

REPORT NUMBER: 201^{VER}CAL-03-04

**SAFETY COMPLIANCE TESTING FOR FMVSS 201
OCCUPANT PROTECTION IN INTERIOR IMPACT**

**HYUNDAI MOTOR COMPANY
2003 HYUNDAI ELANTRA**

NHTSA NUMBER: C30503

VERIDIAN TEST NUMBER: 8655-04

VERIDIAN ENGINEERING
TRANSPORTATION SCIENCES CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225



Test Date: August 25, 2003

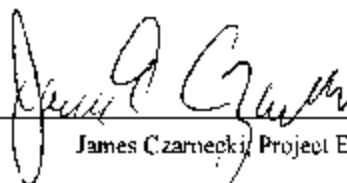
FINAL REPORT

PREPARED FOR

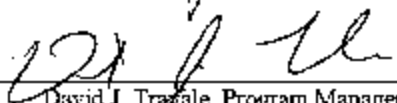
U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
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Office of Vehicle Safety Compliance
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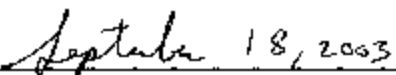
Prepared by:


James Czarniecki, Project Engineer

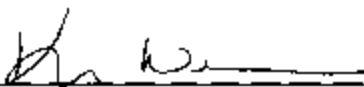
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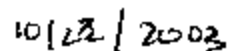

David J. Trivale, Program Manager
Transportation Science Center

Approval Date:


September 18, 2003

FINAL REPORT ACCEPTANCE BY NHTSA:


COIR Vehicle Safety Compliance


Date of Report Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

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16. <i>Abstract</i> Compliance tests were conducted on the subject vehicle a 2003 Hyundai Elantra in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure TP-201-02 for determination of FMVSS 201 compliance. Test failures identified were as follows: None			
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SECTION 1

PURPOSE AND TEST PROCEDURE

This head impact compliance test is part of the FMVSS 201 Occupant Protection in Interior Impact Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-01-C-01025. The purpose of this impact compliance test was to determine whether the subject vehicle, a 2003 Hyundai Elantra, NHTSA No. C30503, meets the performance requirements of FMVSS 201, Occupant Protection in Interior Impact. The compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-201-02 dated March 3, 1989.

SECTION 2

SUMMARY OF OCCUPANT PROTECTION IN INTERIOR IMPACTS

A 2003 Hyundai Elantra, NHTSA No. C30S03, was impacted at various locations throughout its instrument cluster/dash panel and seat back area by a 15 lb, 6.5 inch diameter steel headform. A total of four (4) impacts were performed in this test series. The target area impacts were chosen by the NHTSA Contracting Officer's Technical Representative (COTR). The four (4) chosen impact points were:

Seat Back / Head Rest Area

Instrument Panel Dash Panel Cluster Area

Airbag Cover / Dash Panel Area (2 impacts)

The selected impact areas on the test vehicle appeared to comply with the performance requirements of FMVSS 201.

The 6.5 inch diameter steel headform weighed 15 lb and had an accelerometer mounted along the centerline of the head.

One (1) channel of data for each target impact test was recorded on a Keyser-Threde data acquisition system. Data plots can be found in Appendix B along with still photographs can be found in Appendix A of this report.

To document each target area impact test, one digital photo was taken pre- and post-test at various locations to view the headform contact with the selected target areas.

DATA SHEET 2-1

TEST VEHICLE RECEIVING INSPECTION DATA SHEET

VEHICLE YEAR/MAKE/MODEL/STYLE:	2003 Hyundai Elantra
NHTSA NO.:	C30503
VIN:	KMHJDN45D73U509422
DATE OF MANUFACTURE:	Sept. 14, 2002 (SEE CERTIFICATION LABEL)
COLOR:	Black
ODOMETER READING:	16
LABORATORY:	Veridian Engineering
TEST DATE:	August 25, 2003

NUMBER OF SEATING POSITIONS:

FRONT: 2 REAR: 3

INSTRUMENT PANEL:

NOTE UNUSUAL FEATURES: None

TYPE OF FRONT SEATS:

BENCH: - BUCKET: X SPLIT BACKS: -

TYPE OF HEAD RESTRAINTS:

FIXED: - ADJUSTABLE: X

VEHICLE EQUIPPED WITH ARMRESTS?

NO: - YES: X NUMBER: 5

LOCATION: Front and rear door panels and center console arm rest

VEHICLE EQUIPPED WITH SUN VISORS?

NO: - YES: X

VEHICLE EQUIPPED WITH INTERIOR DOOR LATCHES?

NO: - YES: X NUMBER: 2

LOCATION: Glove Box and Center Console Arm Rest

DATA SHEET 2-2

HEADFORM IMPACT TEST RESULTS INSTRUMENT PANEL

VEHICLE YEAR/MAKE/MODEL/STYLE:	2003 Hyundai Elantra
NHTSA NO.:	C30503
VIN:	KMHJDN45D73U509422
DATE OF MANUFACTURE:	Sept. 14, 2002 (SEE CERTIFICATION LABEL.)
COLOR:	Black
ODOMETER READING:	16
LABORATORY:	Veridian Engineering
TEST DATE:	April 4 and August 25, 2003

IMPACT LOCATION AND NUMBER				VELOCITY (mph)	PEAK ACCELERATION (3 ms Clip) Gs
NUMBER	X (inches)	Y (inches)	ANGLE (degrees)		
1 IP CenterDash	29.9	-14.0	-6	11.42	78.54
2 IP Lower Left of Airbag	31.3	-5.2	-39	11.34	60.40
3 IP Lower Right of Airbag	31.6	3.4	-48	11.31	54.86

REFERENCE POINT: Seating Reference Position (SGRP) on front passenger side is the reference point (x positive forward from SGRP and y positive to the right of the SGRP).

REMARKS:

DATA SHEET 2-3

HEADFORM IMPACT TEST RESULTS SEAT BACKS

VEHICLE YEAR/MAKE/MODEL/STYLE:	2003 Hyundai Elantra
NHTSA NO.:	C30503
VIN:	KMHDM451373U1509422
DATE OF MANUFACTURE:	Sept. 14, 2002 (SEE CERTIFICATION LABEL)
COLOR:	Black
ODOMETER READING:	16
LABORATORY:	Veridian Engineering
TEST DATE:	April 4, 2003

IMPACT LOCATION AND NUMBER				VELOCITY (mph)	PEAK ACCELERATION (3 ms Clip) Gs
NUMBER	X (inches)	Y (inches)	ANGLE (degrees)		
1 Seat Back	3.1	0	-28	14.9	51.93

REFERENCE POINT: SGRP on rear passenger side is the reference point (x positive forward from SGRP and y positive to the right of the SGRP).

DATA SHEET 2-4

SUNVISOR AND ARMREST EVALUATION

VEHICLE YEAR/MAKE/MODEL/STYLE:	2003 Hyundai Elantra
NHTSA NO.:	C30503
VIN:	KMH0N45D7301509422
DATE OF MANUFACTURE:	Sept. 14, 2002 (SEE CERTIFICATION LABEL)
COLOR:	Black
ODOMETER READING:	16
LABORATORY:	Veridian Engineering
TEST DATE:	August 25, 2003

SUN VISOR INFORMATION:

1. Are sun visors constructed of or covered with energy absorbing material?

YES (PASS): X NO (FAIL): -

2. Are any edges statically contactable by a spherical 6.5 inch diameter head form of radius less than 0.125 inch?

YES (FAIL): - NO (PASS): X

ARMREST INFORMATION:

A. FIXED ARMREST

1. Is it constructed of energy absorbing material with the capability of laterally deflecting 2 inches without contacting any underlying rigid material?

YES: N/A NO: N/A

2. Is it constructed of energy absorbing material that deflects or collapses within 1.25 inches of the rigid test panel surface without contacting underlying rigid material between 0.50 and 1.25 inches from the panel which has a vertical height of less than 1 inch?

YES: N/A NO: N/A

3. Does it provide adequate pelvic area impact protection?

YES: X NO: -

4. Does it meet at least one of the criteria No. 1 to 3?

YES (PASS): X NO (FAIL): -

B. FOLDING ARMREST

Is it made of or covered with energy absorbing material? Or does it meet at least one of the criteria No. 1 to 3?

YES (PASS): X NO (FAIL): -

DATA SHEET 2-5

DOOR LATCH EVALUATION

VEHICLE YEAR/MAKE/MODEL/STYLE:	2003 Hyundai Elantra
NHTSA NO.:	C30503
VIN:	KMHFN45D73U509422
DATE OF MANUFACTURE:	Sept. 14, 2002 (SEE CERTIFICATION LABEL)
COLOR:	Black
ODOMETER READING:	16
LABORATORY:	Veridian Engineering
TEST DATE:	August 25, 2003

LATCH ENGAGEMENT INTERFERENCE

DESCRIPTION OF LATCH LOCATION	NO LOAD	10G HORIZONTAL TRANSVERSE	10G VERTICAL	30G HORIZONTAL LONGITUDINAL
Glove Box	N/A	N/A	N/A	N/A
Center Console	N/A	N/A	N/A	N/A

N/A Latch systems were not evaluated.

(APPENDIX C CONTAINS CALCULATION SHEETS WHICH ARE BASED ON MANUFACTURER'S DATA)

DATA SHEET 2-6**SUMMARY OF RESULTS**

VEHICLE YEAR/MAKE/MODEL/STYLE:	2003 Hyundai Elantra
NHTSA NO.:	C30503
VIN:	KMHDN45D73U509422
DATE OF MANUFACTURE:	Sept. 14, 2002 (SEE CERTIFICATION LABEL)
COLOR:	Black
ODOMETER READING:	16
LABORATORY:	Veridian Engineering
TEST DATE:	August 25, 2003

	NUMBER OF IMPACTS	PASS/FAIL
INSTRUMENT PANEL	3	PASS
SEAT BACK	1	PASS
SUN VISORS	N/A	PASS
ARMRESTS	N/A	PASS
INTERIOR COMPARTMENT DOORS	N/A *	N/A *

REMARKS:

* N/A Latch systems were not evaluated.

APPENDIX A
PHOTOGRAPHS

PHOTOGRAPHS

<u>FIGURE</u>	<u>VIEW</u>
A-1	LEFT SIDE VIEW OF VEHICLE
A-2	RIGHT SIDE VIEW OF VEHICLE
A-3	3/4 FRONTAL VIEW FROM LEFT SIDE OF VEHICLE
A-4	3/4 REAR VIEW FROM RIGHT SIDE OF VEHICLE
A-5	VEHICLE'S CERTIFICATION LABEL
A-6	VEHICLE'S TIRE INFORMATION LABEL
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A-17	INSTRUMENT PANEL RIGHT SIDE BELOW AIRBAG IMPACT POST-TEST
A-18	INSTRUMENT PANEL ABOVE CENTER CLUSTER VENT IMPACT PRE-TEST
A-19	INSTRUMENT PANEL ABOVE CENTER CLUSTER VENT IMPACT POST-TEST
A-20	HEAD RESTRAINT
A-21	HEAD RESTRAINT IMPACT AREA PRE-TEST
A-22	HEAD RESTRAINT IMPACT AREA POST-TEST



