

REPORT NUMBER: 220-MGA-05-001

HS No: 637975

**SAFETY COMPLIANCE TESTING FOR  
FMVSS NO. 220  
SCHOOL BUS ROLLOVER PROTECTION**

**Blue Bird Body Company  
2005 Vision School Bus  
NHTSA No.: C50901**

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



**Final Report Date: July 29, 2005**

**FINAL REPORT**

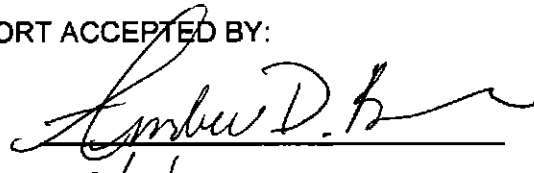
**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
ENFORCEMENT  
OFFICE OF VEHICLE SAFETY COMPLIANCE  
400 SEVENTH STREET, SW, ROOM 6115 (NVS-224)  
WASHINGTON, D.C. 20590**

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Prepared by:  Date: July 29, 2005  
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Reviewed by:  Date: July 29, 2005  
John Roberts, Project Engineer

FINAL REPORT ACCEPTED BY:

  
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**Technical Report Documentation Page**

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16. Abstract Compliance tests were conducted on the subject 2005 Blue Bird Vision School Bus, NHTSA No. C50901 in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-220-02 for the determination of FMVSS 220 compliance.  Test Failures were as Follows:  NONE					
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**SECTION 1**  
**PURPOSE OF COMPLIANCE TEST**

Tests were conducted on a MY2005 Blue Bird Vision School Bus, NHTSA No. C50901, in accordance with the specifications of the Office of Vehicle Safety Compliance (OVSC) Test Procedure, TP-220-02, to determine compliance to the requirements of Federal Motor Vehicle Safety Standards (FMVSS) 220, "School Bus Rollover Protection".

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

**SECTION 2**  
**TEST DATA SUMMARY**

Based on the tests performed, the MY2005 Blue Bird Vision School Bus, NHTSA No. C50901 appears to meet the requirements of FMVSS 220. The ambient temperature during testing was 24.2° C.

**TEST RESULTS**

S4.a	The downward vertical movement of any point on the application plate shall not exceed 130 mm.	<b>PASS</b>
S4.b	Each emergency exit shall be capable of:	
	Unlatching per FMVSS 217	<b>PASS</b>
	Opening per FMVSS 217	<b>PASS</b>

**DATA SHEET 1  
VEHICLE INFORMATION**

Contract No.:	DTNH22-02-D-01057
Laboratory Name:	MGA Research Corporation

INCOMPLETE VEHICLE (if applicable)	
Manufacturer:	
Model:	
VIN:	
Build Date:	
Certification Date:	

COMPLETED VEHICLE (SCHOOL BUS)	
Manufacturer:	Blue Bird
Make/Model:	Vision
VIN:	1BAKGCKH05F227003
NHTSA No.:	C50901
Color:	Yellow
GVWR (kg/lb):	13612 / 30000
Build Date:	09/04
Certification Date:	09/04

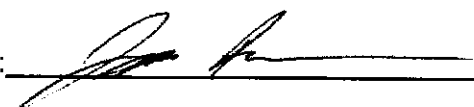
DATES	
Vehicle Receipt:	May 13, 2005
Start of Compliance Test:	July 13, 2005
Completion of Compliance Test:	July 13, 2005

**COMPLIANCE TEST:**

All tests were performed in accordance with the references outlined in: TP-220-02.

**COMMENTS: NONE**

Recorded By: 

Approved By: 

Date: July 13, 2005

**DATA SHEET 1 (CONTINUED)**  
**VEHICLE INFORMATION**

**SCHOOL BUS UNLOADED VEHICLE WEIGHT (UVW)**

Units	LF	RF	LR	RR	TOTAL
kg	1546	1516	2676	2868	8606

**SCHOOL BUS ROOF AND APPLICATION PLATE DATA**

Dimensions	School Bus Roof	Calculated Roof Plate	Actual Roof Plate
Length (mm):	9957	9652	9754
Width (mm):	2390	914	914

Notes:

- (1) The vehicle was centered laterally and longitudinally under the roof load application plate.
- (2) The actual roof plate length was 102 mm longer than calculated length.

School Bus Has:     Rigid Frame;     Unibody

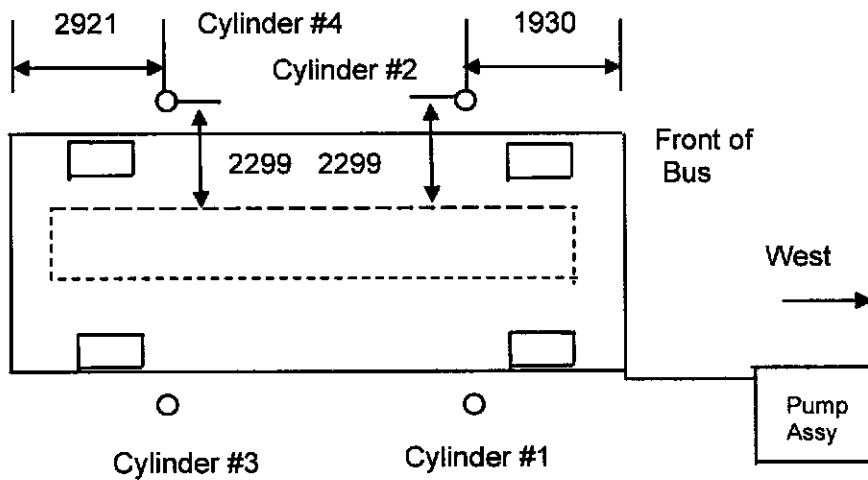
Components Removed From Vehicle Before Testing:    Emergency roof hatch.



**DATA SHEET 1 (CONTINUED)**  
**VEHICLE INFORMATION**

**LINEAR DISPLACEMENT TRANSDUCER LOCATION (inches)**

Description	LF	RF	LR	RR
From closest corner of load application plate (mm)	1930	1930	2921	2921
From closest outside edge of load application plate (mm)	2299	2299	2299	2299



COMMENTS: NONE

Recorded By: *[Signature]*

Approved By: *[Signature]*

Date: July 13, 2005

**SECTION 3**  
**COMPLIANCE TEST DATA**

The following data sheets document the results of testing on the 2005 Blue Bird Vision School Bus, NHTSA No. C50901.

**DATA SHEET 2**  
**FORCE APPLICATION AND DEFLECTION INFORMATION**

Test Vehicle: **2005 Blue Bird Vision School Bus**  
 Test Lab: **MGA Research-Wisconsin Operations**

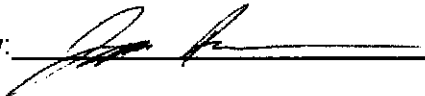
NHTSA No.: **C50901**  
 Test Date: **7/13/05**

Unloaded Delivered Weight (UDW): (kg)	8606 kg
Calculated Test Load = 1.5 * UDW	12909 kg
Range of Test Load (-1% to -3%)	12521kg – 12780 kg
Maximum Deflection at Full Load:	108 mm

		Pre-Load (227 kg)	Max. Load		PASS/FAIL
		Deflection (mm)	Deflection (mm)	Load (kg)	
Cylinder	1	0	108	3275	PASS
	2	0	47	3158	PASS
	3	0	78	3205	PASS
	4	0	40	3250	PASS
Total Load				12,729	
Average Deflection			67		
Backup Measurement	1	0	61		
	2	0	47		
	3	0	25		
	4	0	10		

COMMENTS: 1) Backup measurements taken at four most outboard and longitudinal locations on the roof. Primary cylinder deflections were measured at the locations identified in the diagram on page 5. Maximum deflection allowed = 130 mm

Recorded By: 

Approved By: 

Date: July 13, 2005

**DATA SHEET 3**  
**FORCE AND OPENING AREA TEST OF EMERGENCY EXITS**

Test Vehicle: **2005 Blue Bird Vision School Bus**  
 Test Lab: **MGA Research-Wisconsin Operations**

NHTSA No.: **C50901**  
 Test Date: **7/13/05**

	<b>PASS/FAIL</b>
Can all exits be manually released and extended by a single person without tools, remote controls, and without the engine running?	<b>PASS</b>

NOTE: BEFORE, DURING & AFTER, refer to the point in time in relation to the load applied to the load application plate on the school bus roof.

					<b>PASS/FAIL</b>
BEFORE LOAD:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<b>PASS</b>
DURING LOAD:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<b>PASS</b>
AFTER LOAD:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<b>PASS</b>

Is emergency exit door releasable from outside the school bus?					<b>PASS/FAIL</b>
BEFORE LOAD:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<b>PASS</b>
DURING LOAD:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<b>PASS</b>
AFTER LOAD:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<b>PASS</b>

**DATA SHEET 4**  
**FORCE AND OPENING AREA TEST OF EMERGENCY EXITS (INTERIOR)**

Test Vehicle: 2005 Blue Bird Vision School Bus  
 Test Lab: MGA Research-Wisconsin Operations  
 NHTSA No.: C50901  
 Test Date: 7/13/05

**FORCE TEST TO UNLATCH THE EMERGENCY EXITS:**

Exit Location	Maximum Force	Actual Before (N)	PASS/FAIL	Actual During (N)	PASS/FAIL	Actual After (N)	PASS/FAIL	Type of Motion
Left Exit Window	89 N	1. 56.1	PASS	1. 62.0	PASS	1. 68.0	PASS	Straight
		2. 56.1		2. 66.0		2. 68.3		
		3. 55.8		3. 54.3		3. 69.1		
		Average: 56.0		Average: 60.8		Average: 68.5		
Right Exit Window	89 N	1. 41.6	PASS	1. 48.2	PASS	1. 69.1	PASS	Straight
		2. 42.6		2. 53.0		2. 69.1		
		3. 42.8		3. 47.0		3. 69.4		
		Average: 42.3		Average: 49.4		Average: 69.2		
Rear Exit Door	178 N	1. 17.3	PASS	1. 23.0	PASS	1. 17.6	PASS	Rotary
		2. 17.6		2. 14.0		2. 17.6		
		3. 18.1		3. 16.9		3. 16.1		
		Average: 17.6		Average: 18.0		Average: 17.1		

Note: The "Actual Before" test results were obtained from the FMSSS 217 performed on this vehicle.  
 The "Actual During" and "Actual After" test results were obtained during the FMVSS 220 testing.

**DATA SHEET 4 (CONTINUED)**  
**FORCE AND OPENING AREA TEST OF EMERGENCY EXITS (INTERIOR)**

Test Vehicle: 2005 Blue Bird Vision School Bus  
 Test Lab: MGA Research-Wisconsin Operations

NHTSA No.: C50901  
 Test Date: 7/13/05

**FORCE TESTS TO OPEN THE EMERGENCY EXITS**

Exit Location	Maximum Force	Actual Before (N)	PASS/FAIL	Actual During (N)	PASS/FAIL	Actual After (N)	PASS/FAIL	Type of Motion
Left Exit Window	89 N	1. 36.6	PASS	1. 68.5	PASS	1. 26.3	PASS	Straight
		2. 33.6		2. 53.4		2. 26.0		
		3. 38.0		3. 44.9		3. 27.6		
		Average: 36.1		Average: 55.6		Average: 26.6		
Right Exit Window	89 N	1. 27.1	PASS	1. 20.6	PASS	1. 23.4	PASS	Straight
		2. 34.0		2. 27.9		2. 26		
		3. 35.6		3. 23.4		3. 29.1		
		Average: 32.2		Average: 24.0		Average: 26.2		
Rear Exit Door	178 N	1. 47.5	PASS	1. 20.1	PASS	1. 25.3	PASS	Straight
		2. 49.0		2. 28.8		2. 25.7		
		3. 47.4		3. 30.4		3. 25.6		
		Average: 47.4		Average: 26.4		Average: 25.5		

Note: The "Actual Before" test results were obtained from the FMSSS 217 performed on this vehicle.  
 The "Actual During" and "Actual After" test results were obtained during the FMVSS 220 testing.

DATA SHEET 5

FORCE AND OPENING AREA TEST OF EMERGENCY EXITS (EXTERIOR)

Test Vehicle: 2005 Blue Bird Vision School Bus  
 Test Lab: MGA Research-Wisconsin Operations  
 NHTSA No.: C50901  
 Test Date: 7/13/05

FORCE TEST TO UNLATCH THE EMERGENCY EXITS:

Exit Location	Maximum Force	Actual Before (N)		PASS/FAIL	Actual During (N)		PASS/FAIL	Actual After (N)		PASS/FAIL	Type of Motion
		1.	2.		3.	Average:		1.	2.		
Rear Exit Door	178 N	1.	73.2	PASS	1.	57.9	PASS	1.	72.6	PASS	Rotary
		2.	66.4			58.8			73.8		
		3.	74.5			61.4			73.5		
		Average: 71.3				Average: 59.4			Average: 73.3		

Note: The "Actual Before" test results were obtained from the FMSSS 217 performed on this vehicle.  
 The "Actual During" and "Actual After" test results were obtained during the FMVSS 220 testing.

**DATA SHEET 5 (CONTINUED)**  
**FORCE AND OPENING AREA TEST OF EMERGENCY EXITS (EXTERIOR)**

Test Vehicle: 2005 Blue Bird Vision School Bus  
 Test Lab: MGA Research-Wisconsin Operations  
 NHTSA No.: C50901  
 Test Date: 7/13/05

**FORCE TESTS TO OPEN THE EMERGENCY EXITS**

Exit Location	Maximum Force	Actual Before (N)		PASS/FAIL	Actual During (N)		PASS/FAIL	Actual After (N)		PASS/FAIL	Type of Motion	
		1.	2.		1.	2.		3.	Average:			1.
Rear Exit Door	178 N	1.	31.1	PASS	PASS	1.	31.4	PASS	1.	30.2	PASS	Straight
		2.	36.6			2.	32.7		2.	29.3		
		3.	35.8			3.	28.4		3.	30.6		
		Average: 34.5				Average: 30.8			Average: 30.0			

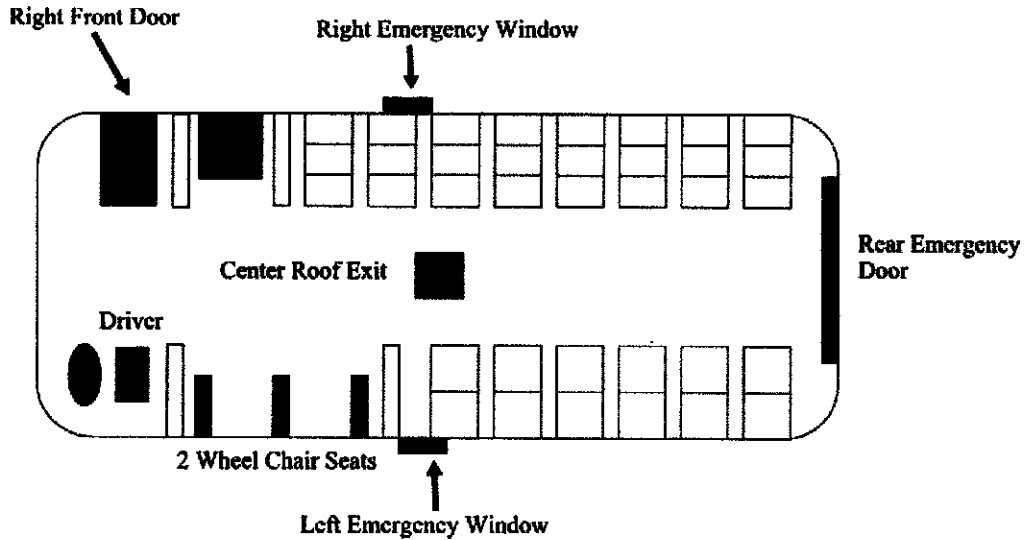
Note: The "Actual Before" test results were obtained from the FMSSS 217 performed on this vehicle.  
 The "Actual During" and "Actual After" test results were obtained during the FMVSS 220 testing.



