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APPENDICES AND SUPPORTING DATA

STUDY 10 - 18 - 89 / 0 - 913
IN COOPERATION WITH

TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

RESEARCH REPORT 913-1F, VOLUME 4
AUGUST 1990

CENTER FOR GEOTECHNICAL & HIGHWAY MATERIALS RESEARCH
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APPENDIX A

SPECIFICATIONS OF EQUIPMENTS USED

Table A.1 Specifications of Piezoelectric Accelerometer (Manufactured by PCB Piezotronics, Inc.)

Description	Units	Values
Model Number		308B02
Range (for ± 5V output)	±g	5
Resolution	g	0.0005
Sensitivity	mv/g	1000
Resonant Frequency (MTD)	kHz	25
Frequency Range (± 5%)	Hz	2.5-3000
Frequency Range (± 10%)	Hz	1.5-5000
Vibration	±gpeak	100
Shock (max)	g	200
Transverse Sensitivity	percent	≤5

Table A.2 Specifications of LVDT (Manufactured by Schaevitz Engineering)

Description	Units	Values
Model		125 HPD
Input Power Supply	Volts	±15
Output	Volts	±10
Output Load	Ohms	.5 MEG
AC Ripple	mV	< 25
Core length	in.	1.10
Core Diameter	in.	.188

Table A.3 Specifications of Proximeter Probe (Manufactured by Bently Nevada, Inc.)

Description	Units	Values
Model		7200
Frequency Range	Hz	DC to 10,000
Resolution	in.	50
Calibrated Range	mils	80
Scale Factor	mV/mils	200
Linearity	mils	0.8*
Output Impedance	Ohms	2,500
Target Material		AISI 4140

* Within 200 mv/mil straight line if calibrated as a system

Table A.4 Specifications of Laser Optocator (Manufactured by Selective Electronic Group)

Description	Units	Values
Model		2201
Measurement Range	in.	±0.31
Light Source		IR Laser Diode
Wavelength	in.	$3.425*10^{-5}$
Pulse Frequency	kHz	32
Stand-off distance	in.	3.74

Table A.5 Specifications of Geophone (Manufactured by Mark Products, Inc.)

Description	Units	
Model		L15 B
Natural Frequency	Hz	4.5
Shunt Resistance	kOhms	6.65
Coil Resistance	Ohms	380
Transduction Constant for open circuit	Volts/in/ Sec	.916
Geophone Transduction Constant	Volts/in/ Sec	.867
Frequency Tolerance	Hz	±.5

Table A.6 Specifications of Piezoelectric Load Cell (Manufactured by PCB Piezotronics, Inc.)

Description	Units	Values
Model Number		200B20
Range (Compression)	lb	20000
Useful OverRange	lb	30000
Sensitivity	mV/lb	.25
Maximum Force	lb	30000
Resolution	lb	0.40
Resonant Frequency	kHz	30
Vibration/Shock	G's peak	2000/50000
Shock (max)	g	200
Stiffness	lb/ in	100

Table A.7 Specifications of Recording Device
(Manufactured by Hewlett Packard, Inc.)

Description	Units	Values
Model Number		3562A
Measurement Range	Hz	64 to 100k
No. of Channels		2
Accuracy	percent	±0.004
Source Output Impedance	Ohms	50 nominal
Source Output Level	Vpk	±10
Input Impedance	MOhms	1±5%
Input Coupling		ac or dc

Table A.8 Specifications of Wavetek Arbitrary Waveform Generator (Manufactured by Wavetek, Inc.)

Description	Units	Values
Model Number		75
Standard Waveforms		DC,Square,Triangle, Sine,Cosine,Inverse Sine,Haversine,up-ramp,down-ramp
Waveform Resolution		2048 points horizontal* 4095 points vertical
Sample Rate Range	Hz	.02 to $4*10^6$
Frequency Resolution	Digits	4
Output Amplitude Range	Volts	±0.005 to 5
Output Signal Resolution	digits	3

Table A.9 Specifications of Multi-Channel Rack Power Unit (Manufactured by PCB Piezotronics, Inc.)

Description	Units	Values
Model		483B05
Voltage Gain		1:1
Frequency Response,±5%	Hz	.25 to 200K
No. of Channels		6
Noise-Electrical-Wideband	V	350
Coupling Time Constant	Sec	2

Table A.10 Specifications of Power Amplifier (Manufactured by MB Dynamics, Inc.)

Specifications of Exciter Amplifier			
S No.	Description	Units	
1	Model		2120 MB
2	Frequency Range	cps	5-10,000
3	Force Vector	lbs.	35
4	Vector Capability	in/sec	70
5	Input Impedance	Ohms	20,000

Table A.11 Specifications of Exciter Used as a Vibration Source (Manufactured by MB Dynamics, Inc)

Description	Units	Values
Model		PM50A
Force Output	lb peak's	50
Displacement (peak to peak)	in	0.5
Acceleration	g	78
Frequency Range	Hz	5-10,000
Rated Drive Coil Current	Amperes	8.5
Drive Coil Resistance	Ohms	1.3

Table A.12 Specifications of Analog-to-Digital Board Used in Experiment

Description	Units	Values
Model		DT 2825
Number of Analog Inputs		16SE, 8DI
Input Ranges	Volts	±10
Output Data Codes		Offset Binary
Gain Range		1,10,100,500
Maximum Input Voltage (Power on)	Volts	± 35
Resolution	bits	12
Channel Crosstalk	dB	-80 at 1kHz
A/D Conversion Time	S	10
A/D Throughput to System Memory	/Sec	45,000 samples
Sample and Hold Droop Rate	mV/ms	0.1
External Trigger Type		Schmitt trigger
Usable Frequency Range	Hz	.5 to 250000

APPENDIX B

RESPONSE OF ACCELEROMETER

APPENDIX B

RESPONSE OF ACCELEROMETER

The pulse response of piezoelectric transducer can be illustrated through an example by considering the displacement input of Figure B.1. The amplitude of pulse is equal to A and duration of pulse is T. The voltage generated due to displacement is assumed to be e_o and K_q is a proportionality constant. The differential equation (Doebelin, 1983) for displacement input of Figure B.1 can be written as:

$$(\tau S + 1)\, e_o = (K \tau S)\, x_i \qquad \text{(B.1)}$$

where τ is discharge time constant of the piezoelectric element, x_i is the amplitude of the pulse. The value of K denotes the sensitivity of the accelerometer and S denotes Laplace transform operator. Since x_i = A for 0<t<T, the Equation B.1 becomes

$$(\tau S + 1)\, e_o = 0 \qquad \text{(B.2)}$$

Now at $t=0^+$, the displacement x_i is A, and so the charge suddenly increases to K_q A/C (C is the capacitance of piezoelectric accelerometer). Thus our initial condition is

$$e_o = \frac{K_q A}{C} \ at \ t = 0^+ \tag{B.3}$$

Solving equation B.2 with the initial condition of Equation B.3 yields:

$$e_o = \frac{K_q A}{C} e^{-\frac{t}{\tau}} \quad 0<t<T \tag{B.4}$$

Equation B.4 holds for $t \leq T$. For $T < t < \infty$, the x suddenly drops an amount A, causing a sudden decrease in charge of K_q A and a sudden decrease in e_o of $K_q A/C$ from its value at t=T. Thus at t=T, e_o is given by

$$e_o = \frac{K_q A}{C}(e^{-\frac{T}{\tau}}-1) \tag{B.5}$$

By combining Equation B.2 and boundary condition (Equation B.5) the solution is then:

$$e_o = \frac{K_q A}{C}(e^{-\frac{T}{\tau}}-1)\ e^{-(t-T)/\tau} \quad T<t<\infty \tag{B.6}$$

Shown in Figure B.2 are the graphical depictions of solutions to Equations B.4 and B.6 for three different discharge time constants. Its quite clear that for faithful reproduction of x_i, large value of τ is desirable. If the decay and "undershoot" at t=T are to be kept within, say, 5 percent of the true value, τ must be at least 20T. The piezoelectric accelerometer used in setup has a discharge time constant of 0.2 Sec, so for accurate measurement pulse duration should not exceed 100 mSec.

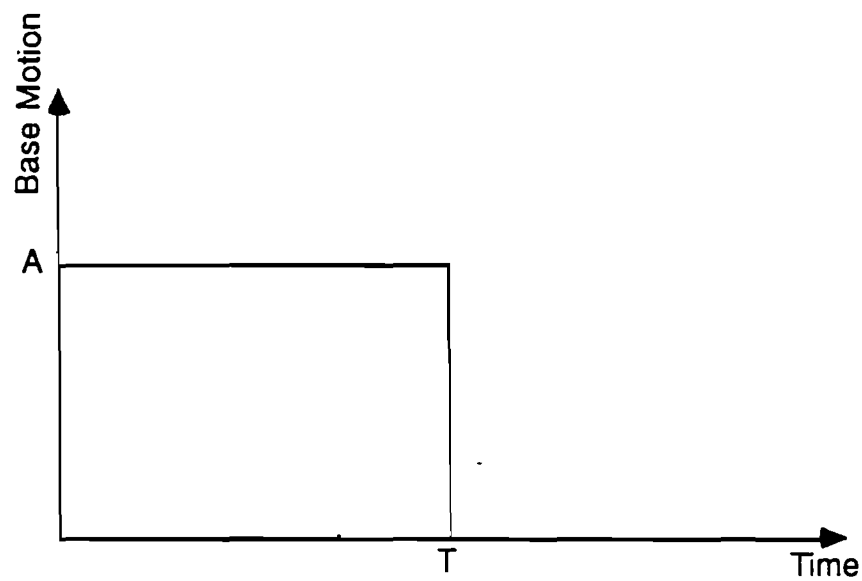


Figure B.1 Input to the Base of Accelerometer (from Doebelin, 1983)

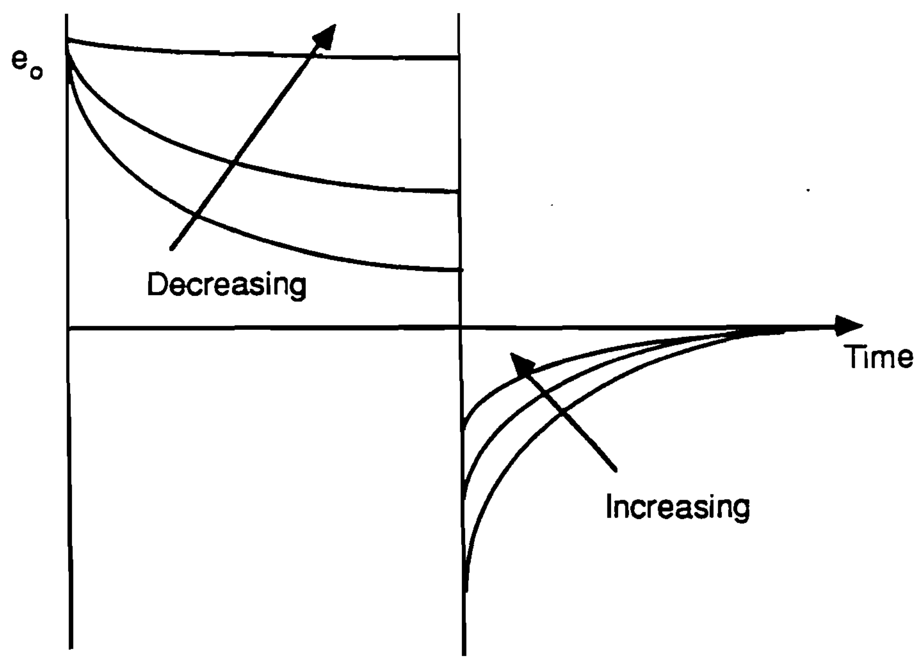


Figure B.2 Theoretical Response of Piezoelectric Accelerometer to a Pulse Shown in Figure B.1 (from Doeblin,1983)

APPENDIX C

CALIBRATION CURVES OF SENSORS

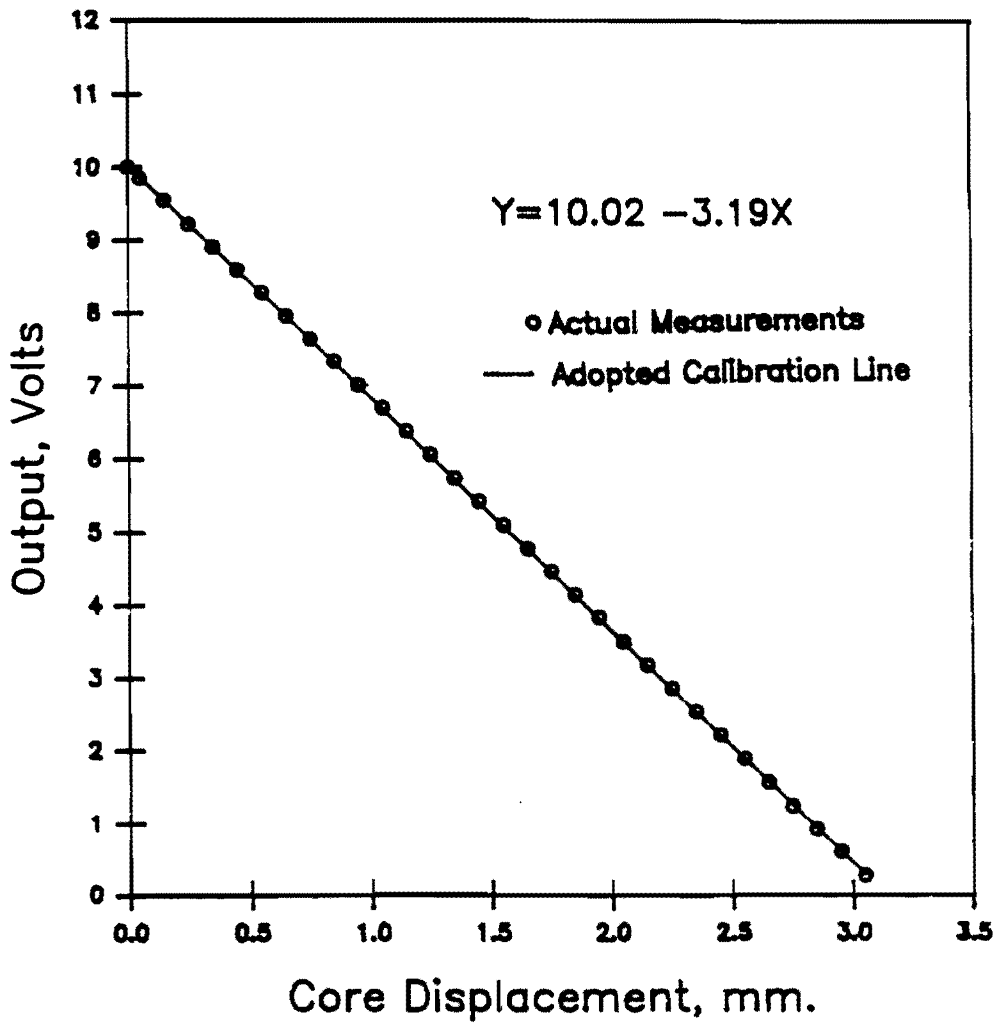


Figure C.1 Calibration Curve for the LVDT Used in This Study.