Figure A-1 : LEFT SIDE VIEW OF VEHICLE



Figure A-2: RIGHT SIDE VIEW OF VEHICLE

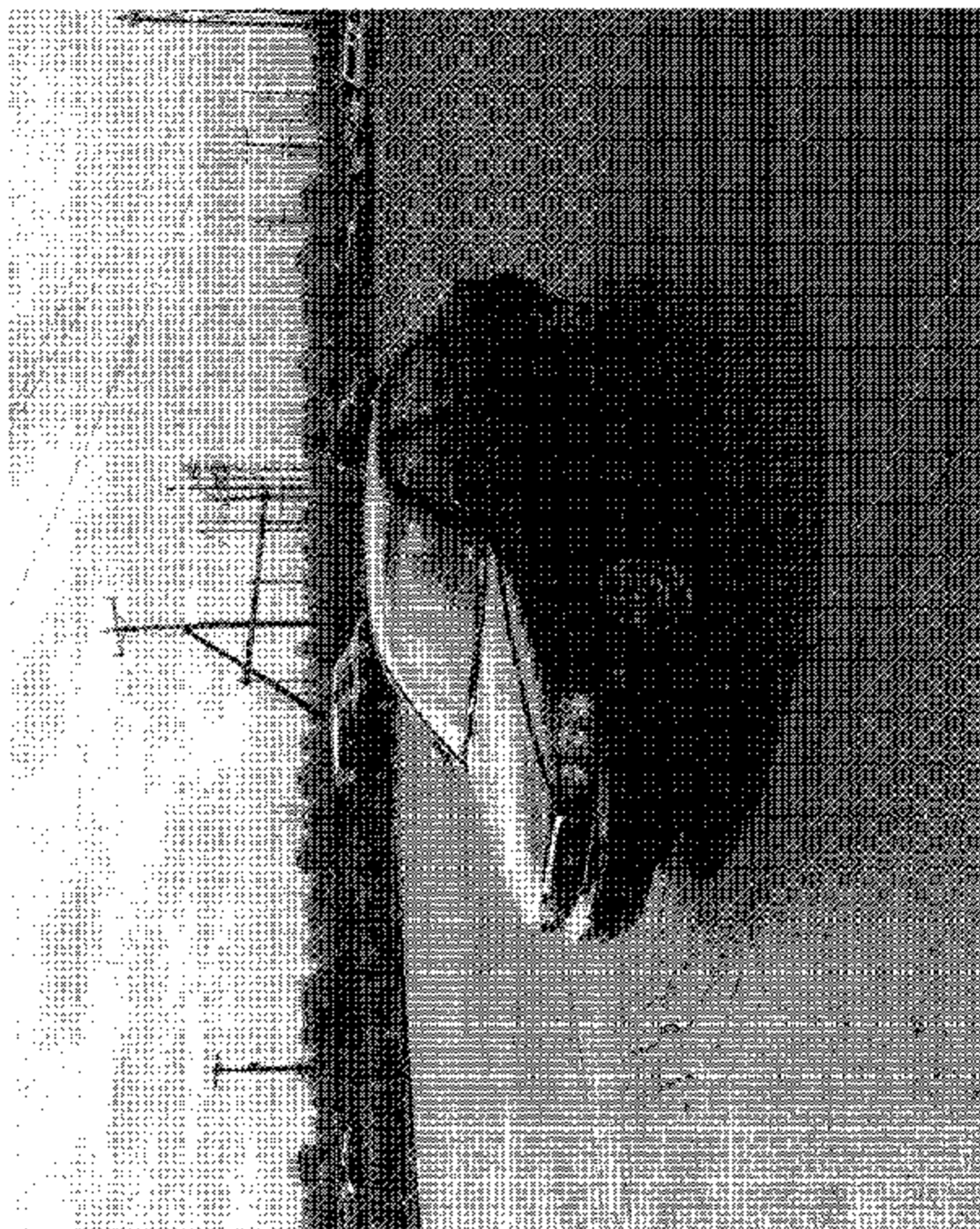


Figure A-3 : 3/4 Frontal View from Left Side of Vehicle

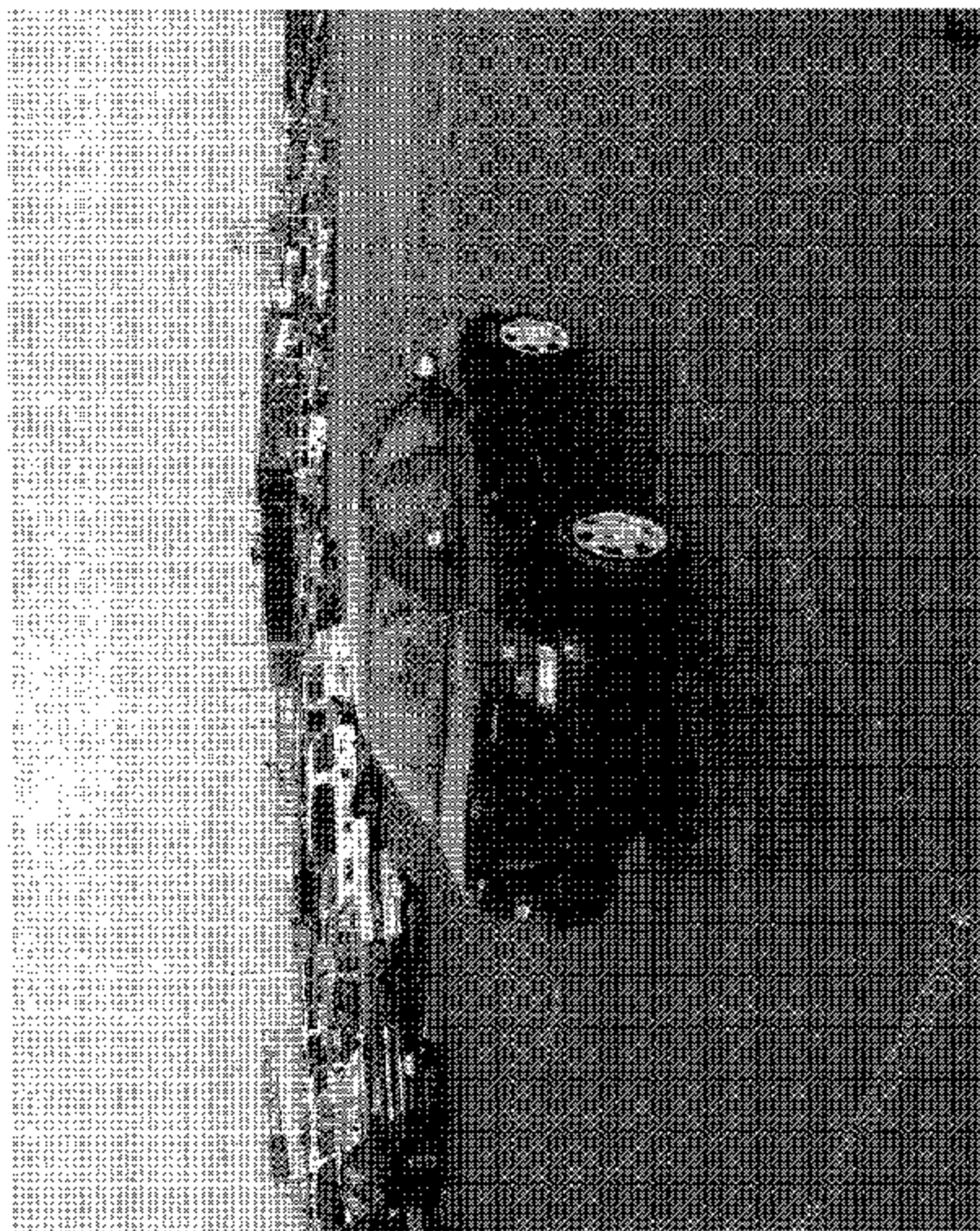


FIGURE 4: 501 REAR VIEW FROM RIGHT SIDE OF VEHICLE

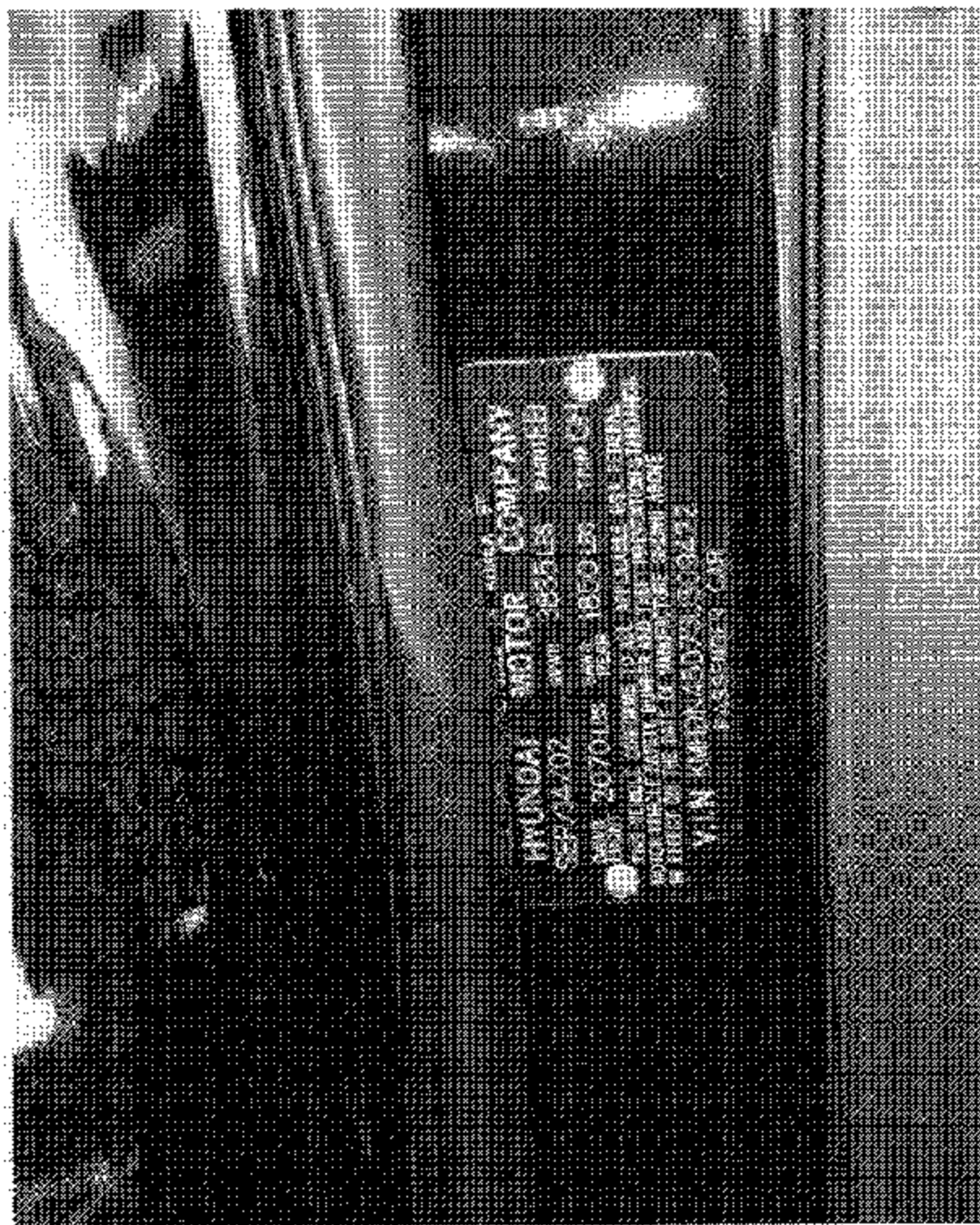


Figure A-3. VEHICLE'S CERTIFICATION LABEL

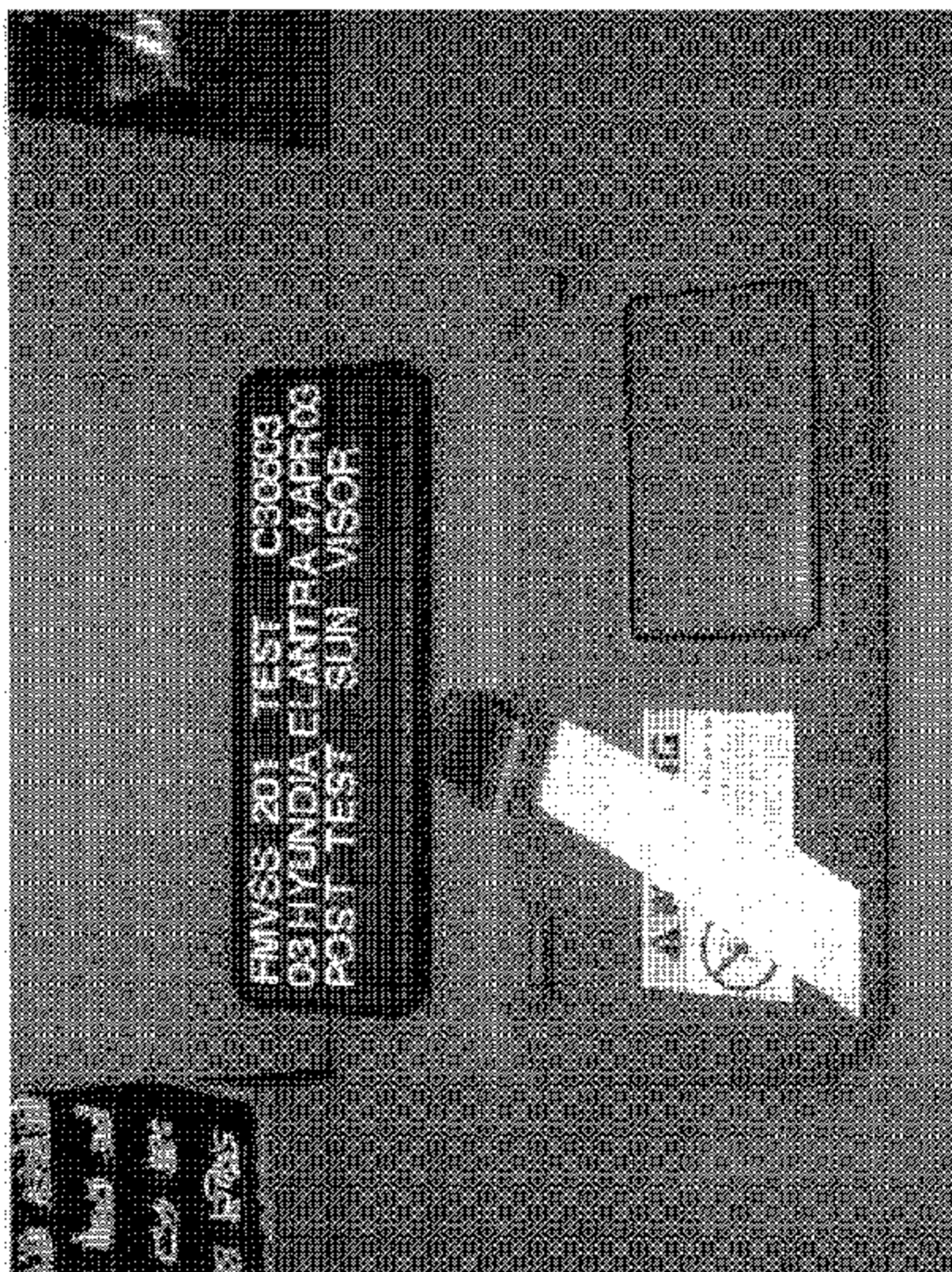