**DATA SHEET 6**  
**EMERGENCY EXIT MEASUREMENTS**

Test Vehicle: **2005 Blue Bird Vision School Bus**  
Test Lab: **MGA Research-Wisconsin Operations**

NHTSA No.: **C50901**  
Test Date: **7/13/05**



		Height (mm)	Width (mm)	Passage of Ellipsoid or Parallelepiped	PASS/FAIL
1	Roof Exit	571	577	Ellipsoid	PASS
2	Left Exit Window	647	609	Ellipsoid	PASS
3	Right Exit Window	647	609	Ellipsoid	PASS
4	Rear Exit Door	1295	958	114 x 61 x 30 Parallelepiped	PASS

COMMENTS: NONE

Recorded By: *[Signature]*

Approved By: *[Signature]*

Date: July 13, 2005

**SECTION 4**  
**INSTRUMENTATION AND EQUIPMENT LIST**

Test Vehicle: **2005 Blue Bird Vision School Bus**  
Test Lab: **MGA Research-Wisconsin Operations**

NHTSA No.: **C50901**  
Test Date: **7/13/05**

Equipment	Description	Model/Serial No.	Cal. Date	Next Cal. Date
Computer	HP	Vectra / US03263612	---	---
Steel Tape	Stanley	Powerlock / 101	05-31-05	11-31-05
Scale	GSE	PRO-WEIGH 84 212091/212092	6-10-05	12-10-05
Cylinder #1 Load Cell	Interface	1220AF/143208	4-20-05	10-20-05
Cylinder #1 Displacement Pot.	Patriot	20650	7-11-05	2-11-06
Cylinder #2 Load Cell	Interface	1220AF/137781	4-20-05	10-20-05
Cylinder #2 Displacement Pot.	Patriot	1202-19368	7-11-05	2-11-06
Cylinder #3 Load Cell	Interface	1220AF/152045	4-20-05	10-20-05
Cylinder #3 Displacement Pot.	Patriot	1102-19181	7-11-05	2-11-06
Cylinder #4 Load Cell	Interface	1220AF/137783	4-20-05	10-20-05
Cylinder #4 Displacement Pot.	Patriot	1202-19364	7-11-05	2-11-06
Ellipsoid	MGA	ELLIP - 1A	When used	When used
Parallepiped	MGA	PARA - 1A	When used	When used
Force Gauge	Dillon	DFGS-R-ND / F31754	05-19-05	11-19-05

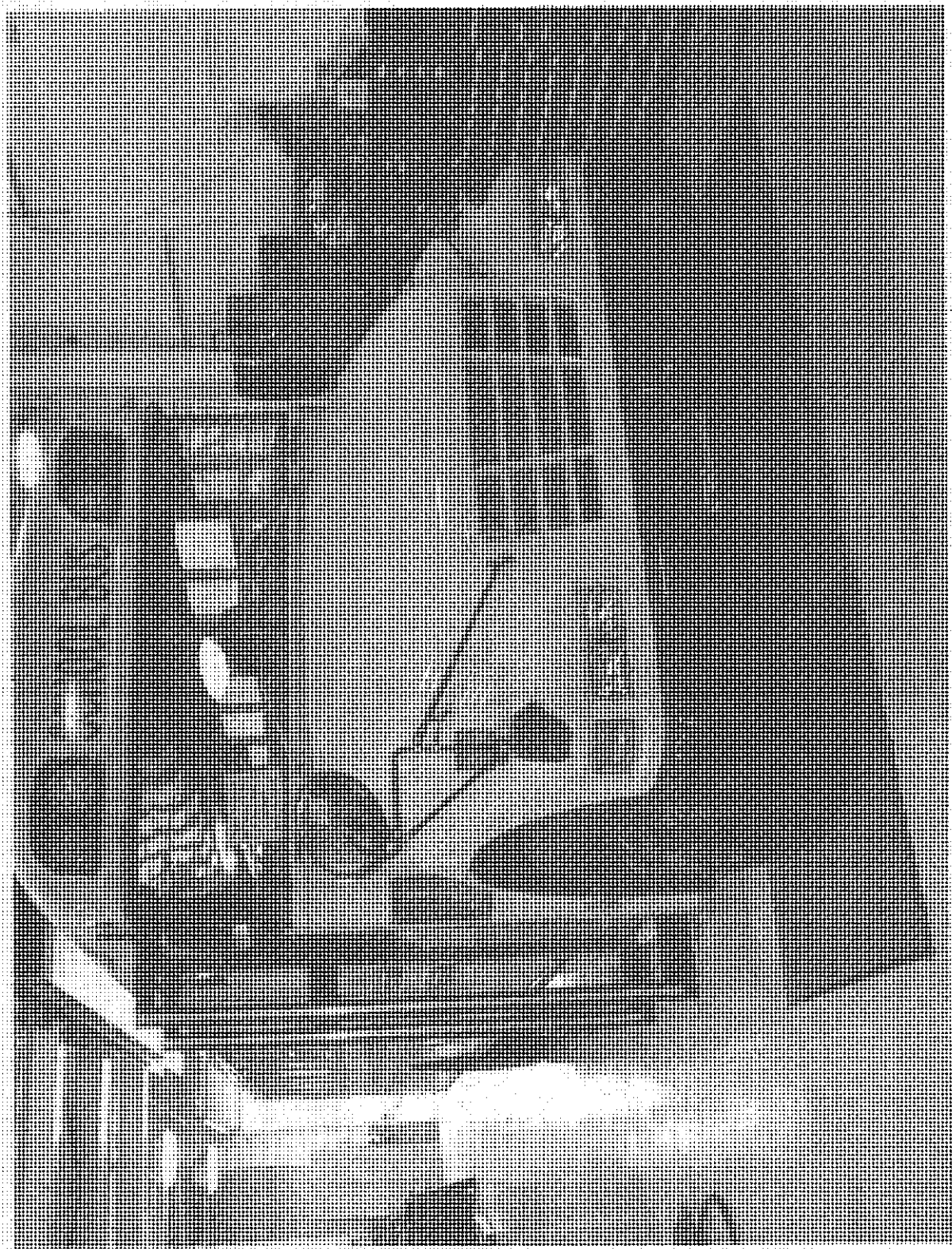
**SECTION 5  
PHOTOGRAPHS**

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Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

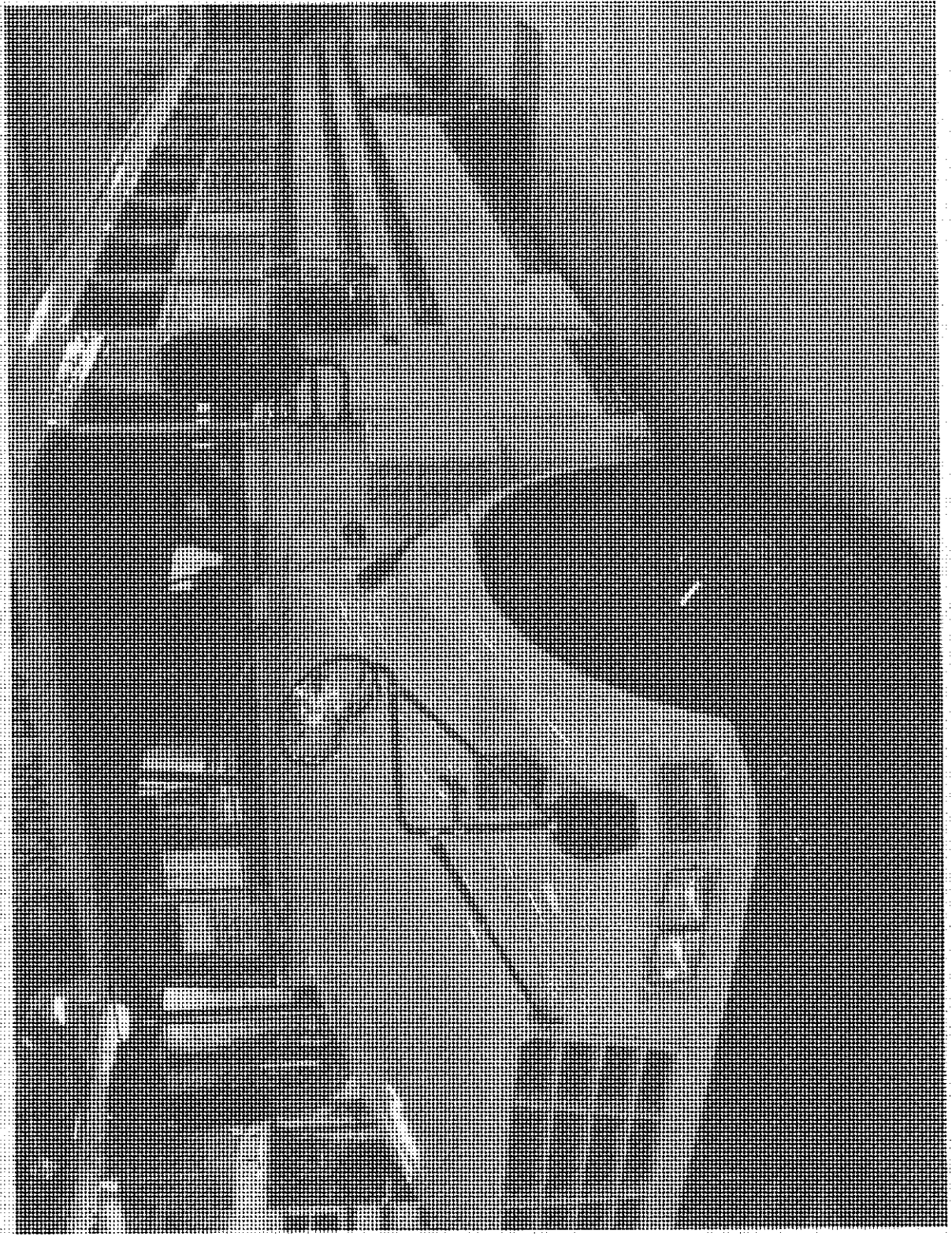
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School Bus Front Axle Being Weighed