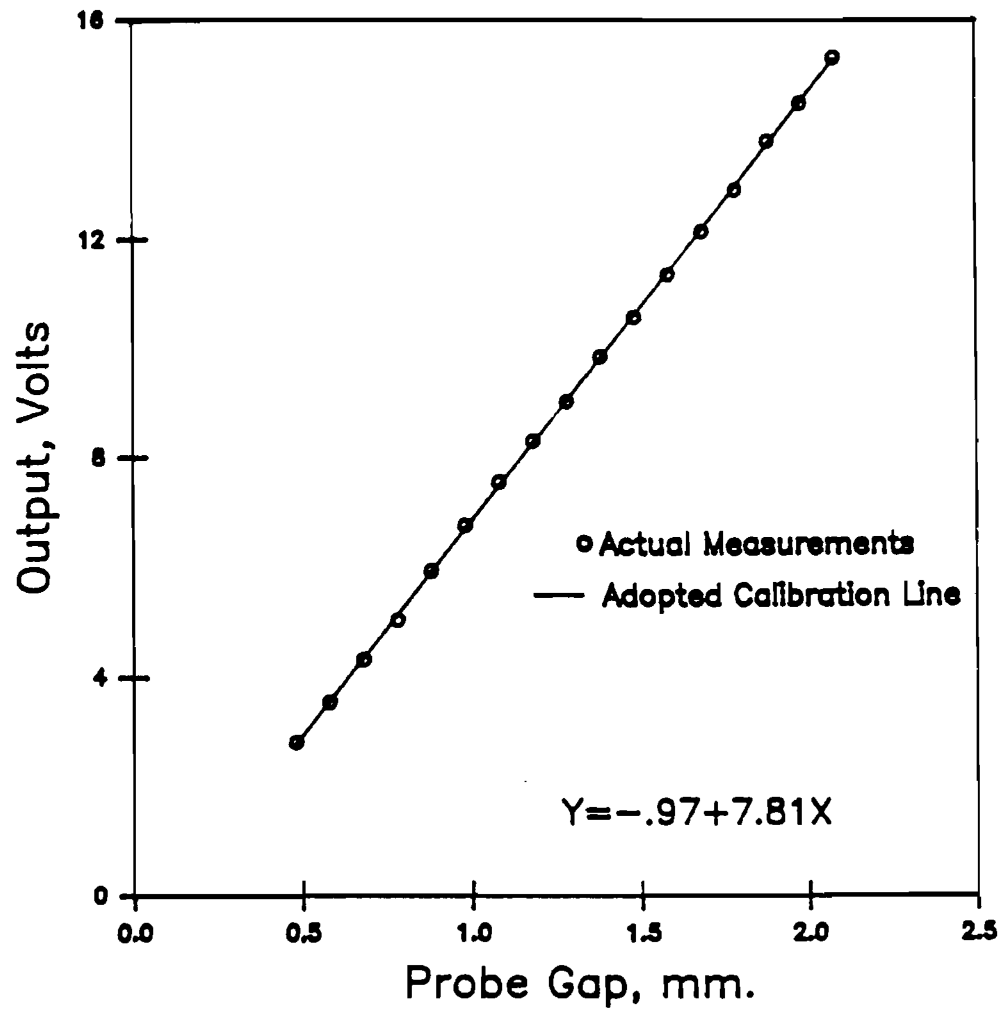


Figure C.2 First Calibration Curve for the Proximeter Used in This Study (Calibrated in February, 1989)

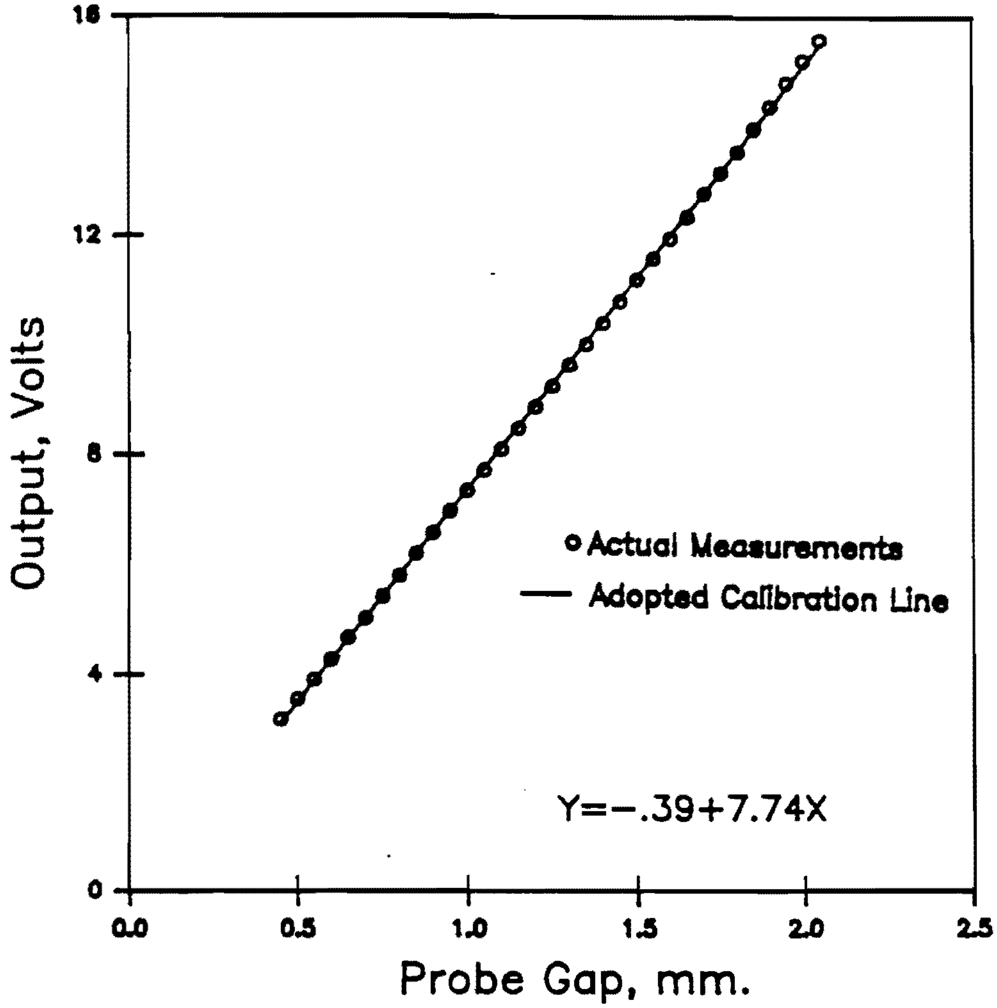


Figure C.3 Second Calibration Curve for the Proximeter Used in This Study (Calibrated in August, 1989)

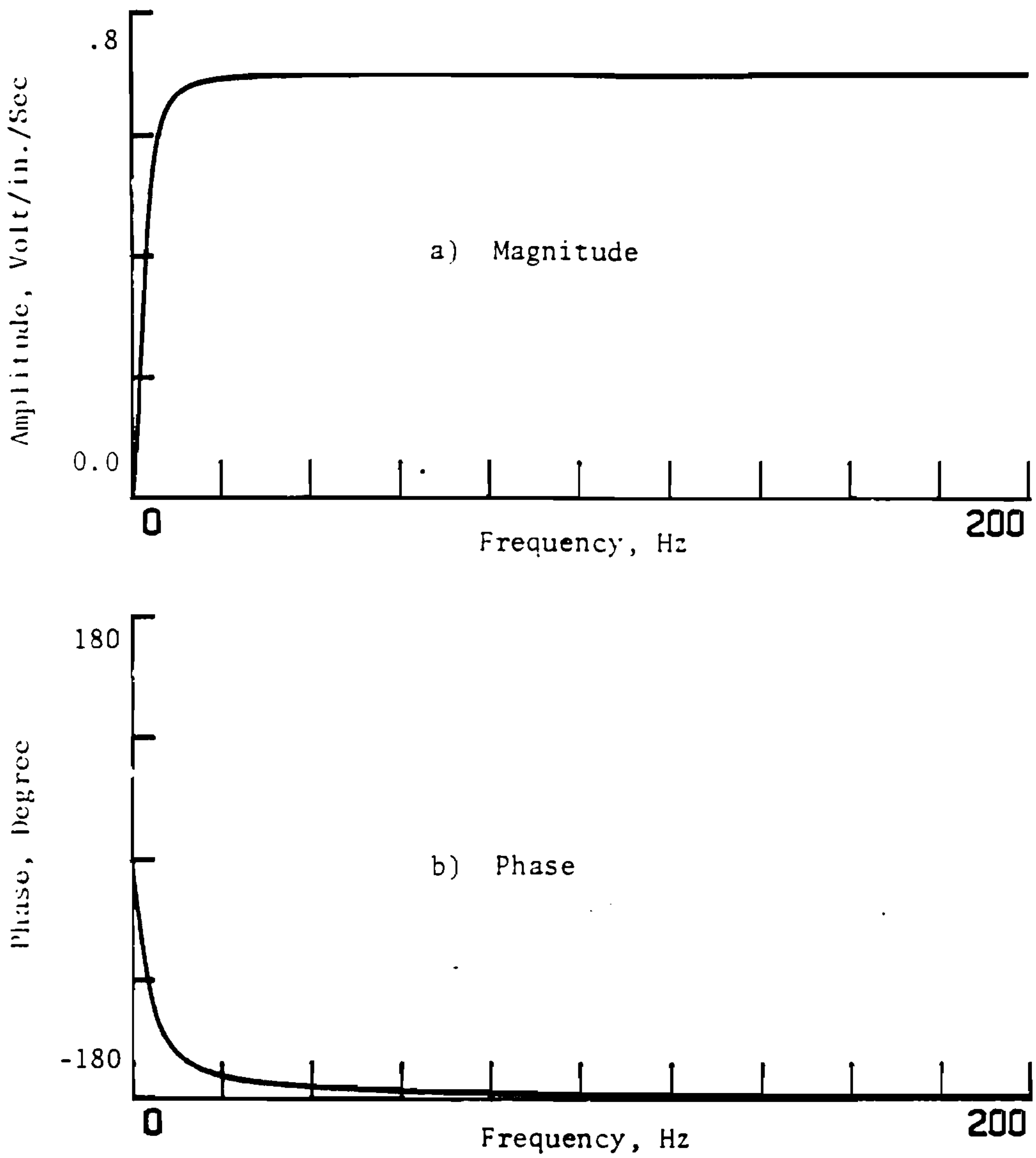


Figure C.4 Calibration Curves for Geophone 1.

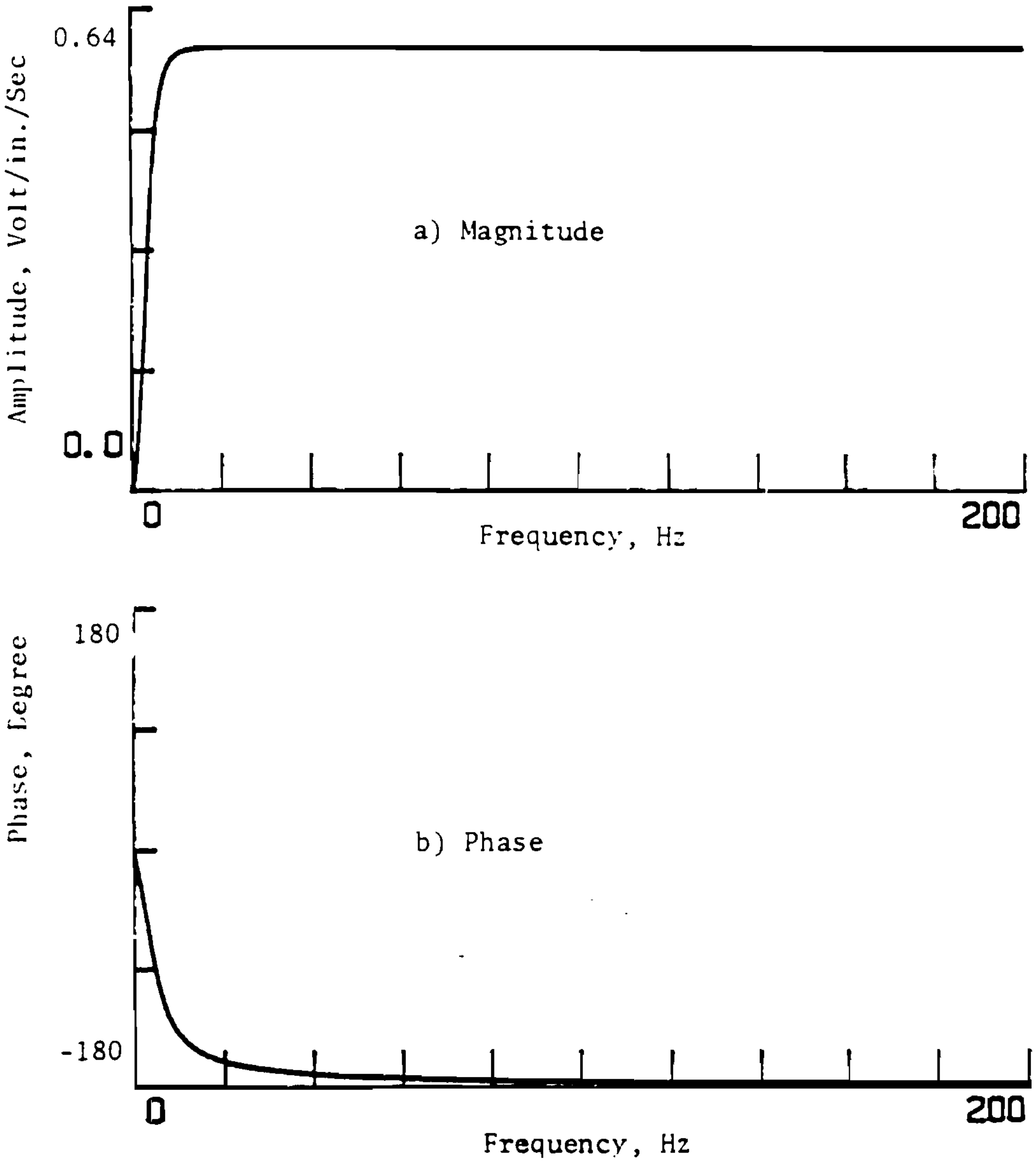


Figure C.5 Calibration Curves for Geophone 2.

