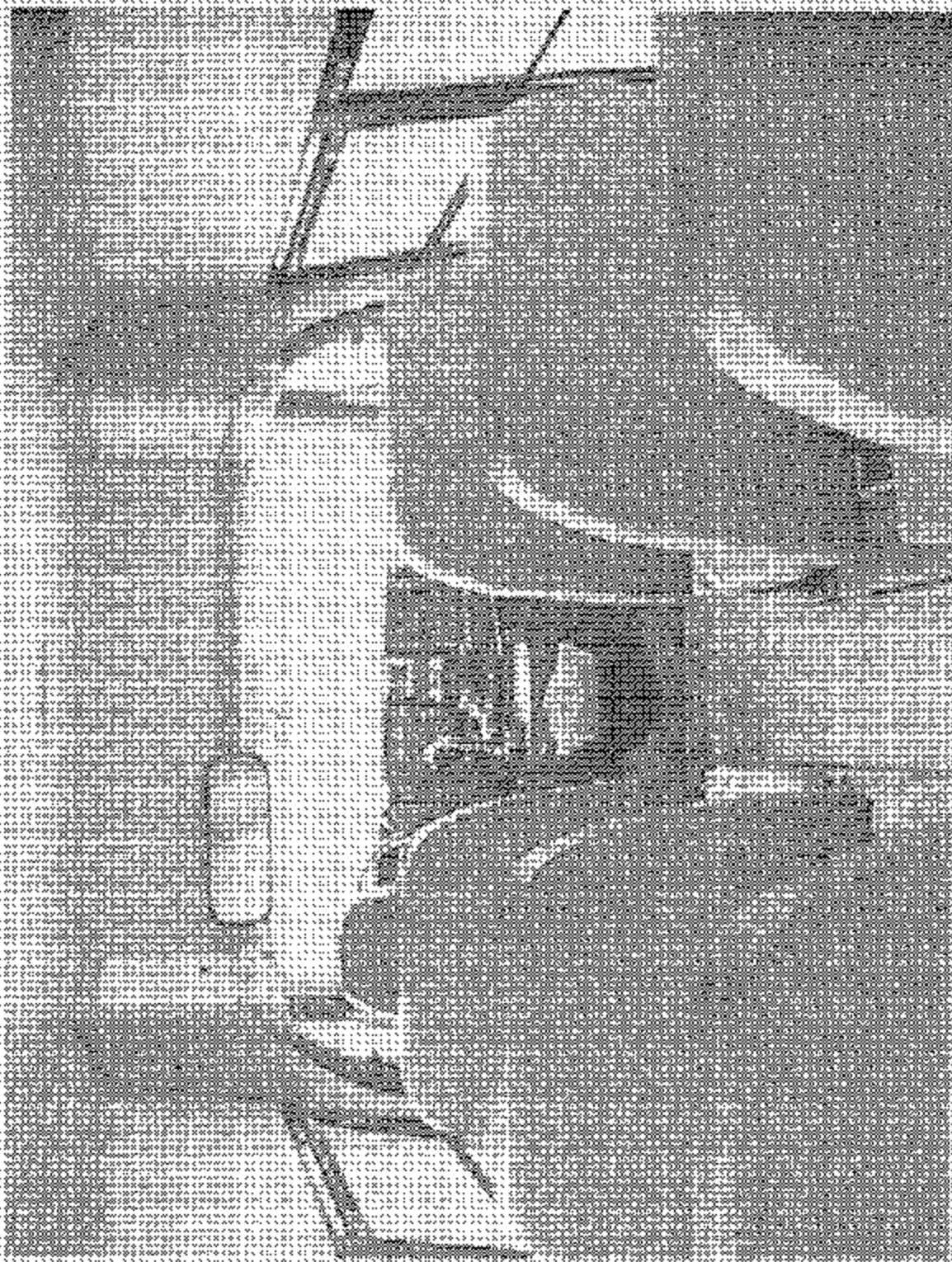


Photo by Dave Johnson, 2003

1961 Liberty-Freedom School Bus
FRANCE 2X

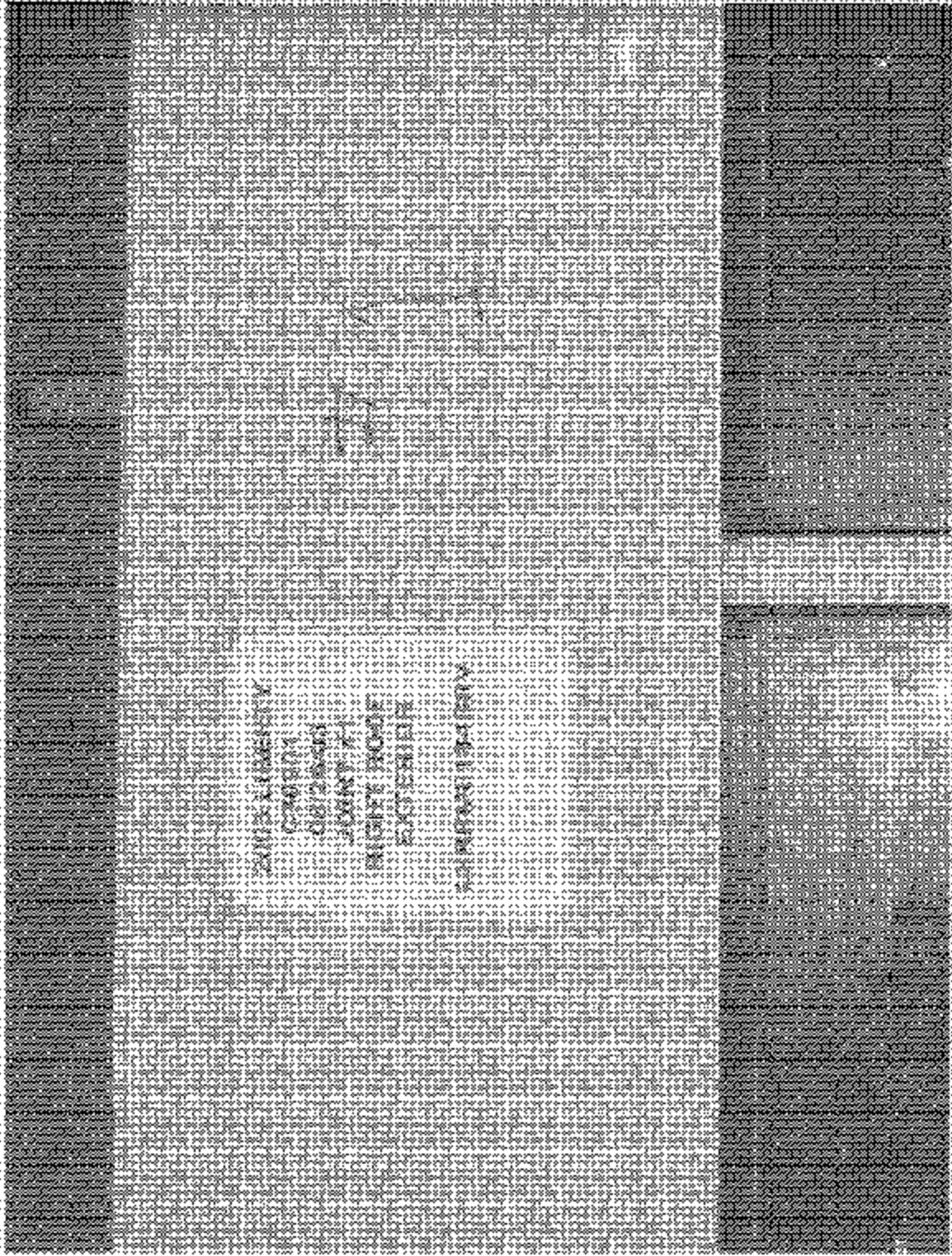
MAY 1961



1961 Liberty-Freedom School Bus

2003 LIBRARY FREEDOM SCHOOL BUS
PROCESSES

APR 25 11 03 AM '03

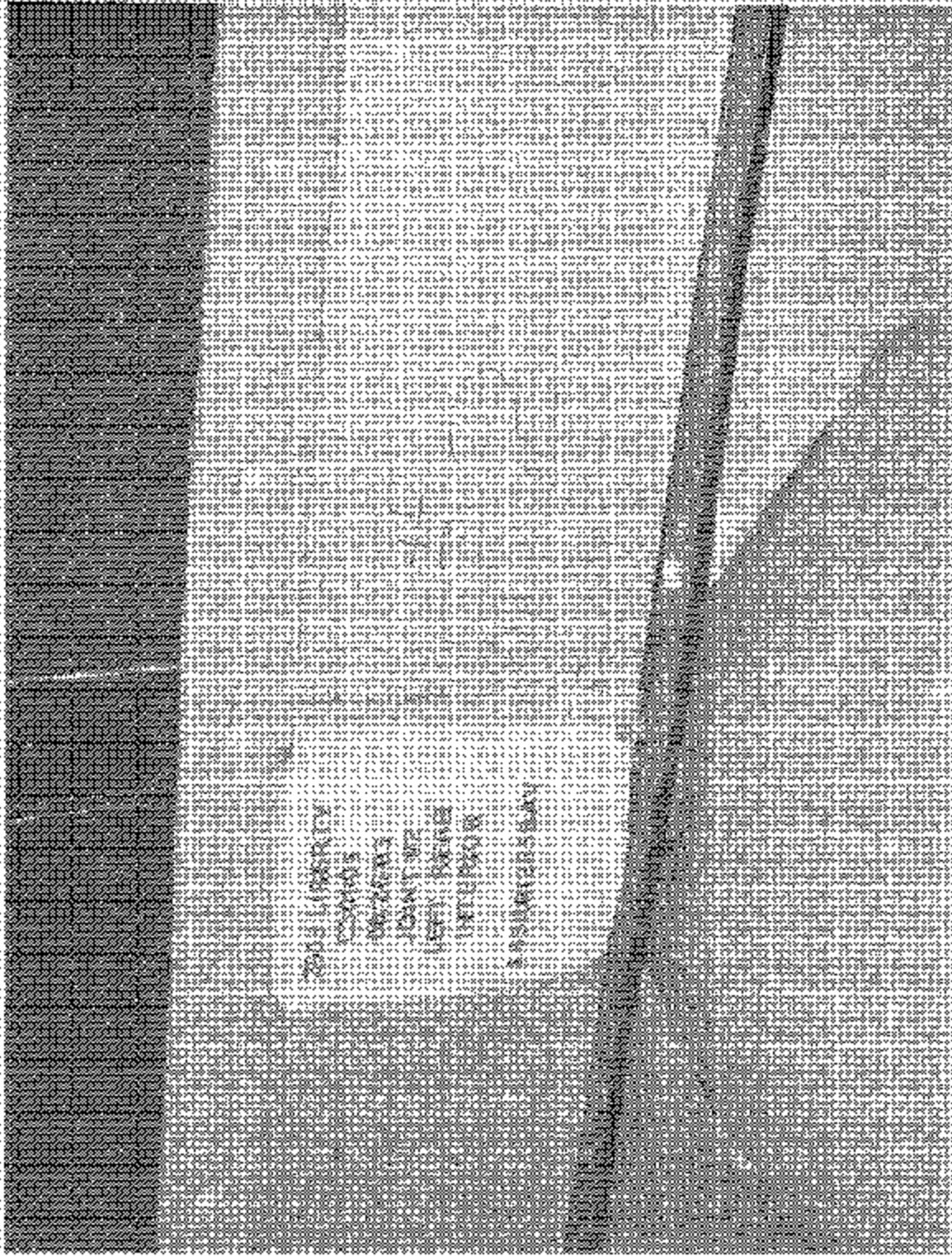


LIBRARY FREEDOM
SCHOOL BUS
PROCESSES

APR 25 11 03 AM '03