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 229

NHTSA No: C50901

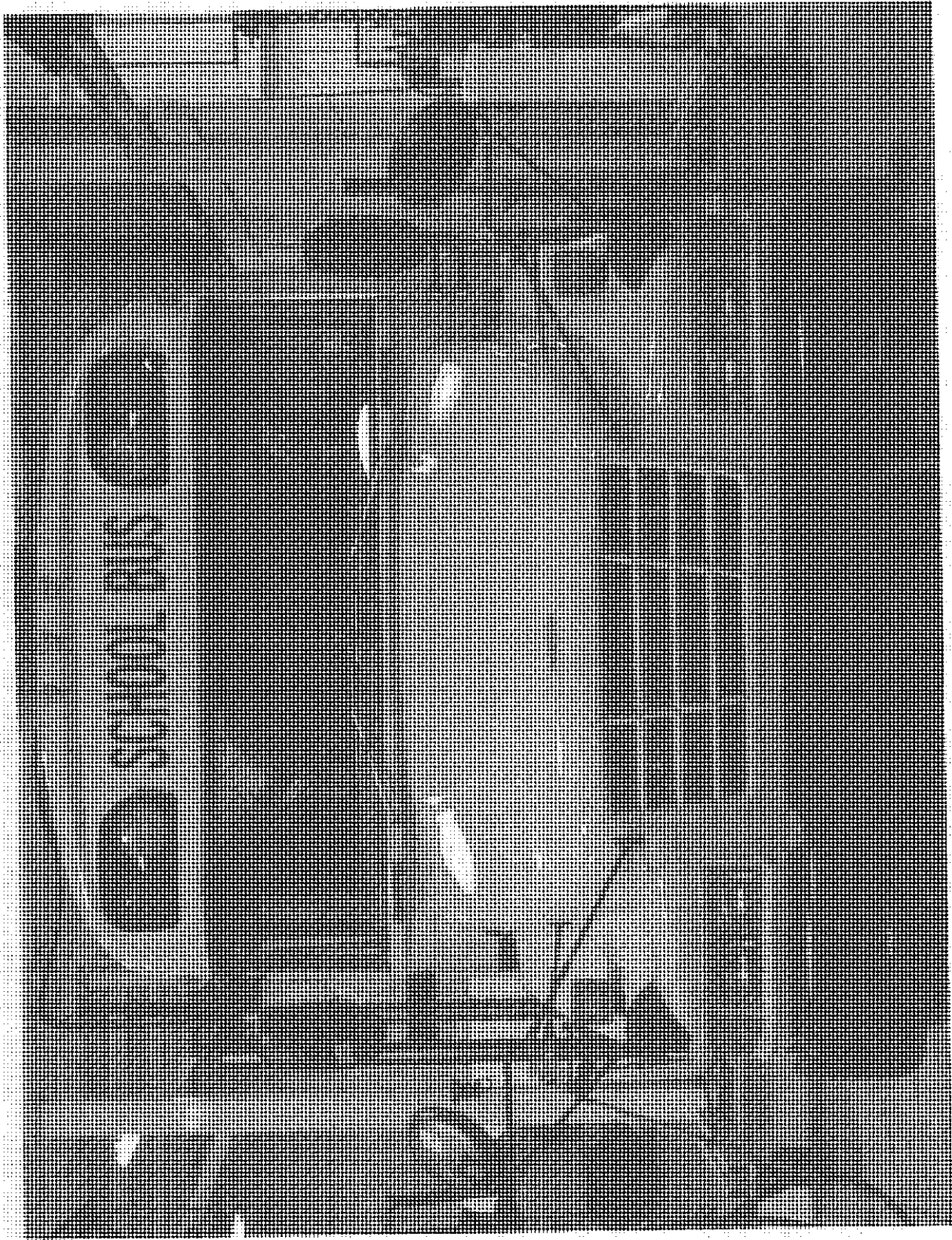


School Bus Rear Axle Being Weighed



Test Vehicle: 2005 Blue Blue Vision  
Procedure: FMVSS 220

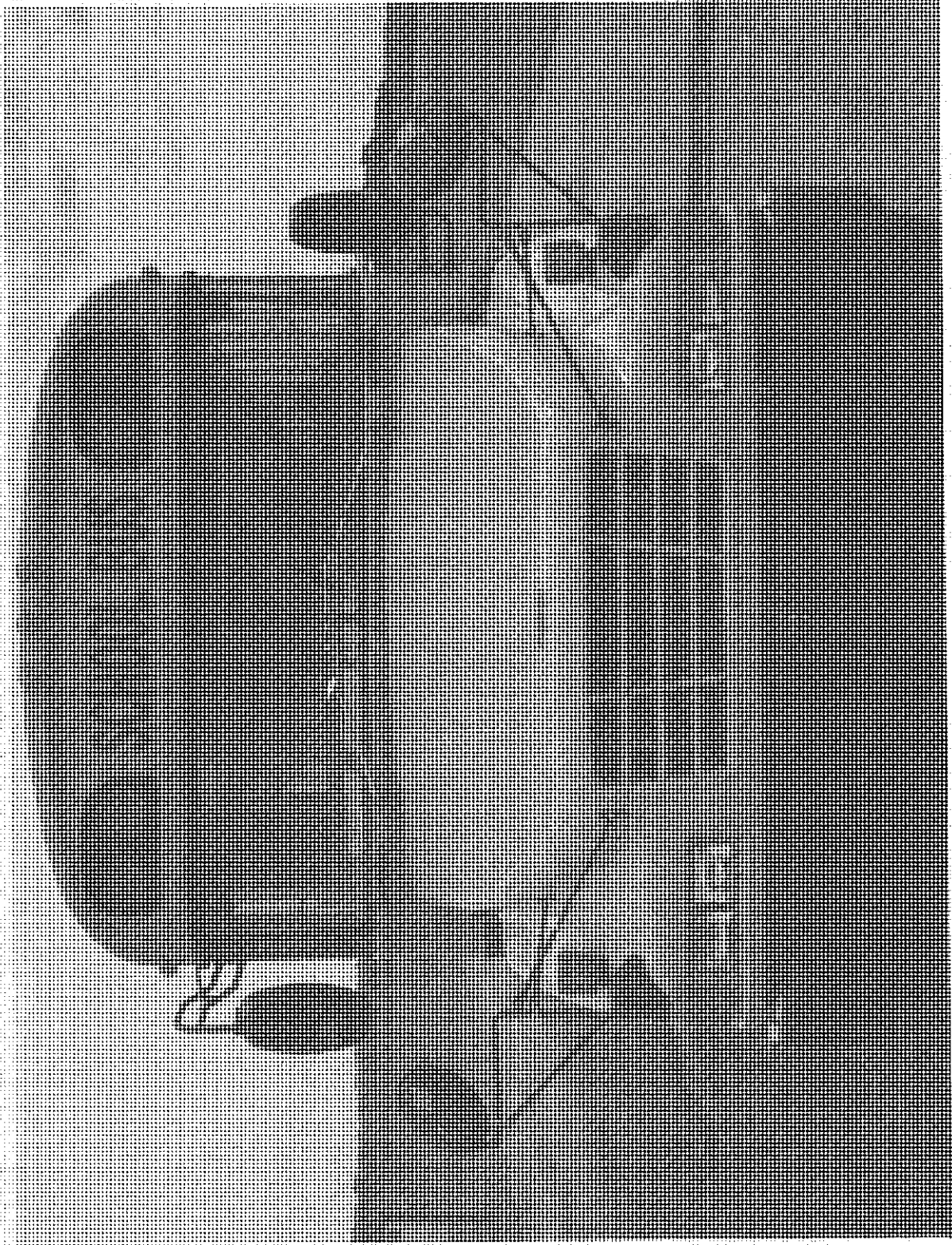
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Frontal View of School Bus Before Testing