Figure A-7 : SUNVISOR CONSTRUCTION

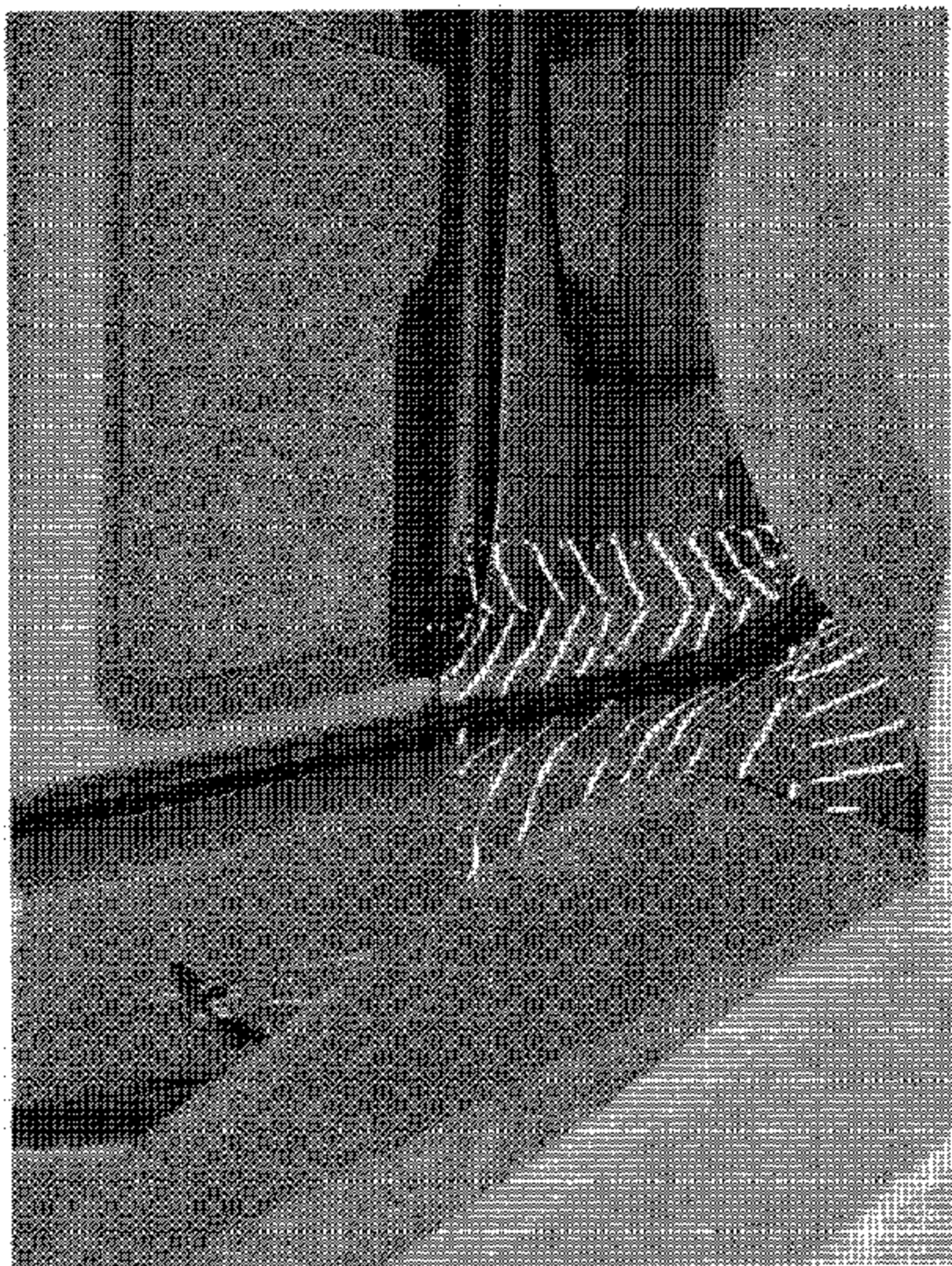


Figure A-8: ARMREST LEFT FRONT DOOR

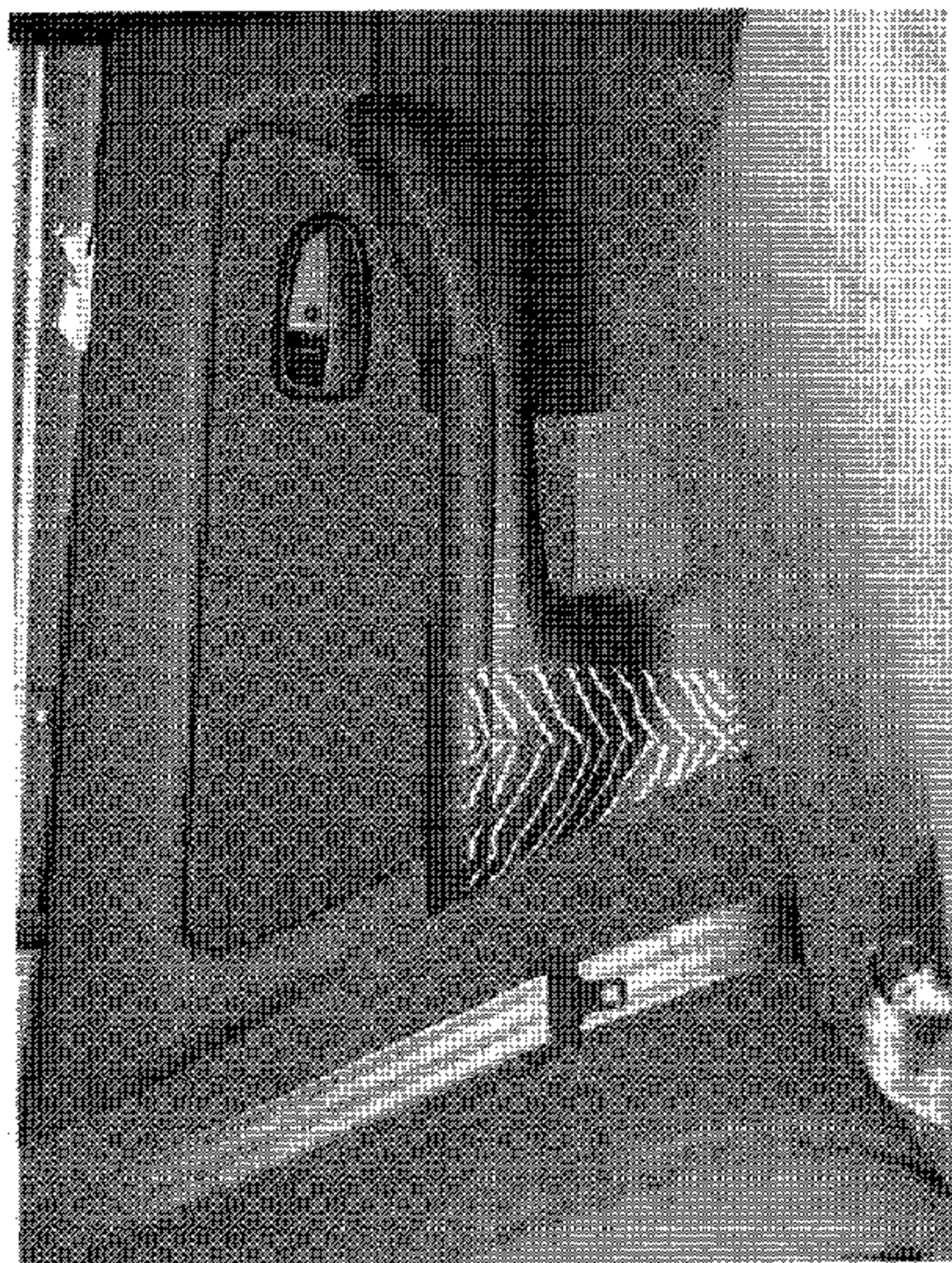


Figure A-9 ARMREST LEFT NEAR DOOR

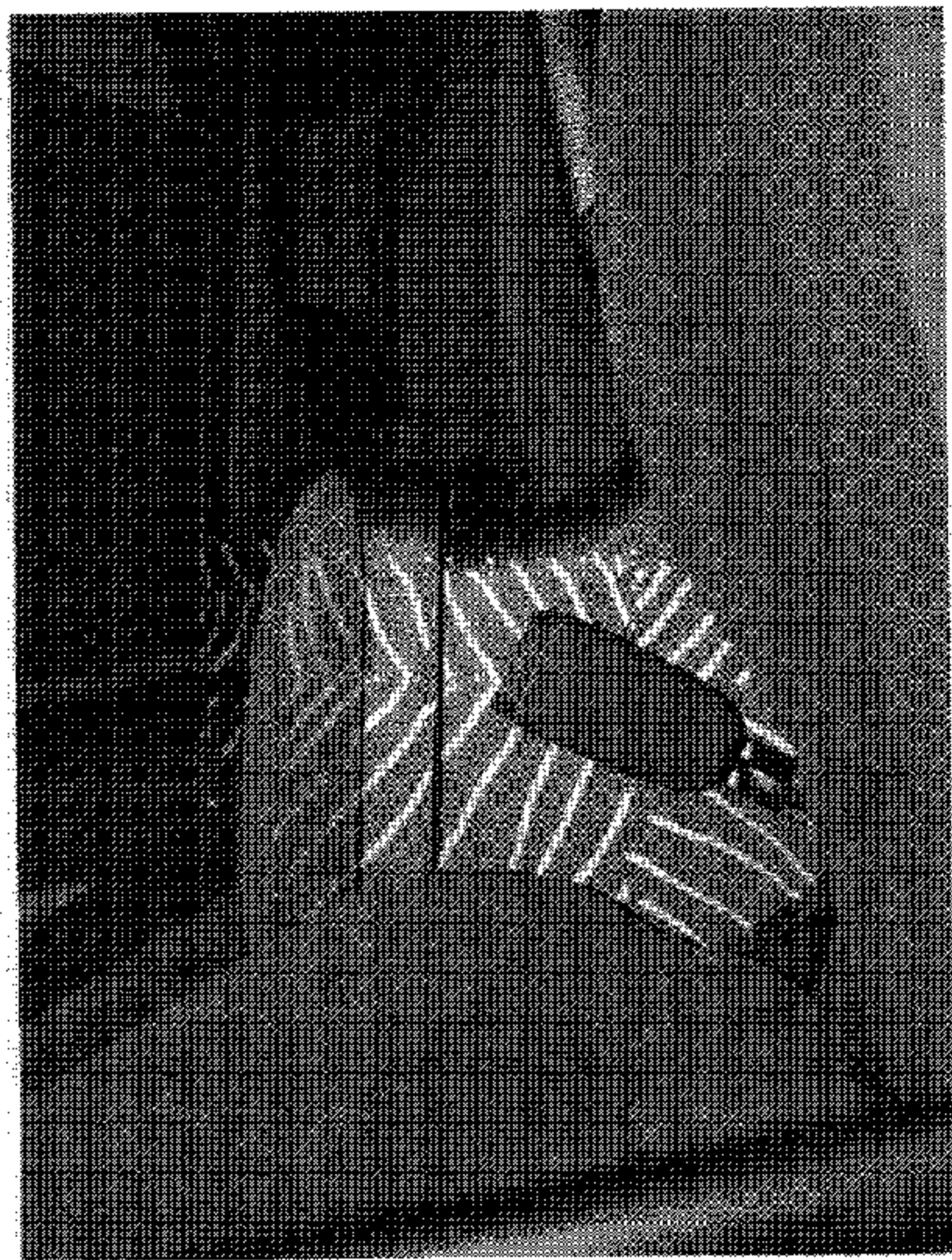


Figure A-10: CENTER ARMREST

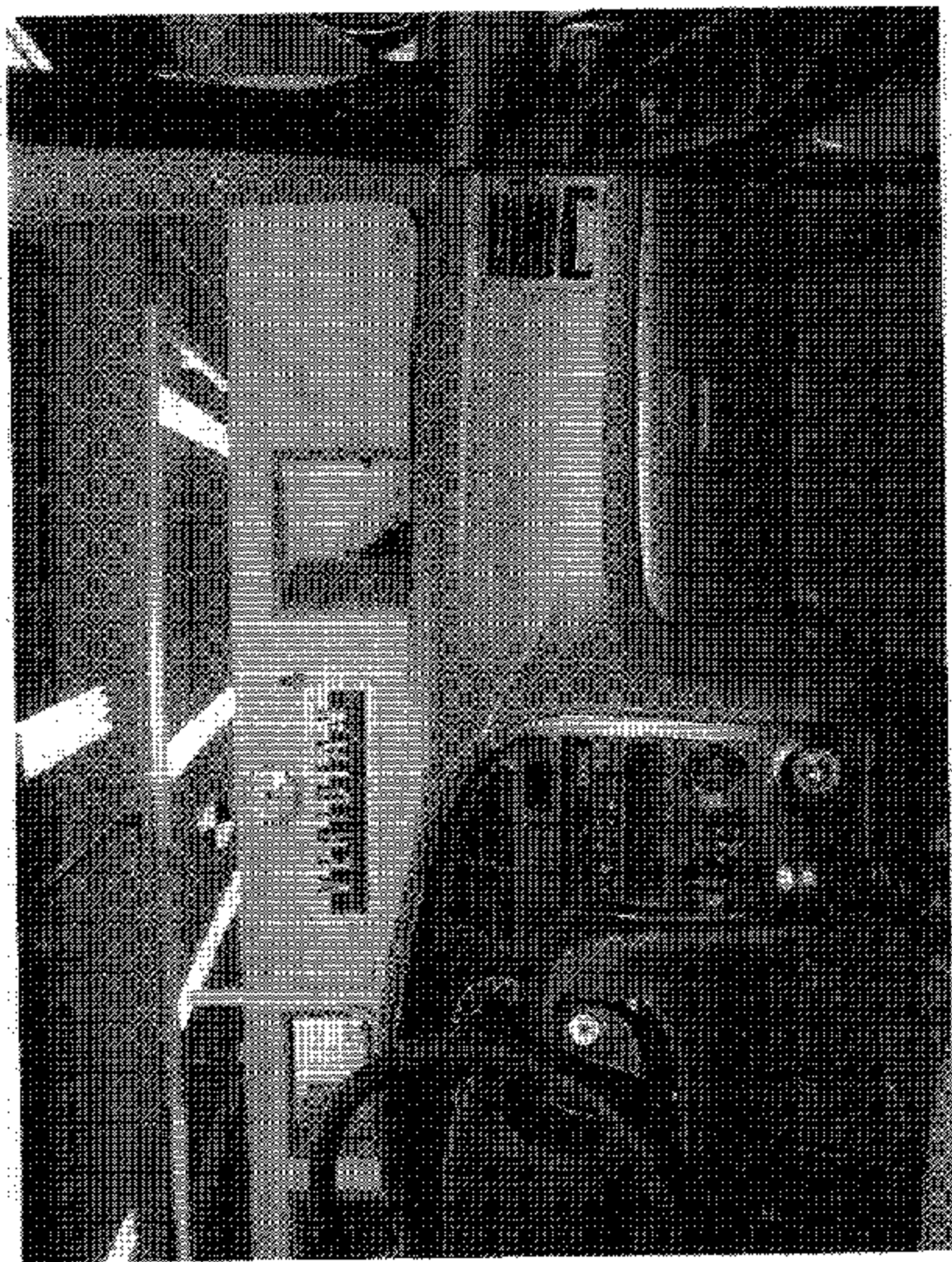


Figure A-11: INSTRUMENT PANEL

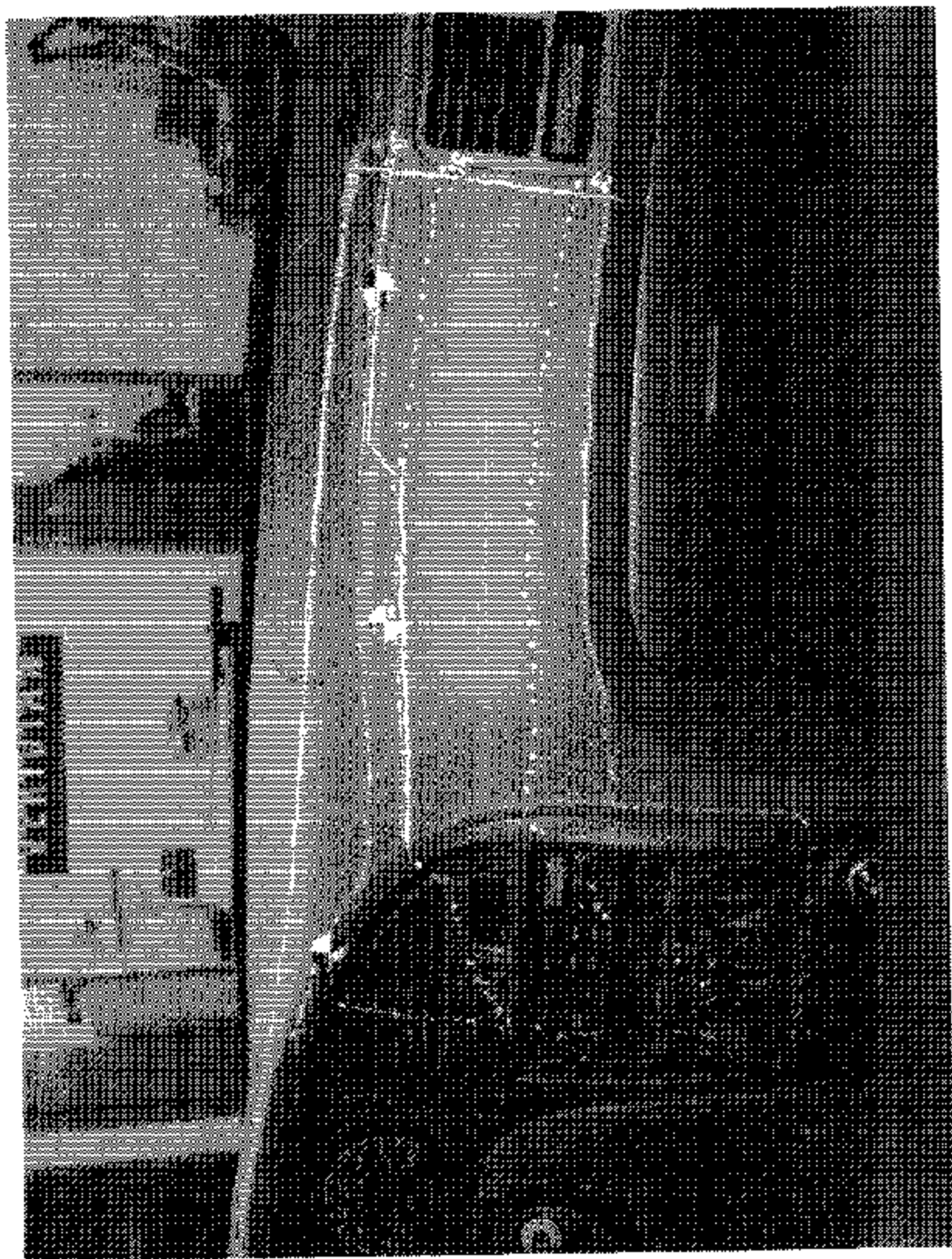