2009 Liberty Precinct Election Day
Precinct: 200901

200901



200901
200901
200901
200901
200901
200901

Case: 2016-00016 2007 Liberty Firstclass School Bus
Attribute: FBI/SS 321

KHFS No: C50501



2007 Liberty Firstclass School Bus

1001 Liberty Freestock School Bus
FMS#S 2E1

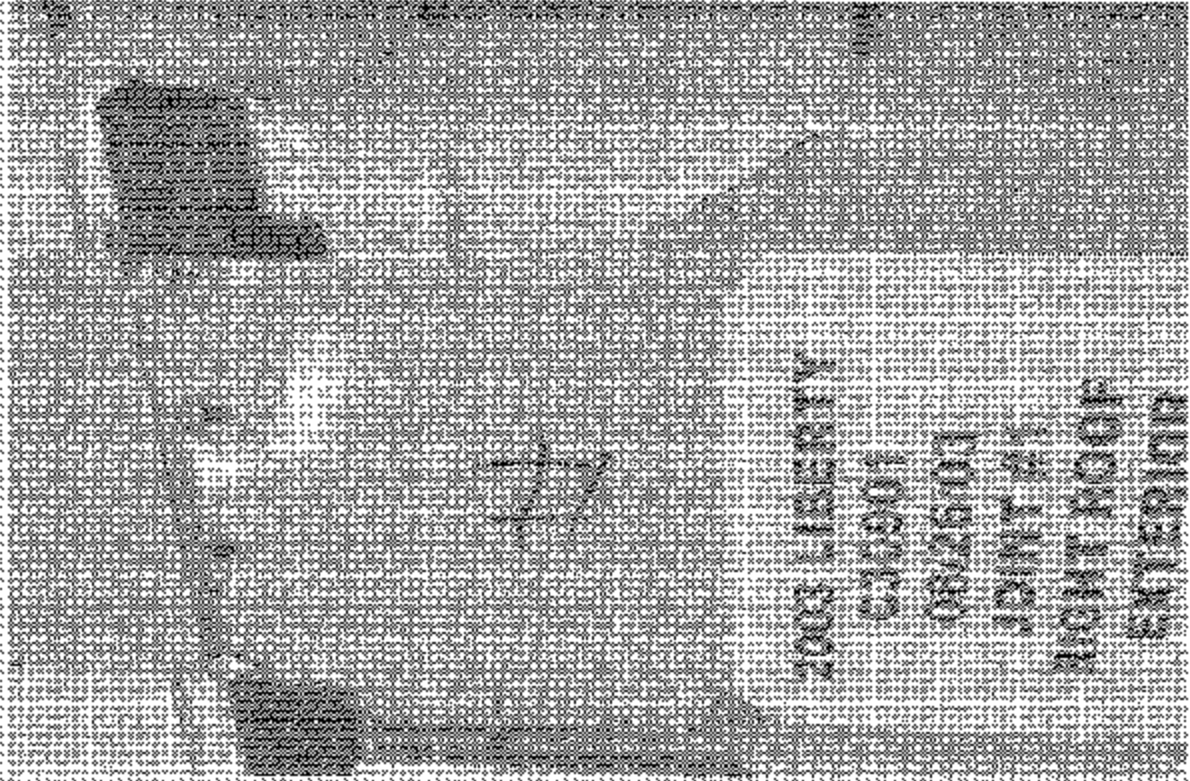
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PH#DA NE 029301