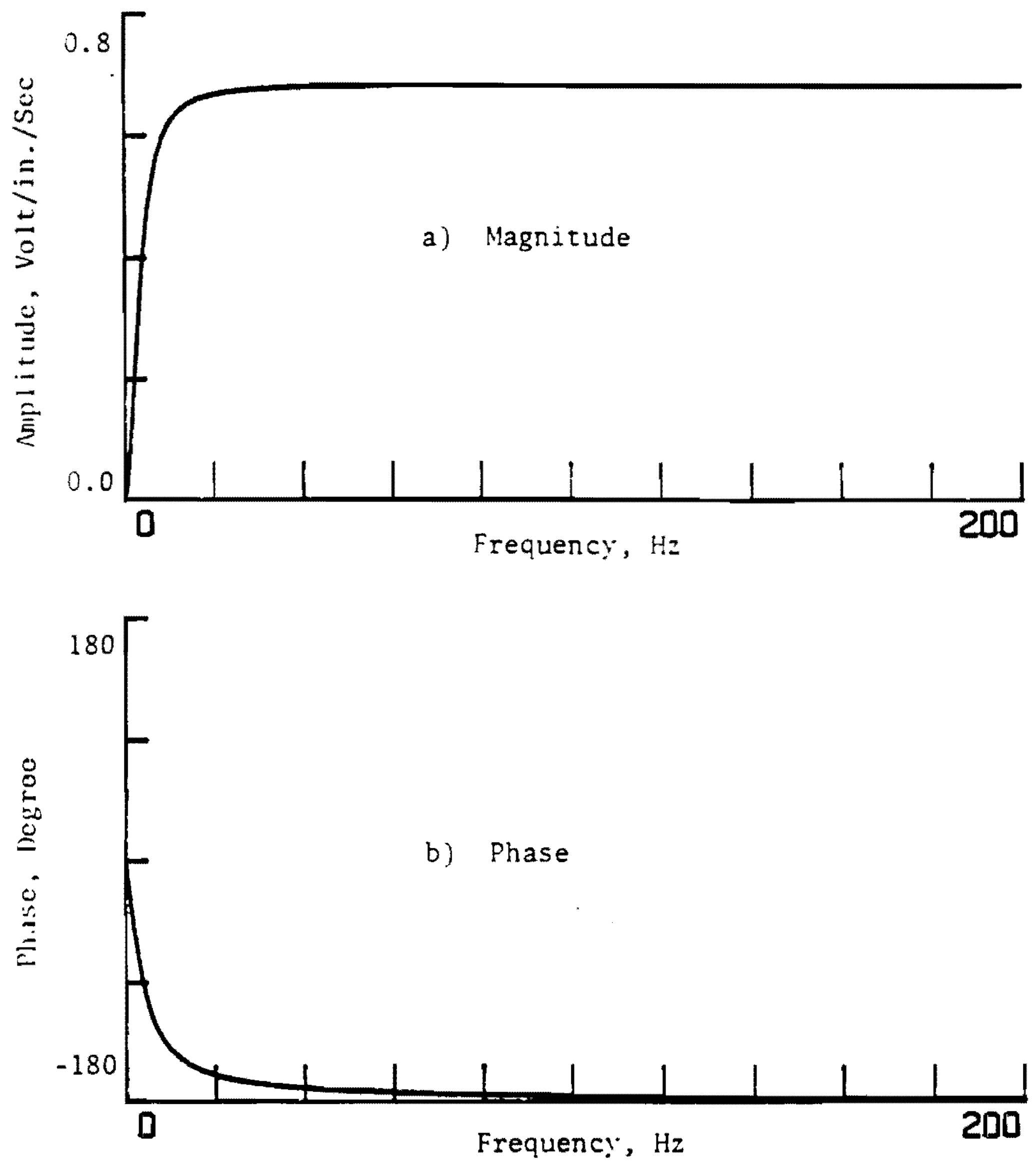


Figure C.6 Calibration Curves for Geophone 5

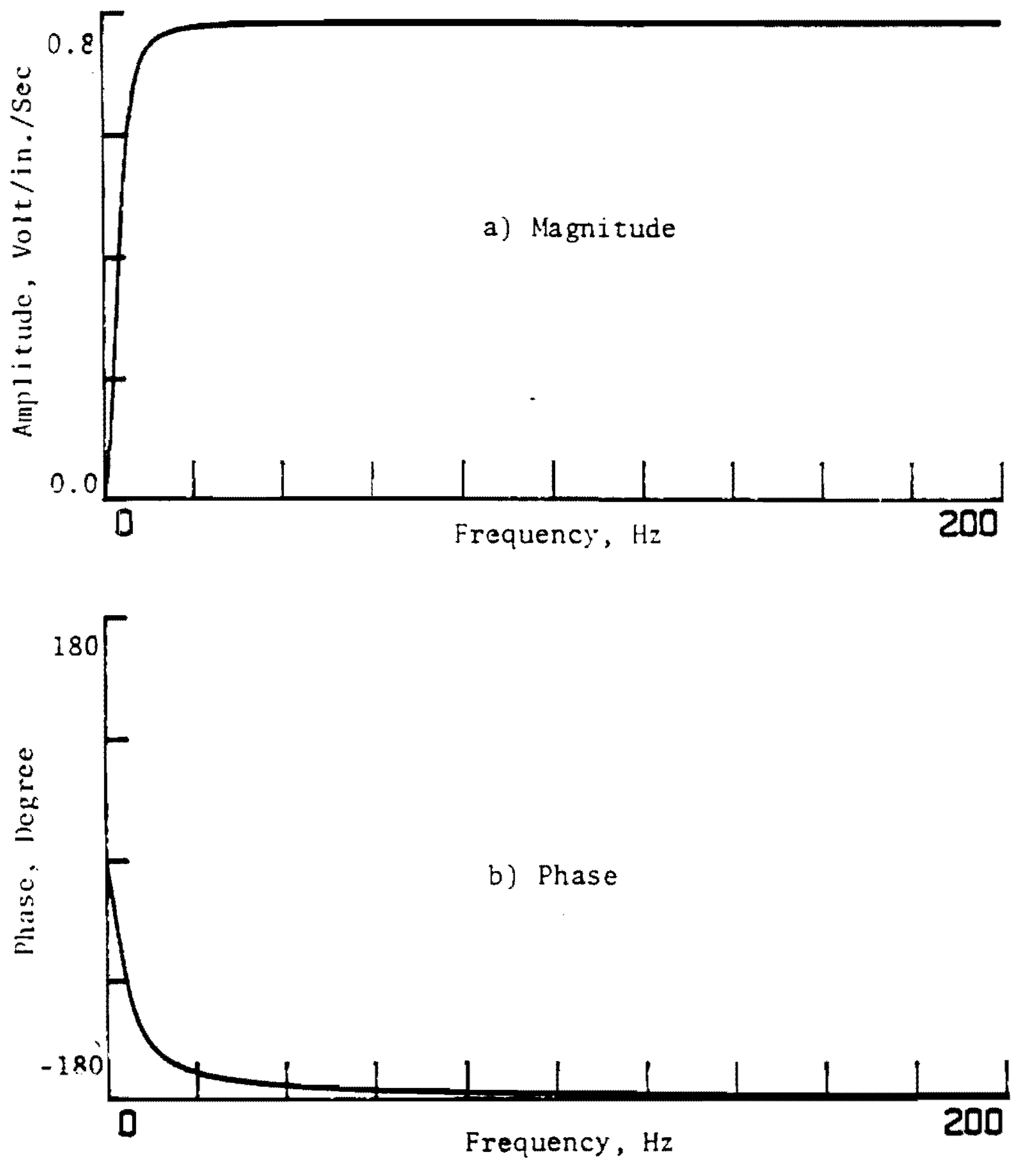


Figure C.7 Calibration Curves for Geophone 6.

PCB

PIEZOTRONICS

CALIBRATION DATA

ICP ACCELEROMETER (per ISA-RP 37.2)

Model No. 308B02

Serial No. 23641

By P. Jarmuez

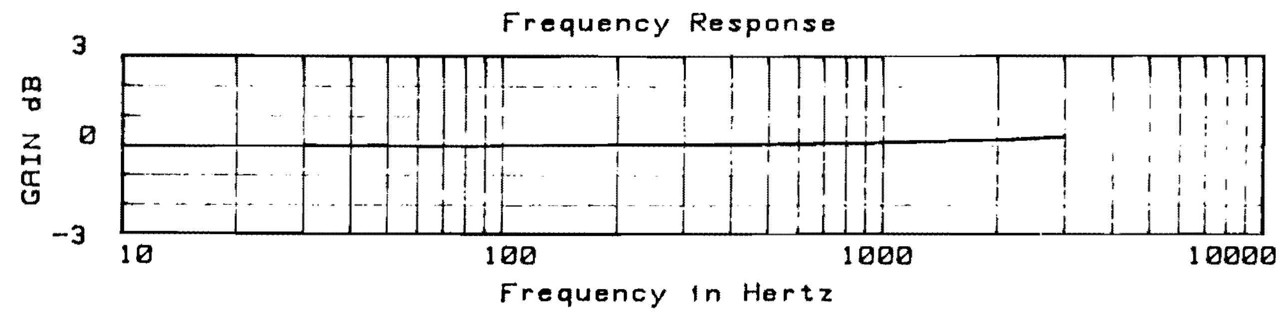
Date 11-18-88

Voltage sensitivity:	989	mV/g		Resonant Frequency:	34	kHz
Transverse sensitivity:	4.2	%		Time constant:	0 .2	s
Resolution:	0.0005	g		Maximum temperature:	250	°F
Output bias level:	11.7	V		Range:	5	± g

The Calibration procedure of PCB Piezotronics is in compliance with MIL-STD-45662.

Freq. Hz	10	15	30	50	100	300	500	1000	3000			
Deviation %	-1.0	-.7	0.0	0.0	0.0	.5	.9	1.4	3.7			

Calibration traceable to NBS through project no. 732/241226-88



PCB PIEZOTRONICS, INC. 3425 Walden Avenue Depew, New York 14043-2495

Figure C.8 Calibration of Accelerometer 1 (from Piezotronics, Inc., 1989)

Figure C.9 Calibration of Accelerometer 2 (from Piezotronics, Inc., 1989)

PCB

PIEZOTRONICS

CALIBRATION DATA
ICP ACCELEROMETER (per ISA-RP 37.2)
Model No. 308B02
Serial No. 23642

By [signature]

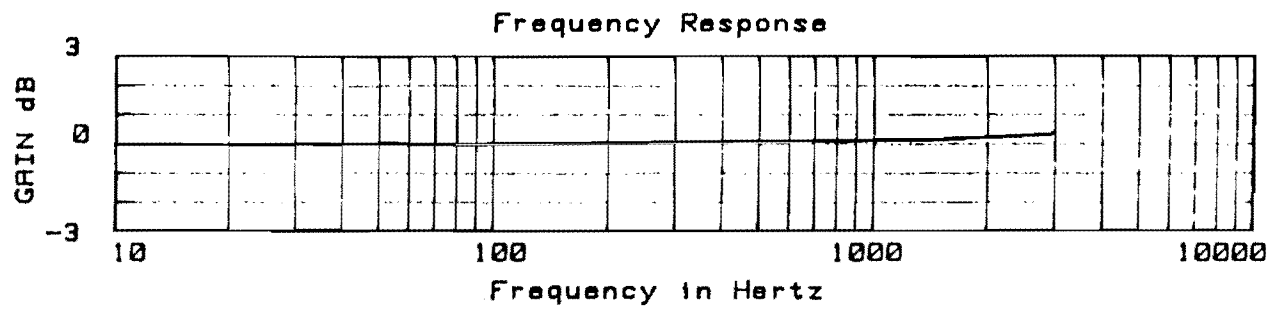
Date 11-18-88

Voltage sensitivity:	984	mV/g		Resonant Frequency:	33.5	kHz
Transverse sensitivity:	1.8	%		Time constant:	0 .2	s
Resolution:	0.0005	g		Maximum temperature:	250	°F
Output bias level:	11.6	V		Range:	5	± g

The Calibration procedure of PCB Piezotronics is in compliance with MIL-STD-45662.

Freq. Hz	10	15	30	50	100	300	500	1000	3000			
Deviation %	-.8	-.8	-.1	0.0	0.0	.5	1.0	1.5	4.3			

Calibration traceable to NBS through project no. 732/241226-88



PCB PIEZOTRONICS, INC. 3425 Walden Avenue Depew, New York 14043-2495

ICP CALIBRATION DATA

PCB

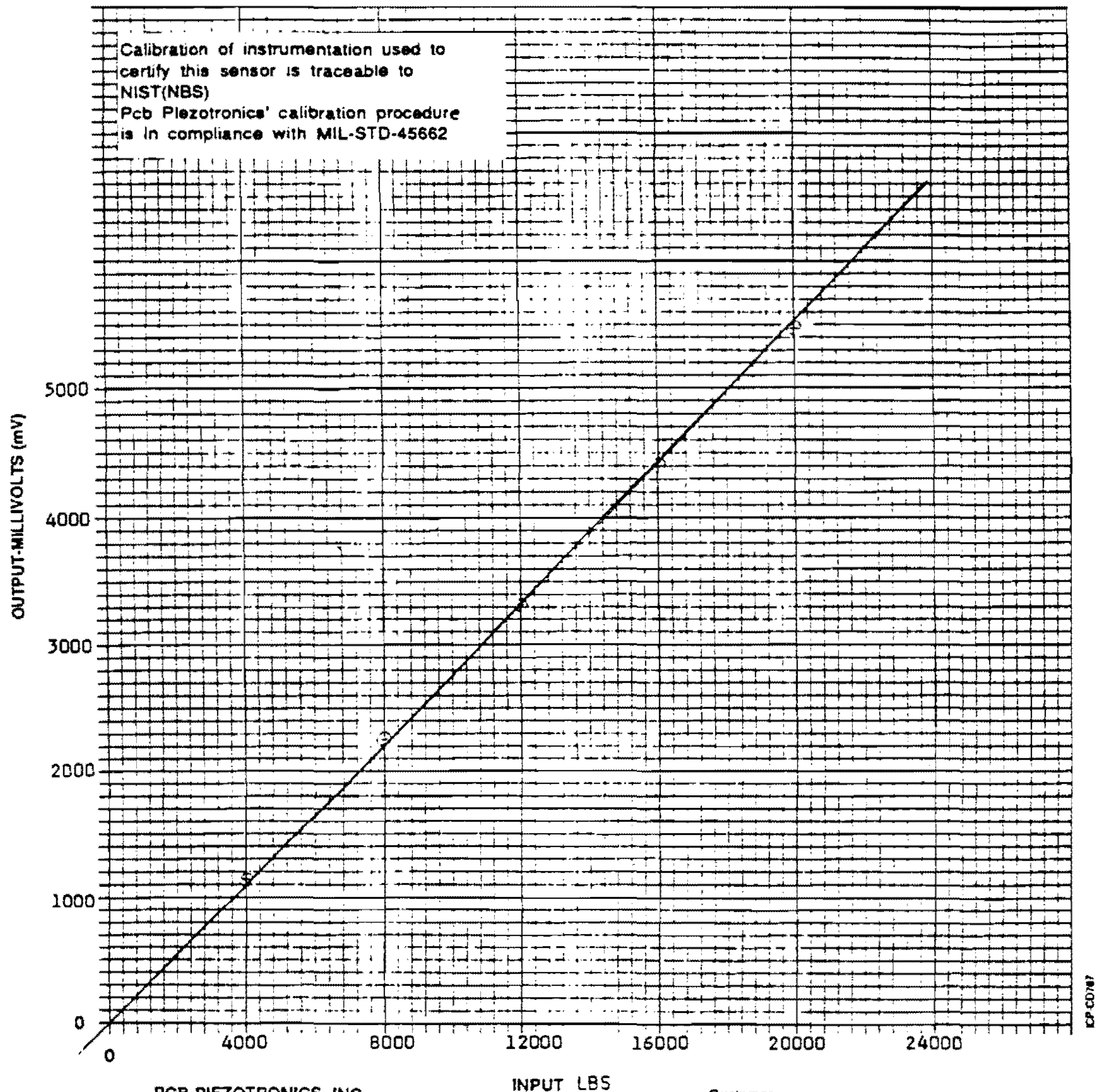
Cal Range 0 - 20,000 LBS   Input TC 2000 sec

Model 200B20   Sens* 0.277 mV/ lbs   Rise Time 15 μ sec   By R. Burk

S/N 1759   Linearity* 1.0 %FS   Nat'l Freq 30 kHz   Date 8-16-89

* By comparison with reference standard per ISA S37.10. Zero Based best straight line.