Figure A-12: DELINEATED INSTRUMENT PANEL IMPACT ZONE PRE-TEST

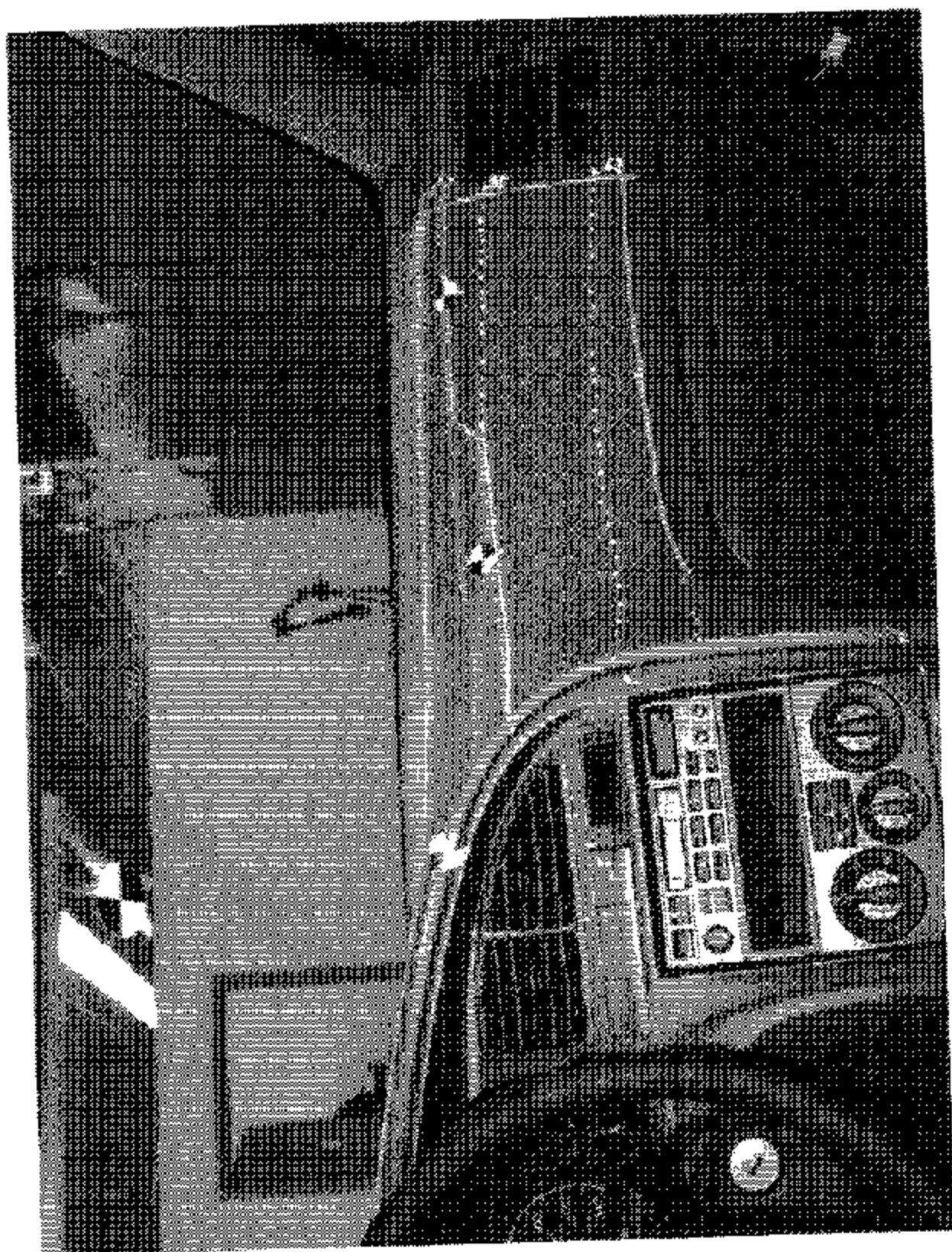


Figure A-13 DELINEATED INSTRUMENT PANEL IMPACT ZONE POST-TEST

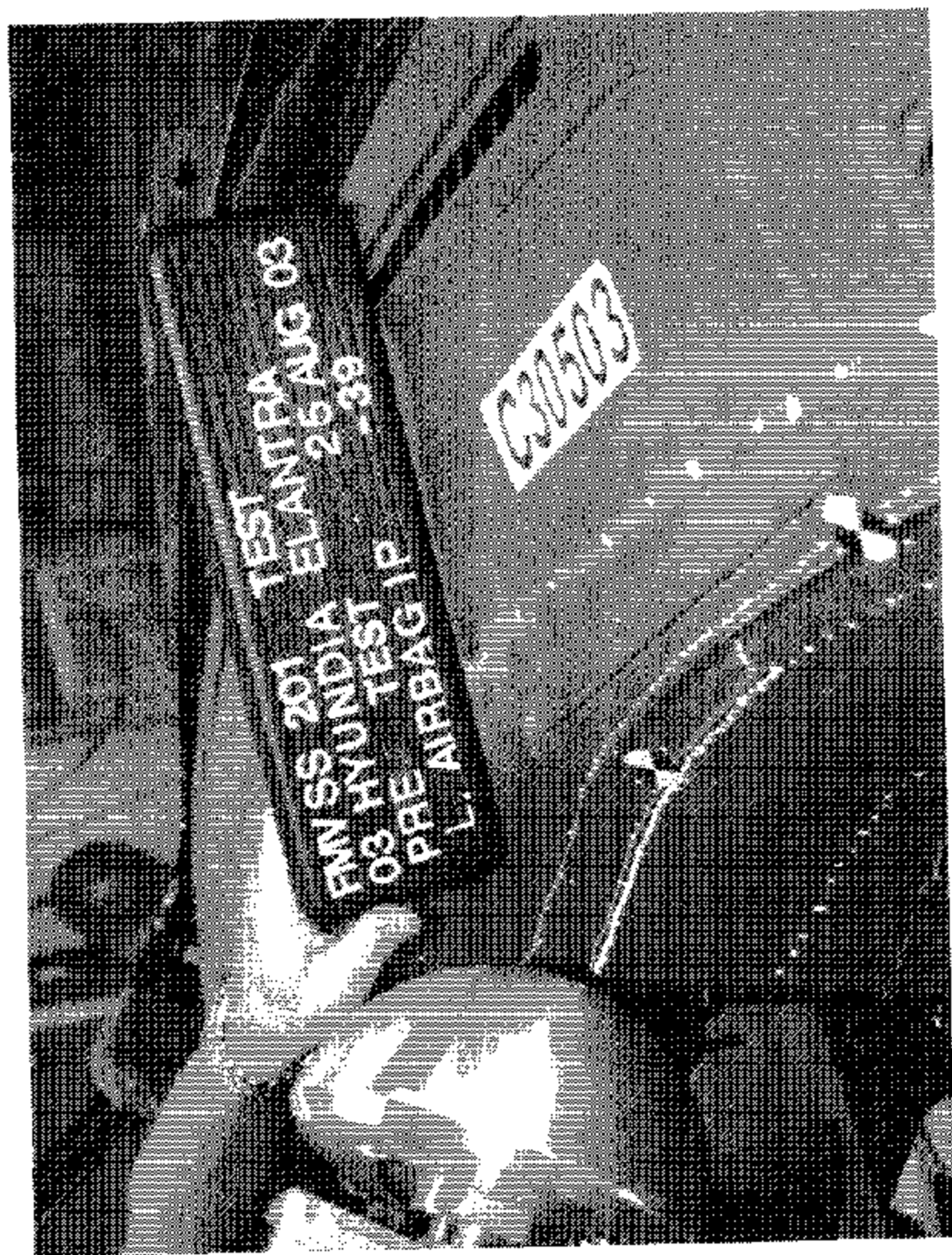


Figure A-14 INSTRUMENT PANEL LEFT SIDE BELOW AIRBAG IMPACT PRE-TEST

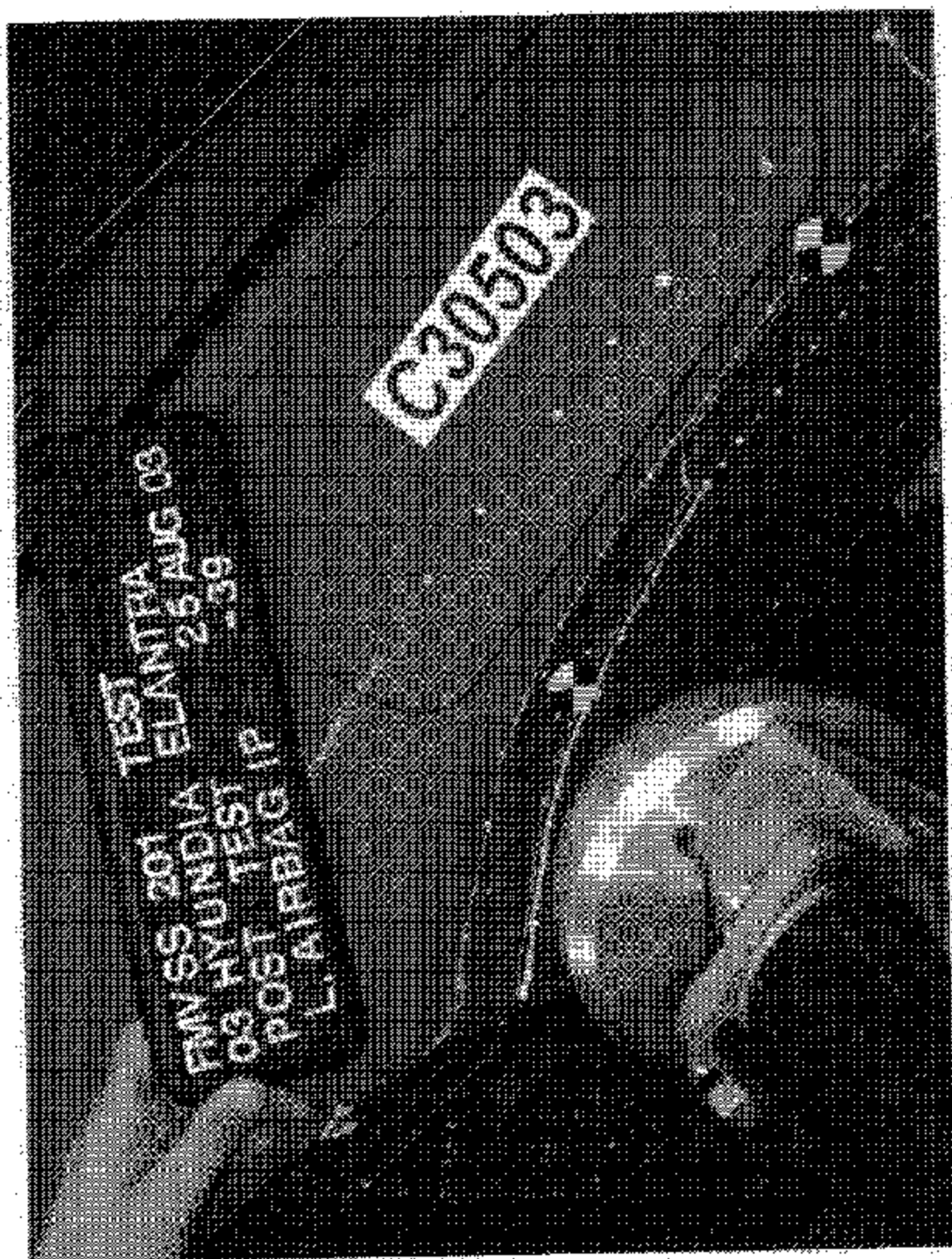


Figure A-15. INSTRUMENT PANEL LEFT SIDE BELOW AIRBAG IMPACT POST-TEST

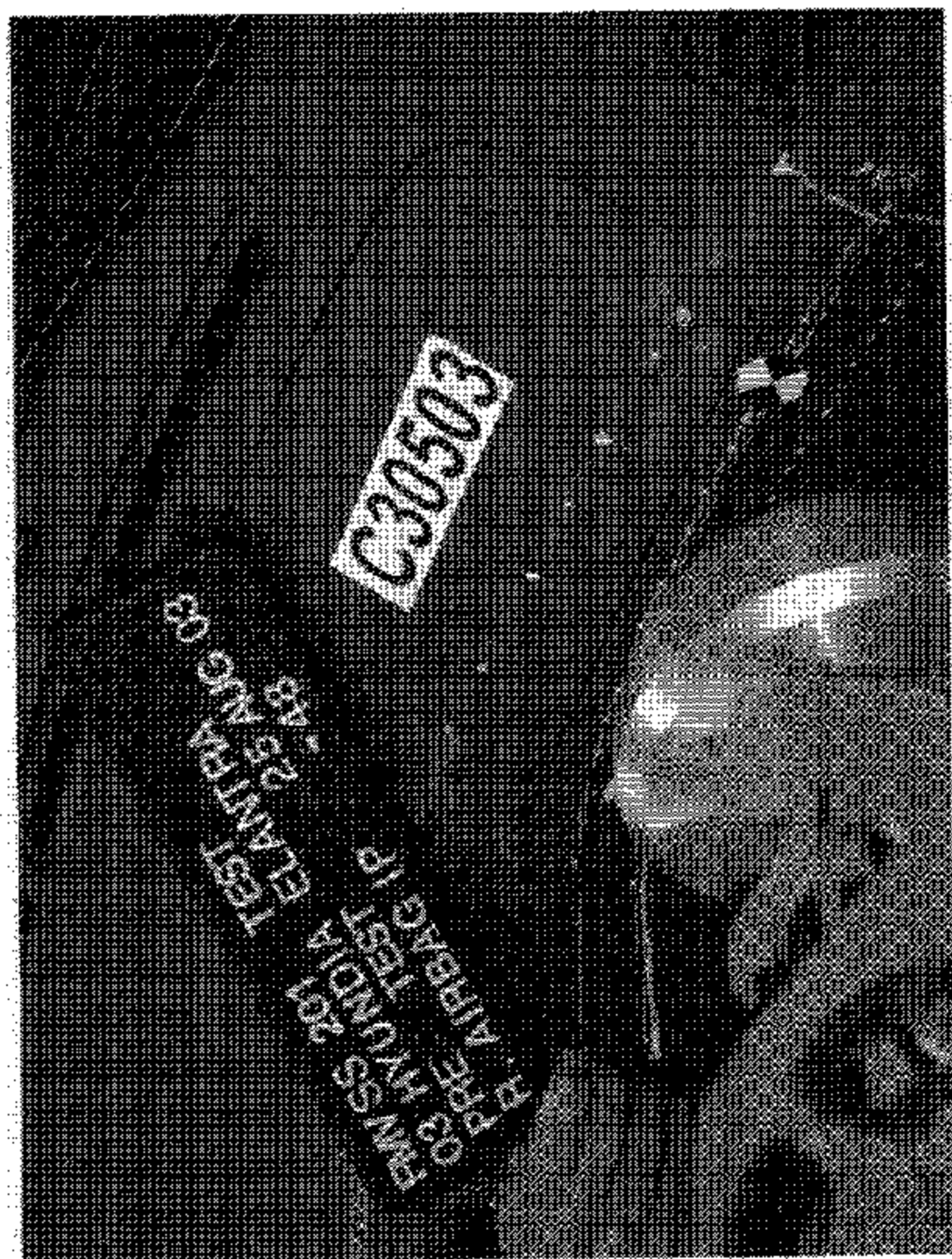