Task Order: 2003 Liberty Freedom School Bus
Pipestone: FVSS 721

NAESK No: C30801

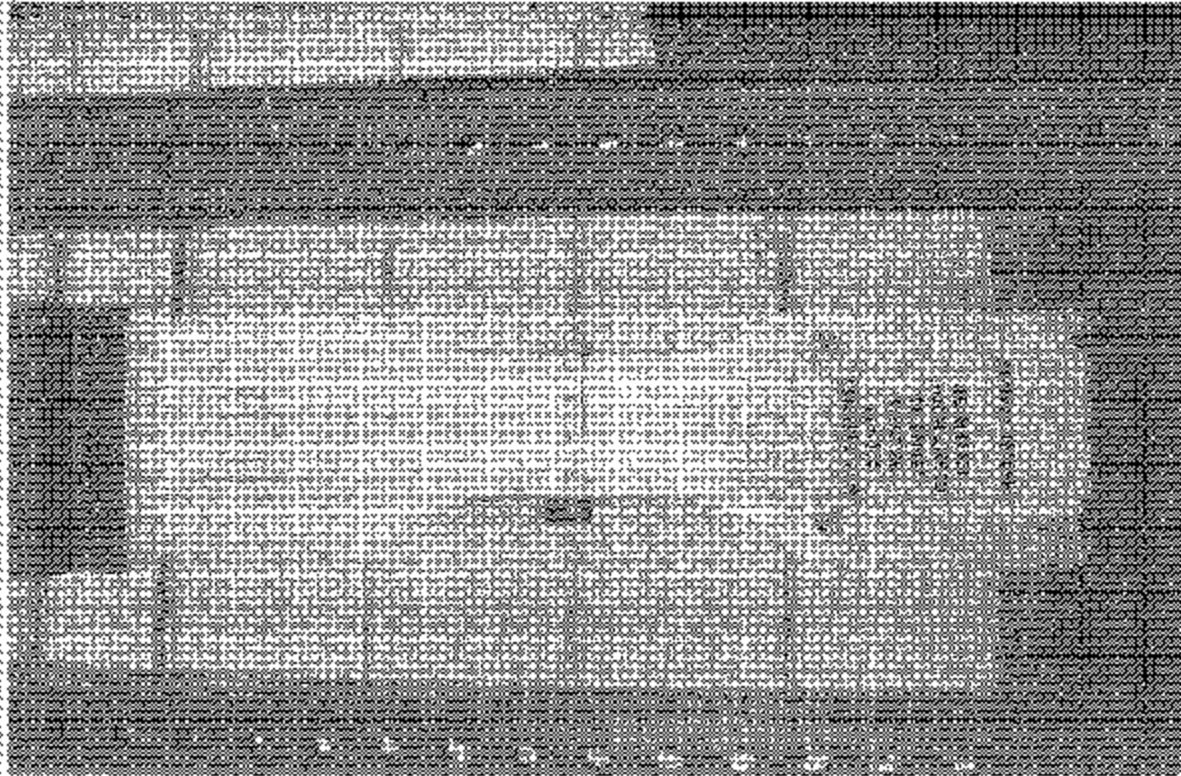


2003 LIBERTY
C30801
0826001
JOINT HT
JOINT HOOP
EXTERIOR

2003 Liberty Freedom School Bus

Fast Vehicle 2000 Liberty Freedom Bus
Procedure: XWV55 201

XWV55 No. C30901

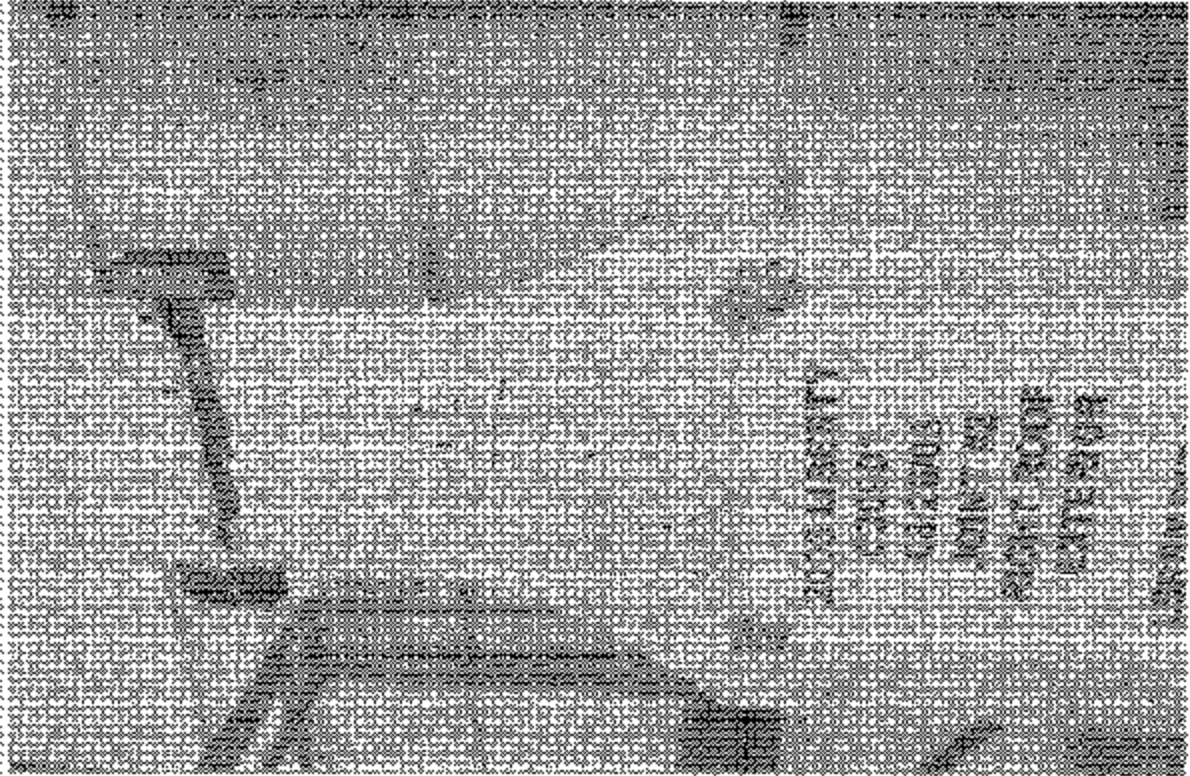


2000 Liberty Freedom Bus

Task Valves
sequencing

2003 Jimmy Transition School Bus
FWISS 271

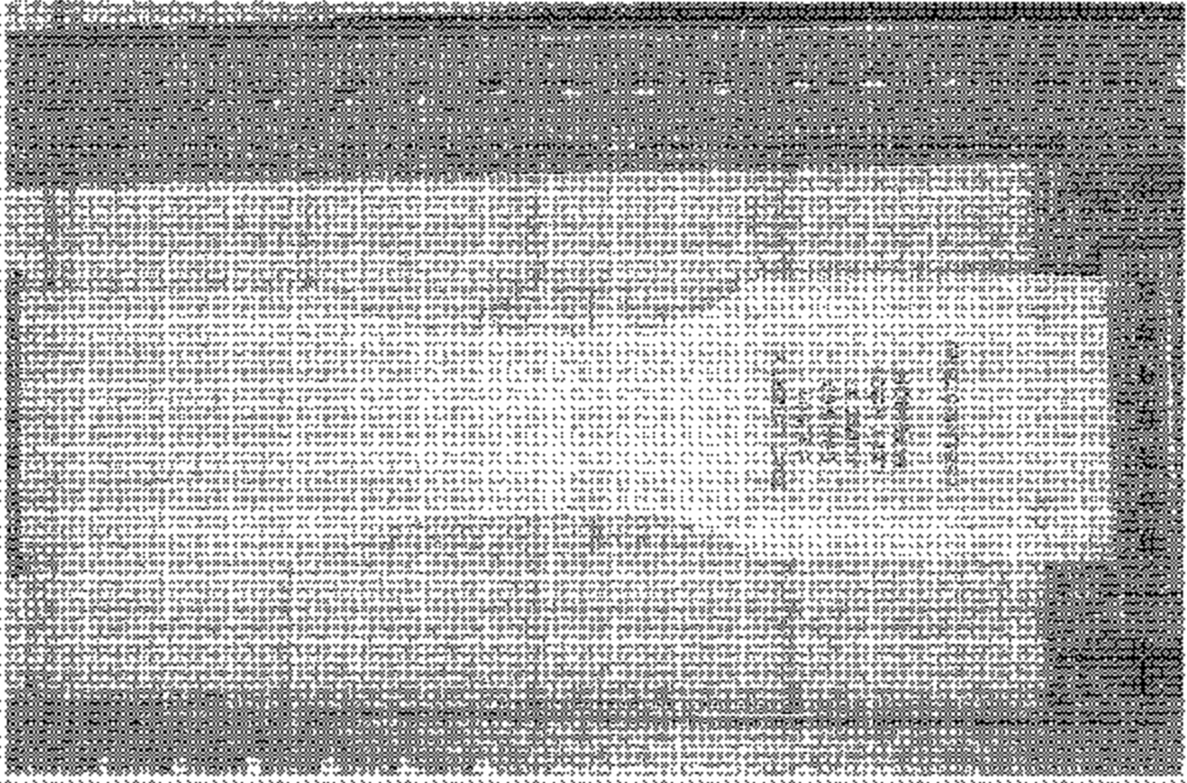
NHTSA No. C309M



Source: https://www.nhtsa.gov

Test Vehicle: 2001 Lincoln Navigator SUV/M SUV
Procedure: FMVSS 714

NHTSA No.: C19901



Sample provided by the Test Vehicle

Test Vehicle:
Procedure:

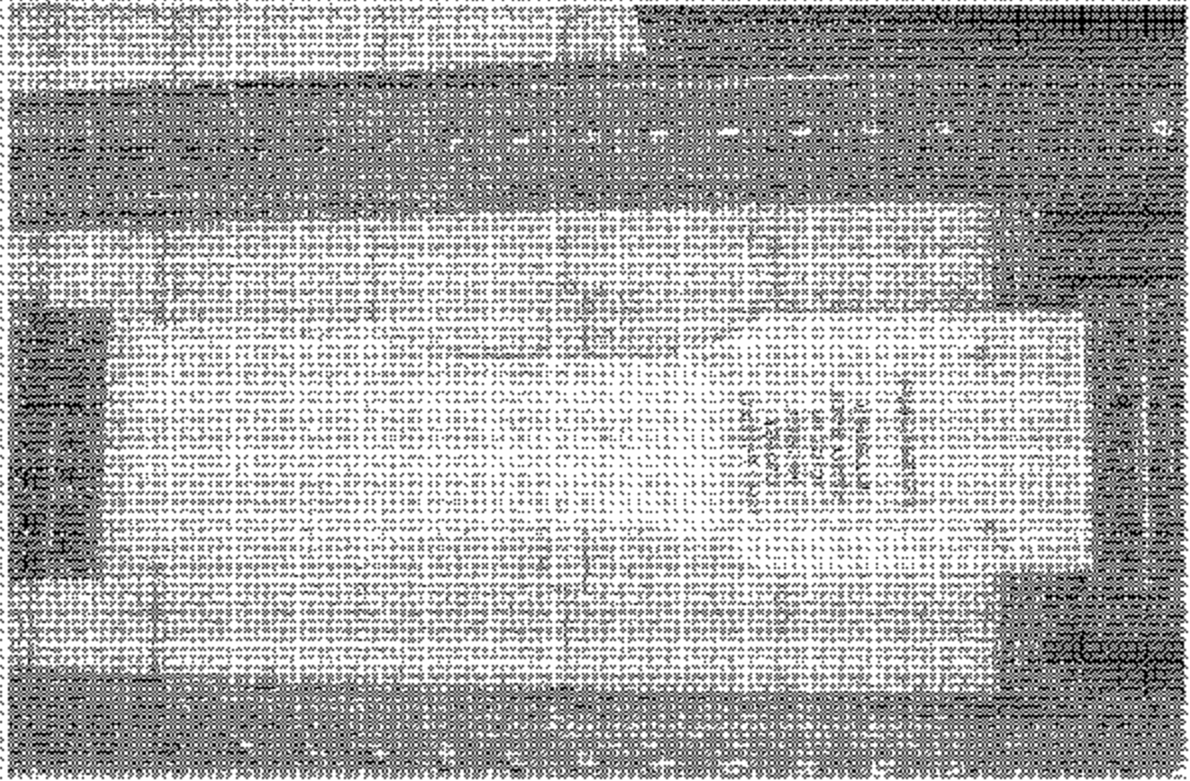
2013 Toyota's Resistor Surface Data
P/N: 371