Output Imp <100 ohms



PCB PIEZOTRONICS, INC.
3425 Walden Avenue, Depew NY 14043
Tel: 716-684 0001 TWX: 710-263 1371

Customer ______

PO Number ______

Figure C.10 Calibration Curve of Load cell 1 (from Piezotronics, Inc., 1989)

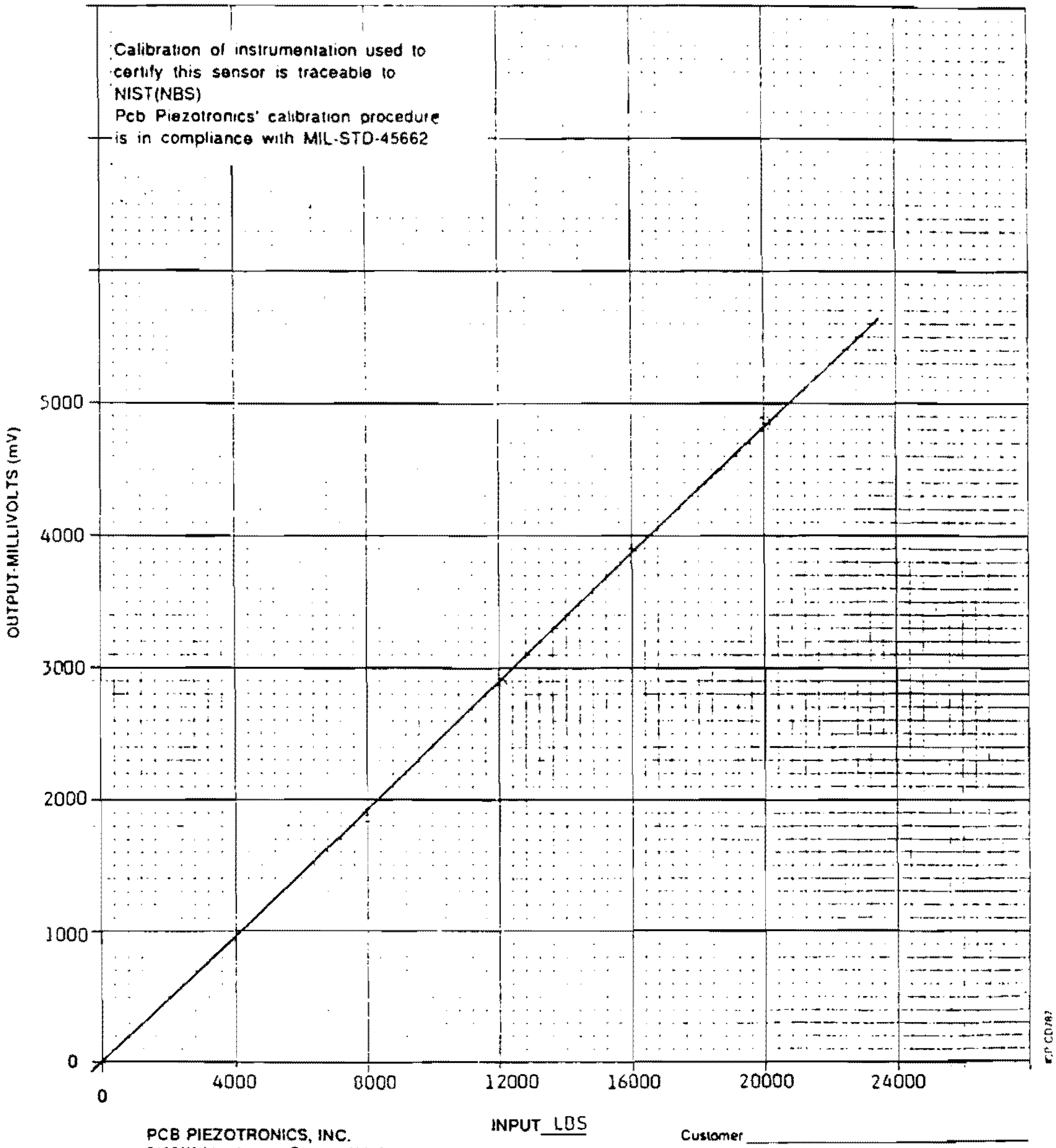
ICP CALIBRATION DATA

PCB

Model 200 B20 — Cal Range 0 - 20,000 LBS — Sens* 0.241 mV/ lbs — Linearity* ≤1.0 %FS

S/N 1505 — Input TC 2000 sec — Rise Time 15 µsec — Nat'l Freq 30 kHz — Output Imp <100 ohms

By R. Busch — Date 11-22-89



PCB PIEZOTRONICS, INC.
3425 Walden Avenue, Depew NY 14043
Tel 716-684-0001 TWX 710-263-1371

Customer ____________

PO Number ____________

Figure C.11 Calibration curve of Load cell 2 (from Piezotronics, Inc., 1989)

ICP CALIBRATION DATA

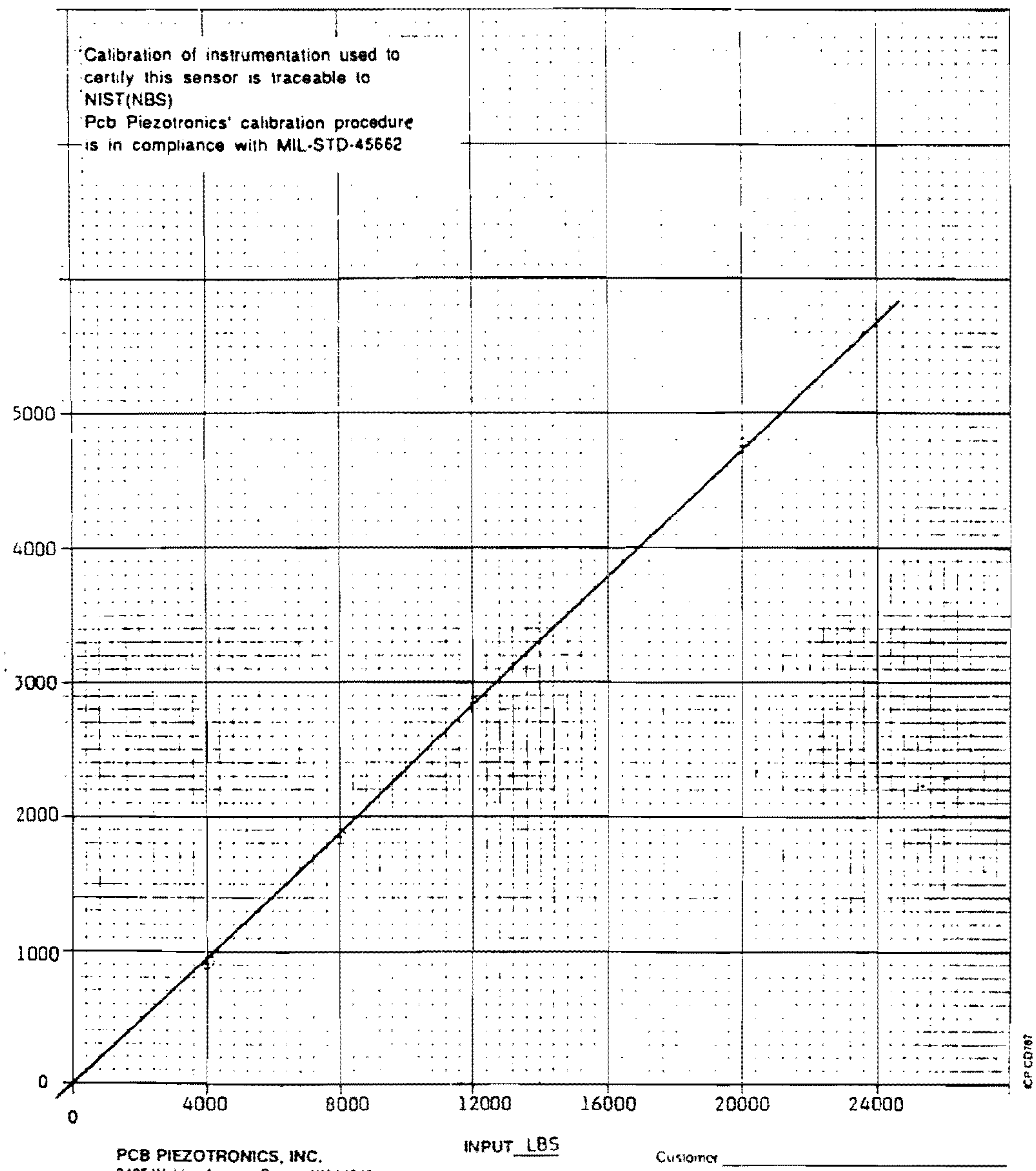
PCB

Cal Range 0 - 20,000 LBS | Input TC 2000 sec

Model 200B20 | Sens* 0.237 mV/ lbs | Rise Time 15 μ sec | By R. Banks

S/N 1806 | Linearity* ≤1.0 %FS | Nat'l Freq 30 kHz | Date 11-22-89

* By comparison with reference standard per ISA S37.10 Zero Based best straight line | Output Imp < 100 ohms



PCB PIEZOTRONICS, INC.
3425 Walden Avenue, Depew NY 14043
Tel 716-684 0001 TWX 710-263 1371

Customer ____________

PO Number ____________

Figure C.12 Calibration Curve of Load cell 3 (from Piezotronics, Inc., 1989)

Table C.1 Equipments Used for Calibration of LVDT

Date of Calibration : Feb. 1, 1989

Initial Reading of Micrometer : 3.25 mm

Equipment	Manufactured By	Model	Serial No.
LVDT	Schaevitz	125 HPD	4745
Micrometer	Mitutoyo	L.C. .01 mm	----
Multimeter	Tenmax	72-058	----
DC Supply ±15 V	Tenmax	72-420	8700642

Table C.2 Comparison of the Measured Output to the Calibrated Output for LVDT Used in This Study

Core Displacement (mm)	Measured Output (DC volts)	Calibrated Output* (DC volts)	Percent Difference+
1	2	3	4
0.00	10.00	10.02	-0.24
0.05	9.85	9.86	-0.15
0.15	9.54	9.54	-0.06
0.25	9.21	9.22	-0.18
0.35	8.90	8.90	-0.09
0.45	8.58	8.58	-0.04
0.55	8.27	8.26	0.00
0.65	7.95	7.95	-0.01
0.75	7.63	7.63	-0.02
0.85	7.32	7.31	0.10
0.95	7.00	6.99	0.09
1.05	6.69	6.67	0.23
1.15	6.37	6.35	0.22
1.25	6.05	6.03	0.22
1.35	5.73	5.71	0.21
1.45	5.41	5.39	0.21
1.55	5.09	5.07	0.20
1.65	4.77	4.76	0.30
1.75	4.45	4.44	0.19
1.85	4.13	4.12	0.18
1.95	3.82	3.80	0.43
2.05	3.49	3.48	0.15
2.15	3.17	3.16	0.13
2.25	2.85	2.84	0.11
2.35	2.53	2.52	0.09
2.45	2.21	2.20	0.06
2.55	1.88	1.88	-0.25
2.65	1.55	1.57	-1.08
2.75	1.23	1.25	-1.36
2.85	0.91	0.93	-1.51
2.95	0.60	0.61	-1.46
3.05	0.27	0.29	-5.76

+Percent Difference $= \frac{\{col(2)-col(3)\}*100}{col(2)}$

*Calibrated Output is Linear Curve Fit data obtained by the Equation Y=10.02-3.19X where X is Core Displacement (mm) and Y is Calibrated Output (Volts).

Table C.3 Equipment Used for Calibration of the Proximeter in February, 1989

Date of Calibration : February 21, 1989

Initial Reading of Micrometer : 0.32 mm

Equipment	Manufactured By	Model	Serial No.
Proximeter	Bently Nevada	7200-5 mm	4745
Micrometer	Mitutoyo	L.C. .01 mm	----
Multimeter	Tenmax	72-058	----
DC Supply -24 V	Hewlett Packard	6220b	7a0503

Table C.4 Equipment Used For Calibration of the Proximeter in August, 1989

Date of Calibration : August 1, 1989

Initial Reading of Micrometer : 0.32 mm

Equipment	Manufactured By	Model	Serial No.
Proximeter	Bently Nevada	7200-5 mm	4745
Micrometer	Mitutoyo	L.C. .01 mm	----
Multimeter	John Fluke Mfg. Co.	8000A	15535
DC Supply -20 V	Hewlett Packard	6237B	----

Table C.5 Comparison of the Measured Output to the Calibrated Output for the Proximeter Used in This Study (Calibrated Date : February, 1989)

Probe Gap (mm)	Measured Output (Volts)	Calibrated Output (Volts)*	Percent Difference
1	2	3	4
0.48	2.81	2.78	0.85
0.58	3.55	3.56	-0.35
0.68	4.32	4.34	-0.67
0.78	5.04	5.13	-1.69
0.88	5.93	5.91	0.31
0.98	6.75	6.69	0.92
1.08	7.54	7.47	0.87
1.18	8.29	8.25	0.42
1.28	9.02	9.03	-0.19
1.38	9.84	9.81	0.22
1.48	10.56	10.59	-0.37
1.58	11.35	11.38	-0.27
1.68	12.13	12.16	-0.26
1.78	12.89	12.94	-0.41
1.88	13.78	13.72	0.40
1.98	14.49	14.50	-0.11
2.08	15.32	15.28	0.21

+ Percent Difference $= \frac{\{col(2) - col(3)\} * 100}{col(2)}$

* Calibration is valid in the range of probe gaps of .48 mm to 2.08 mm. Calibrated Output is Linear Curve Fit data obtained by the equation Y=-.97+7.81X where X is probe gap (mm) and Y is Calibrated Output (Volts).