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

NHTSA No.: C50901

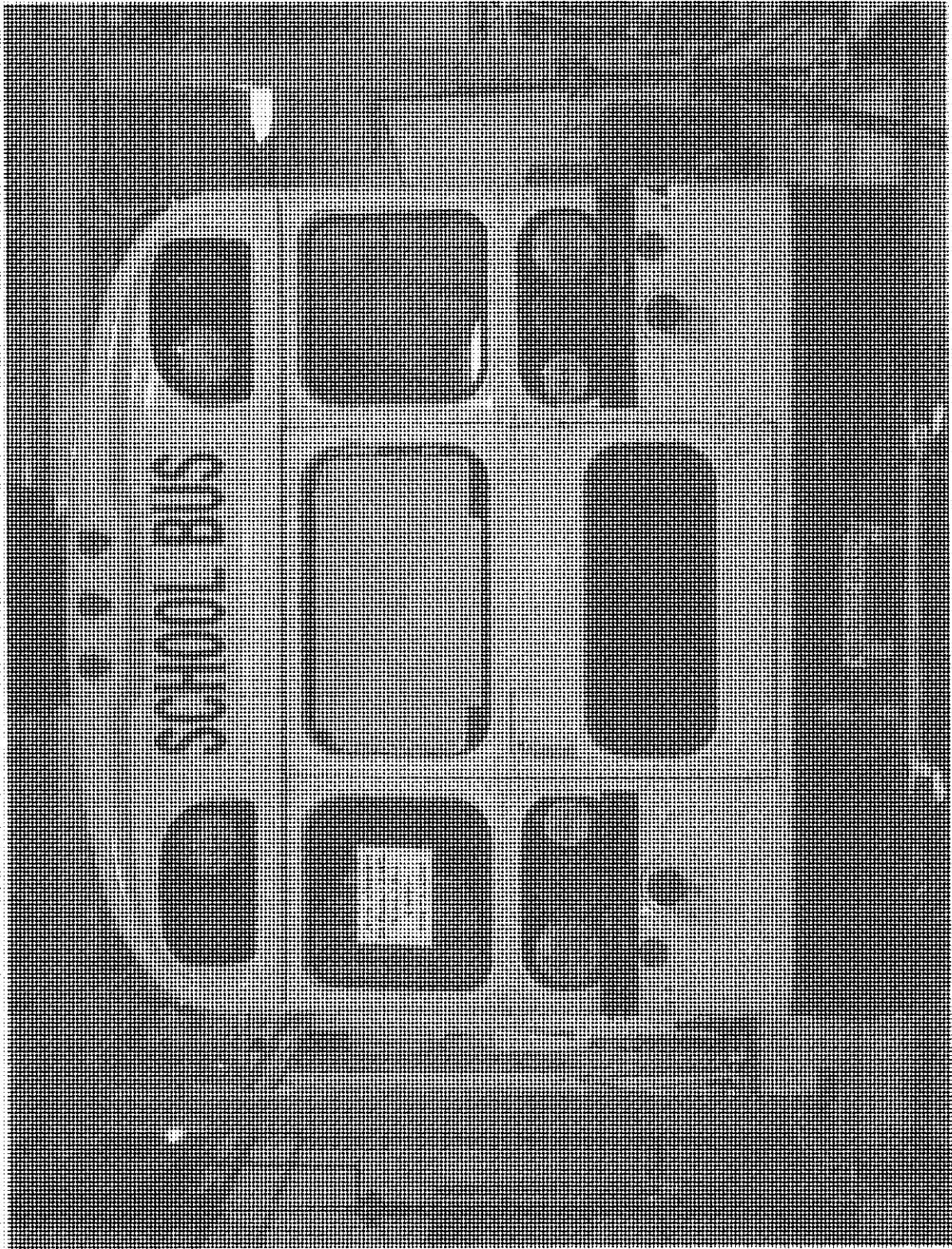


Frontal View of School Bus After Testing



Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

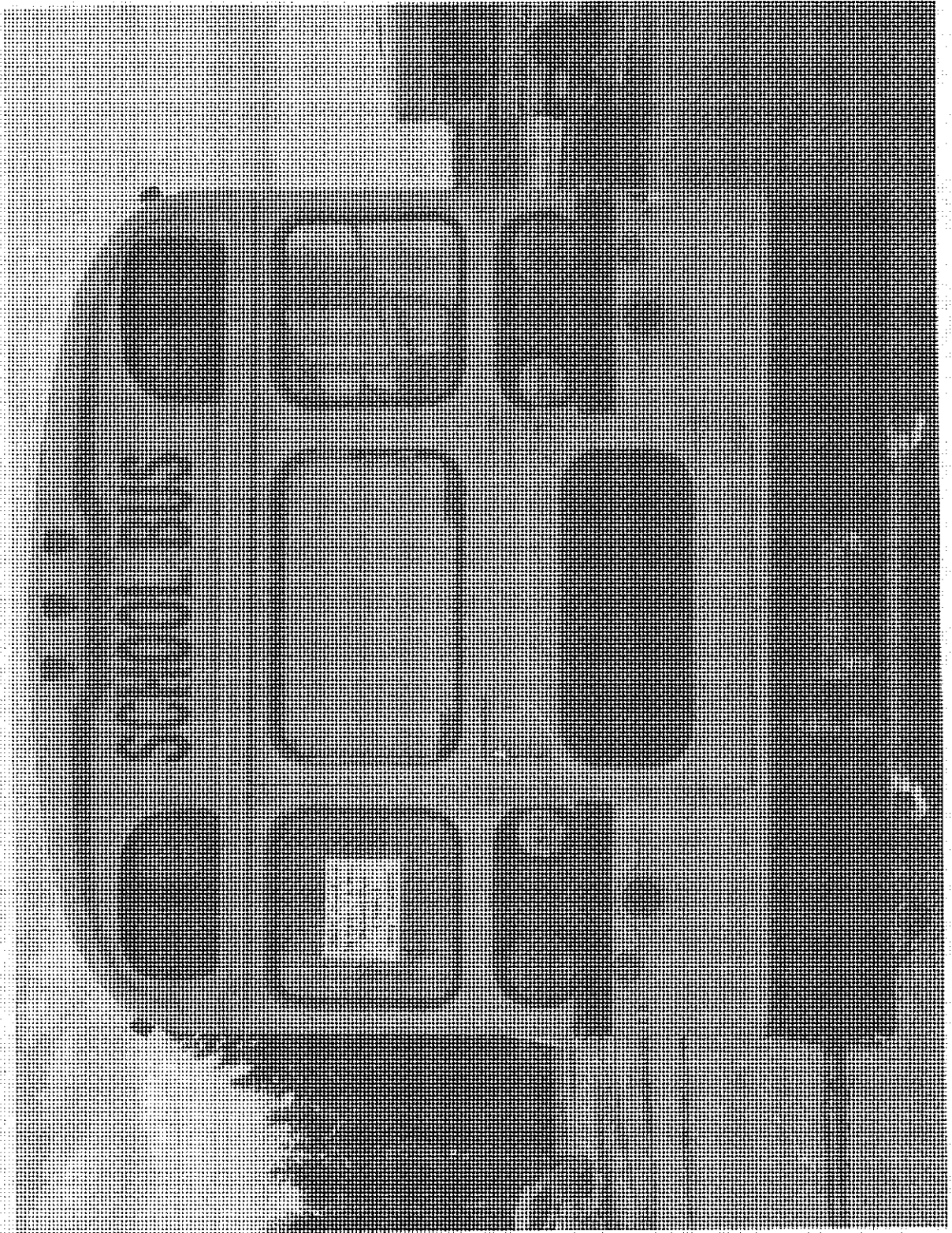
NHTSA No.: CE0901



Rear View of School Bus Before Testing

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 120

NHTSA No.: C50901



Rear View of School Bus After Testing

Test Vehicle: 2004 Blue Biac Vision  
Procedure: FMVSS 220

NHTSA No.: CE6901

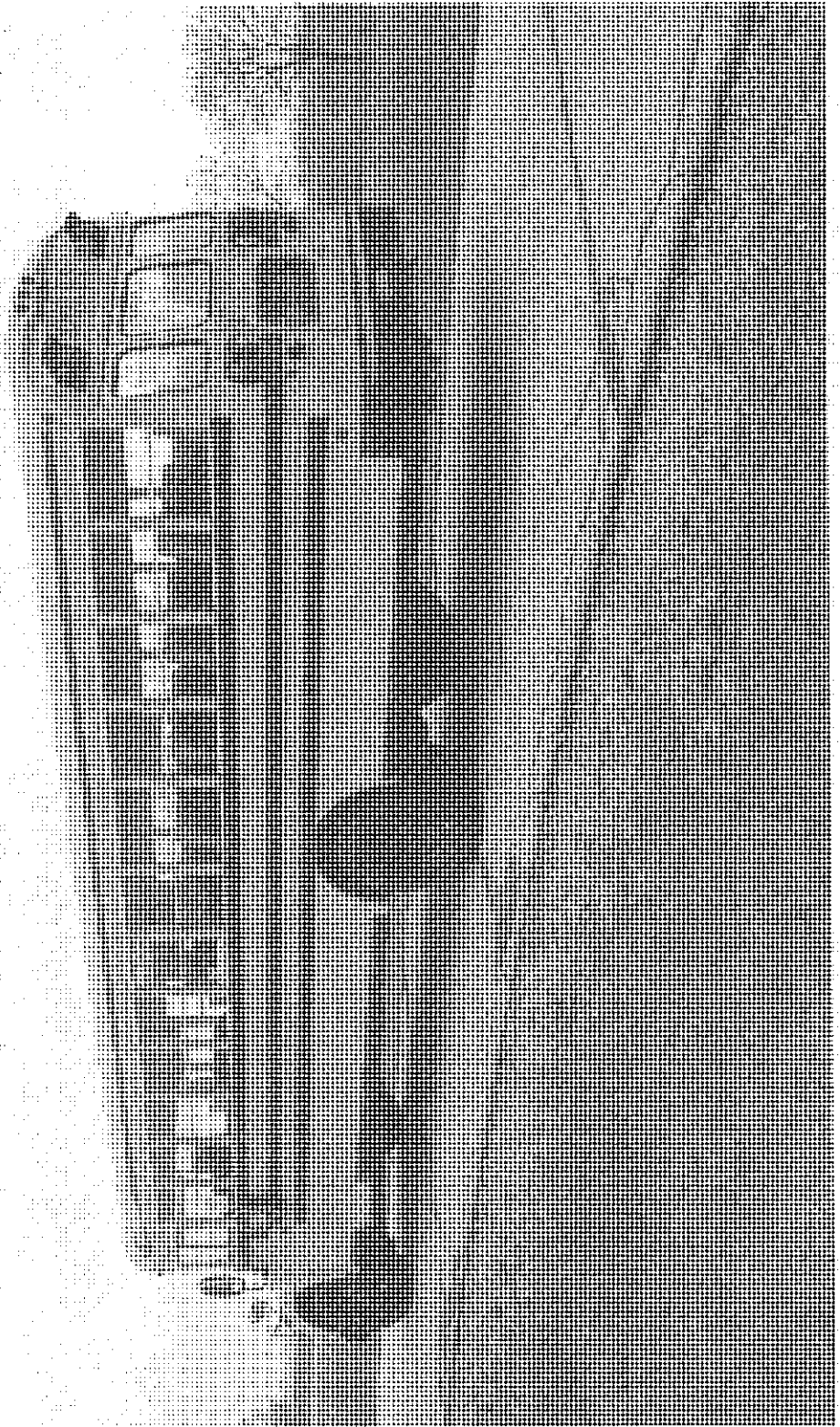


Left Front of School Bus Before Testing ¼ View



Test Vehicle: 2005 Blue Bird Vistaort  
Procedure: FMVSS 220

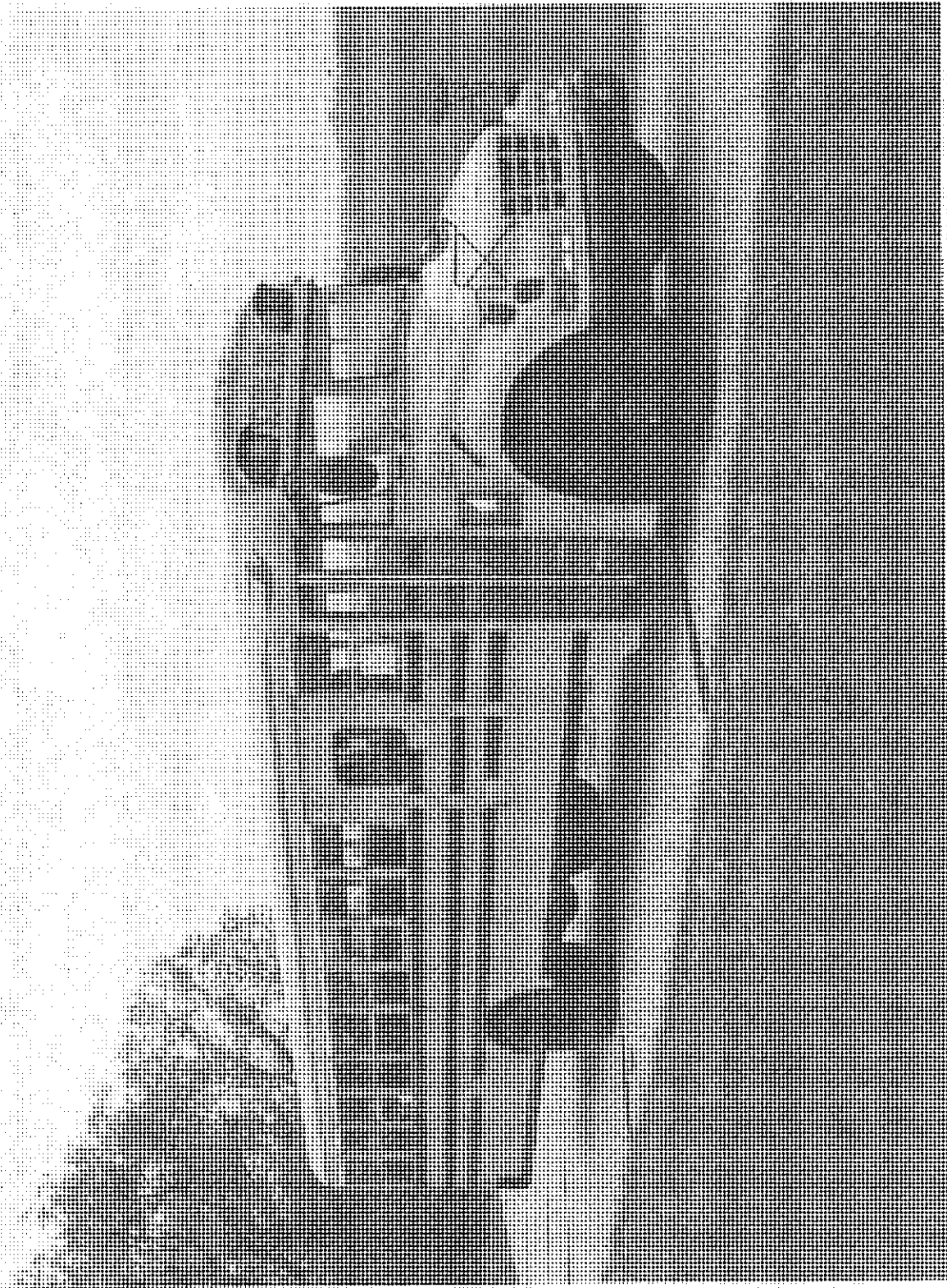
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Left Rear of School Bus Before Testing 3/4 view

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FHVSS 220

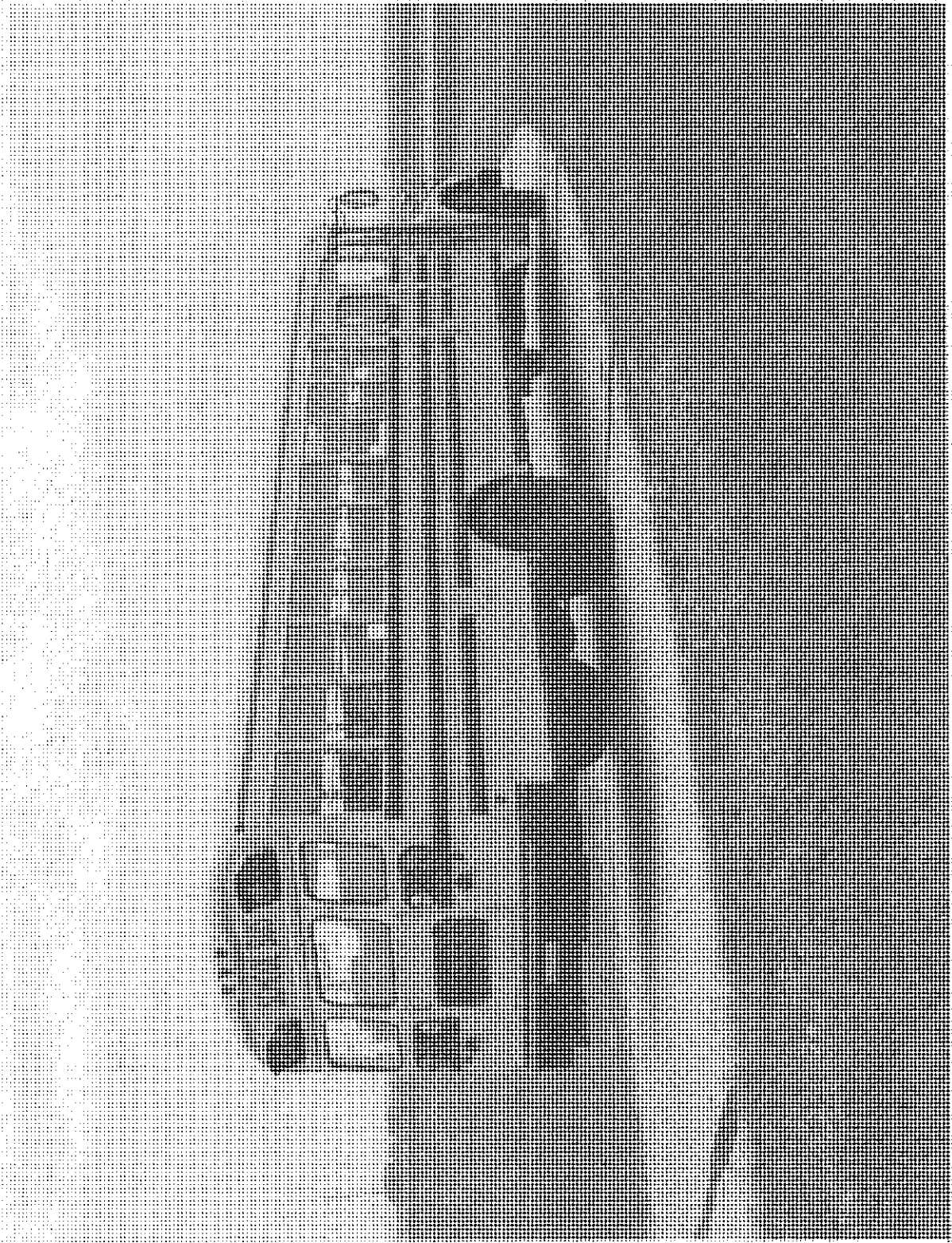
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Right Front of School Bus Before Testing 3/4 View

Test Vehicle: 2006 Blue Bird Vision  
Procedure: FMVSS 220

NHTSA No.: C60901

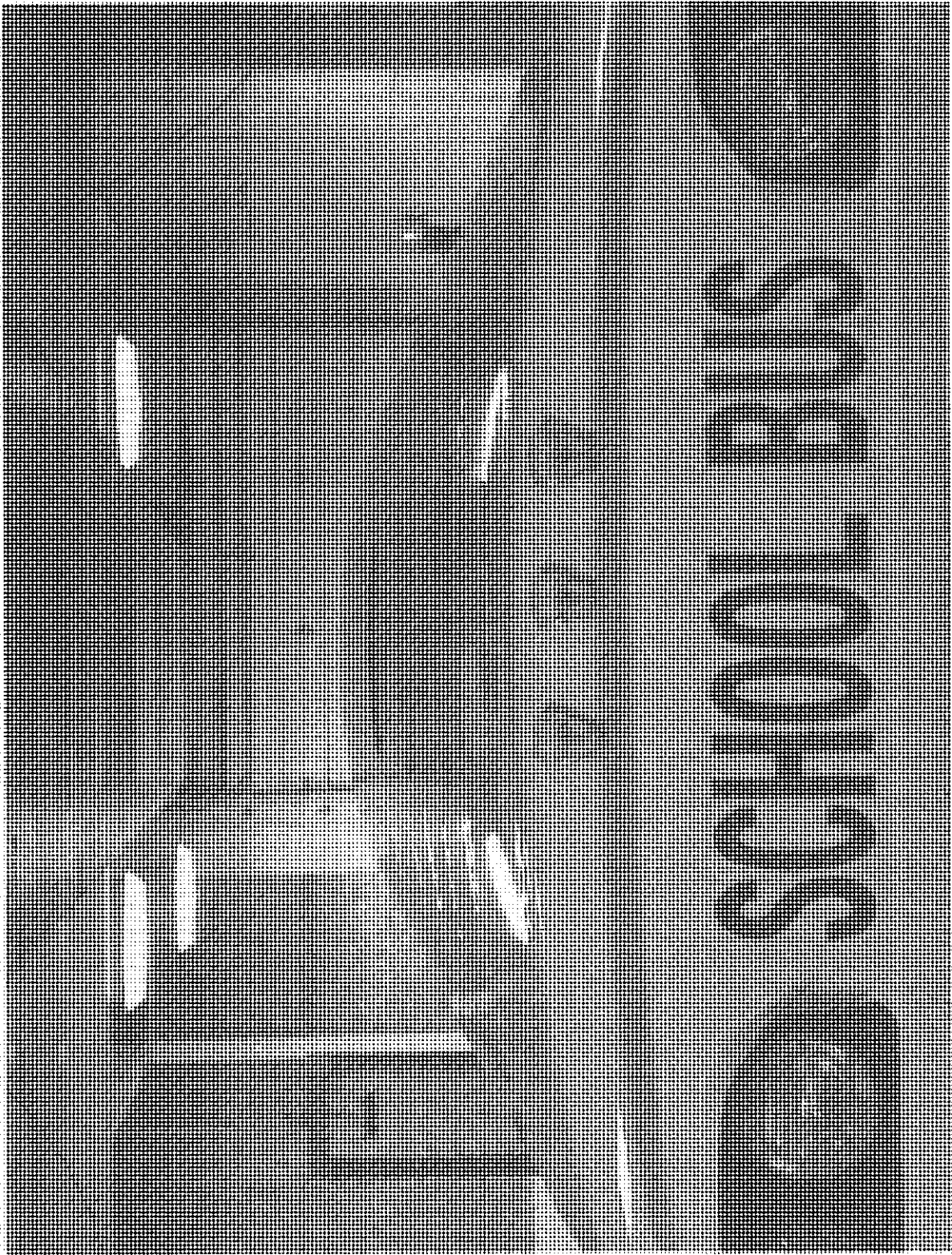


Right Rear of School Bus Before Testing ¼ View



Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

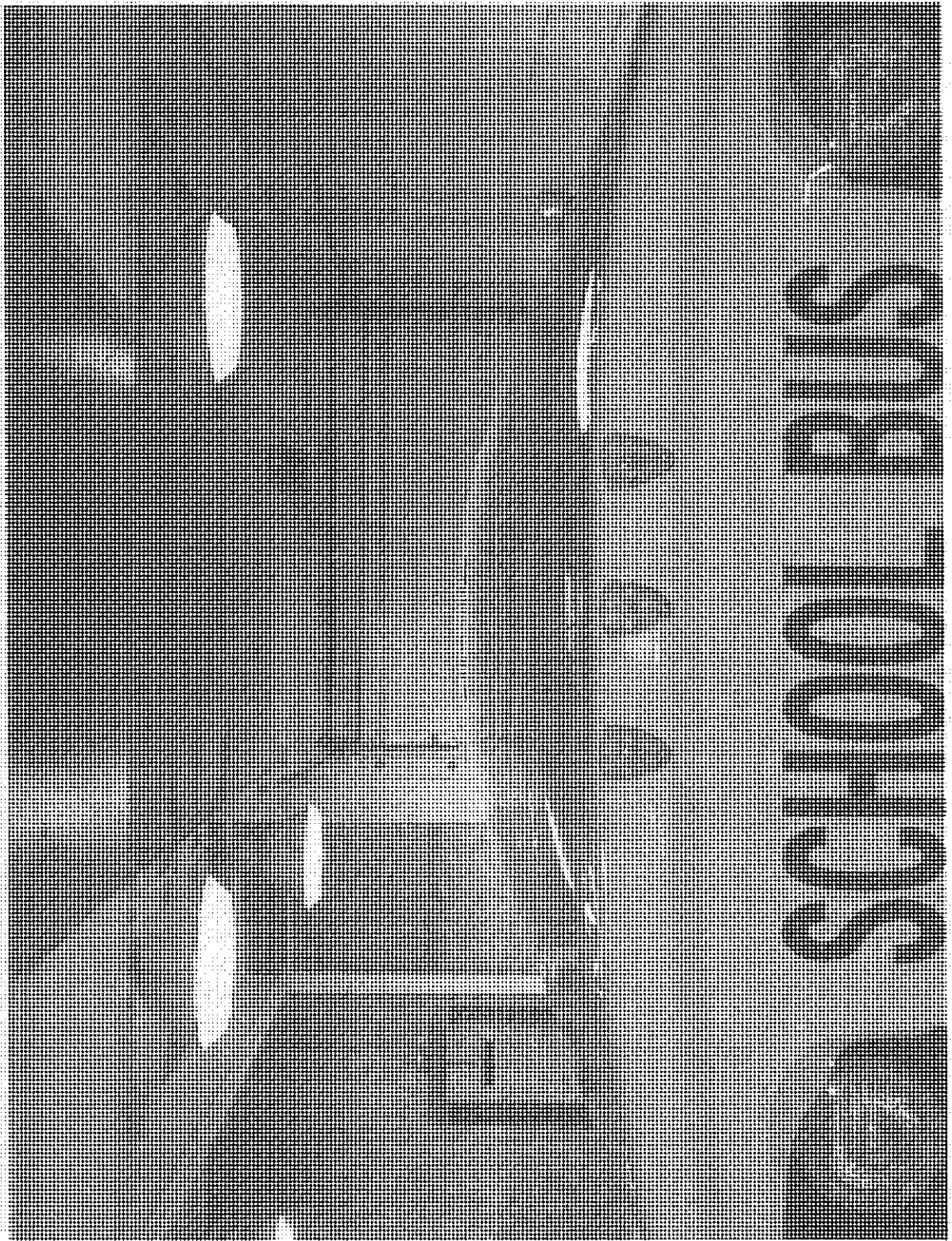
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View of Bus Roof From Front Before Testing