NATS# N# : C30801



Test Vehicle: 2007 Toyota Prius
Procedure: NASS 71

DATE: 05/08/07

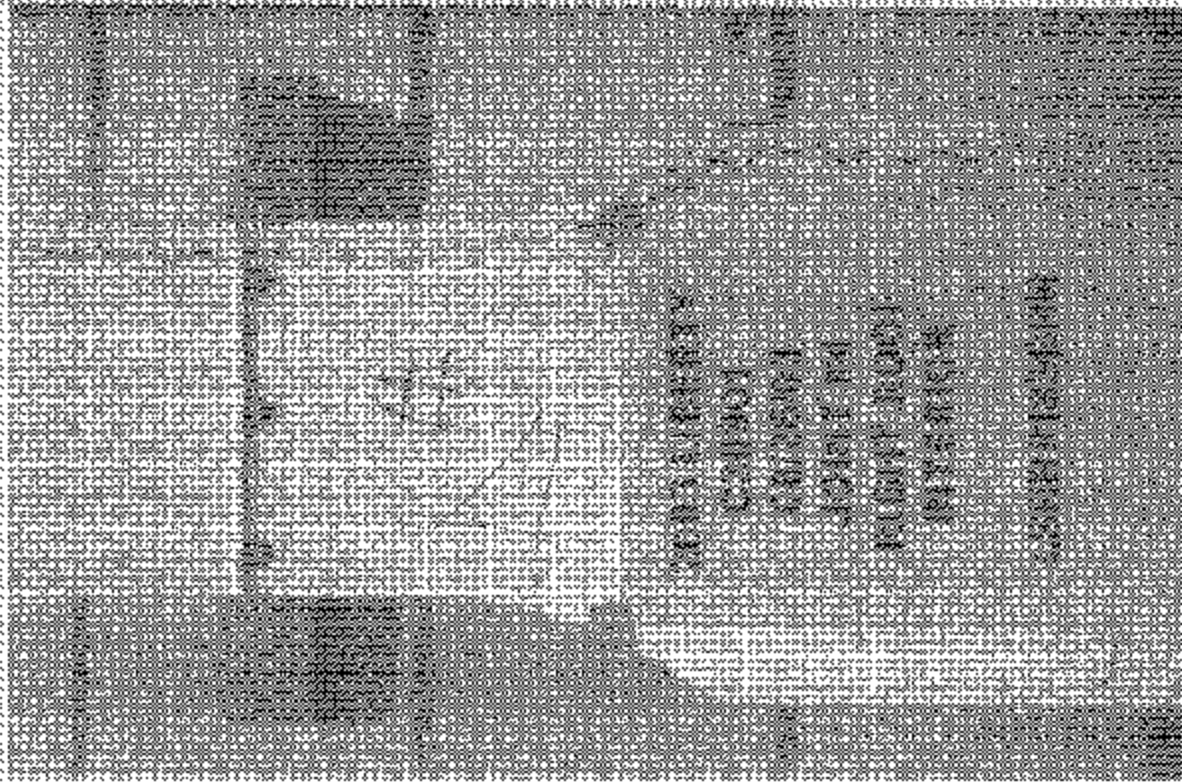


021

Tank Vehicle
Procedure

1995 Liberty 3 ton tractor trailer
PMA 58 271

NORTH NJ 030801



Source: At Risk Fuel Generator

**SECTION 7
TEST PLOTS**

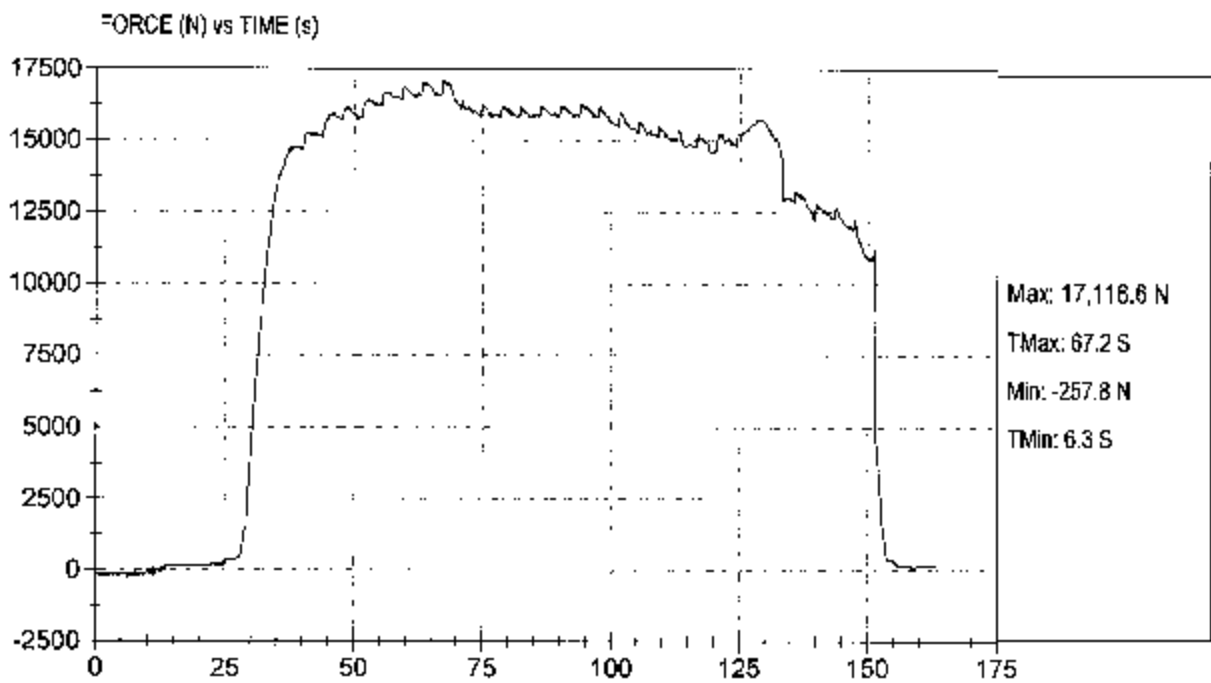
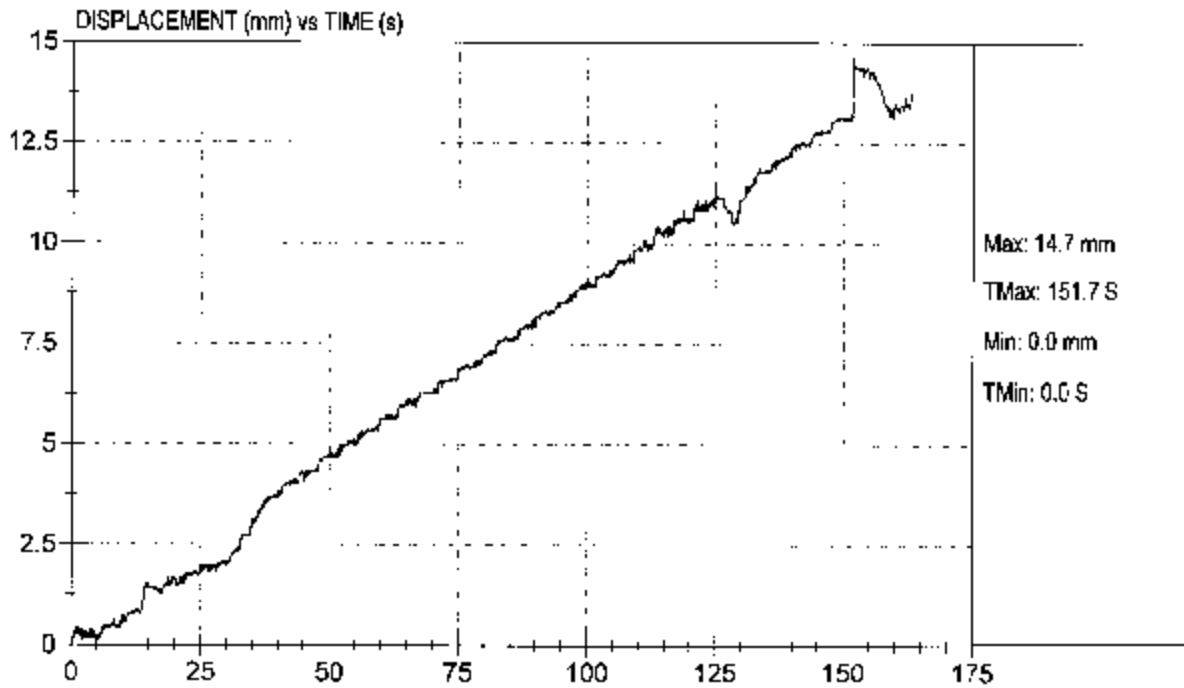
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Test Desc: LSRRME1B4BRV (Right Roof Ext) (1)
Component ID: Liberty

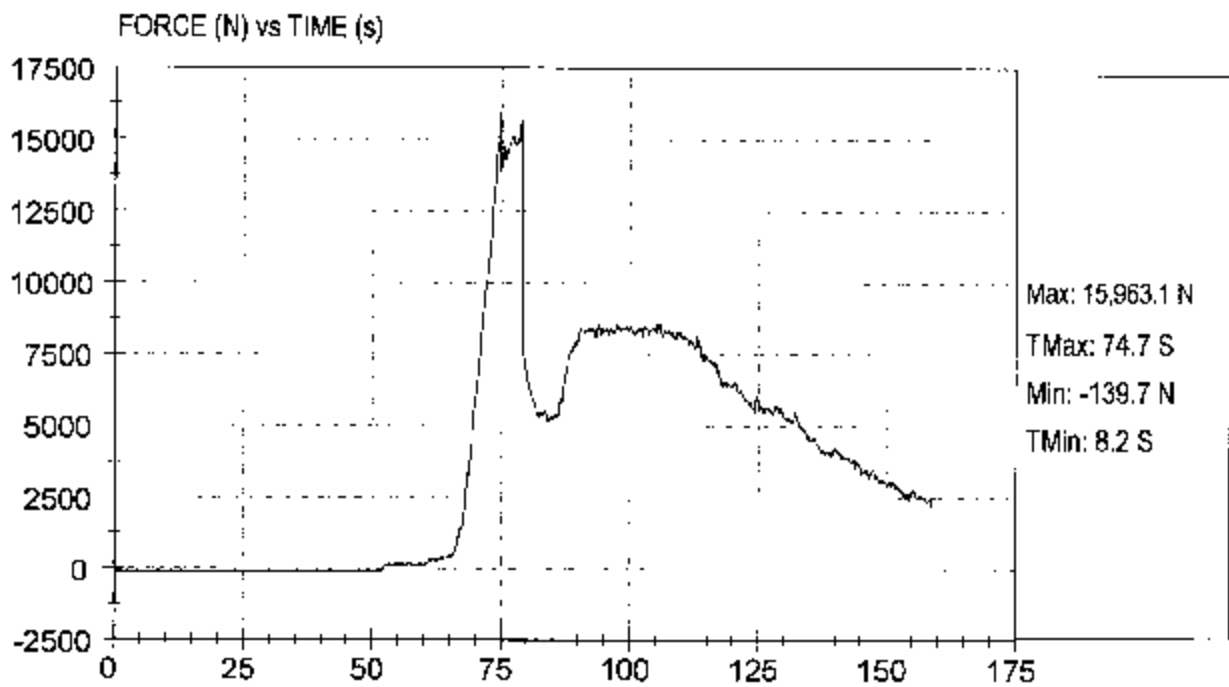
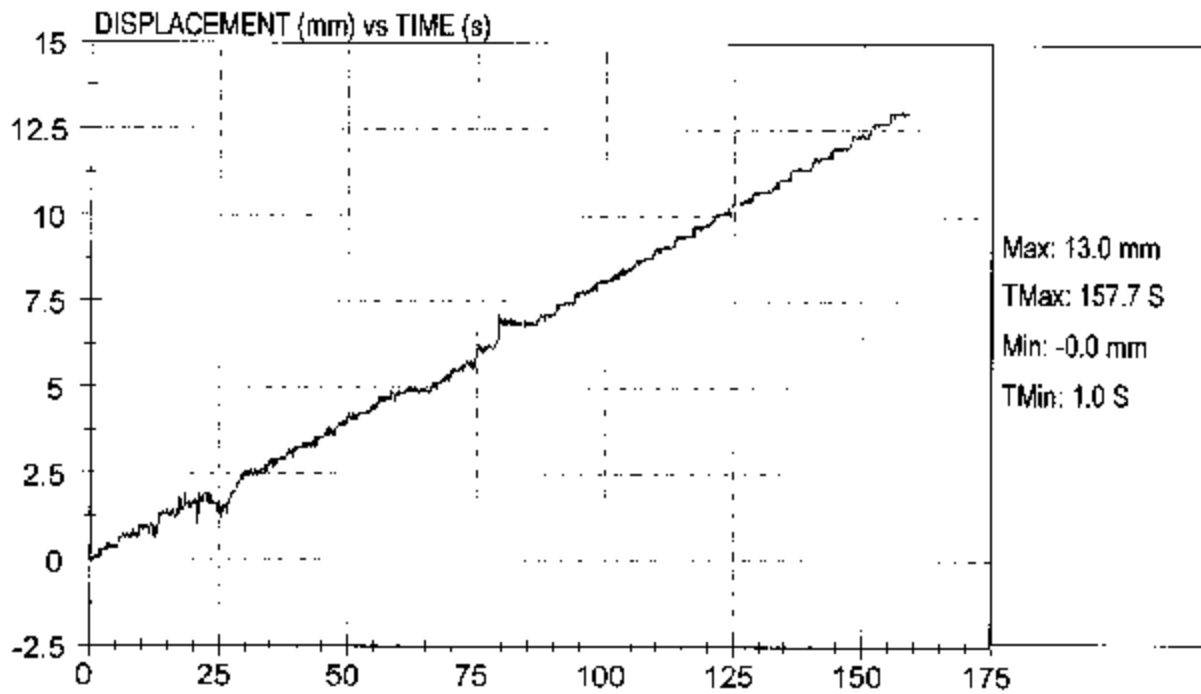
Test Date: 8/26/03
NHTSA #: C30901