Figure A-16: INSTRUMENT PANEL RIGHT SIDE BELOW AIRBAG IMPACT PRE-TEST

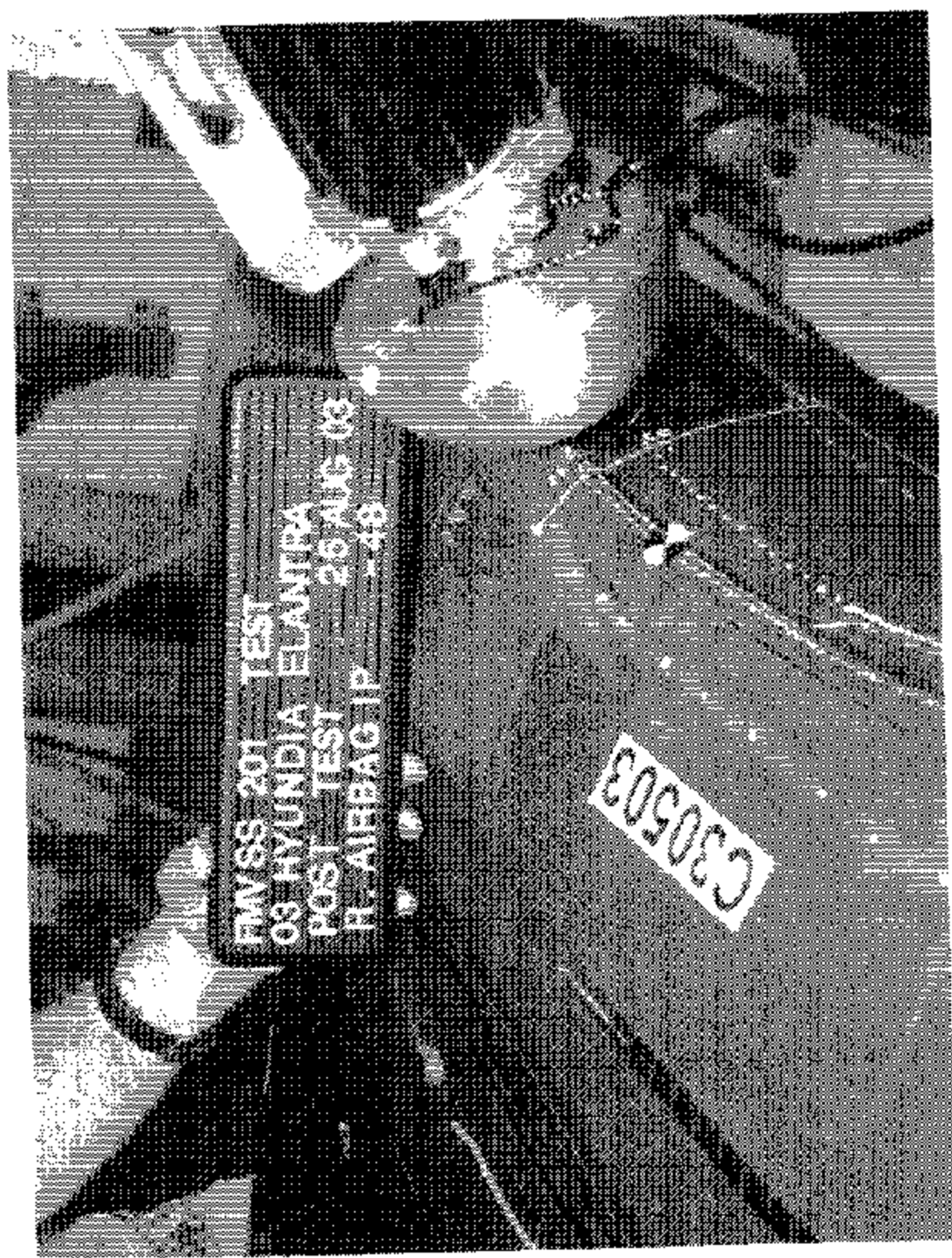


FIGURE 7 INSTRUMENT PANEL RIGHT SIDE BELOW AIRBAG IMPACT POST-TEST

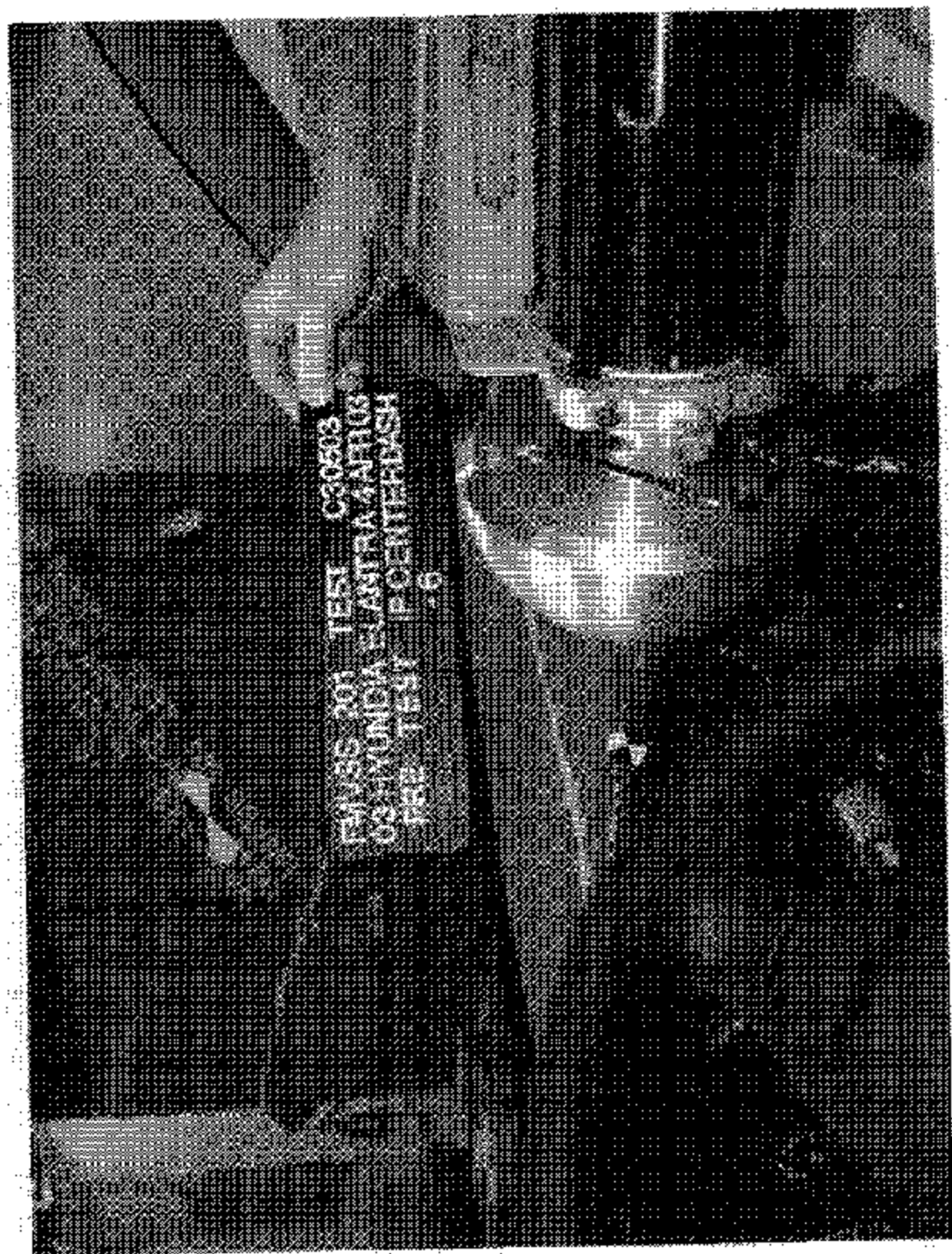


Figure A-18: INSTRUMENT PANEL ABOVE CENTER CLUSTER VENT IMPACT PRE-TEST



Figure A-19: INSTRUMENT PANEL ABOVE CENTER CLUSTER VENT IMPACT POST-TEST