Table C.6 Comparison of the Measured Output to the Calibrated Output for the Proximeter Used in This Study (Calibrated Date : August, 1989)

Probe Gap (mm)	Measured Output (Volts)	Calibrated Output (Volts)*	Percent+ Difference
1	2	3	4
0.45	3.16	3.09	2.25
0.50	3.53	3.47	1.53
0.55	3.90	3.86	0.95
0.60	4.27	4.25	0.47
0.65	4.67	4.64	0.71
0.70	5.02	5.02	-0.07
0.75	5.42	5.41	0.17
0.80	5.79	5.80	-0.13
0.85	6.19	6.18	0.09
0.90	6.56	6.57	-0.18
0.95	6.96	6.96	0.02
1.00	7.33	7.35	-0.21
1.05	7.70	7.73	-0.42
1.10	8.08	8.12	-0.49
1.15	8.47	8.51	-0.43
1.20	8.86	8.89	-0.38
1.25	9.24	9.28	-0.44
1.30	9.63	9.67	-0.39
1.35	10.01	10.05	-0.44
1.40	10.40	10.44	-0.40
1.45	10.79	10.83	-0.35
1.50	11.19	11.22	-0.23
1.55	11.58	11.60	-0.19
1.60	11.94	11.98	-0.41
1.65	12.34	12.37	-0.29
1.70	12.77	12.76	0.05
1.75	13.15	13.15	0.00
1.80	13.53	13.54	-0.05
1.85	13.95	13.92	0.19
1.90	14.36	14.31	0.34
1.95	14.79	14.70	0.62
2.00	15.20	15.08	0.76

+ Percent Difference $= \frac{\{col(2) - col(3)\}*100}{col(2)}$

* Calibration is valid in the range of probe gaps of .48 mm to 2.08 mm. Calibrated Output is Linear Curve Fit data obtained by the equation Y=-.39+7.74X where X is probe gap (mm) and Y is Calibrated Output (Volts).

Table C.7 Equipment Used For Calibration of Load cells

Date of Calibration : May 22, 1989

Initial Seating Load : 100 lbs

Equipment	Manufactured By	Model	Serial No.
Load cell (Calibration System)	PCB Piezotronics	2020B	1855
MTS Load cell	MTS Systems Corporation	MTS Soil mechanics test System	----
Wave Generator	Wavetek San Dieago, Inc.	Model 75	----
Dynamic signal Anlyzer	Hewlett Packard	HP 3562A	----

Table C.8 Calibration of Load cell 2 (Calibration System) Used in the Experiment (without aluminum casing)

MTS Load Cell (lbs)	Load cell (Calibration System) (lbs)	Calibrated Output (lbs)	Difference* (percent)
490.37	493.60	495.54	-0.39
1003.52	1018.00	1014.10	0.38
1514.29	1528.00	1530.25	-0.15
2042.55	2050.00	2064.09	-0.69
2550.50	2590.00	2577.39	0.49
3078.28	3104.00	3110.73	-0.22
3604.65	3638.00	3642.65	-0.13
4127.13	4179.00	4170.63	0.20

* Difference = {Load cell (Calibration System)- Calibrated Output)}*100/{ Load cell (Calibration System)}

Table C.9 Calibration of Load cell 2 (Calibration System) Used in the Experiment (with aluminum casing)

MTS Load Cell (lbs)	Load cell (Calibration System) (lbs)	Calibrated Output (lbs)	Difference* (percent)
467.96	464.90	463.07	0.39
984.30	970.30	974.02	-0.38
1497.43	1484.00	1481.79	0.15
2030.38	2023.00	2009.17	0.68
2580.35	2541.00	2553.40	-0.49
3086.58	3061.00	3054.34	0.22
3608.07	3575.00	3570.39	0.13
4143.43	4092.00	4100.15	-0.20

* Difference = {Load cell (Calibration System)- Calibrated Output)}*100/{ Load cell (Calibration System)}

APPENDIX D

DATA REDUCTION PROCESS FOR ALL SENSORS

APPENDIX D

D.1 Geophone (Steady-State Motion)

1) The voltage-output time history of the geophone is captured (called the "raw" velocity-time history, hereafter).
2) The "raw" velocity-time history is Fourier-transformed to obtain the "raw" velocity spectrum.
3) The "raw" velocity spectrum is divided by the calibration curve, to obtain the "actual" velocity spectrum.
4) The "actual" velocity spectrum is integrated to obtain displacement spectrum.
5) The peak value of the displacement spectrum gives the deflection (peak) obtained from the geophone.

D.2 Accelerometer (Steady-State Motion)

1) The voltage-output time history of an accelerometer is captured and is called "raw" acceleration-time history, hereafter.
2) The "raw" acceleration-time history is Fourier-transformed to obtain the "raw" acceleration spectrum.
3) The "raw" acceleration spectrum is divided by the calibration curve to obtain the "actual" acceleration spectrum.
4) The "actual" acceleration spectrum is integrated to obtain the "actual"

velocity spectrum.

5) The "actual" velocity spectrum is integrated to obtain the "actual" displacement spectrum.

6) The peak value from the displacement spectrum curve gives the deflection (zero to peak) obtained from the accelerometer.

D.3 Proximeter, LASER and LVDT (Steady-State Motion)

1) The voltage-output time history is captured with the corresponding sensor.

2) The voltage-output time history is multiplied by the calibration factor to obtain the "actual" displacement-time history.

3) The displacement time history is Fourier-transformed to obtain the displacement spectrum.

4) The peak value from displacement spectrum gives the deflection (peak) obtained from the proximeter.

D.4 Geophone (Pulse Motion)

1-4) Same as section D.1

5) The displacement spectrum is inverse-Fourier transformed to determine the "actual" displacement-time history; and finally,

6) The difference of minimum and maximum values of displacement-time history gives the peak-to-peak deflection.

D.5 Accelerometer (Pulse Motion)

1-5) Same as section D.2

6) The "actual" displacement spectrum is inverse-Fourier transformed to determine the "actual" displacement-time history; and finally,

7) The difference of minimum and maximum values of displacement-time history gives the peak-to-peak deflection.

D.6 Proximeter, LASER and LVDT (Pulse Motion)

1-2) Same as section D.3

3) The difference of minimum and maximum values of displacement-time history gives the peak-to-peak deflection.

D.7 EXAMPLE OF GEOPHONE (Steady-State Motion)

In this example, the raw velocity time history from an experiment with a frequency of 10 Hz and amplitude of 1.2 Volts is shown in Figure D.1. The velocity spectrum (Step 2) obtained from this geophone record is shown in Figure D.2. The peak value of 1.2 Volts occurs at a frequency of 10 Hz and another peak can be seen at a frequency of 20 Hz corresponding to the multiple mode of vibration. The "actual" velocity spectrum (step 3) is shown in Figure D.3. After dividing by the calibration curve, the peak value has changed from 1.2 (Volts) to 20 in/Sec. The data obtained from step 4 of section D.1 is shown in Figure D.4. The deflection obtained from geophone is 24.5 mils.

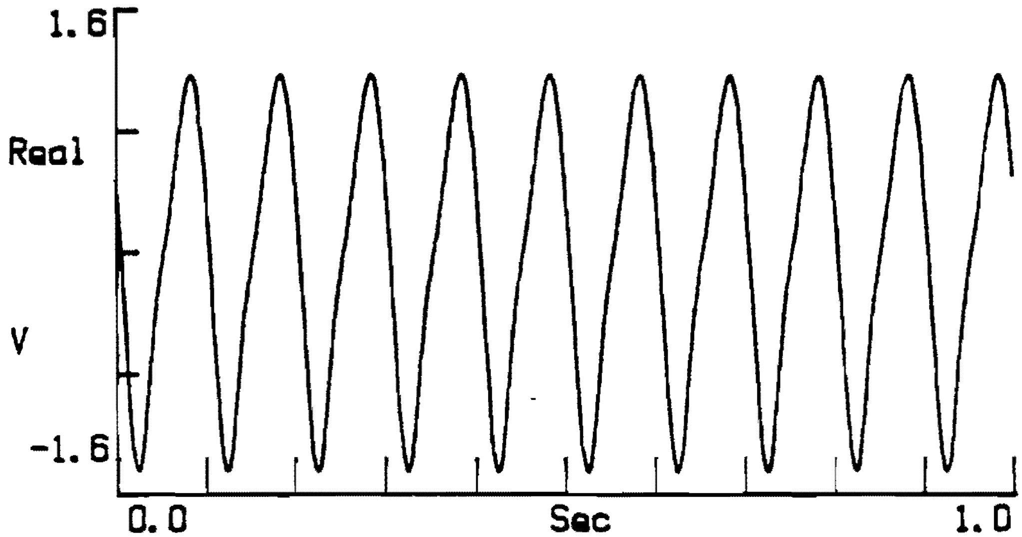


Figure D.1 Raw Velocity-Time History of Geophone 1

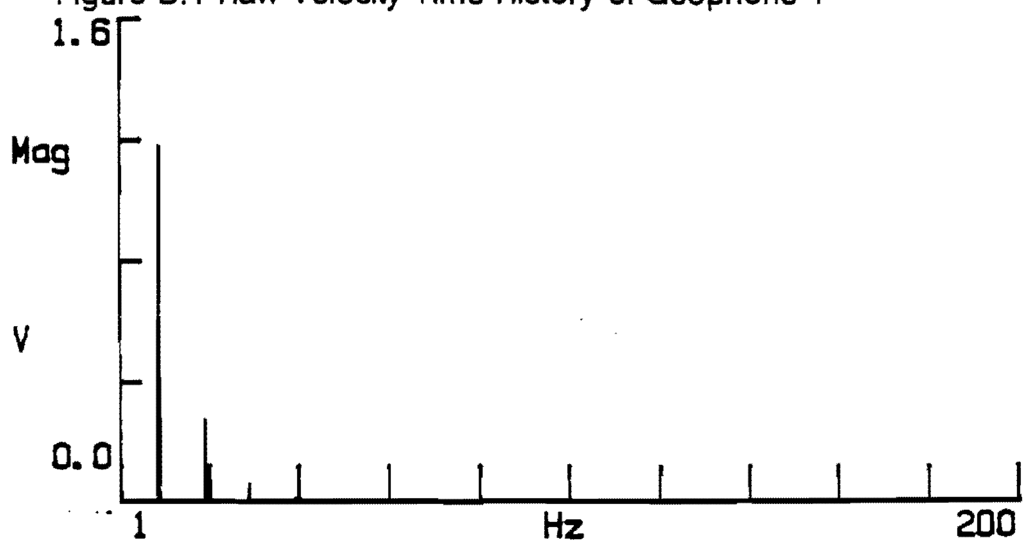


Figure D.2 Raw Velocity Spectrum of Geophone 1

Figure D.3 Actual Velocity Spectrum of Geophone 1

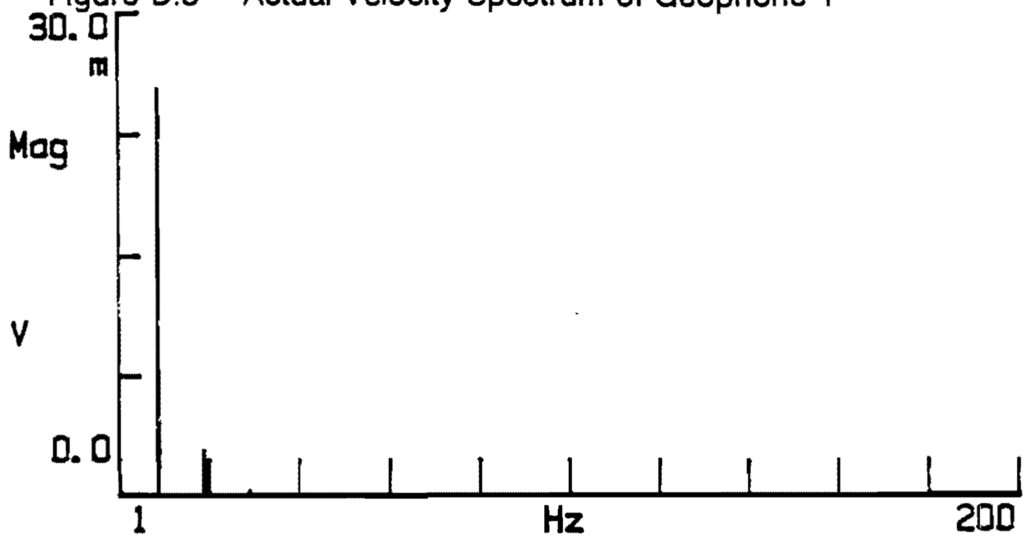


Figure D.4 Actual Displacement Spectrum of Geophone 1

D.8 EXAMPLE OF ACCELEROMETER (Steady-State Motion)

The captured accelerometer (Step 1) from a motion similar to that of previous example is shown in Figure D.5. The raw acceleration spectrum (Step 2) of this record is shown in Figure D.6. The peak value obtained from the Figure D.6 is 260 Mvolts at 10 Hz frequency. Other peaks can be seen in the Figure D.6 at 20 Hz and 30 Hz corresponding to the multiple mode of vibration. The "actual" acceleration spectrum (Step 3) is shown in Figure D.7. The peak value has changed from 260 Mvolts to 66 in/Sec^2. After double integration of actual acceleration spectrum, the deflection spectrum obtained is shown in Figure D.8. The actual deflection obtained is 25.76 mils.

D.9 EXAMPLE OF PROXIMETER (Steady-State Motion)

The raw data (Step 1) is shown in Figure D.9. The frequency of vibration is 10 Hz. When data is multiplied by calibration factor of proximeter, the actual displacement-time history as shown in Figure D.10 is obtained. The data obtained from step 3 is shown in Figure D.11. The deflection obtained from step 4 of section D.3 is 25.57 mils.