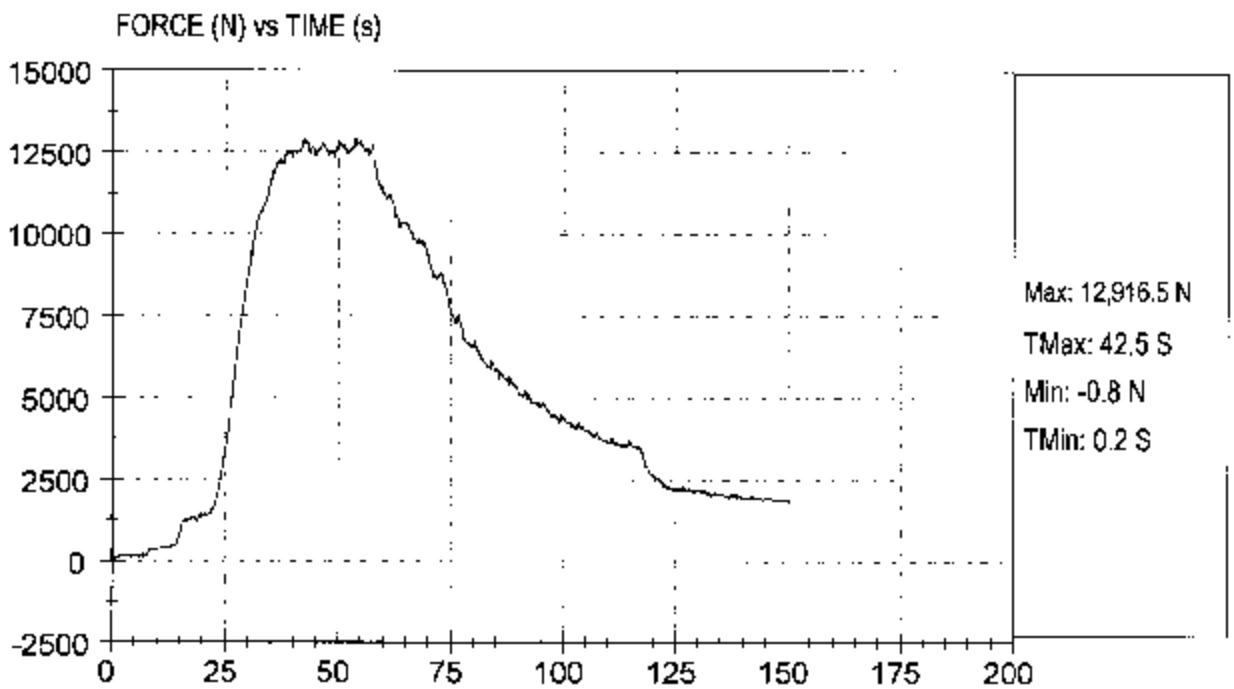
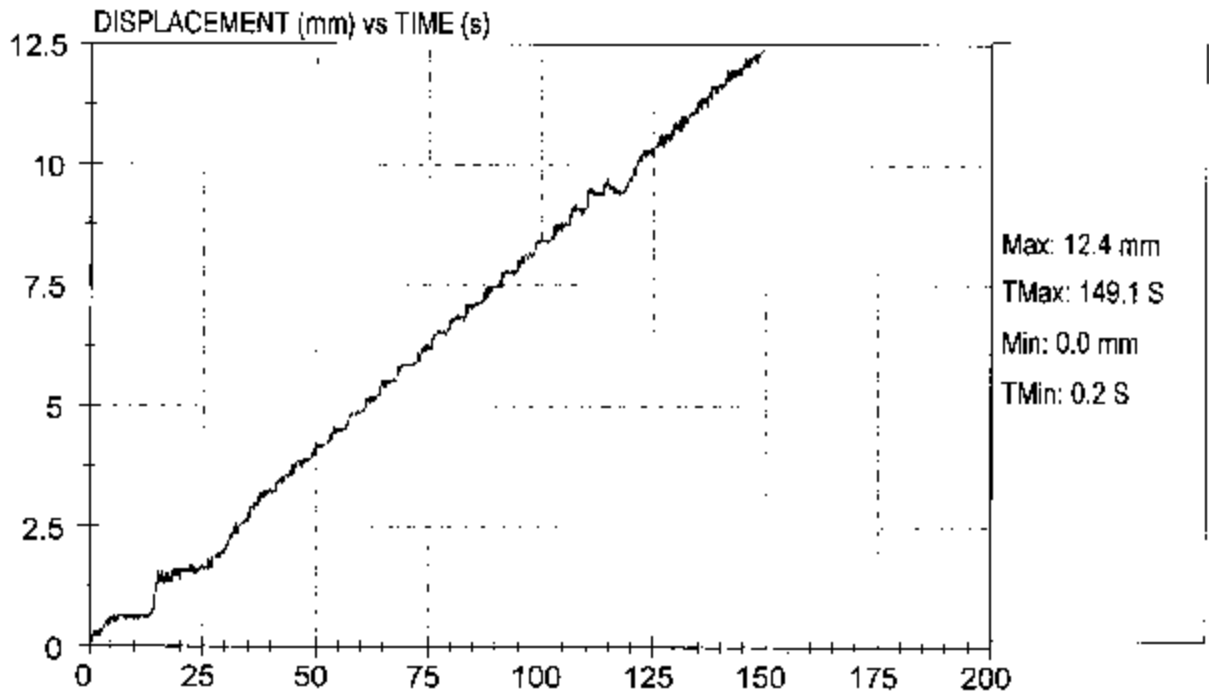
Test Desc: LSSRRI285BAV (Left Roof Int) (2)
Component ID: Liberty

Test Date: 8/26/03
NHTSA #: C30901





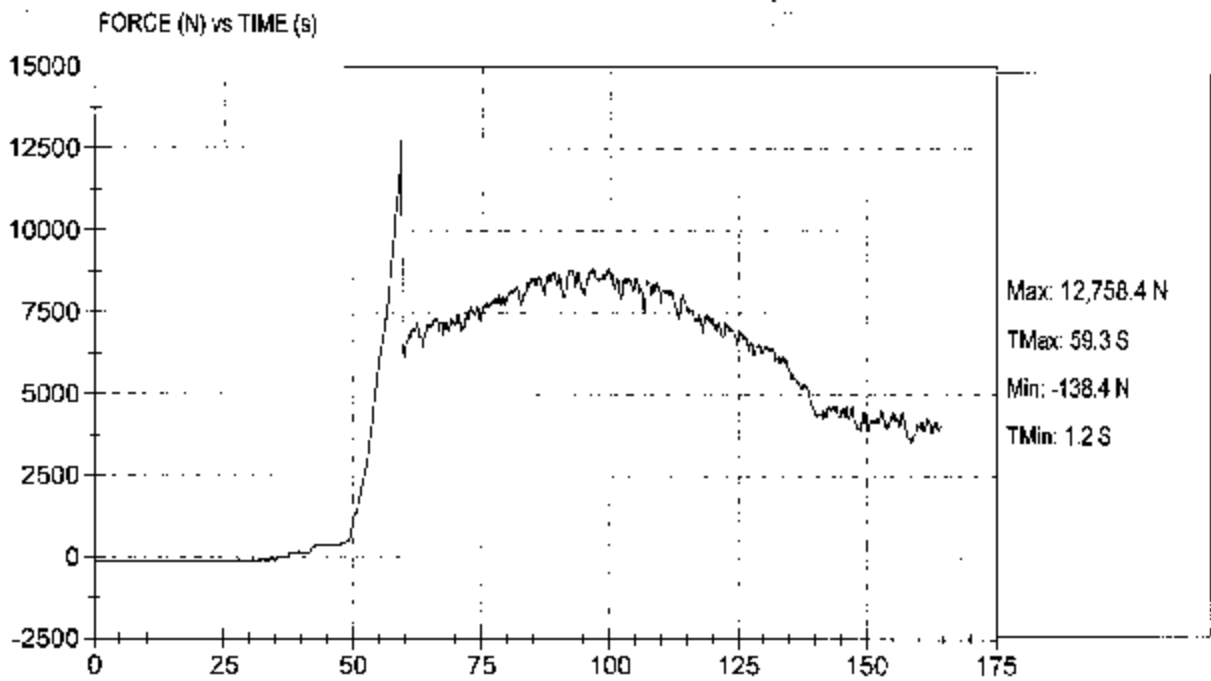
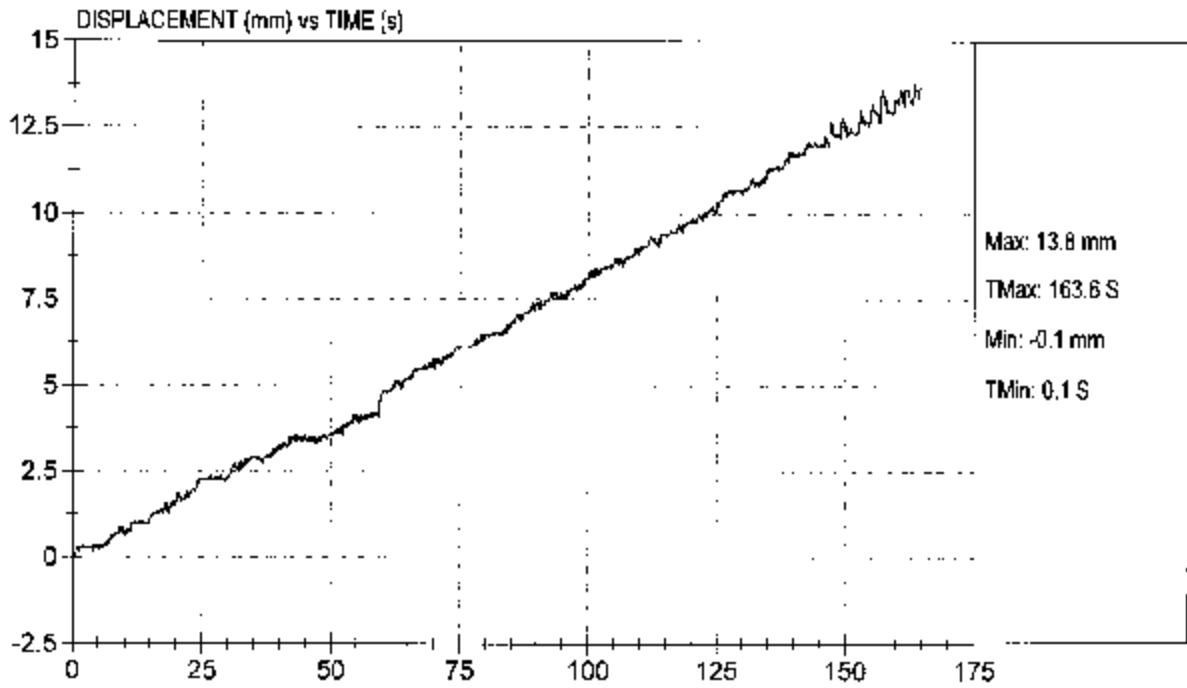
Test Desc: LSSLR1387BRV (Left Side Above Window Int) (3) Test Date: 8/26/03
Component ID: Liberty NHTSA #: C30901