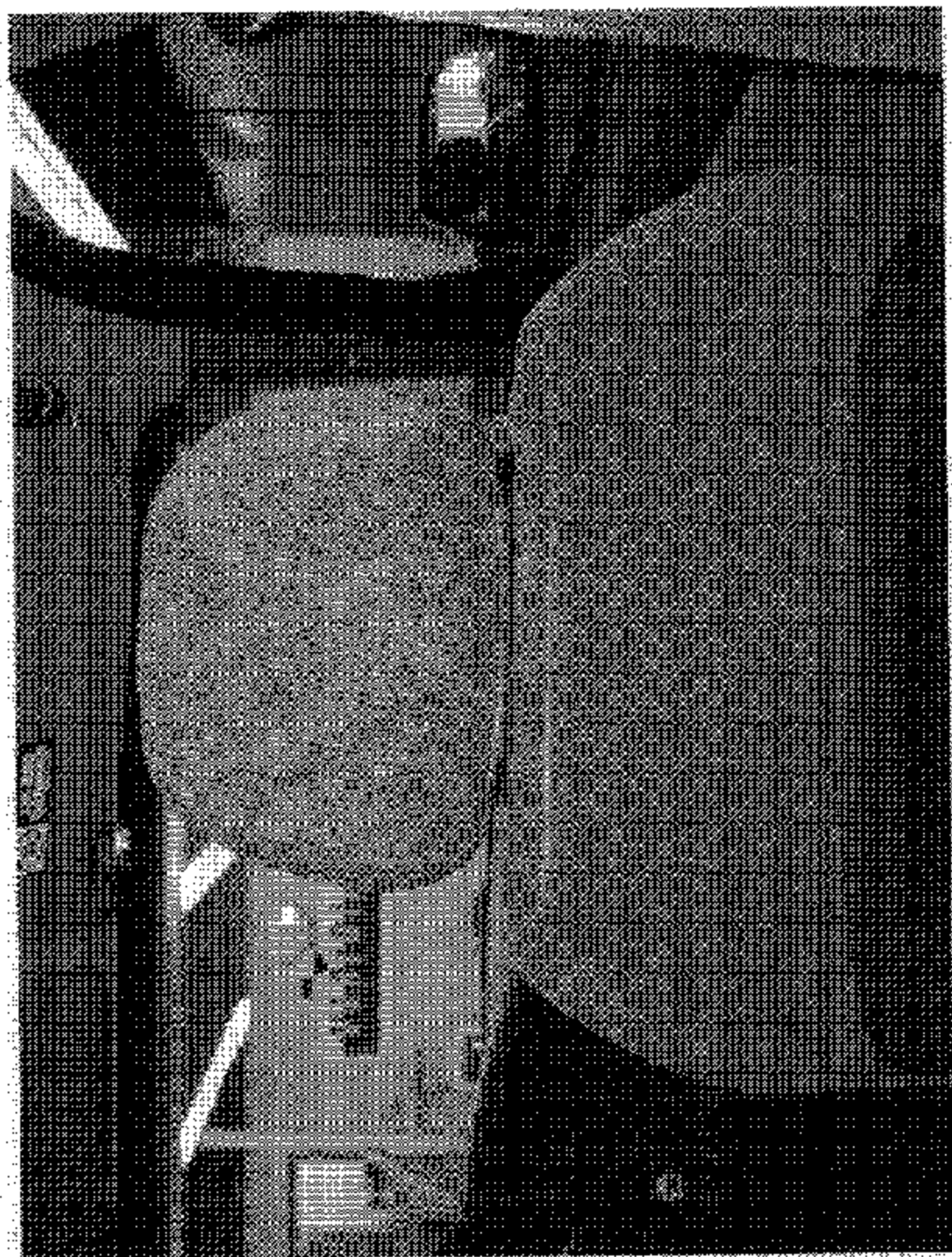


FIGURE A-20: HEAD RESTRAINT

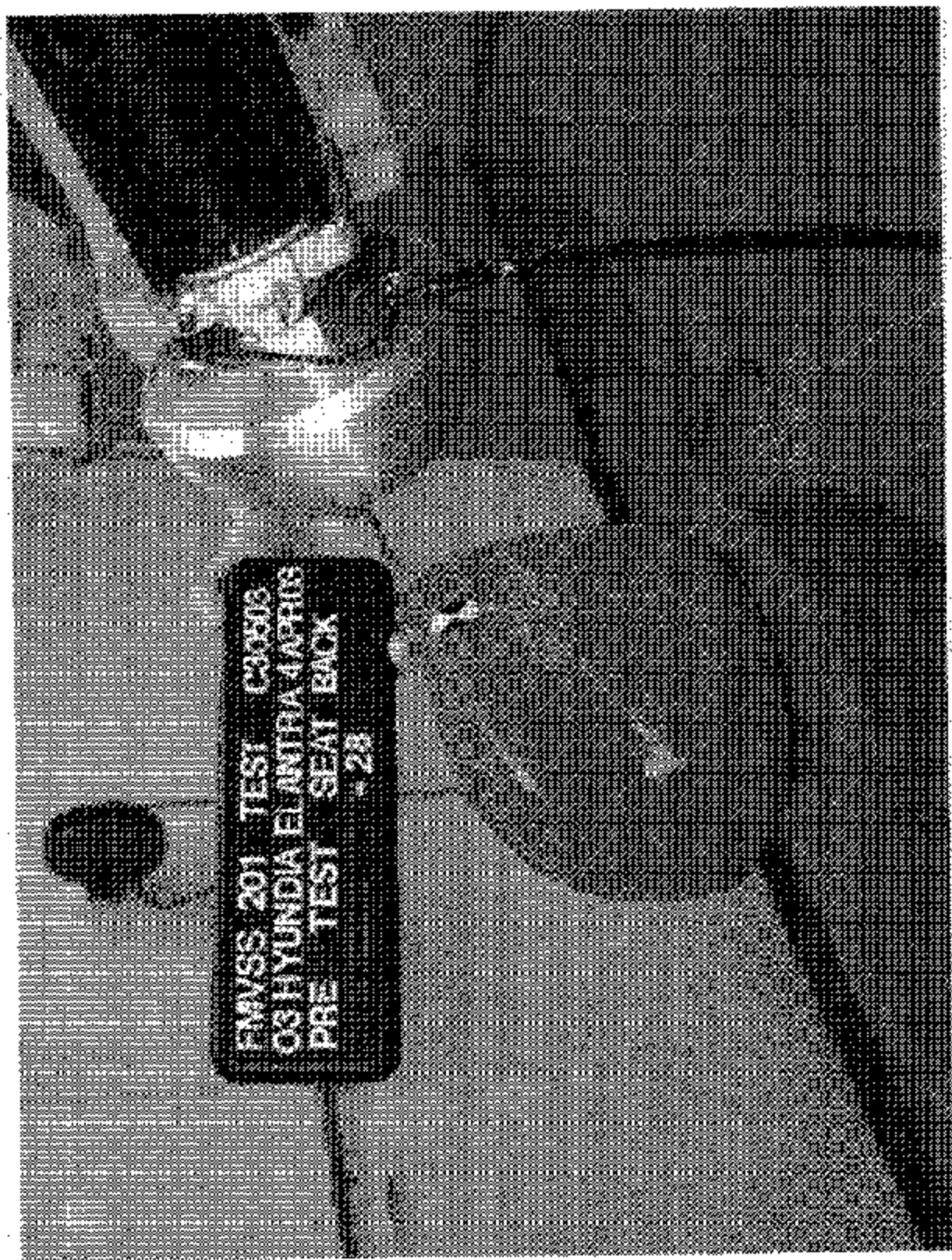


FIGURE A-21 HEAD RESTRAINT IMPACT AREA PRE-TEST

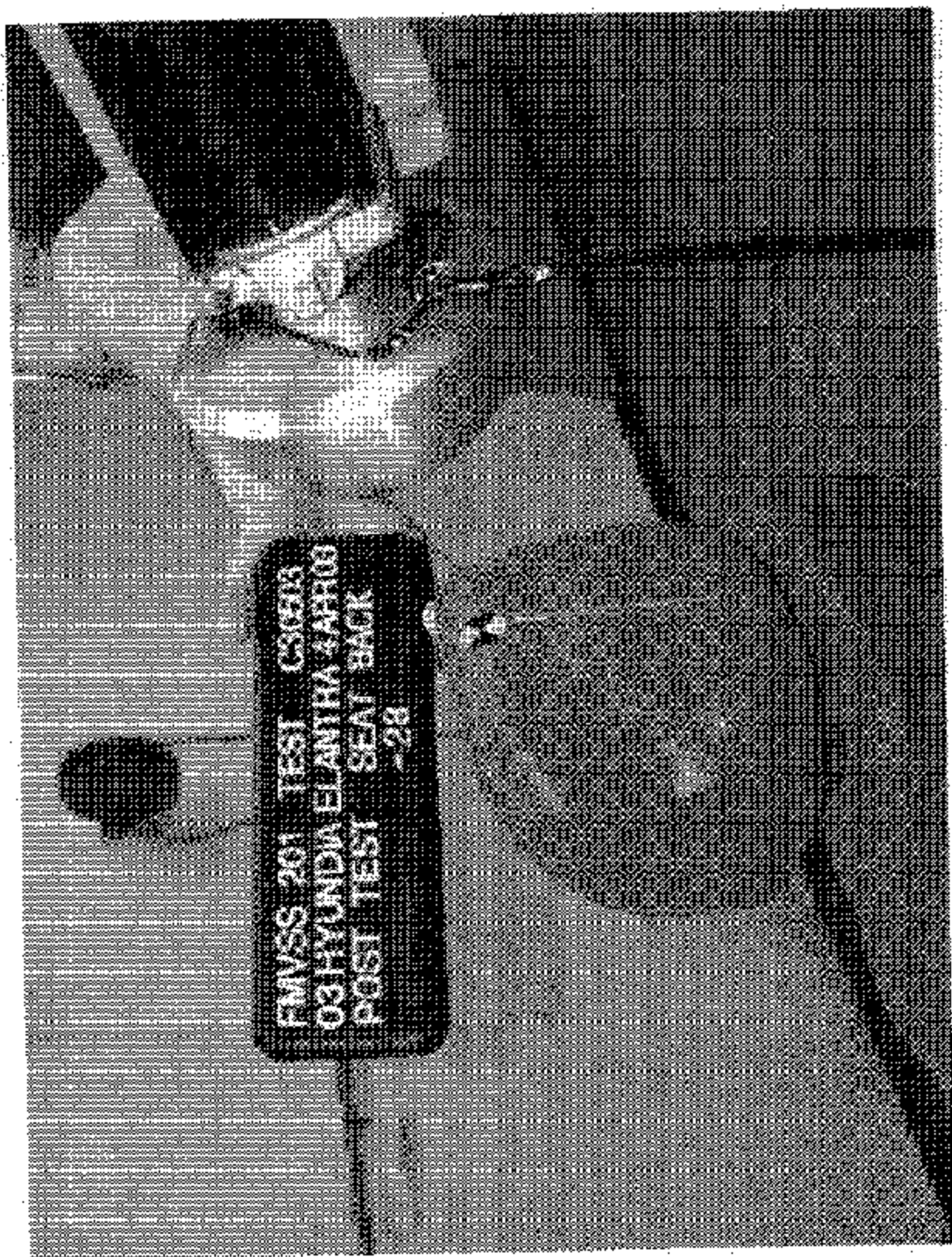


Figure A-22: HEAD RESTRAINT IMPACT AREA POST-TEST

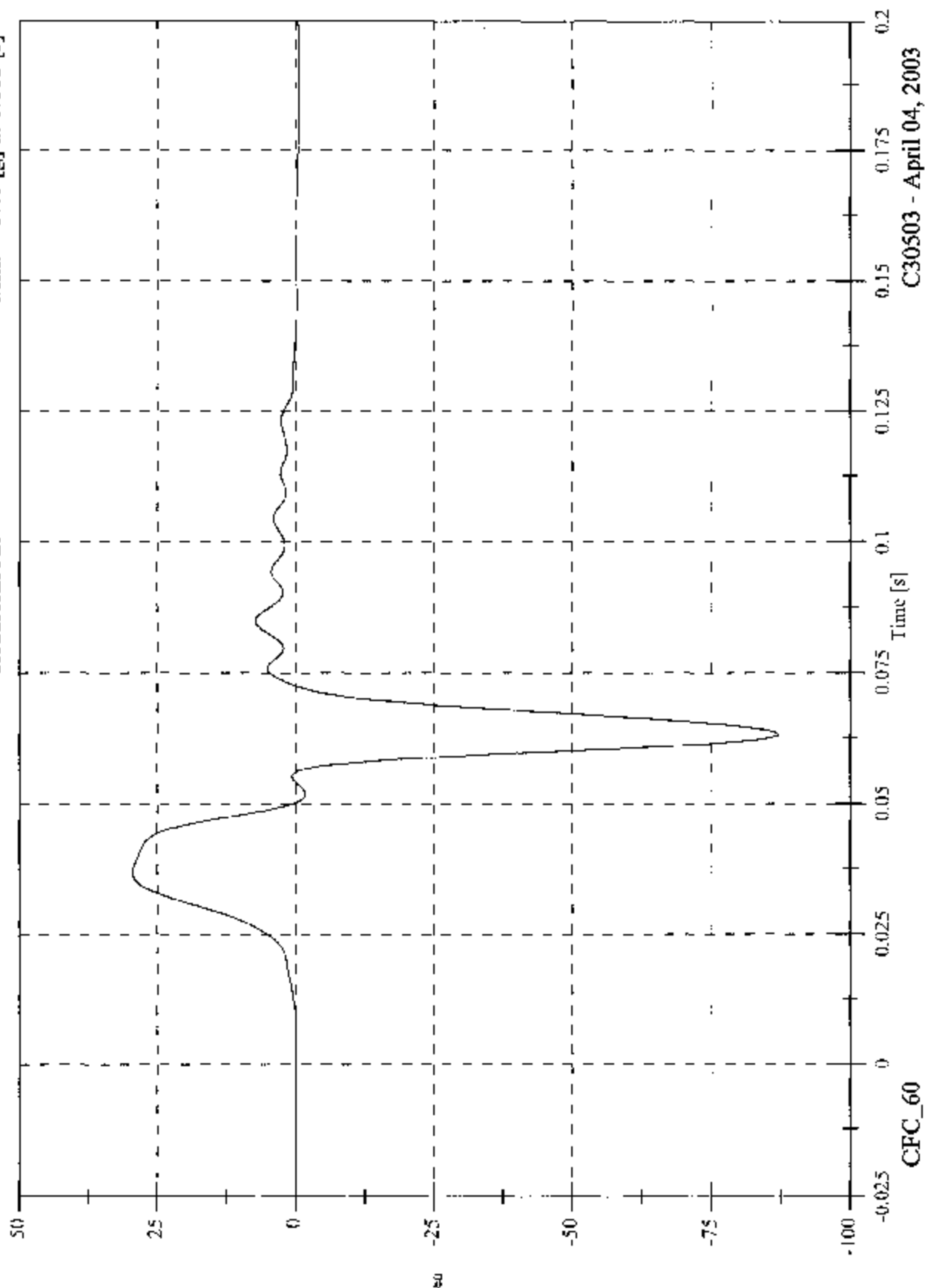
APPENDIX B

DATA PLOTS

FMVSS 201 Linear Impact - 2003 Hyundai Elantra

Max: 29.5 [g] at 0.037 [s]
Min: -87.0 [g] at 0.063 [s]