D.10 EXAMPLES OF LVDT AND LASER DEVICE (Steady State Motion)

The process and results are very similar to those of the proximeter. Therefore, for each device only the raw data and final are depicted (See Figures D.12 through D.17)

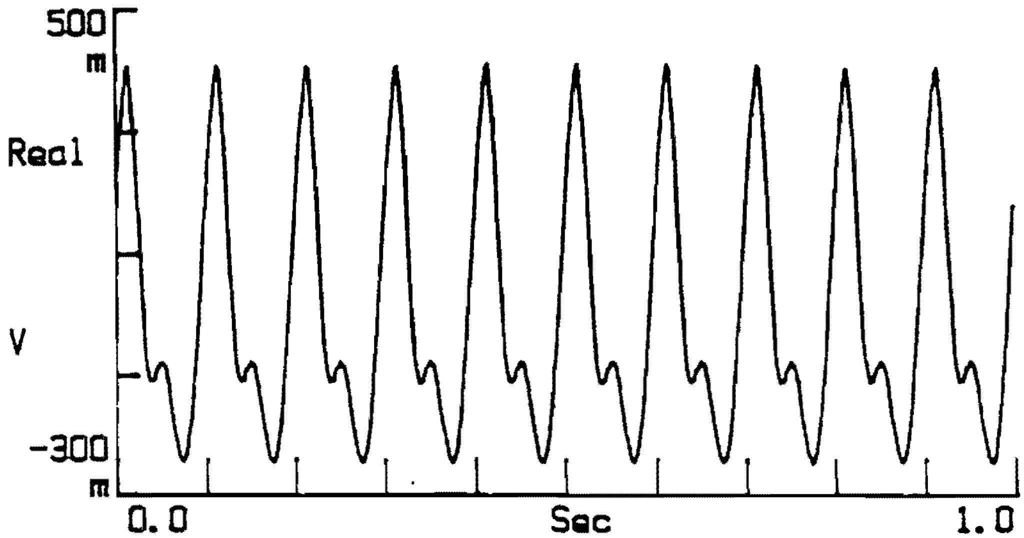


Figure D.5 Raw Acceleration-Time History

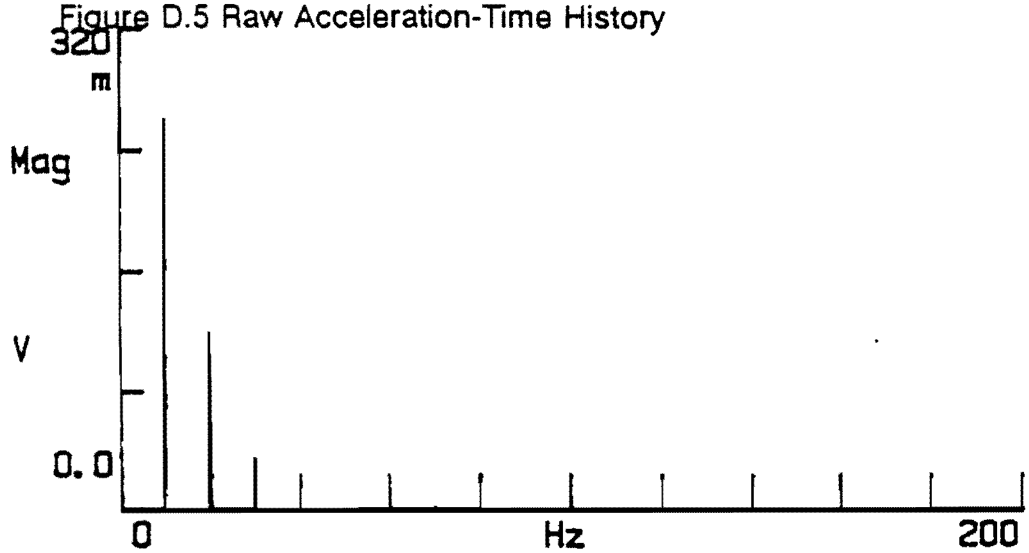


Figure D.6 Raw Acceleration Spectrum

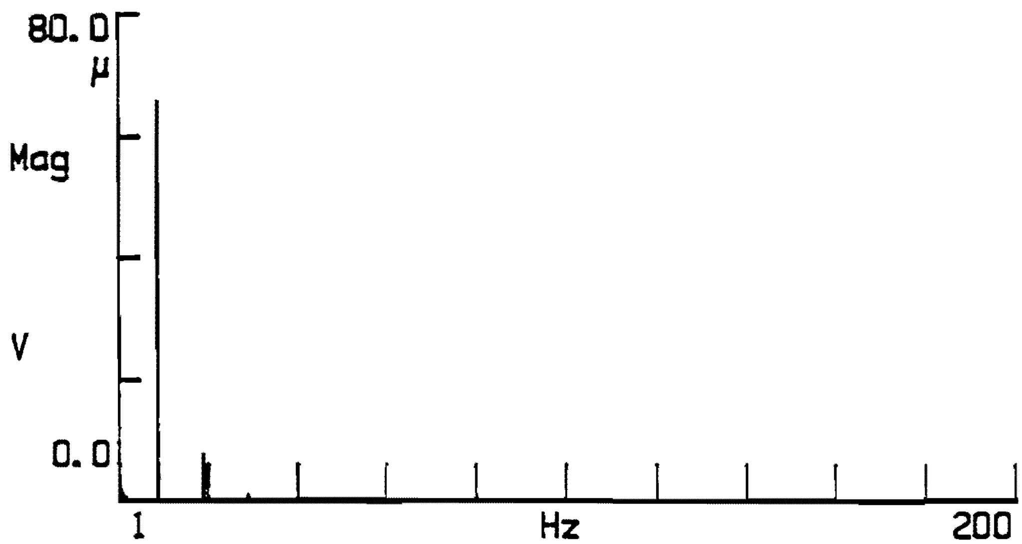


Figure D.7 Actual Acceleration Spectrum

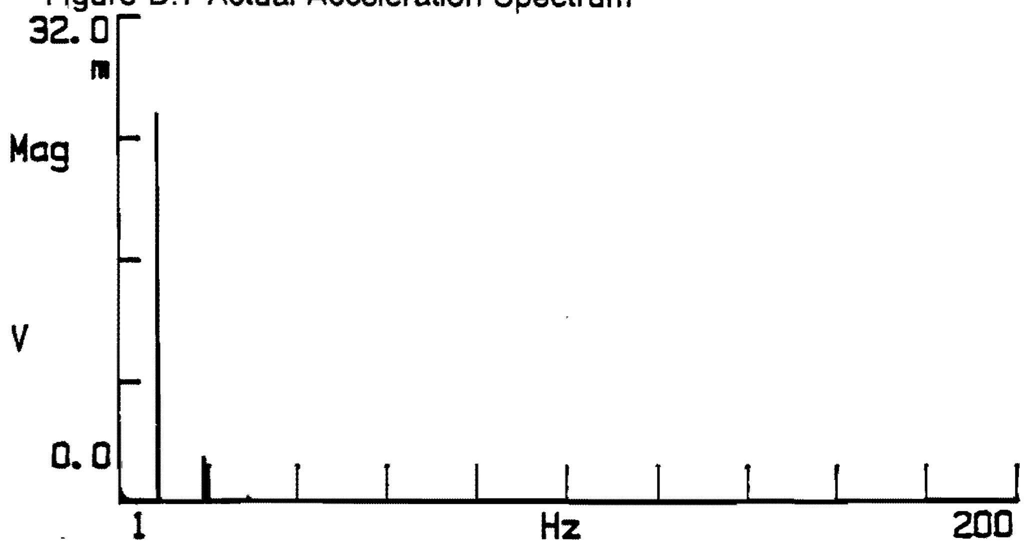


Figure D.8 Actual Displacement Spectrum

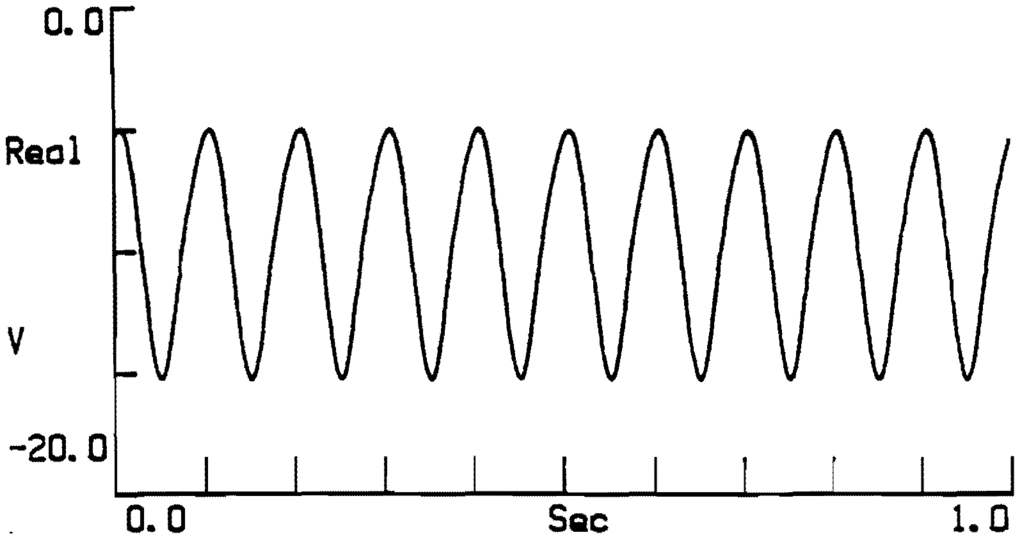


Figure D.9 Raw Displacement-Time History of Proximeter

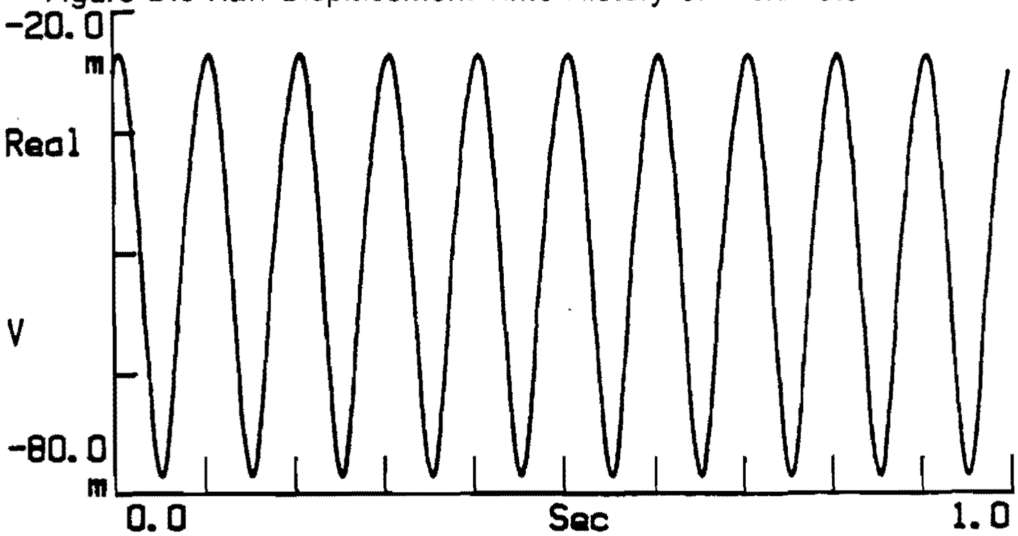


Figure D.10 Actual Displacement Time History of Proximeter

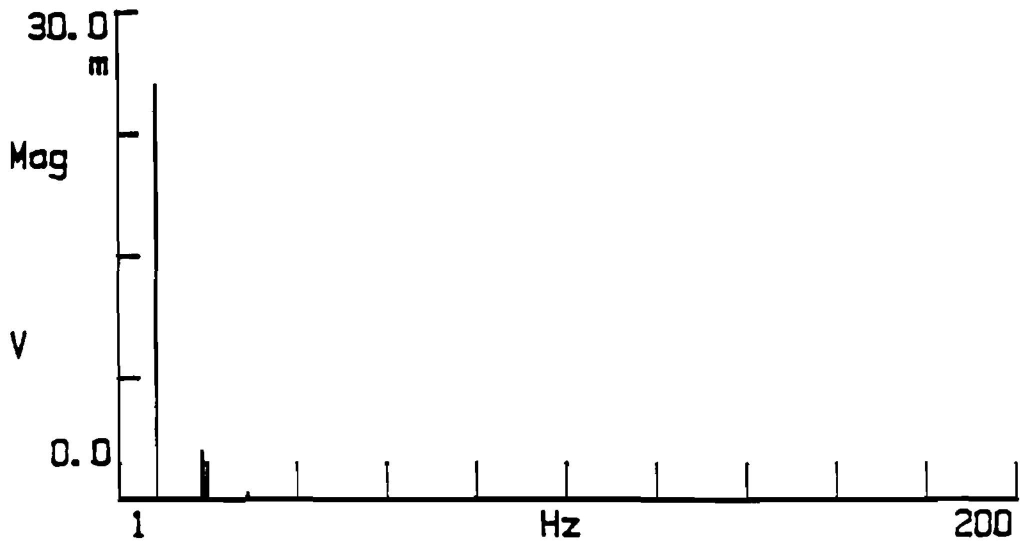


Figure D.11 Actual Displacement Spectrum of Proximeter

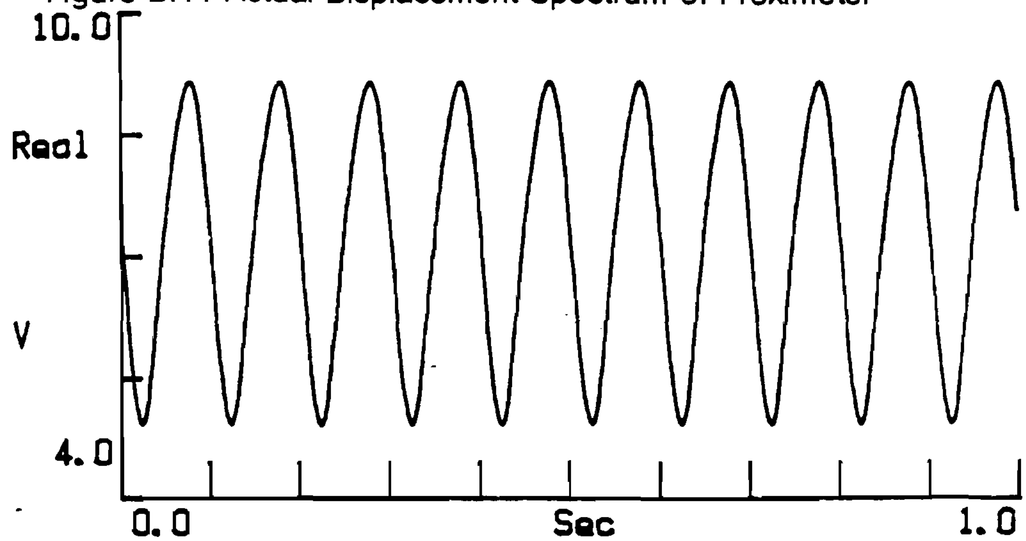


Figure D.12 Raw Displacement Time History of LVDT

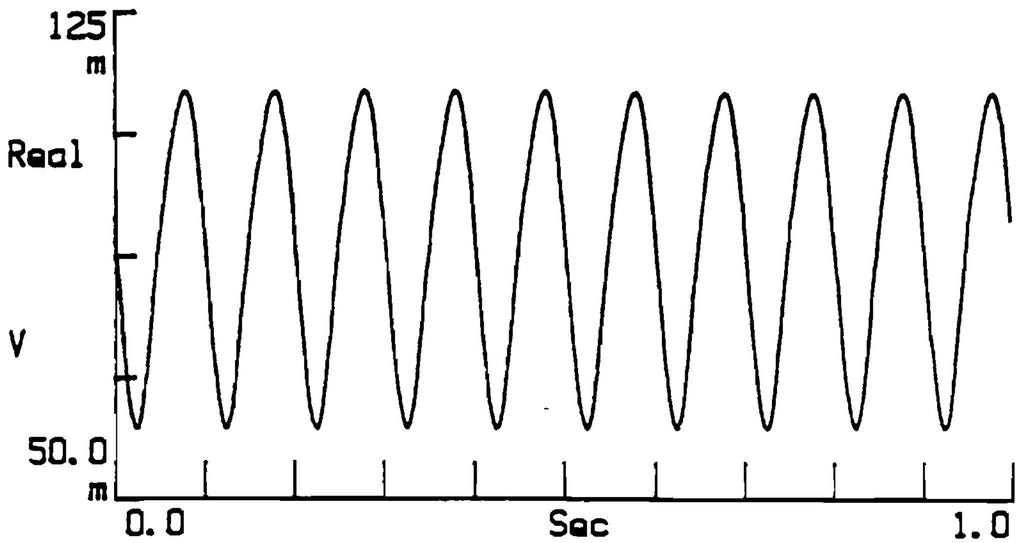


Figure D.13 Actual Displacement Time History of LVDT

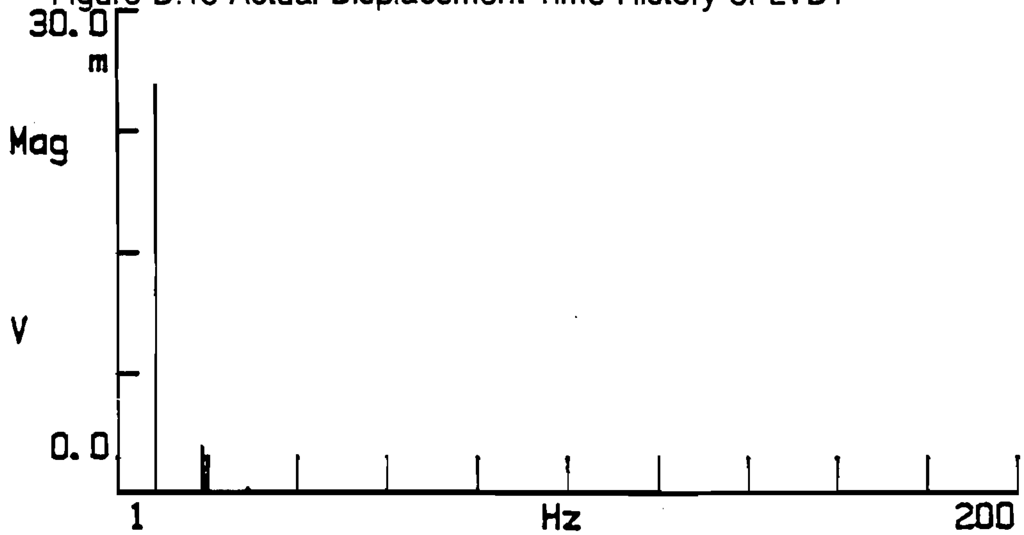


Figure D.14 Actual Displacement Spectrum of LVDT

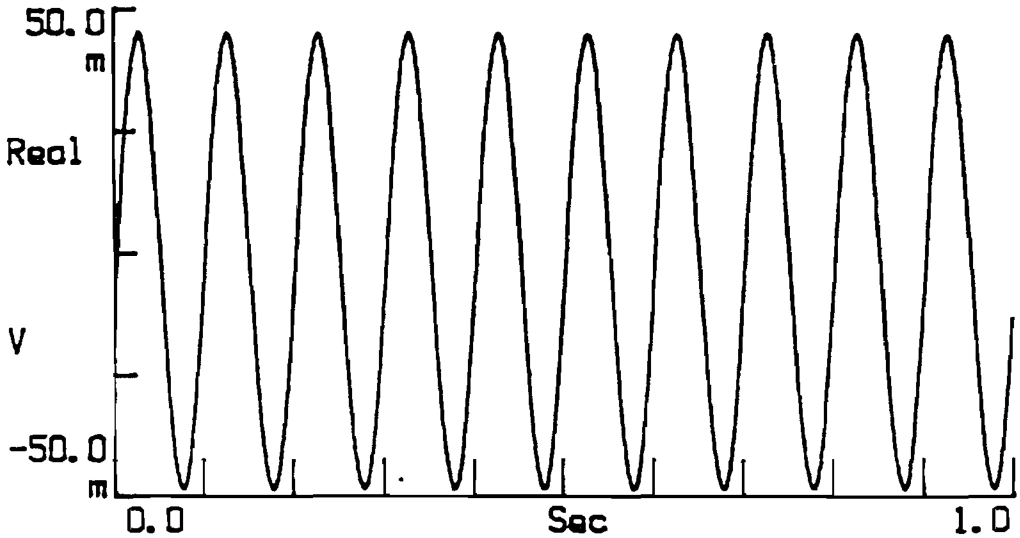


Figure D.15 Raw Displacement Time History of Laser

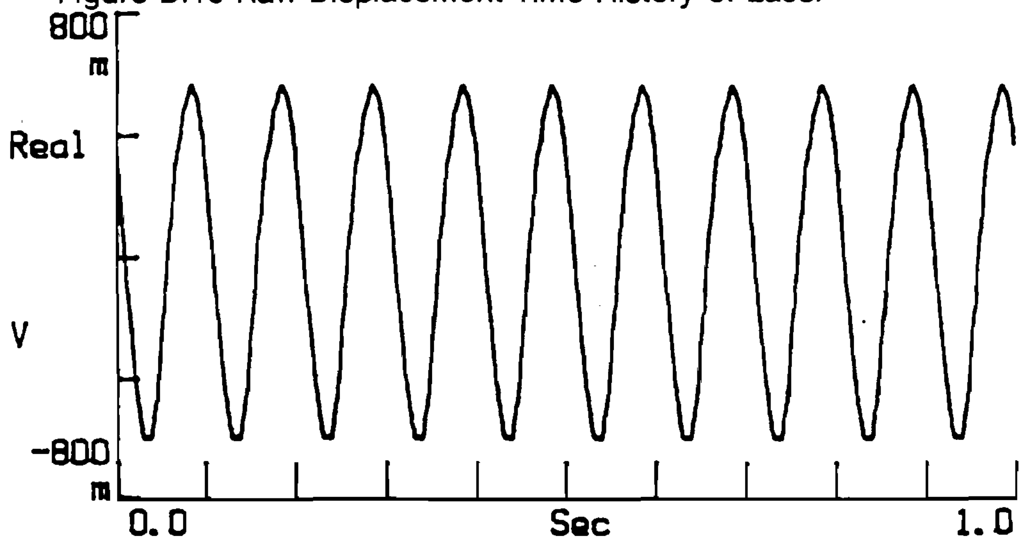


Figure D.16 Actual Displacement Time History of Laser

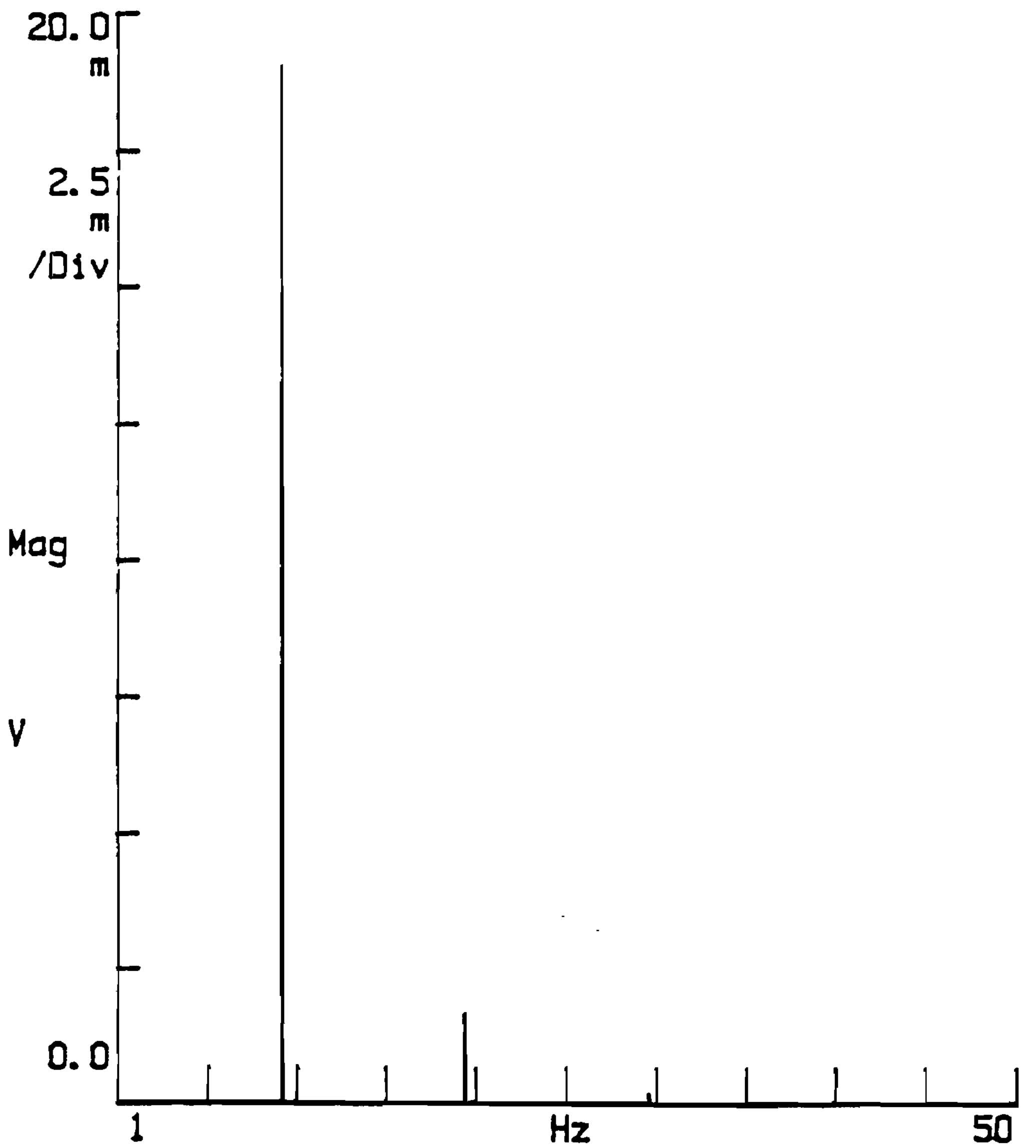


Figure D.17 Actual Displacement Spectrum of Laser

D.11 EXAMPLE OF GEOPHONE (Pulse Motion)