Test Desc: LSRRRI483BRH (Right Roof In.) (4)
Component ID: Liberty

Test Date: 8/26/03
NHTSA #: C30901



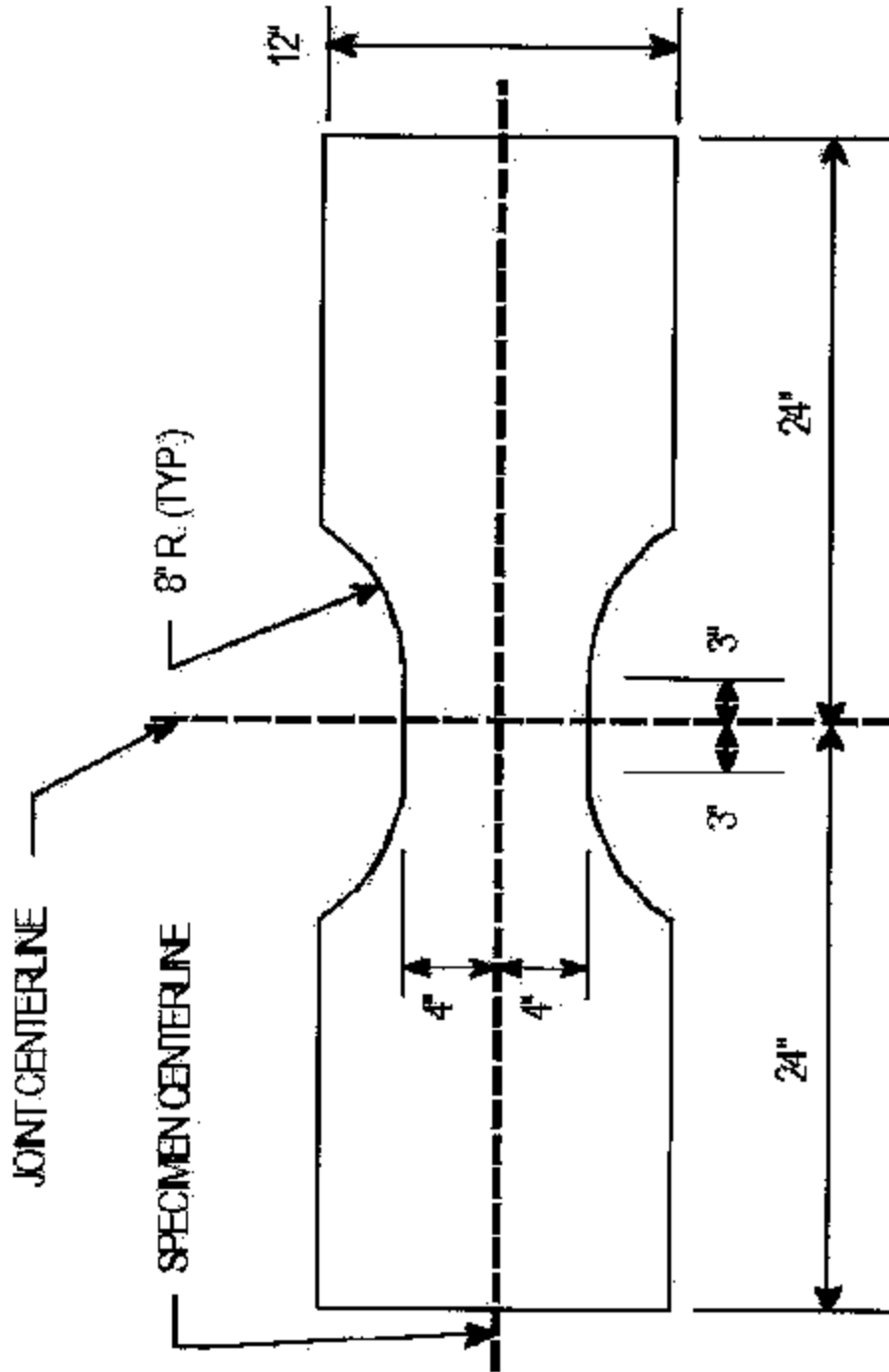
SECTION 8
JOINT CONFIGURATIONS

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Test Vehicle: 2003 Liberty Freedom School Bus
Procedure: FMVSS 221