Test Vehicle: 2006 Blue Bird Vision  
Procedure: FMVSS 220

NHTSA No: C50901

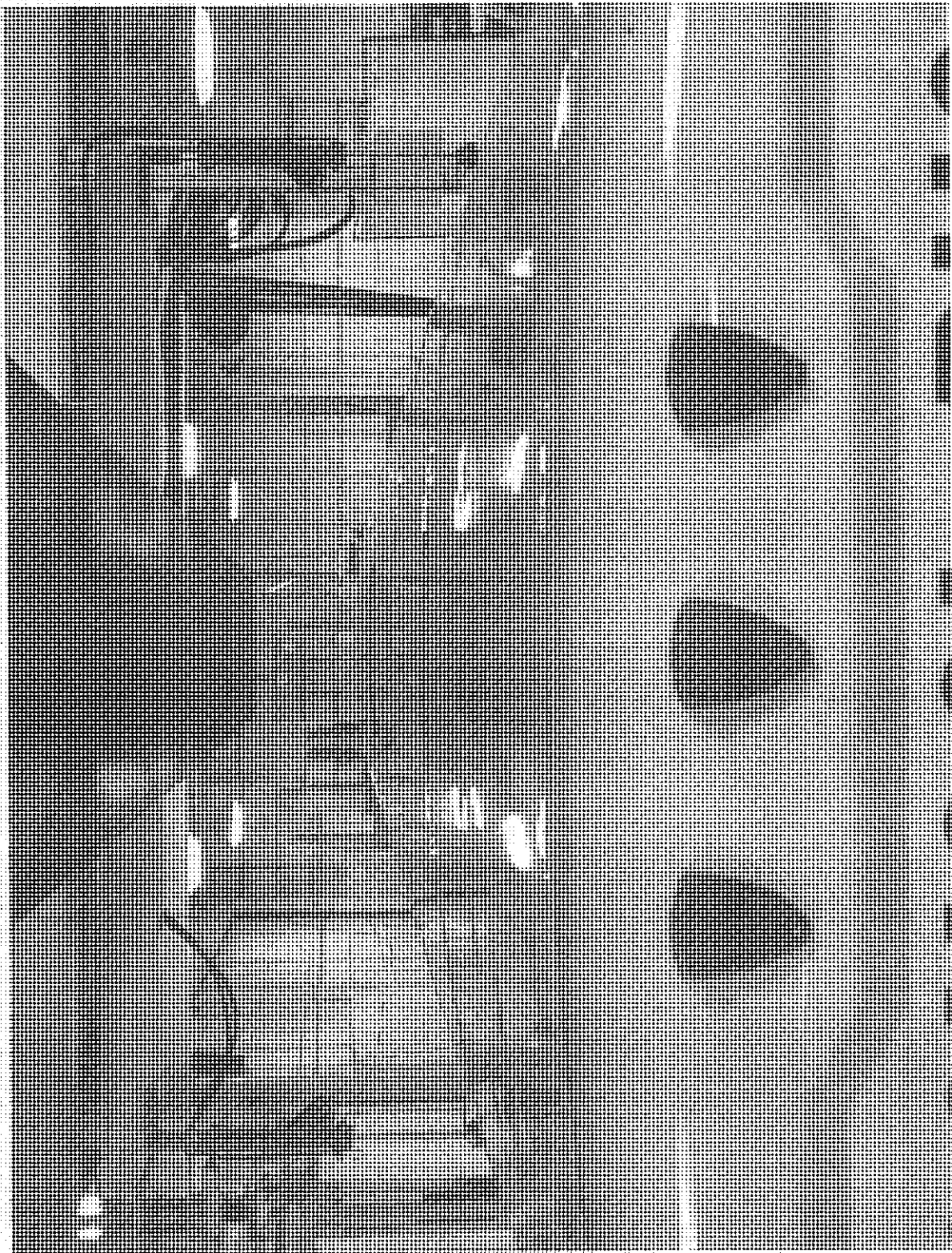


View of Bus Roof From Front After Testing



Test Vehicle: 2000 Blue Bird Vision  
Procedure: FMVSS 220

NHTSA No: C50991



View of Bus Roof From Rear Before Testing

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

NPITSA No: C50901

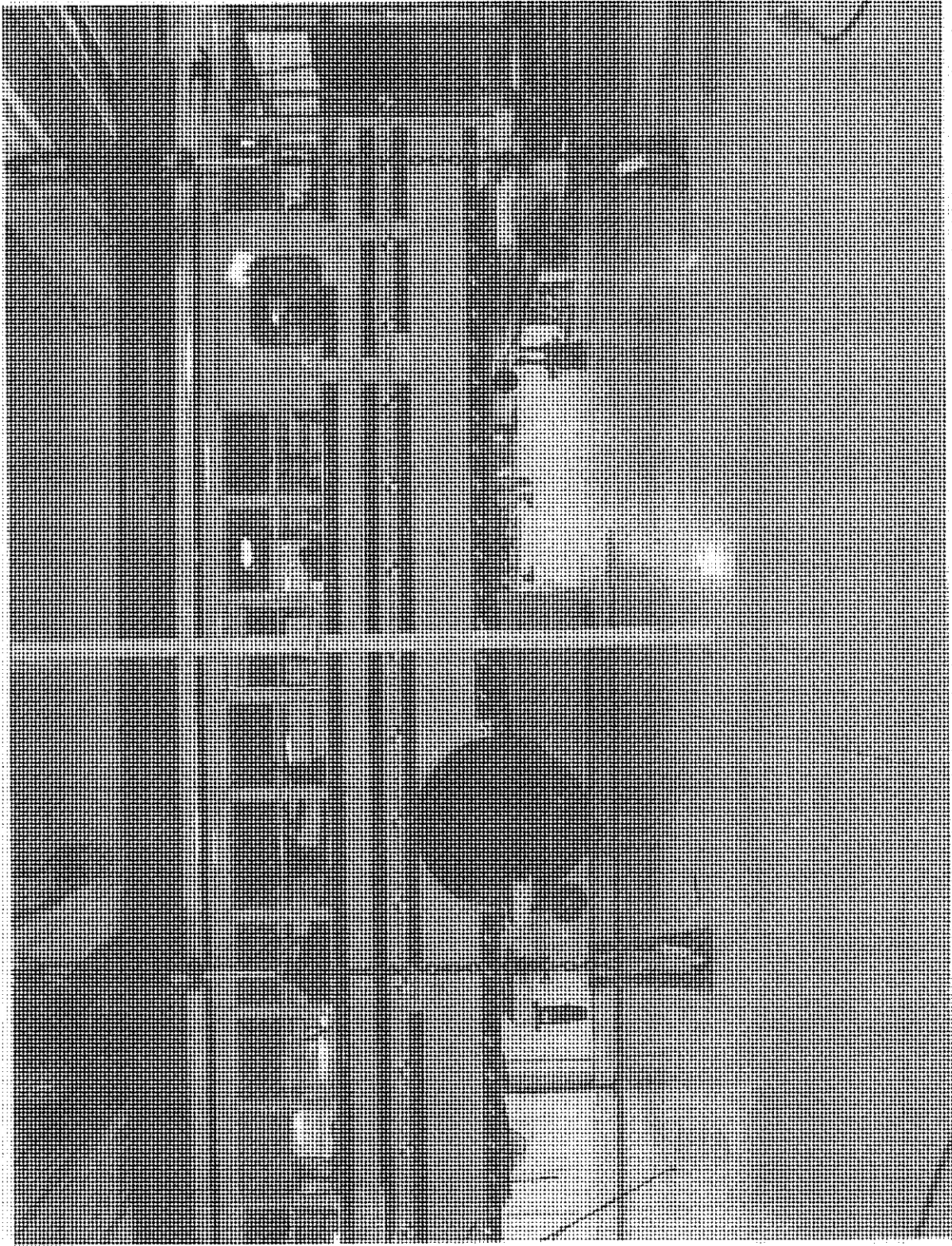


View of Blue Roof From Rear Axle Testing



Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

NTTSA No: CE0901

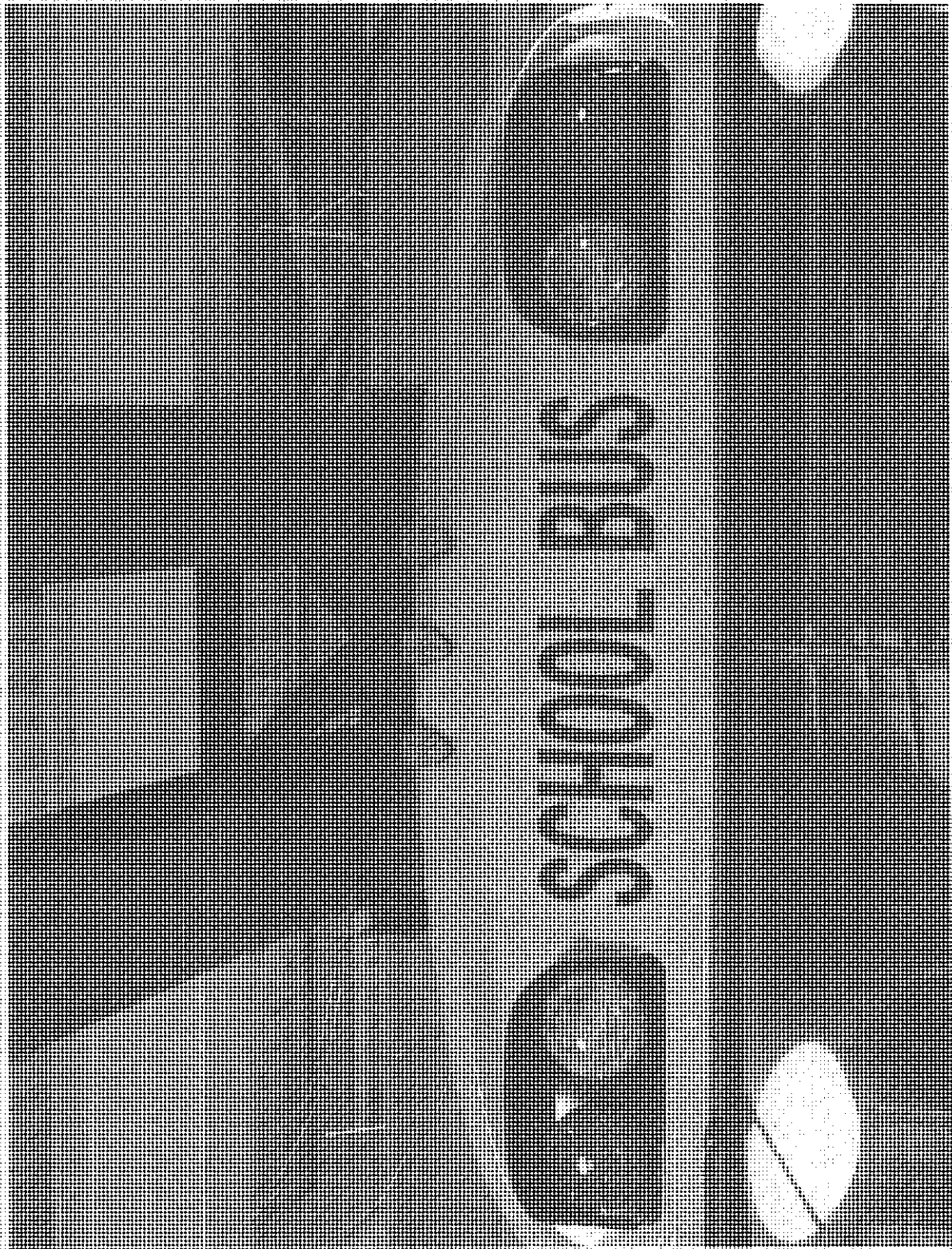


Loading Device Placed Against Bus Roof At Start of Test

Test Vehicle: 2005 Blue Bird Vision

Procedure: FMVSS 229

NHTSA No: C50991

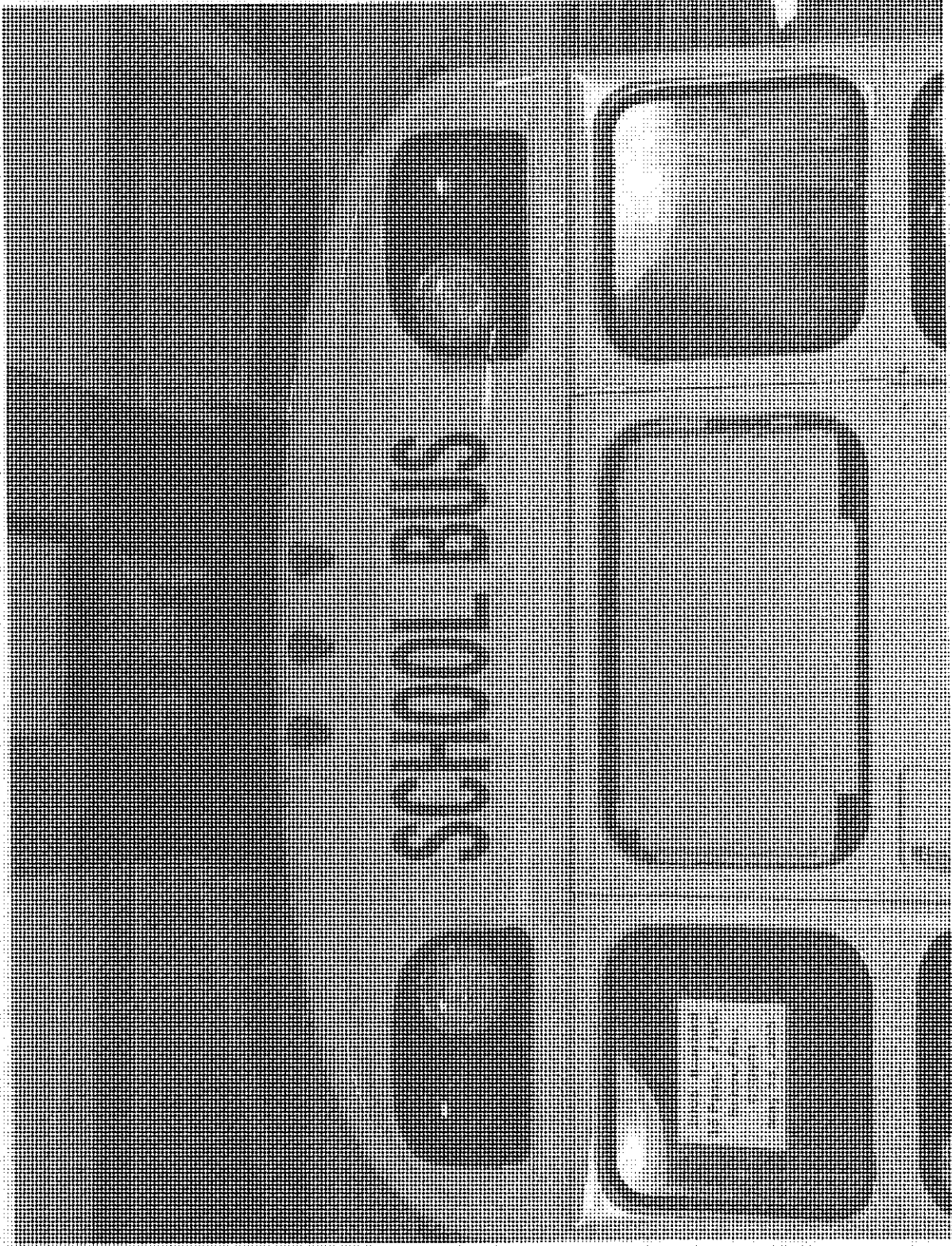


Loading Device Places Against Bus Roof at Maximum Load (Front View)