Headform Ax

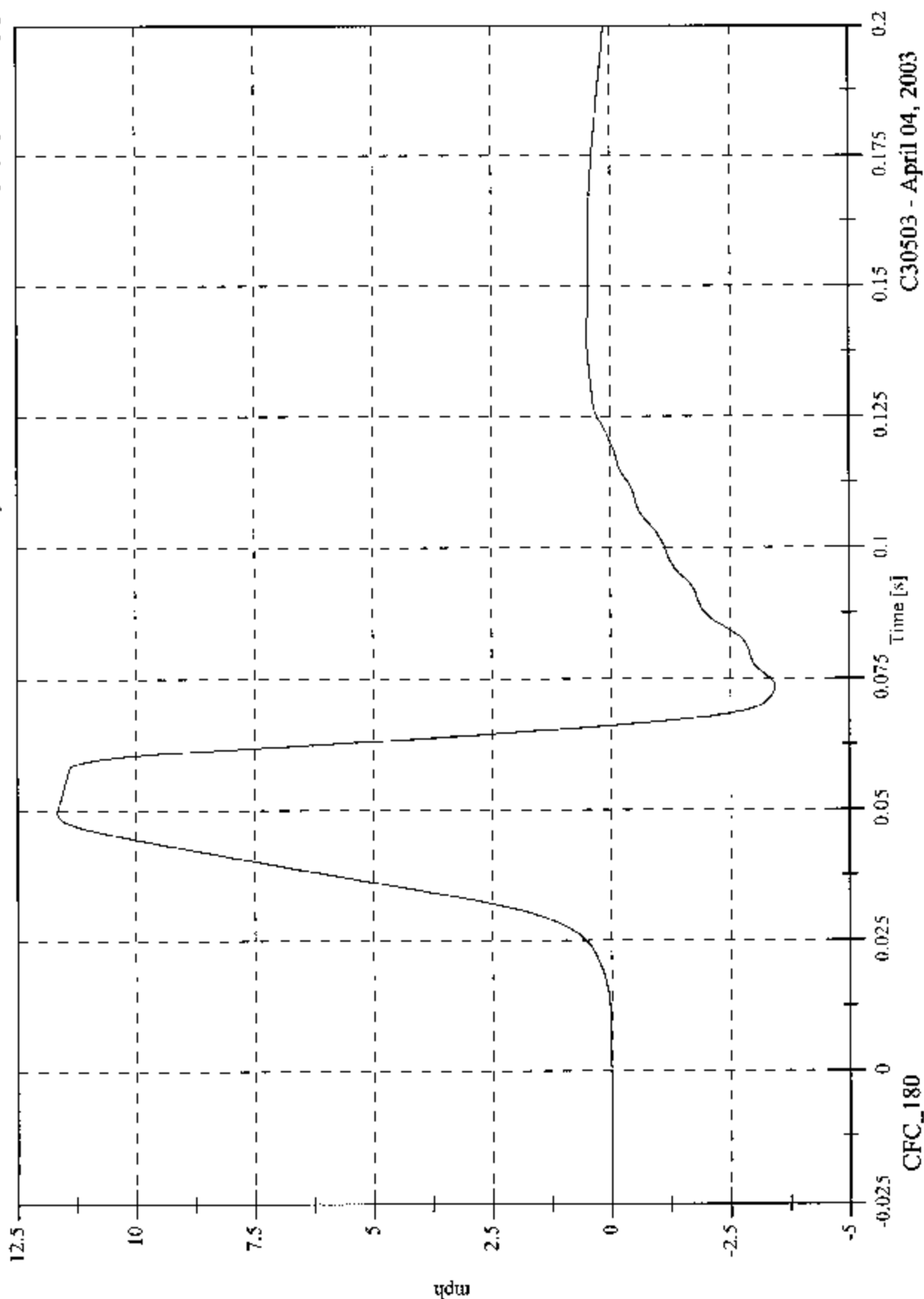


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FMVSS 201 Linear Impact - 2003 Hyundai Elantra

Max: 11.7 [mph] at 0.050 [s]
 Min: -3.4 [mph] at 0.073 [s]

Headform Ax Velocity



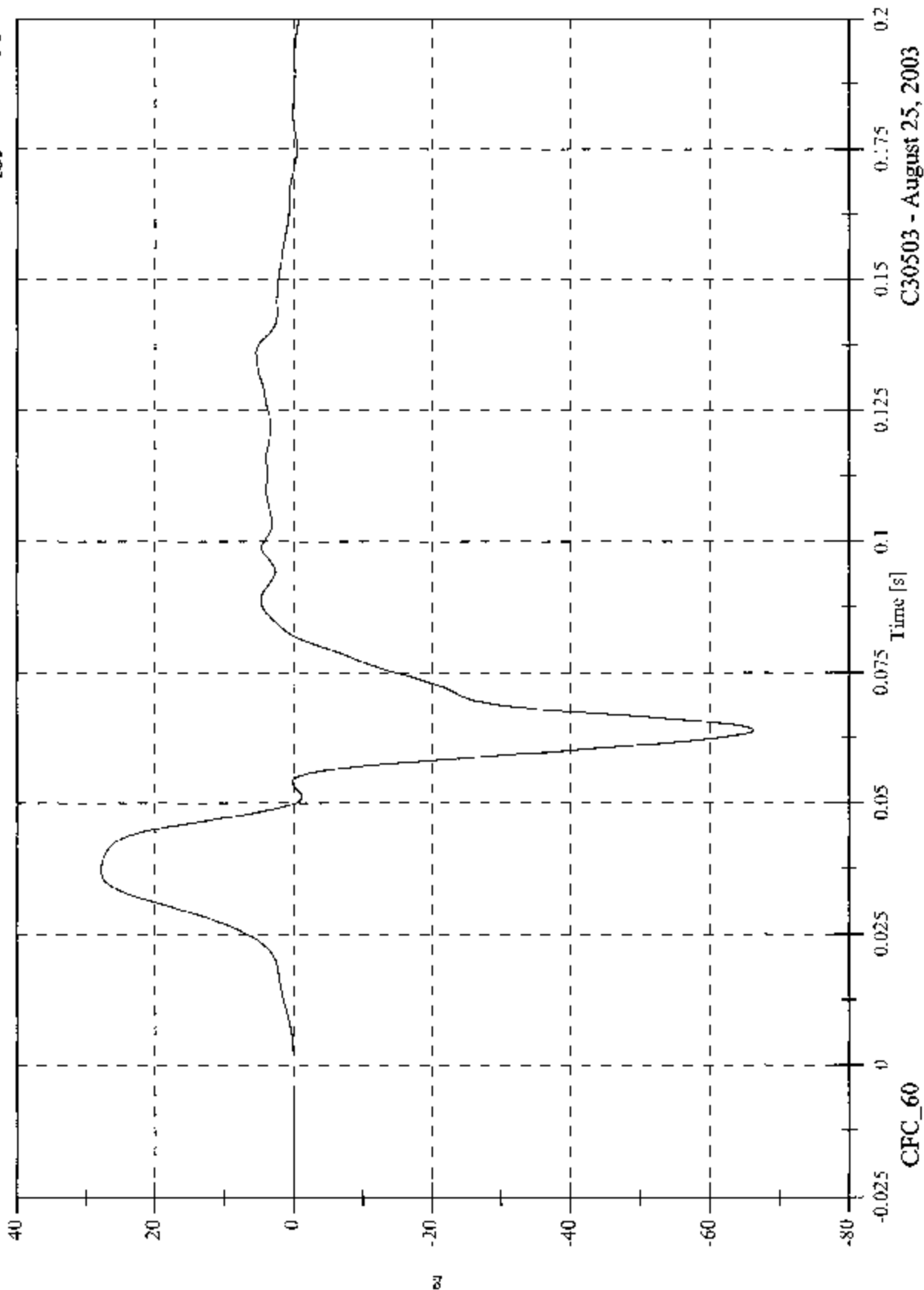
C30503 - April 04, 2003

FMVSS 201 Linear Impact - 2003 Hyundai Elantra

Headform Ax

Max: 27.9 [g] at 0.037 [s]

Min: -66.2 [g] at 0.064 [s]



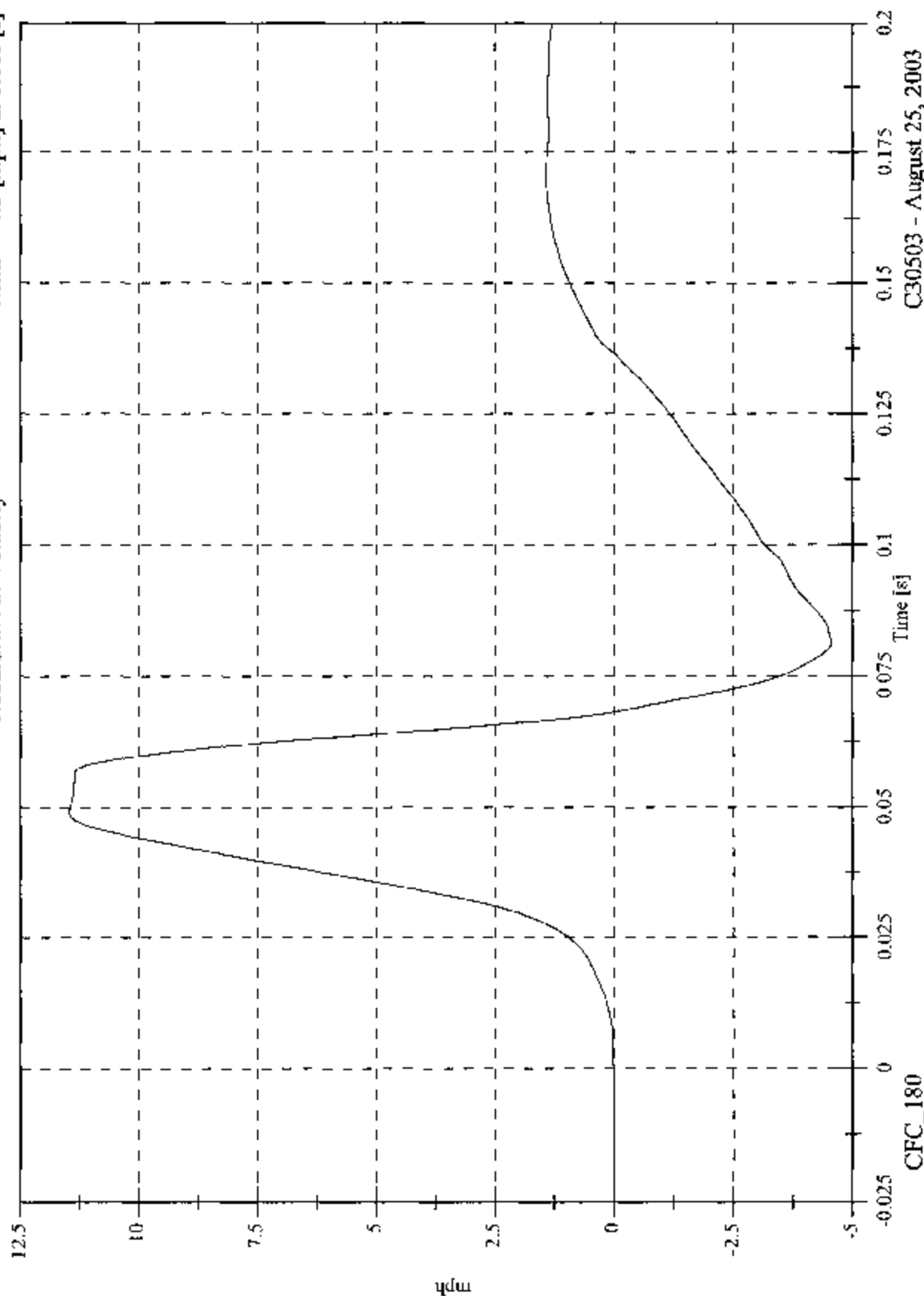
CFC_60

C30503 - August 25, 2003

FMVSS 201 Linear Impact - 2003 Hyundai Elantra

Headform Ax Velocity

Max: 11.5 [mph] at 0.049 [s]
Min: -4.5 [mph] at 0.081 [s]



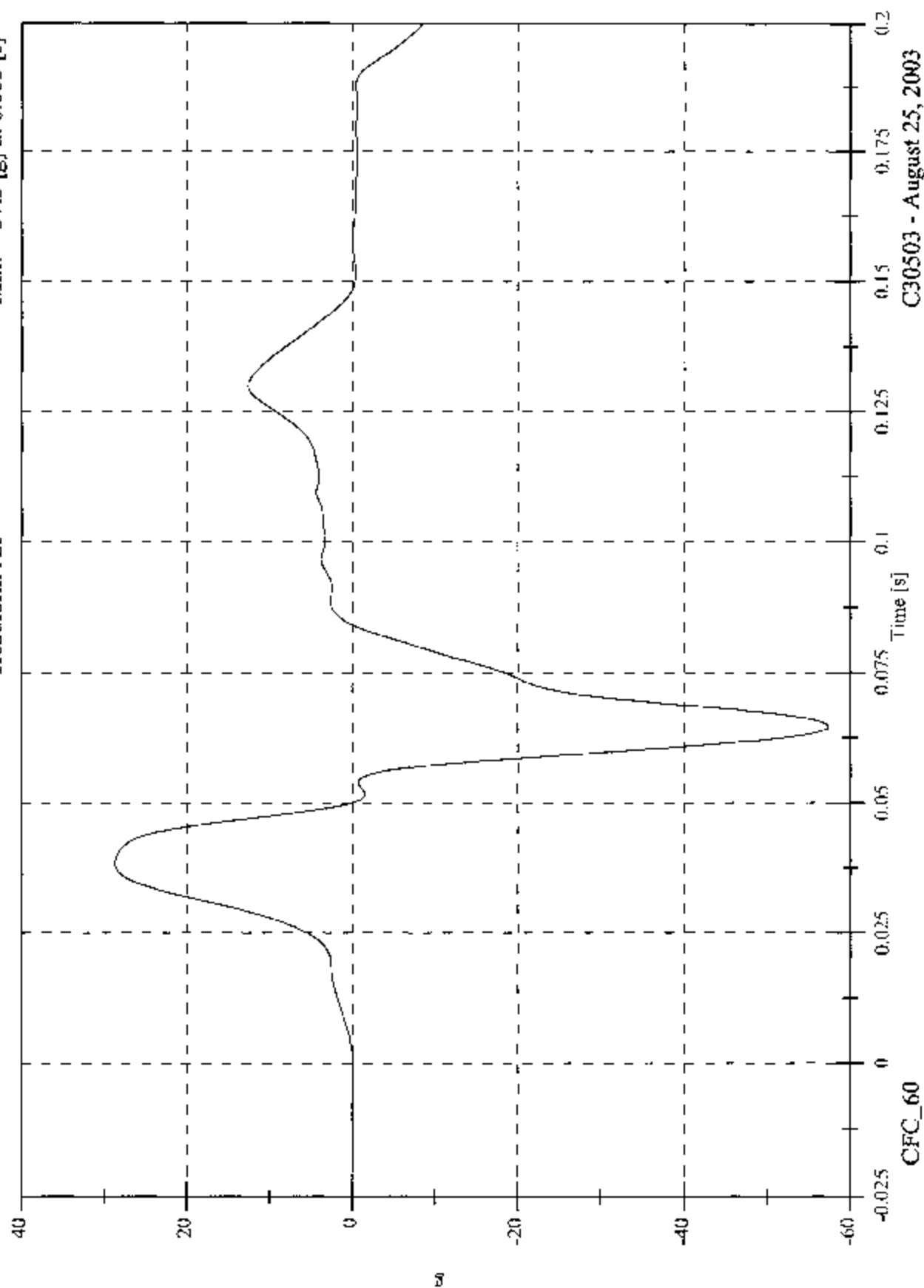
C30503 - August 25, 2003

FMVSS 201 Linear Impact - 2003 Hyundai Elantra

Headform Ax

Max: 28.7 [g] at 0.038 [s]