The data selected for example is obtained by using a half Sine Wave with a pulse width of 25 Msec. The raw velocity-time history obtained from step 1 is shown in Figure D.18. The velocity spectrum (Step 2) is shown in Figure D.19. It can be seen that, unlike to the Steady-State motion tests, the amplitude is distributed over a wide range of frequencies from 0 to about 70 Hz. The actual velocity spectrum (Step 3) is shown in Figure D.20 and the displacement spectrum (Step 4) is shown in Figure D.21. Comparing the frequency content of the actual velocity and displacement spectra (Figure D.20-D.21) one can appreciate the shifting of the energy towards lower frequencies. This is the so-called smoothing effects of integration. The actual displacement-time history (Step 5) is shown in Figure D.22. The deflection (Step 6) is 25.36 mils.

D.12 EXAMPLE OF ACCELEROMETER (Pulse Motion)

The raw acceleration-time history (Step 1) is shown in Figure D.23. The raw acceleration spectrum (Step 2) is shown in Figure D.24. The main component of the acceleration energy occurs at a frequency of about 24 Hz. The actual acceleration spectrum (Step 3) is shown in Figure D.25. The actual velocity spectrum obtained from (Step 4) is shown in Figure D.26. From the actual velocity spectrum, main component of energy is shifted to about 20 Hz. The actual displacement spectrum (Step 5) is shown in Figure D.27. The actual displacement-time history (Step 6) is shown in Figure D.28. The deflection (Step 7) is 26.27 mils.

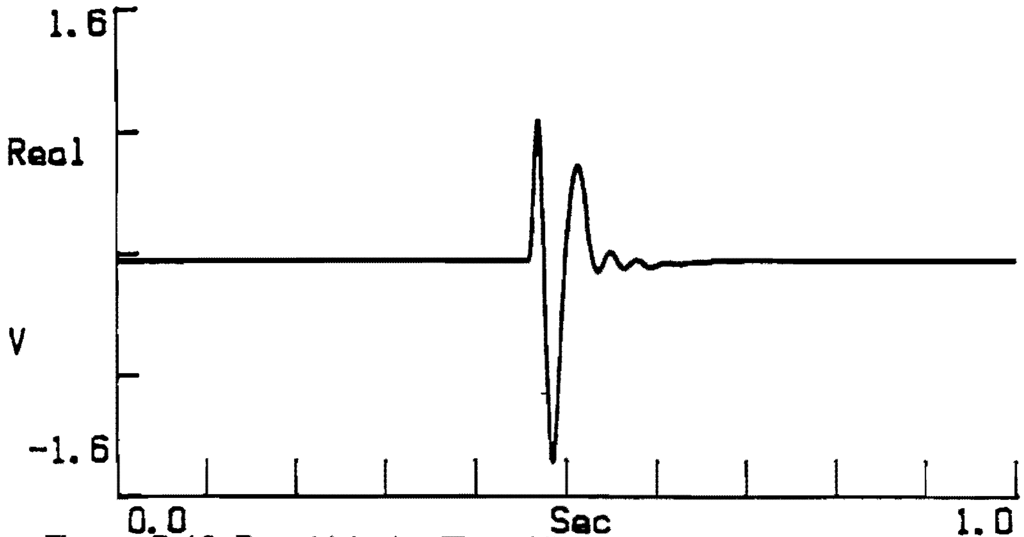


Figure D.18 Raw Velocity Time History of Geophone 1 Due to a Half-Sine Wave Pulse Load