Test Vehicle: 2006 Blue Bird Vision  
Procedure: FMVSS 220

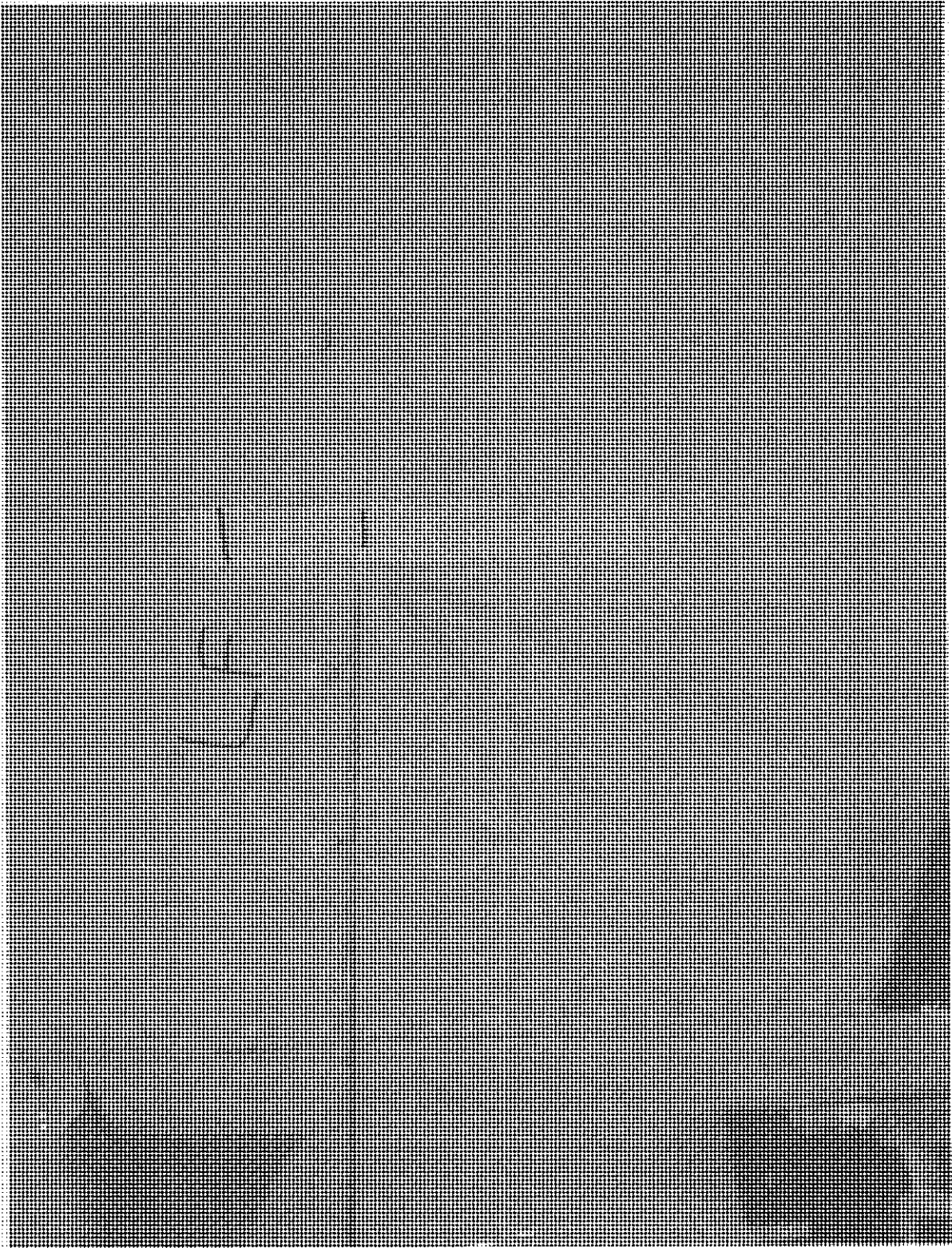
NHTSA No.: C50901



Loading Device Placed Against Bus Roof at Maximum Load (Rear View)