Min: -57.3 [g] at 0.065 [s]

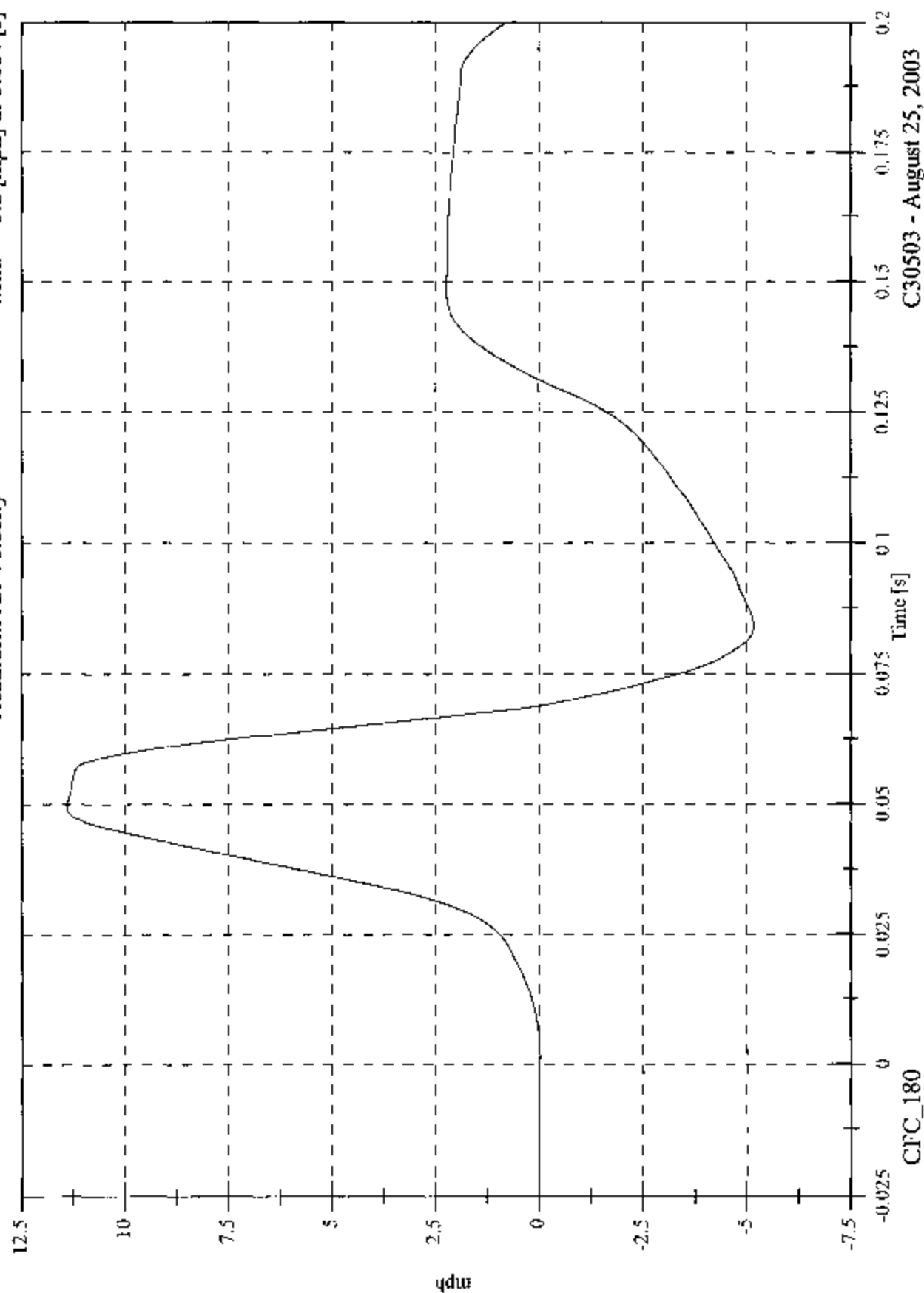


C30503 - August 25, 2003

FMVSS 201 Linear Impact - 2003 Hyundai Elantra

Headform Ax Velocity

Max: 11.4 [mph] at 0.049 [s]
Min: -5.2 [mph] at 0.084 [s]



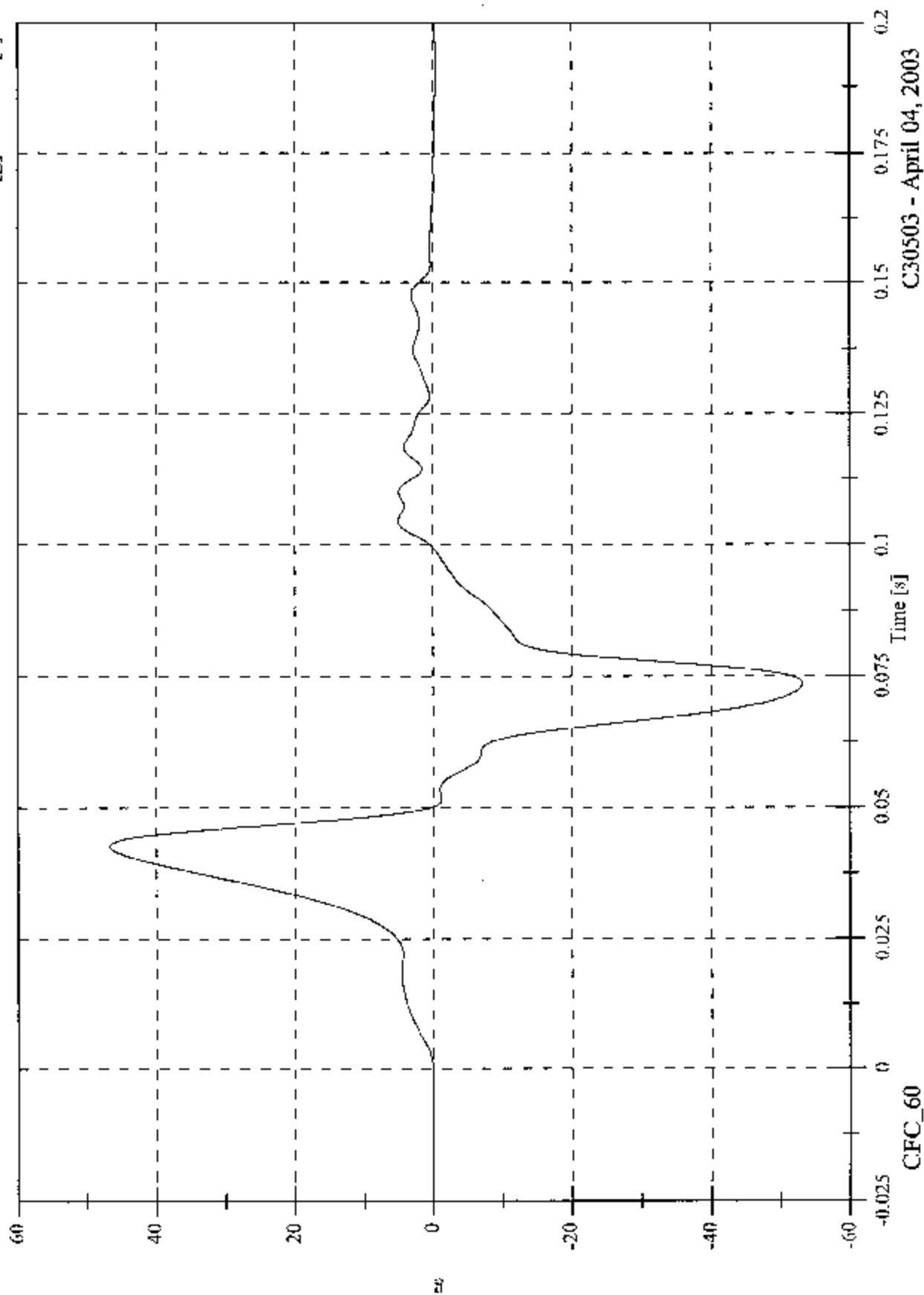
CFC_180

C30503 - August 25, 2003

FMVSS 201 Linear Impact - 2003 Hyundai Elantra

Max: 46.8 [g] at 0.042 [s]
Min: -53.1 [g] at 0.073 [s]

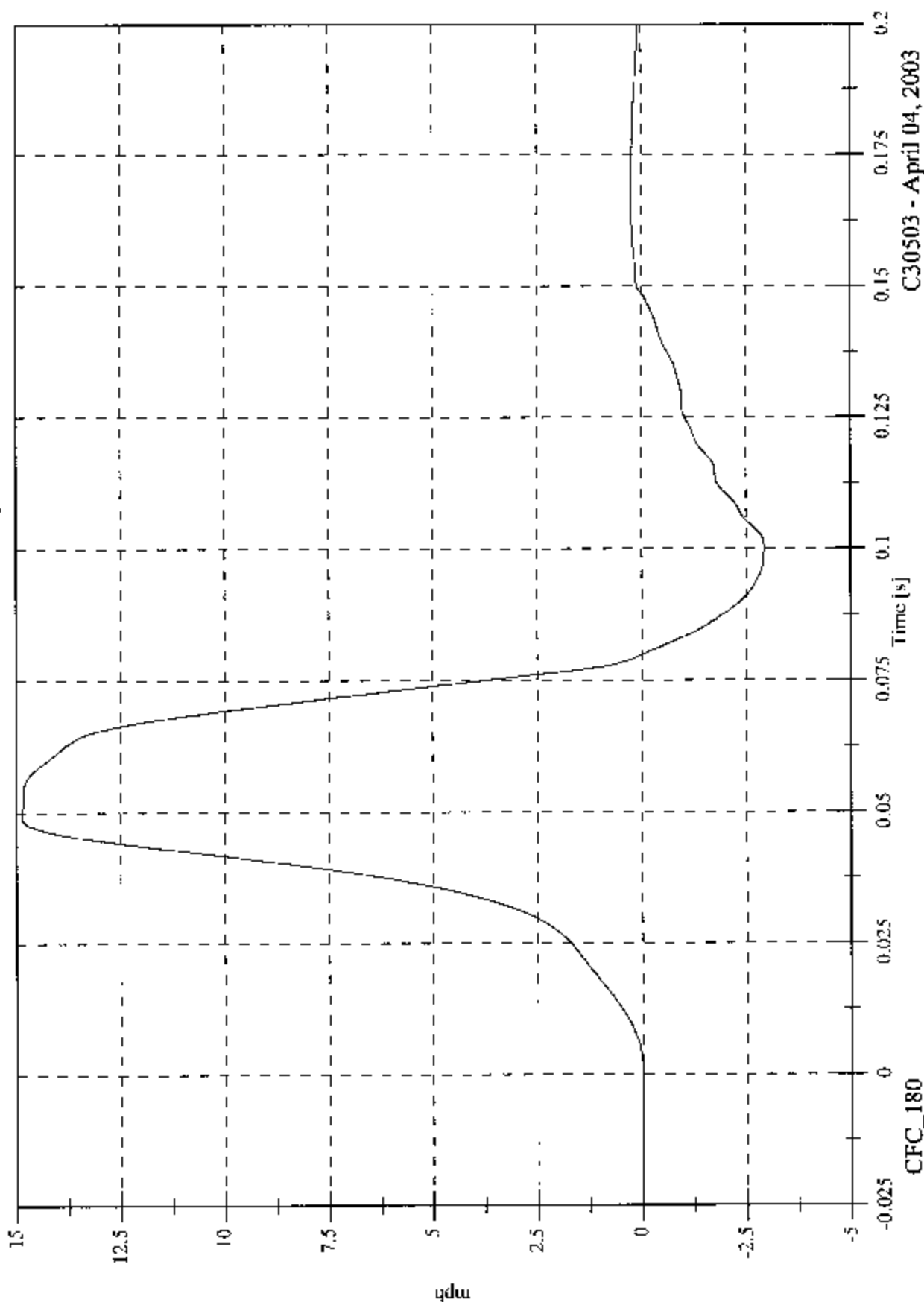
Headform Ax



Max: 14.9 [mph] at 0.049 [s]
Min: -2.9 [mph] at 0.100 [s]

FMVSS 201 Linear Impact - 2003 Hyundai Elantra

Headform Ax Velocity



C30503 - April 04, 2003

APPENDIX C

INTERIOR COMPARTMENT DOOR CALCULATIONS

Note: Latch systems were not evaluated.