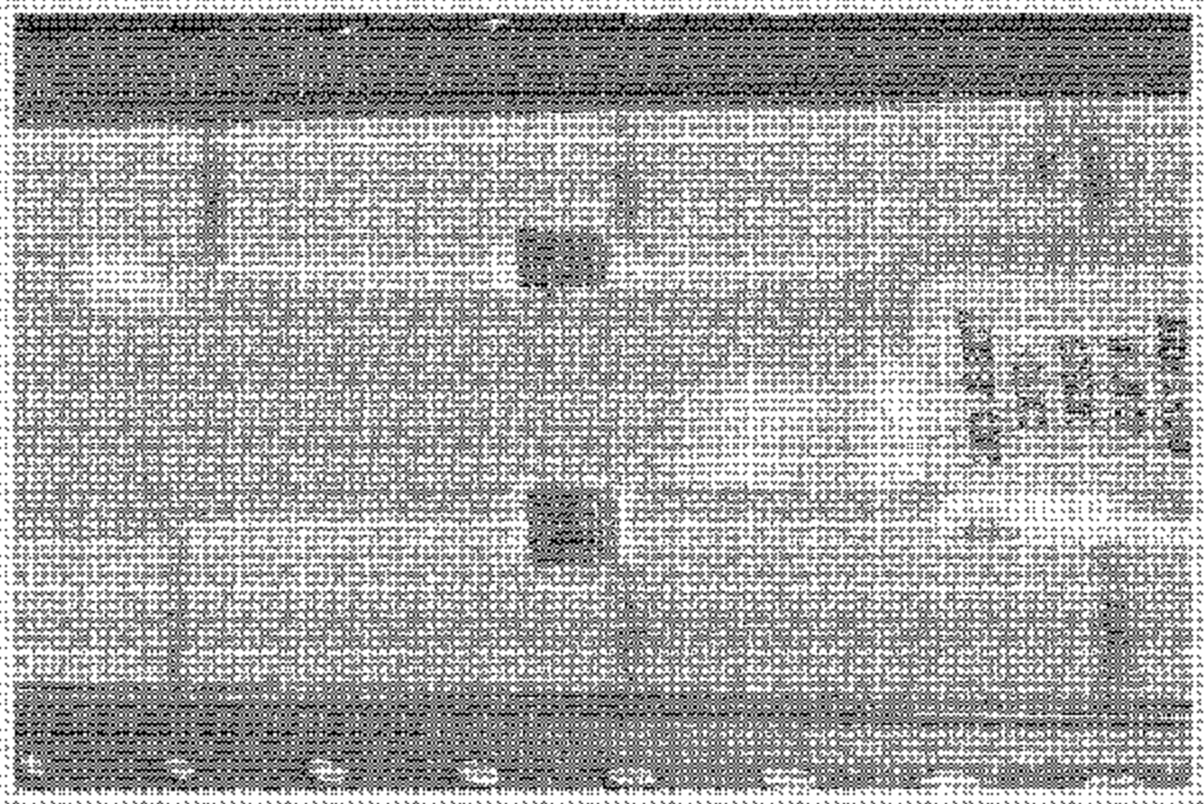
NHTSA No.: C30901

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



East Valley 2000 Property Transition Record of Deeds
Procedure F WVS 27

WFTS No. C39903



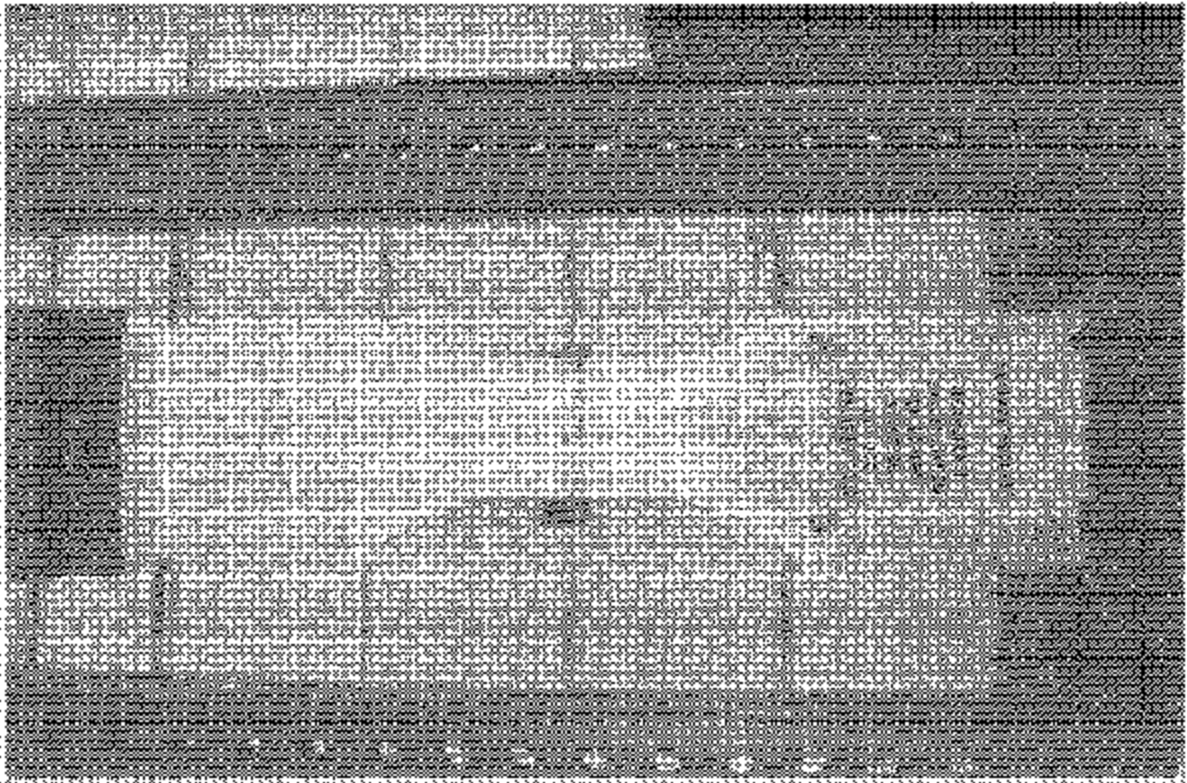
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TABLE 22. 2003 LIBRARY FINANCING SOURCE BY
FINANCING TYPE

UNITED STATES: CONTINUED

Test Vehicle: 2010 Toyota Prius
Procedure: XRAY SYSTEM

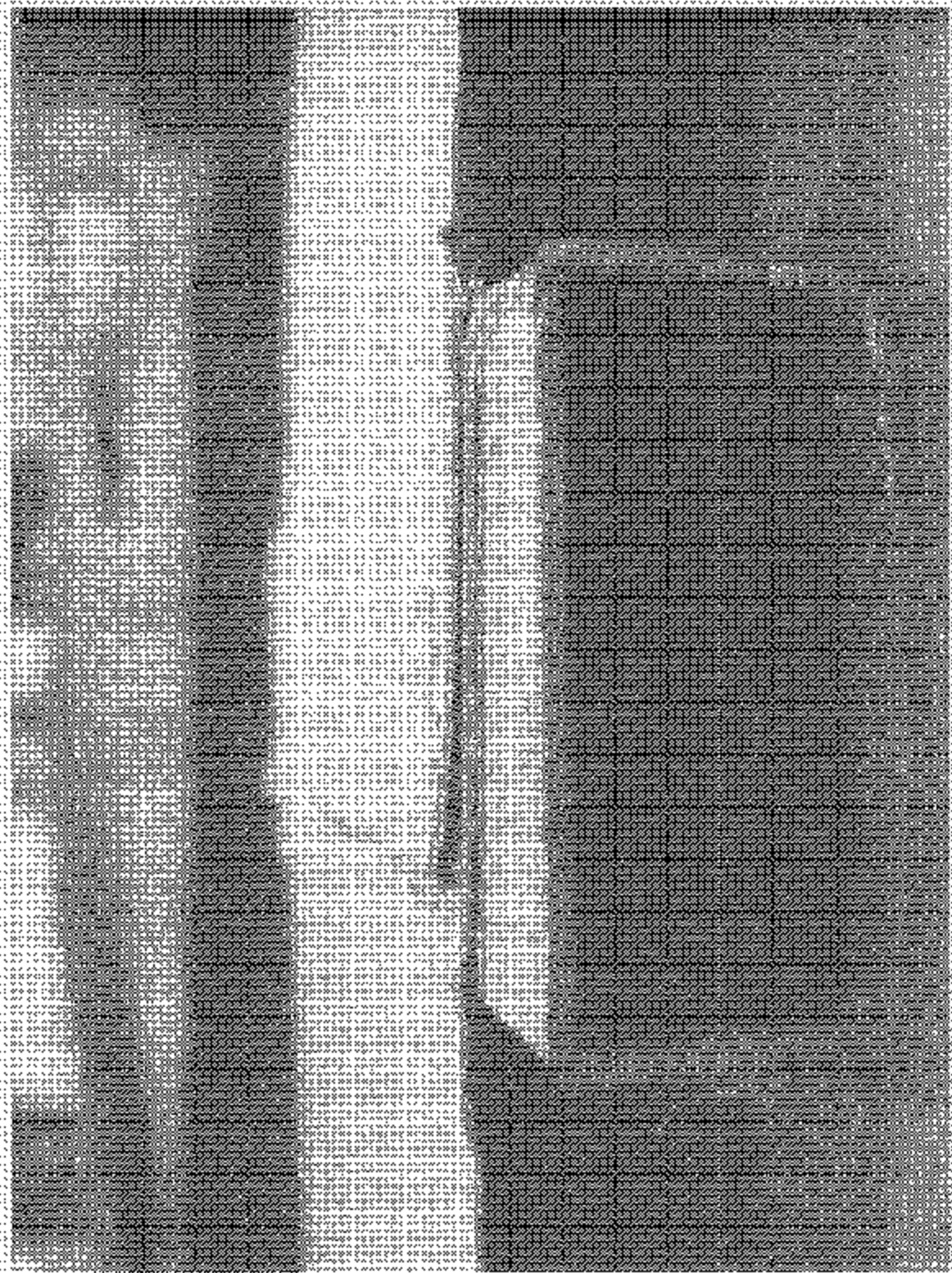
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From Page Of Image