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

NHTSA No: C50951



Back-up Roof Deflection Measuring Device at LF Corner of Bus at Full Load



Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

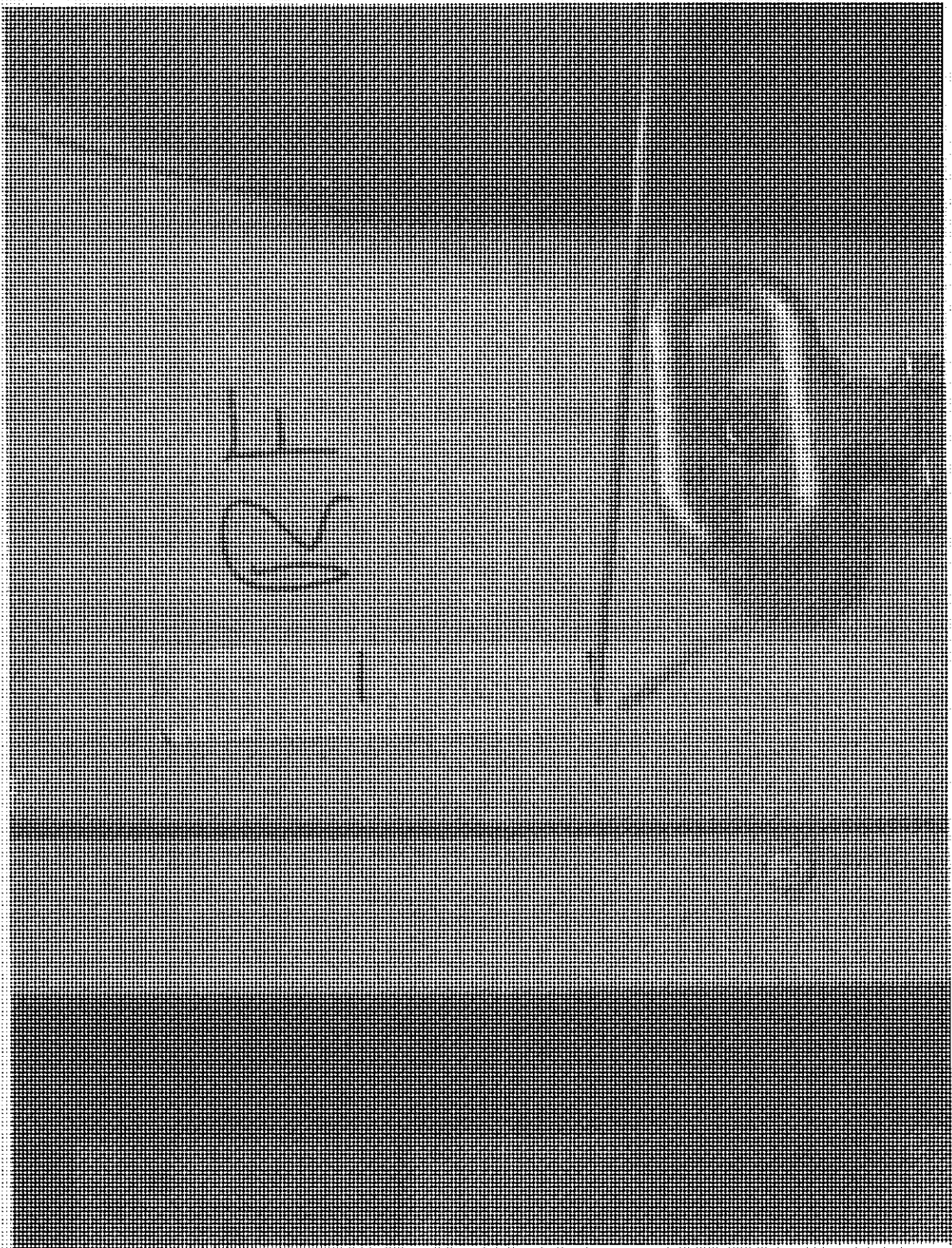
NHTSA No.: C50501



Back-up Roof Deflection Measuring Device at LR Corner of Bus at Full Load

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

NHTSA No.: C50991

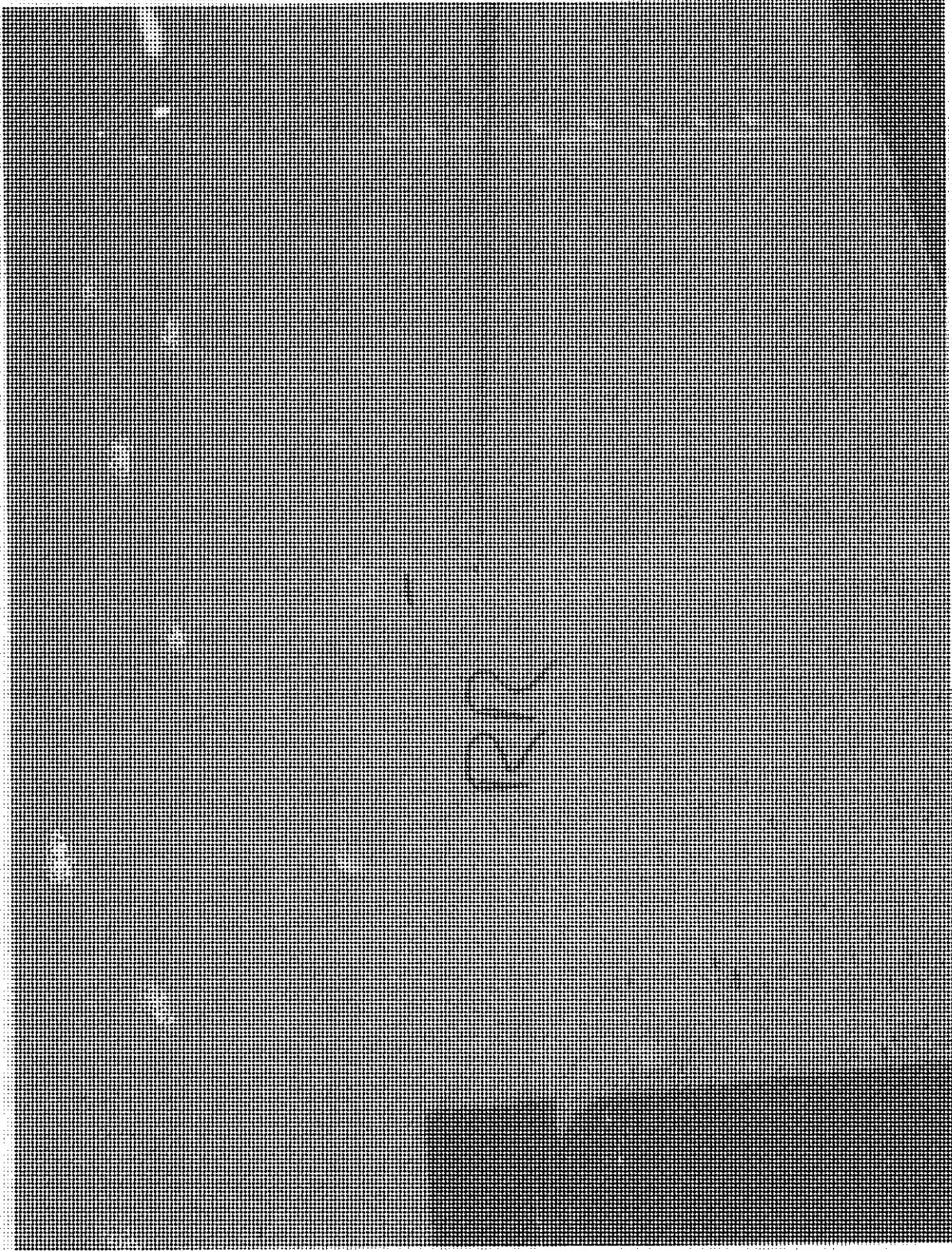


Back-up Roof Deflection Measuring Device at RE Corner of Bus at Full Load



Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

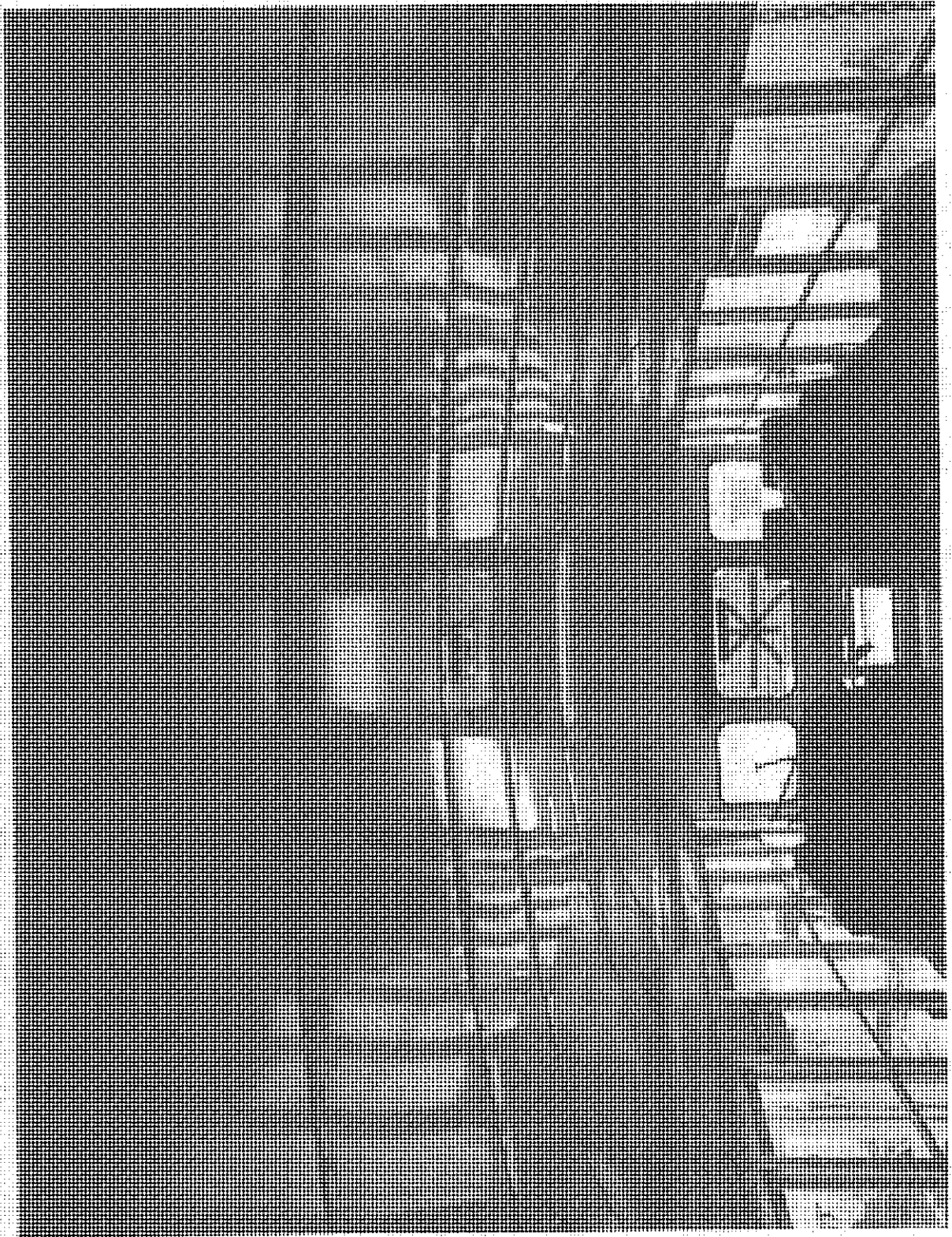
NHTSA No: C50901



Back-up Roof Deflection Measuring Device at RR Corner of Bus at Full Load

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

NHTSA No.: C50901



Roof, Before Application of Loading Device, Viewed From Bus Interior



Test Vehicle: 2005 Buick Bird Vision  
Procedure: FMVSS 220

NHTSA No. C-50901

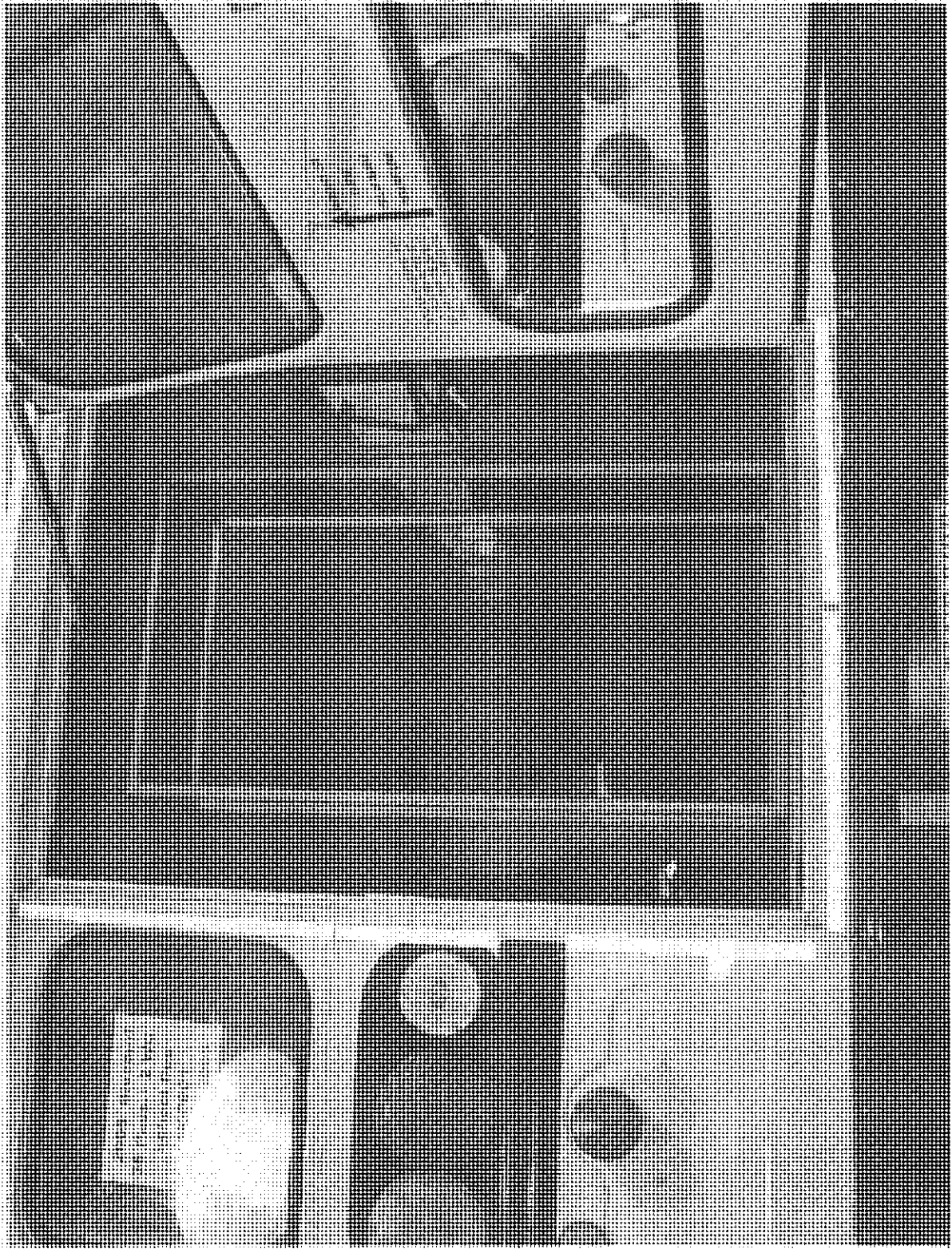


Roof, After Removal of Loading Device, Viewed From Bus Interior

Test Vehicle: 2005 Blue Bird Vision

Procedure: FMVSS 220

NHTSA No: C59961



Exit Opened After Roof Loading is Attained with Parallelepiped in Place



Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMVSS 220

NHTSA No.: C50901

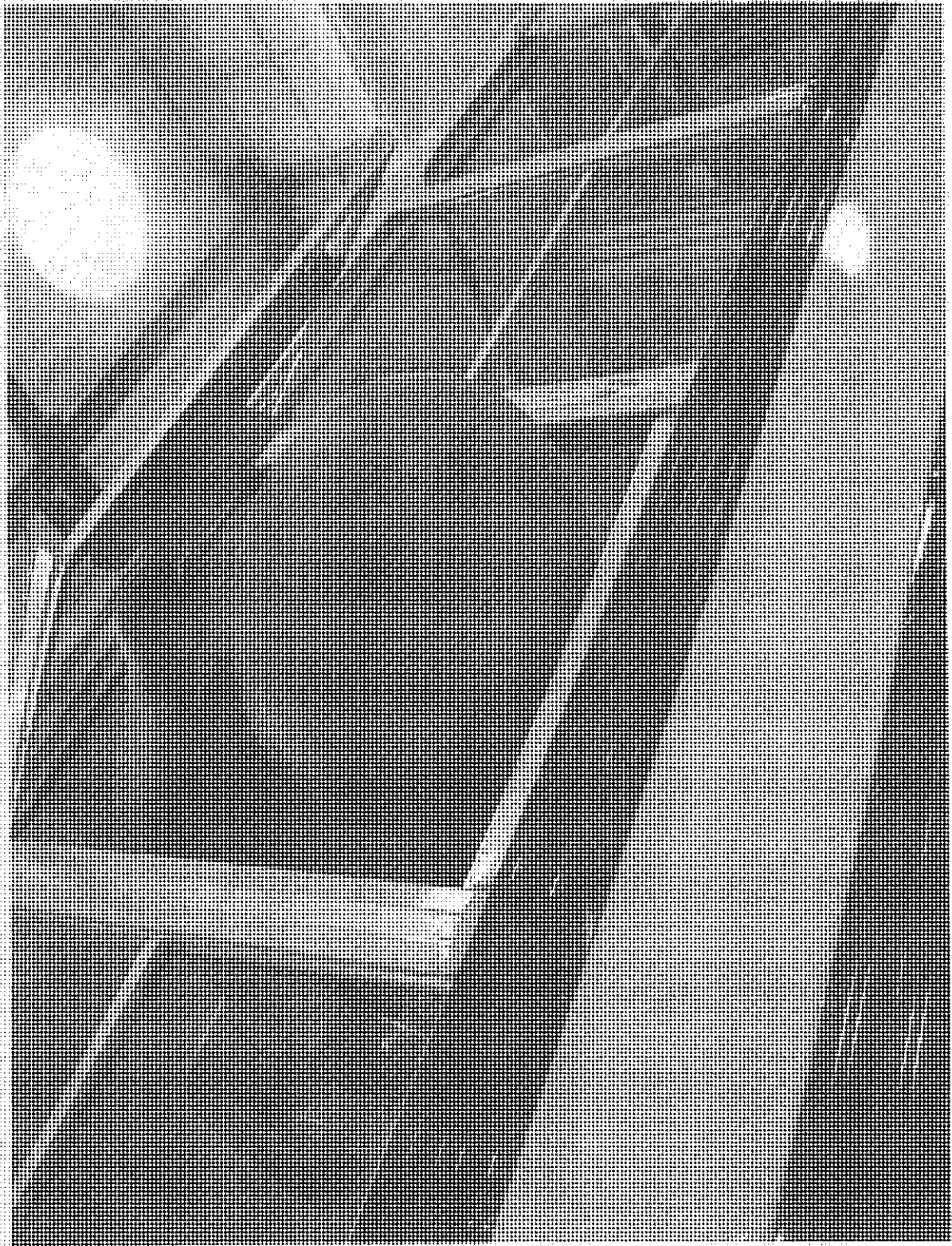


LF Exit Opened After Roof Loading is Aligned with Measuring Device in Place

Test Vehicle: 2005 Blue Bird Vision

Procedure: FMVSS 210

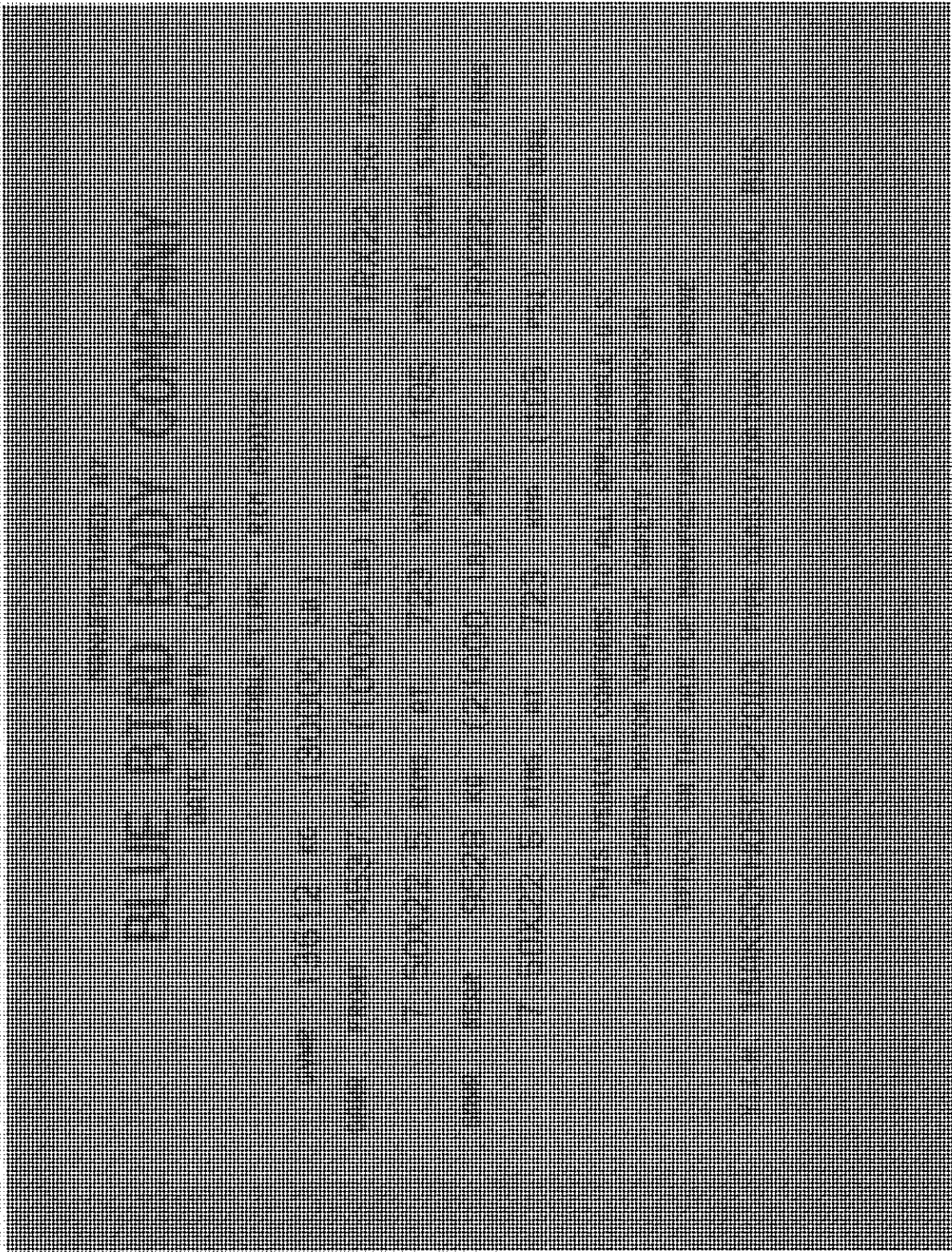
NHTSA No.: C50901



RF Exit Opened After Roof Loading is Attained with Measuring Device in Place

Test Vehicle: 2005 Blue Bird Vision  
Procedure: FMYSS 220

NP/ESA No.: C66901



Close-up View of School Bus Certification Label

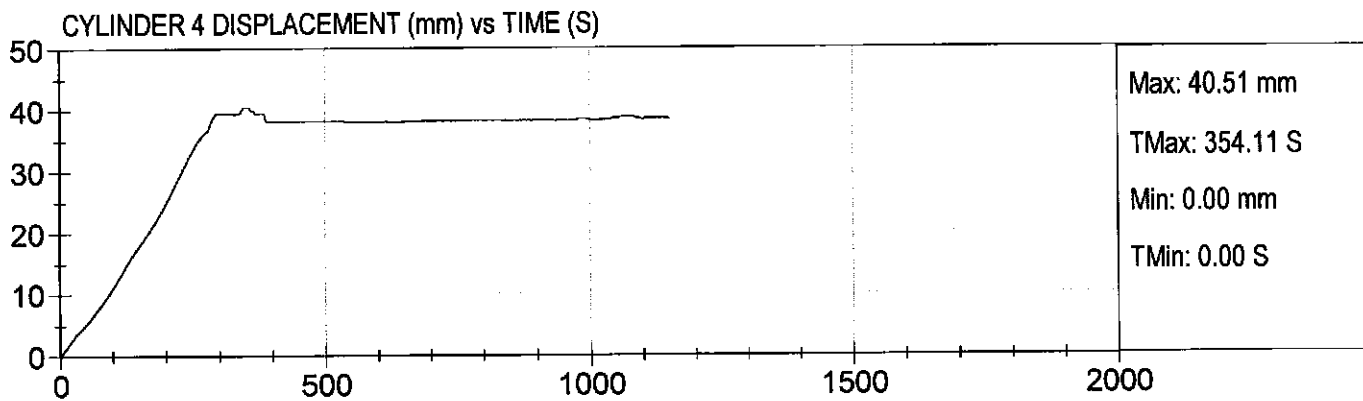
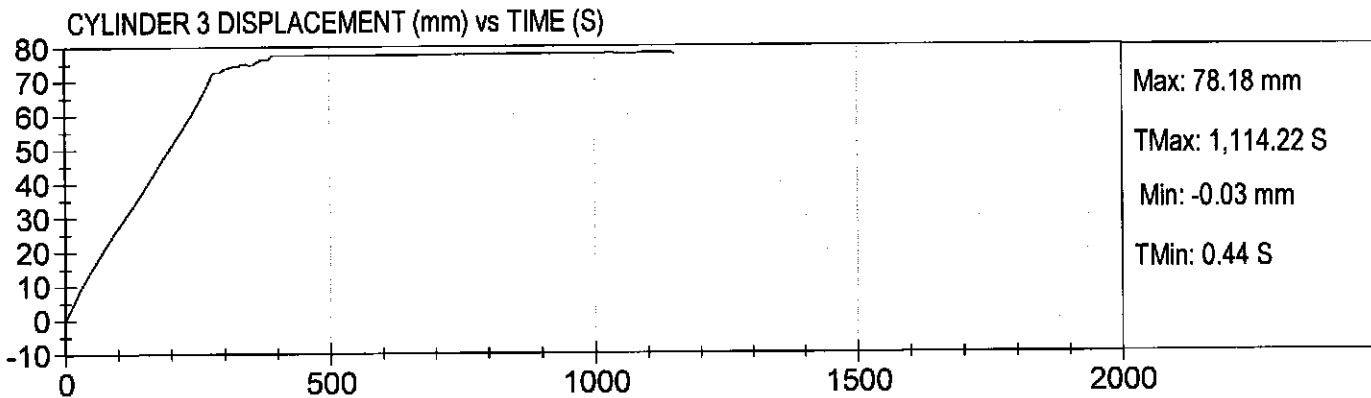
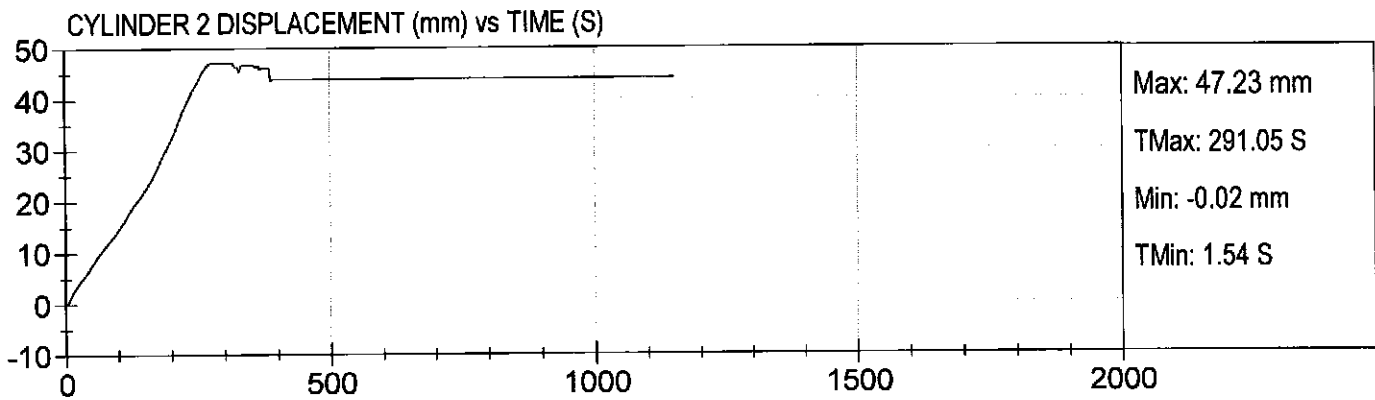
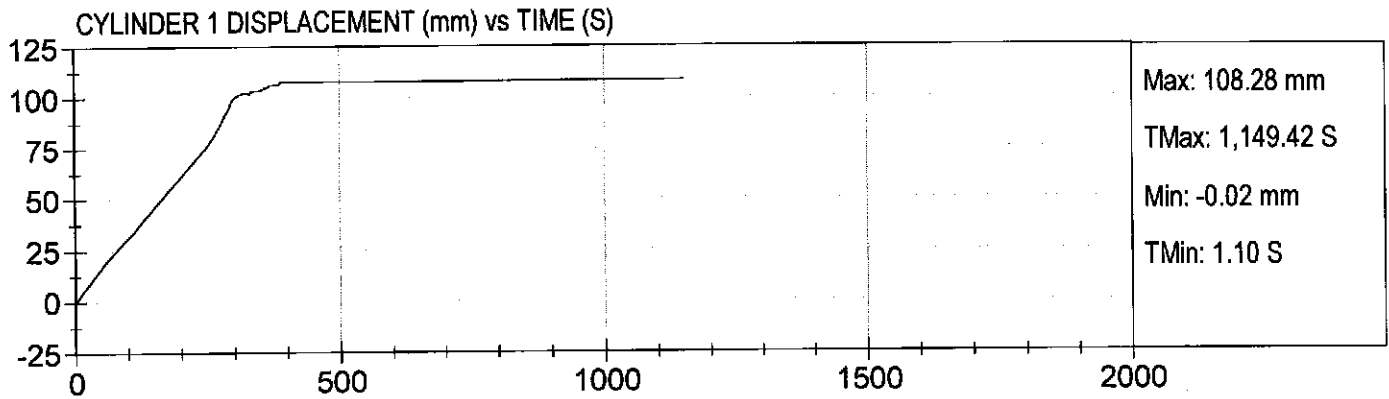
**SECTION 6  
TEST PLOTS**

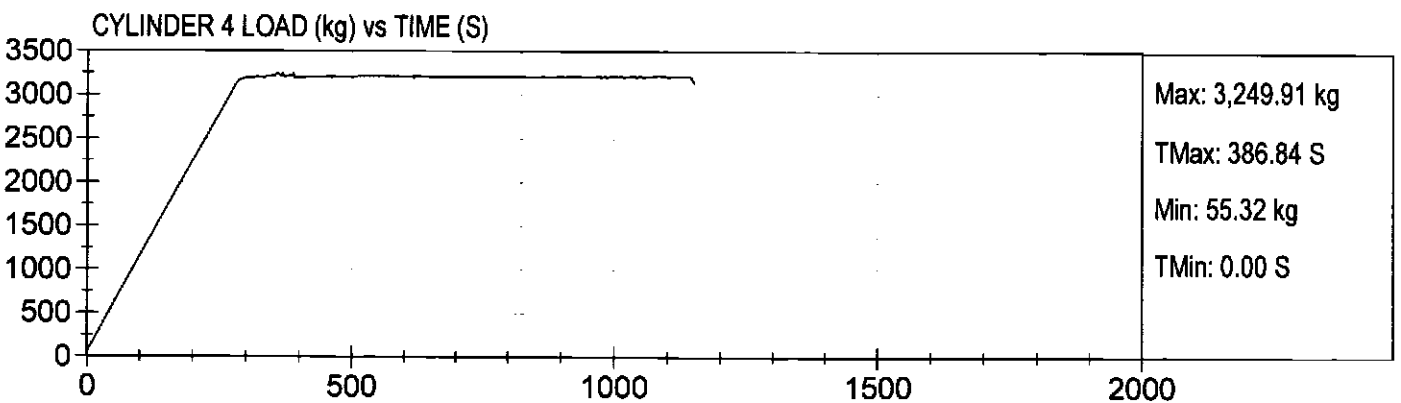
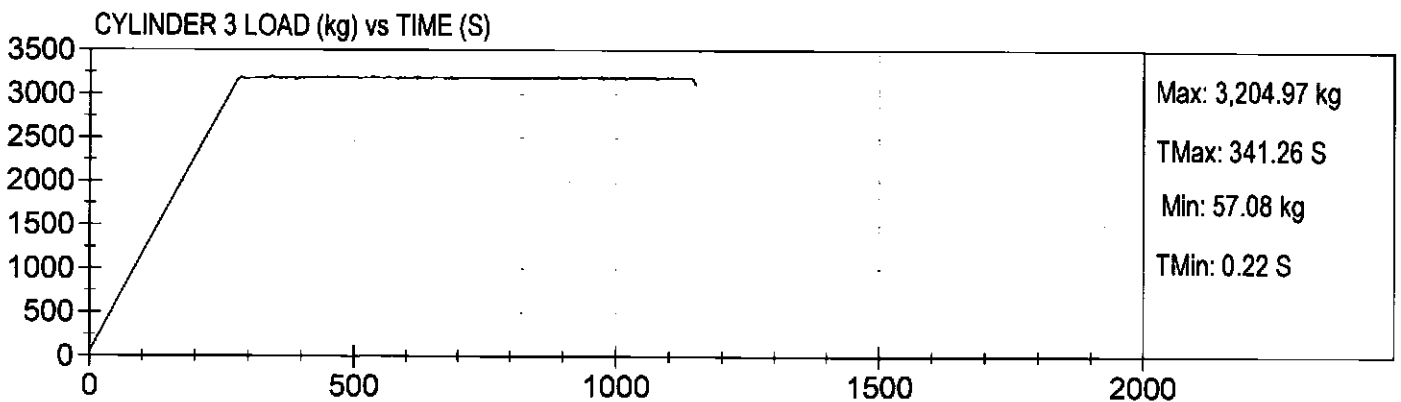
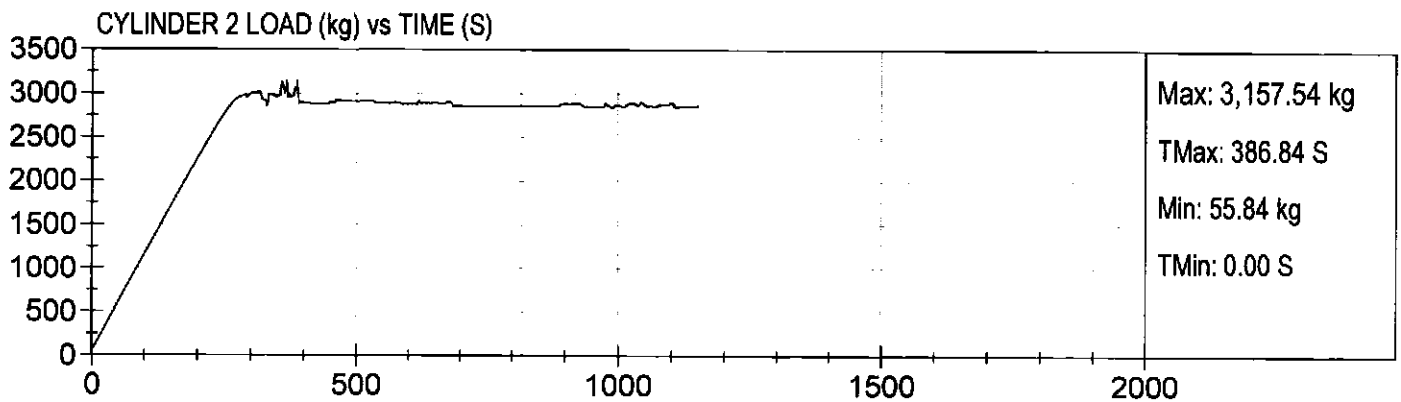
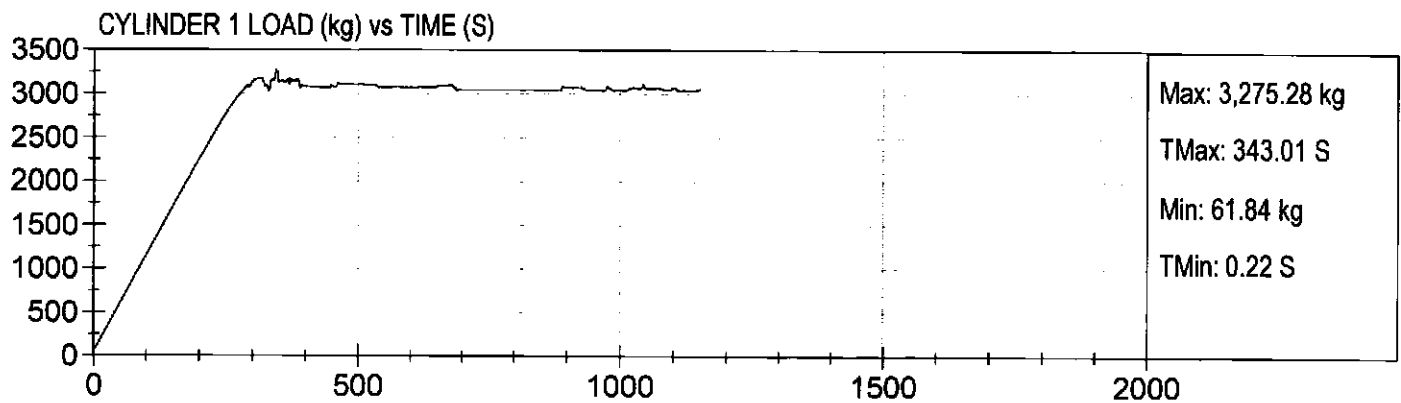




Test Desc: FMVSS 220  
NHTSA No: C50901

Test Date: 7-13-05  
Vehicle ID: Blue Bird



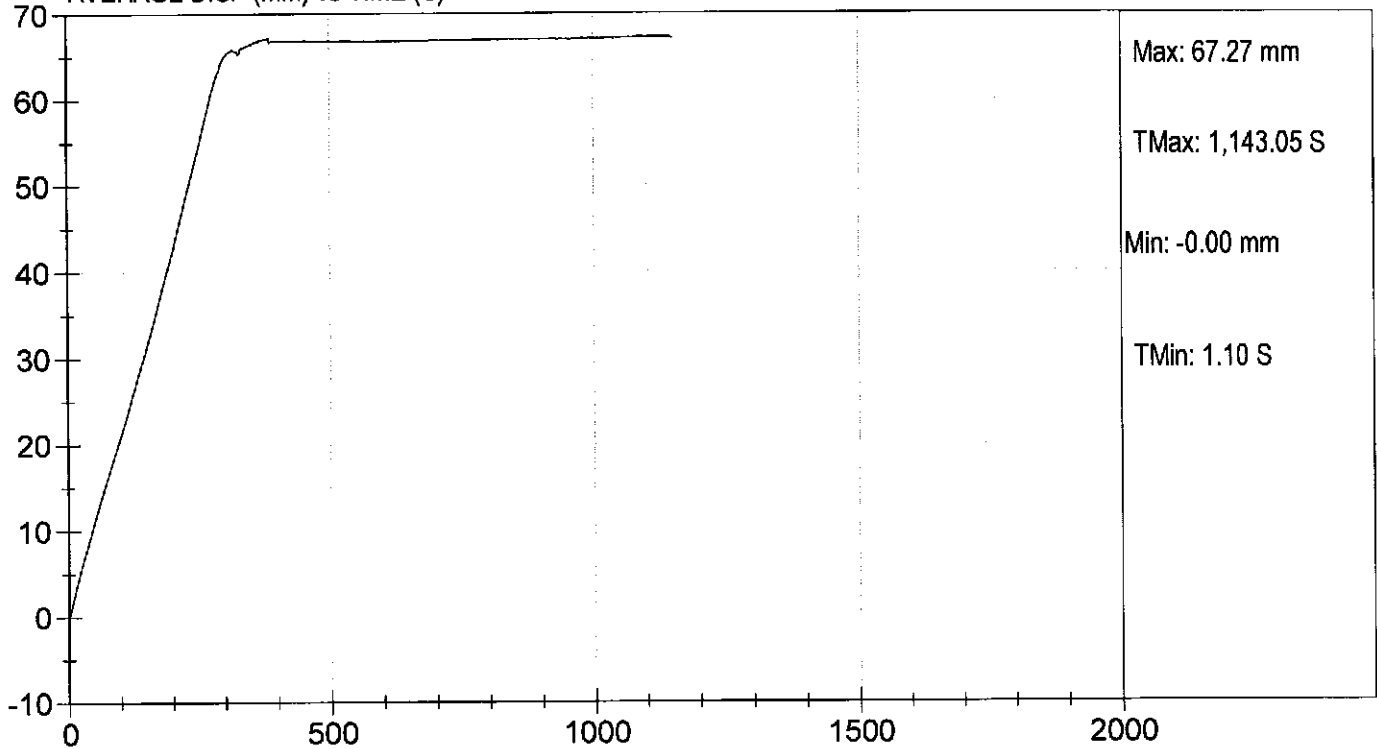




Test Desc: FMVSS 220  
NHTSA NO: C50901

Test Date: 7-13-05  
Vehicle ID: Blue Bird

AVERAGE DISP (mm) vs TIME (S)



TOTAL FORCE (CALC) (kg) vs TIME (S)