POST-ADVICE 2004 LABORATORY FINDINGS REPORT Q116
INVESTIGATION: 20040527A

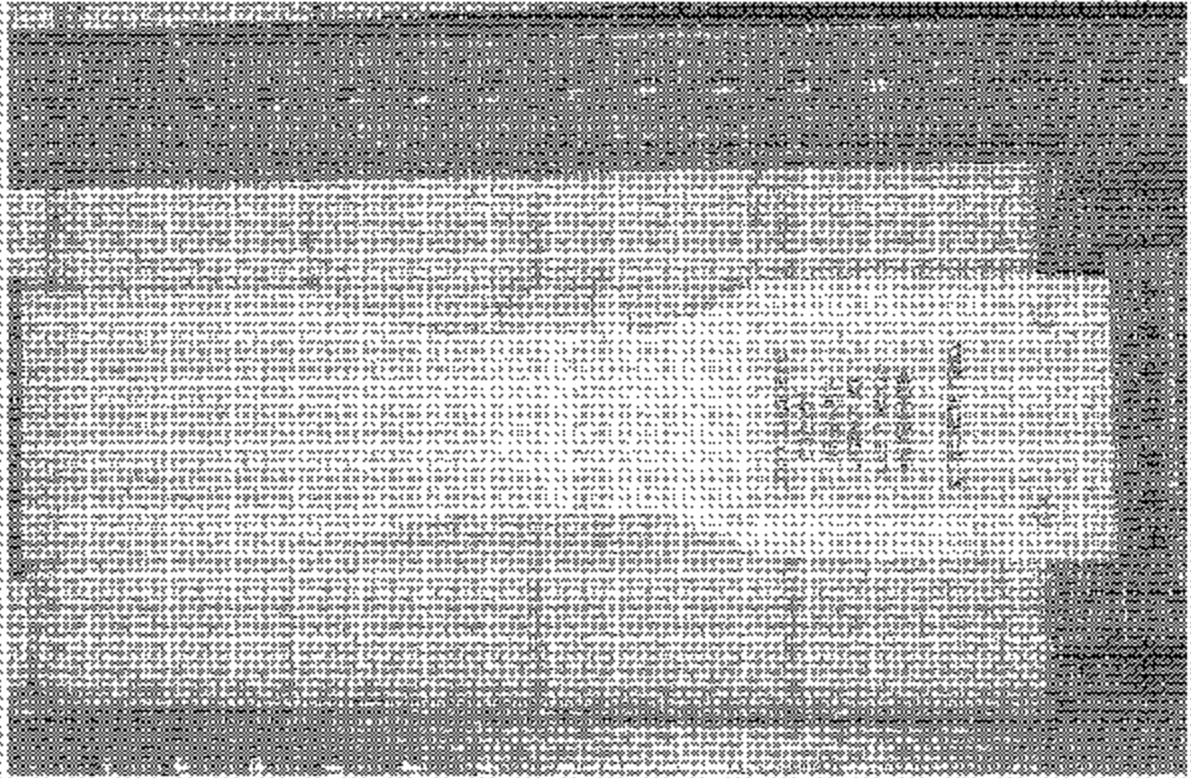
REF: 1004-115-010003



20040527A

Fastlane
PublicLink
2003 Liberty Freedom School Bus
FMVSS 201

WFOF No. 031901



Fastlane
PublicLink

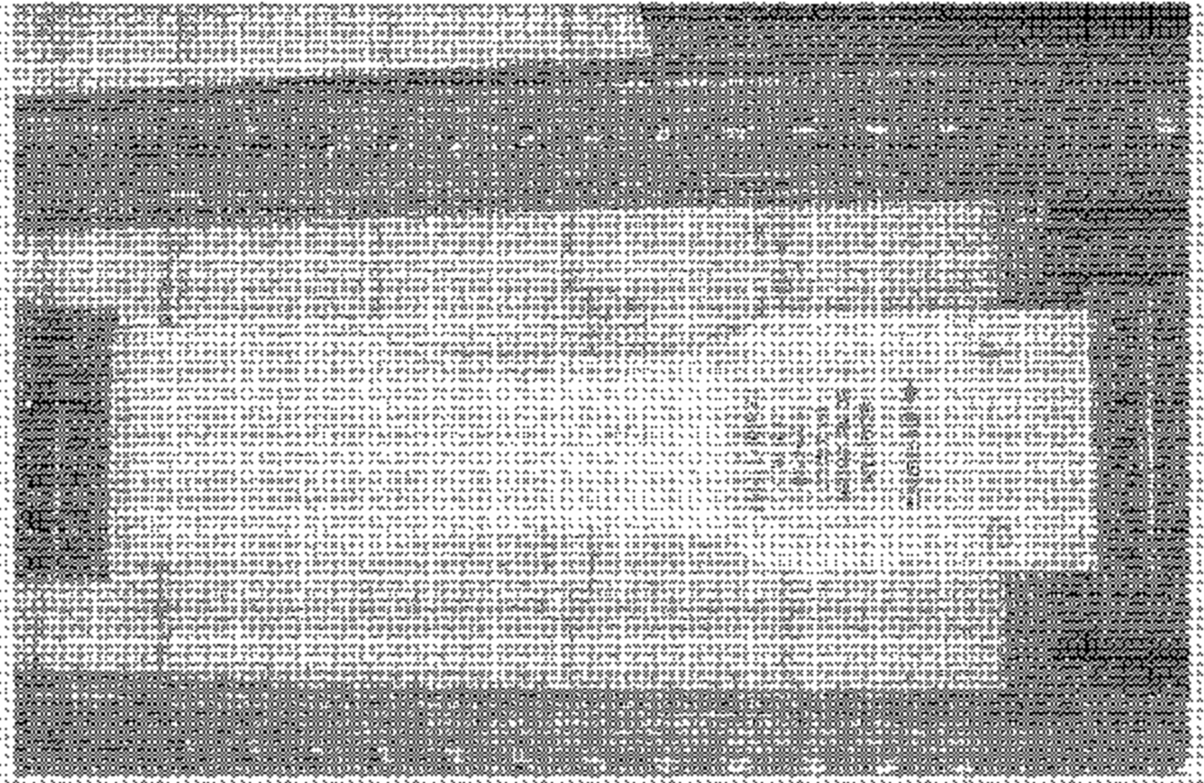
2000 LIBRARY FACILITY SURVEY 2000
FACILITY SURVEY 2000

2000 LIBRARY FACILITY SURVEY 2000

2000 LIBRARY FACILITY SURVEY 2000

2007 Liberty Fleetsort & Parcel Bus
FLEETS RT

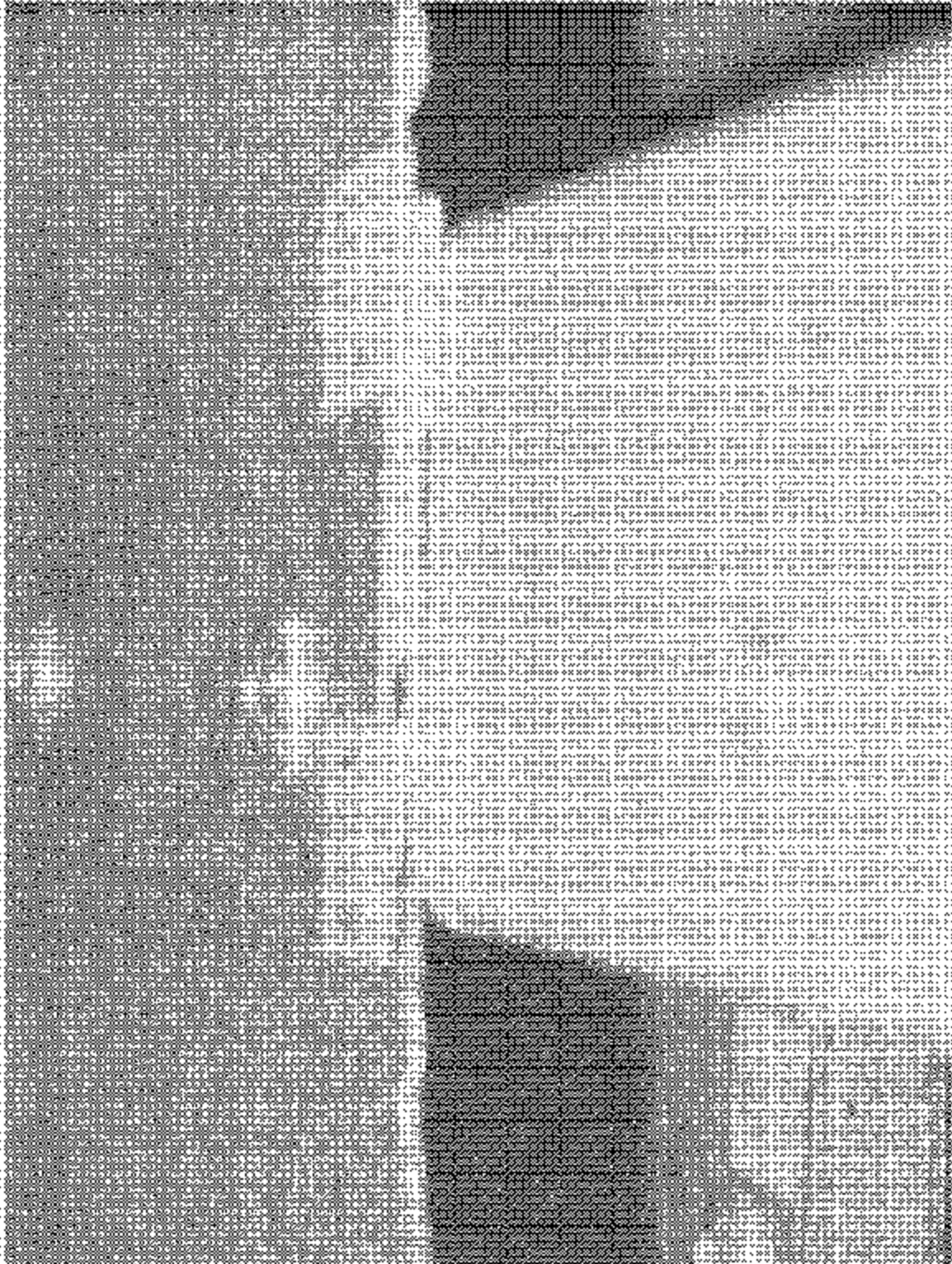
ARTIST NO: 630901



Page 1 of 1

THE SOURCE: 2003 ARMY PIGEON SERVICE BUS
PHOTOGRAPH: FEBRUARY 2001

PHOTOGRAPH: FEBRUARY 2001



SECTION 9
LABORATORY NOTICE OF TEST FAILURE TO OVSC



LABORATORY NOTICE OF TEST FAILURE TO OVSC

Test Procedure:	FMVSS 221	Test Date:	August 26, 2003
Test Vehicle:	2003 Liberty Freedom	Test Lab:	MGA Research Corp.
NHTSA No.:	C30901	Project Engineer:	Michael Janovicz
Contract No.:	DTNH22-02-D-01057	Delivery Order No.:	Contract
MFR.:	Liberty Bus	VIN:	1GBHG39U831110237
Build Date:	02/03		

TEST FAILURE DESCRIPTION

Interior side panel LSRRME184BRV failed to meet load requirement of 44,307.8 newtons when tensile tested as described in 49 CFR 571.221. Actual load was 17,118.4 newtons.

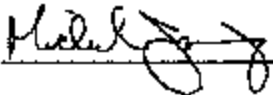
FMVSS REQUIREMENTS DESCRIPTION

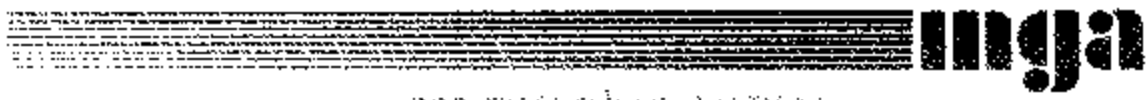
Paragraph S.5: "When tested in accordance with the procedure of S6, each body panel joint shall be capable of holding the body panel to the member to which it is joined when subjected to a force of 60% of the tensile strength of the weakest joined body panel determined pursuant to S6.2."

Remarks: No remarks.

Notification to NHTSA (COTR): Amanda Prescott

Date: September 3, 2003

By: 



mga research corporation

LABORATORY NOTICE OF TEST FAILURE TO OVSC

Test Procedure:	FMVSS 221	Test Date:	August 26, 2003
Test Vehicle:	2003 Liberty Freedom	Test Lab:	MGA Research Corp.
NHTSA No.:	C30901	Project Engineer:	Michael Janovicz
Contract No.:	DTNH22-02-D-01057	Delivery Order No.:	Contract
MFR.:	Liberty Bus	VIN:	1GBHG39U831110237
Build Date:	02/03		

TEST FAILURE DESCRIPTION

Interior side panel LSSRR1285BAV failed to meet load requirement of 24,279.7 newtons when tensile tested as described in 49 CFR 571.221. Actual load was 15,963.8 newtons

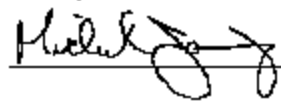
FMVSS REQUIREMENTS DESCRIPTION

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: September 3, 2003

By: 



mga research corporation

LABORATORY NOTICE OF TEST FAILURE TO OVSC

Test Procedure:	FMVSS 221	Test Date:	August 26, 2003
Test Vehicle:	2003 Liberty Freedom	Test Lab:	MGA Research Corp.
NHTSA No.:	C30901	Project Engineer:	Michael Janovicz
Contract No.:	DTNH22-02-D-01057	Delivery Order No.:	Contract
MFR.:	Liberty Bus	VIN:	1GBHG39U831110237
Build Date:	02/03		

TEST FAILURE DESCRIPTION

Interior side panel LSSLRI387BRV failed to meet load requirement of 22,334.9 newtons when tensile tested as described in 49 CFR 571.221. Actual load was 12,916.5 newtons

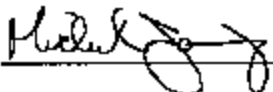
FMVSS REQUIREMENTS DESCRIPTION

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: September 3, 2003

By: 

LABORATORY NOTICE OF TEST FAILURE TO OVSC

Test Procedure:	FMVSS 221	Test Date:	August 26, 2003
Test Vehicle:	2003 Liberty Freedom	Test Lab:	MGA Research Corp.
NHTSA No.:	C30901	Project Engineer:	Michael Janovicz
Contract No.:	DTNH22-02-D-01057	Delivery Order No.:	Contract
MFR.:	Liberty Bus	VIN:	1GBHG39U831110237
Build Date:	02/03		

TEST FAILURE DESCRIPTION

Interior side panel LSRRRI483BRH failed to meet load requirement of 24,928 newtons when tensile tested as described in 49 CFR 571.221. Actual load was 12,758.8 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: September 3, 2003

By: 