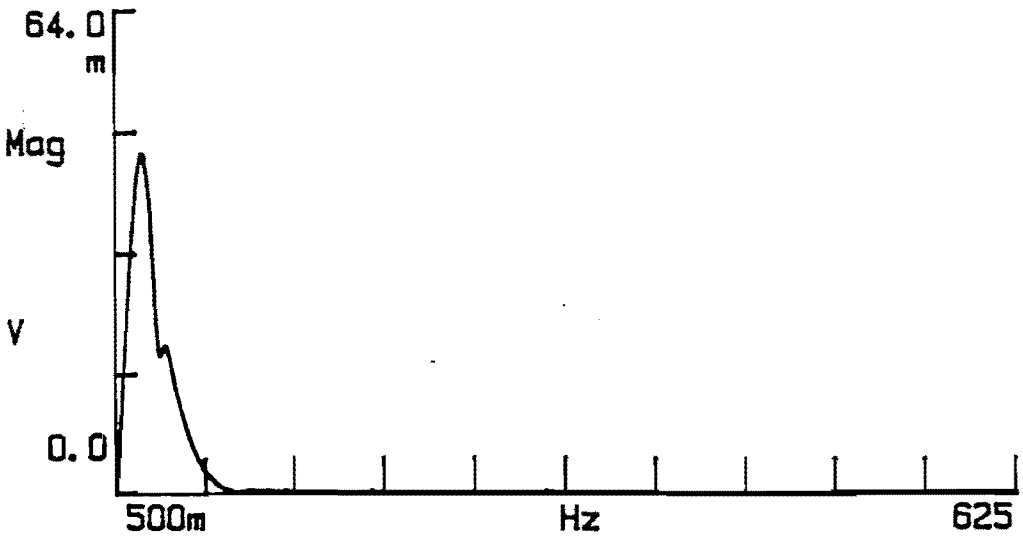


Figure D.19 Raw Velocity Spectrum of Geophone 1

Figure D.20 Actual Velocity Spectrum of Geophone 1

Figure D.21 Actual Displacement Spectrum of Geophone 1

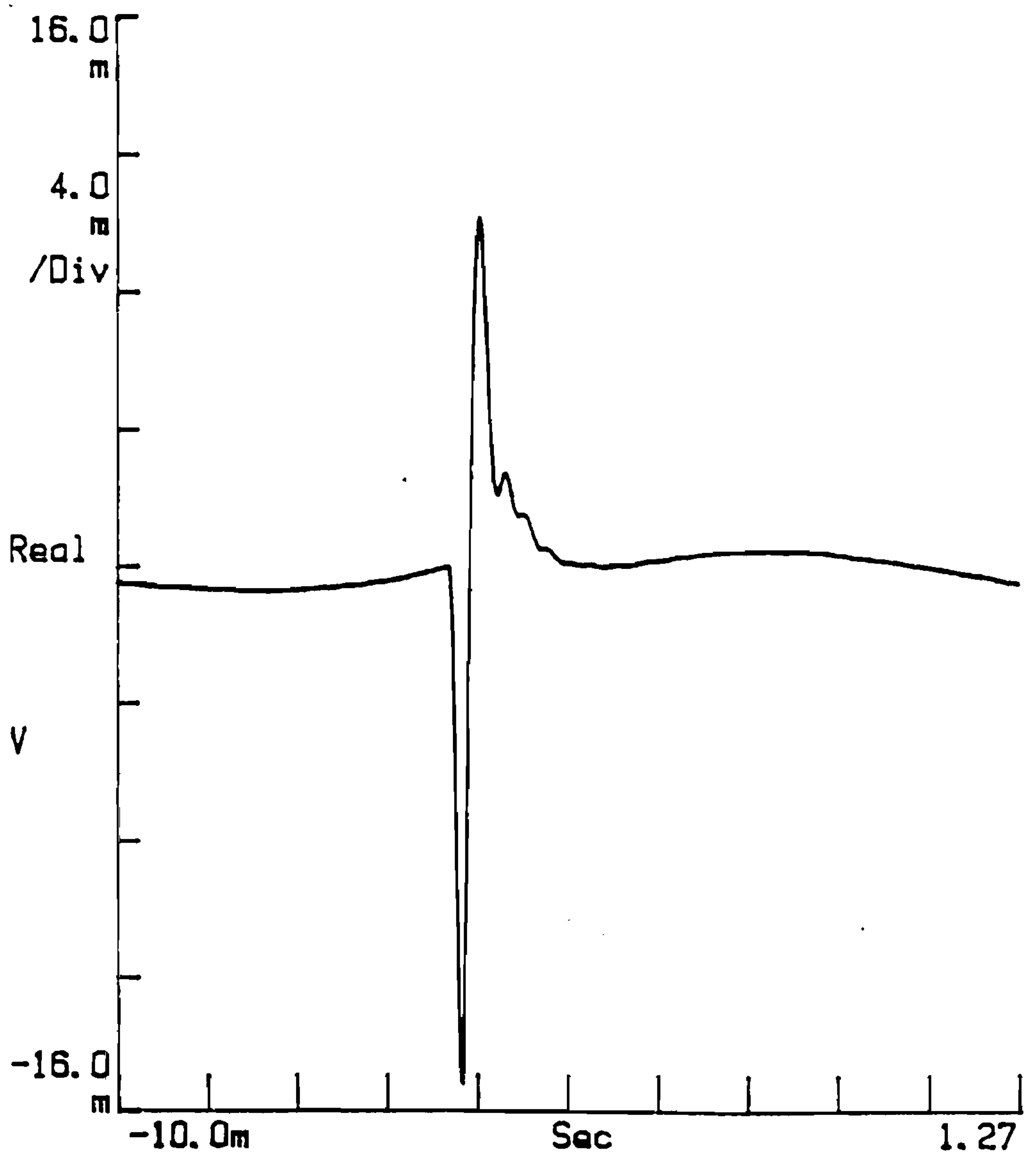


Figure D.22 Actual Displacement Time History of Geophone

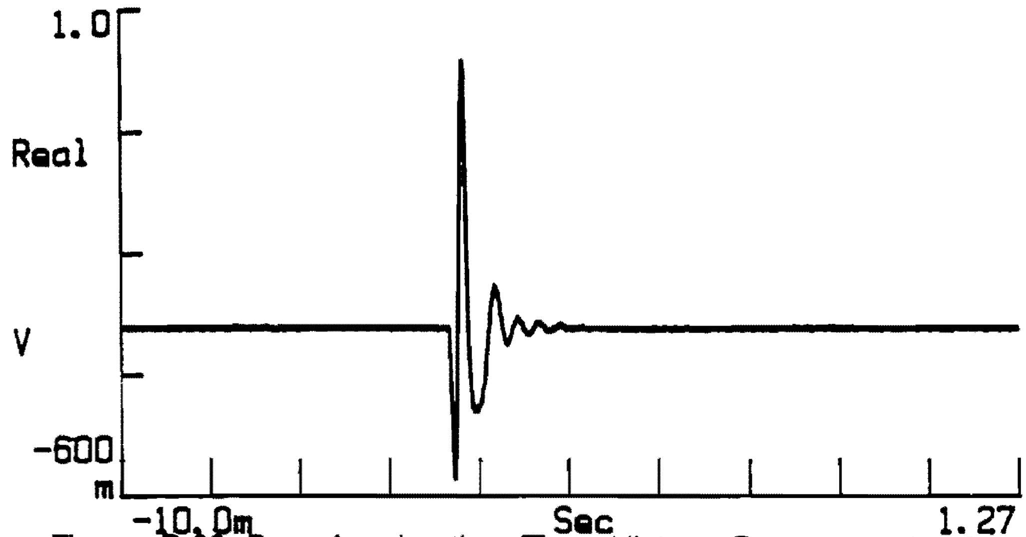


Figure D.23 Raw Acceleration Time History Due to a Half-Sine Pulse Load

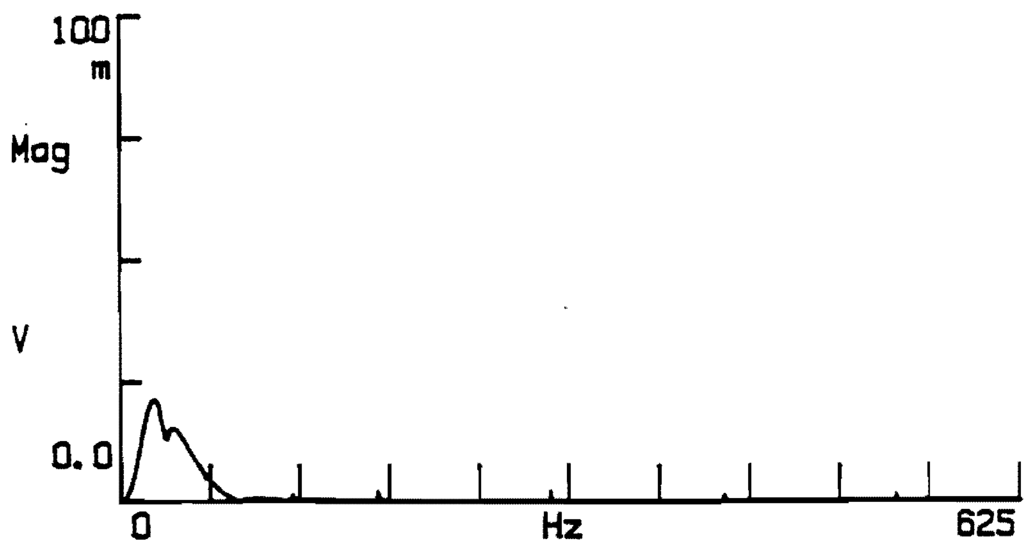


Figure D.24 Raw Acceleration Spectrum

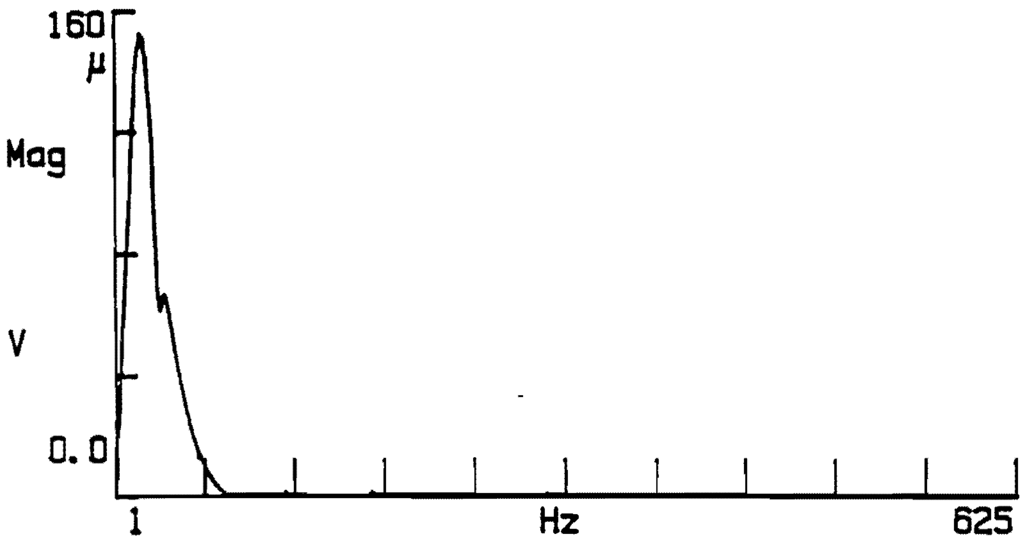


Figure D.25 Raw Velocity Spectrum of Accelerometer

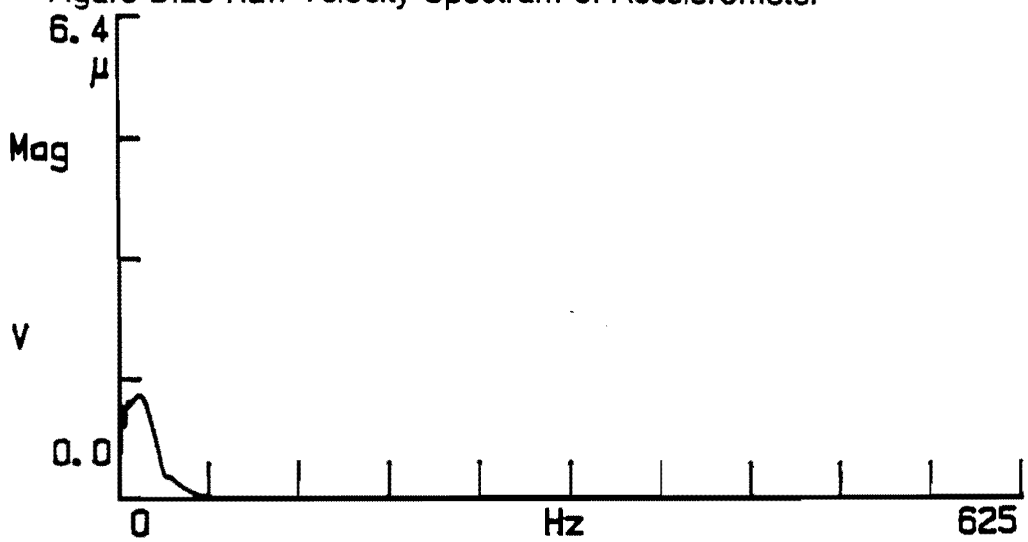


Figure D.26 Raw Displacement Spectrum of Accelerometer

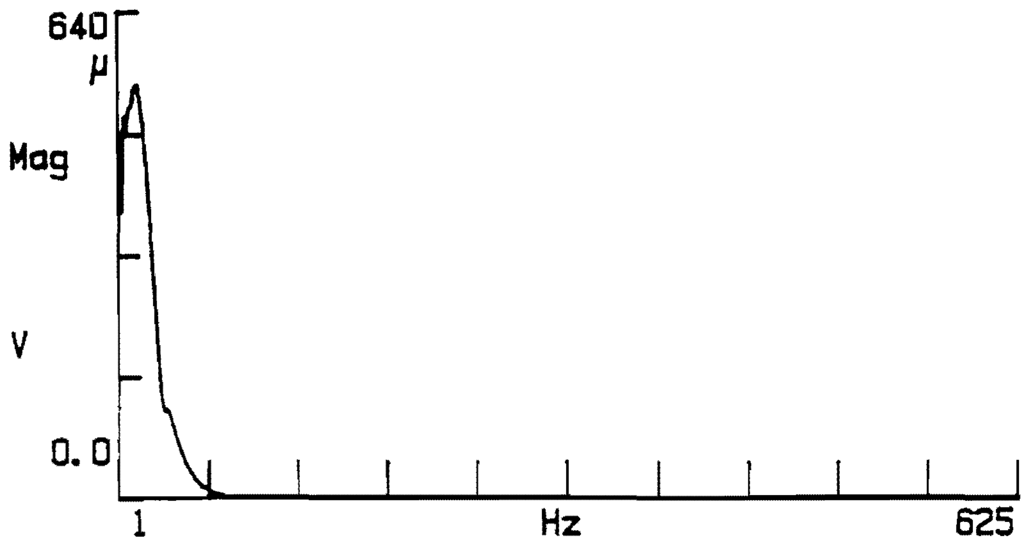


Figure D.27 Actual Displacement Spectrum of Accelerometer

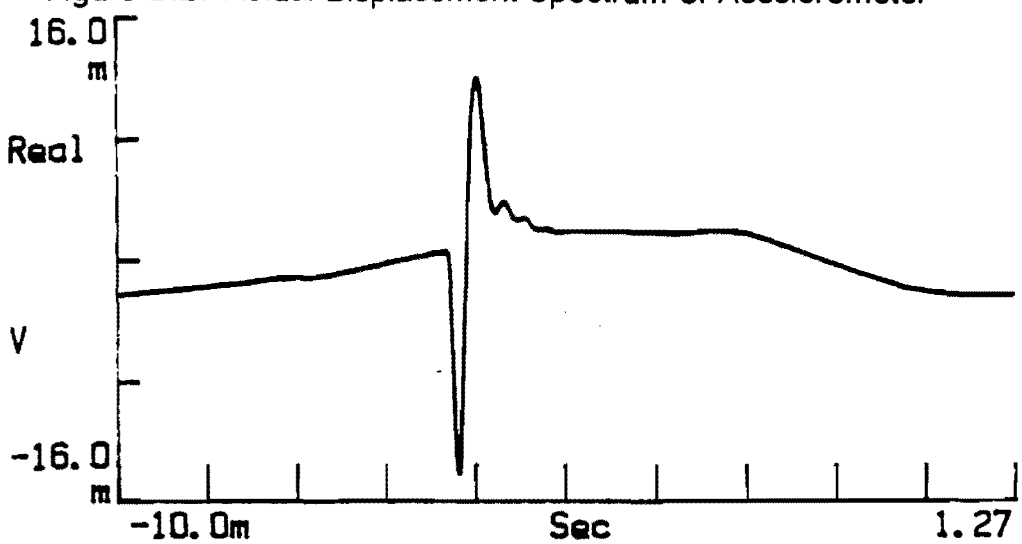


Figure D.28 Actual Displacement Time History of Accelerometer

D.13 EXAMPLE OF PROXIMETER (Pulse Motion)

The data from Step 1 is shown in Figure D.29. This data is multiplied by calibration factor is shown in Figure D.30. The deflection (Step 3) is 25.70 mils.

D.14 EXAMPLE OF LVDT (Pulse Motion)

The data (Step 1) is shown in Figure D.31. The data multiplied by calibration factor is shown in Figure D.32. The deflection (Step 3) is 25.65 mils.

D.15 EXAMPLE OF LASER (Pulse Motion)

The data (Step 1) is shown in Figure D.33. The data (Step 1) multiplied by calibration factor is shown in Figure D.34. The deflection (Step 3) is 25.24 mils.

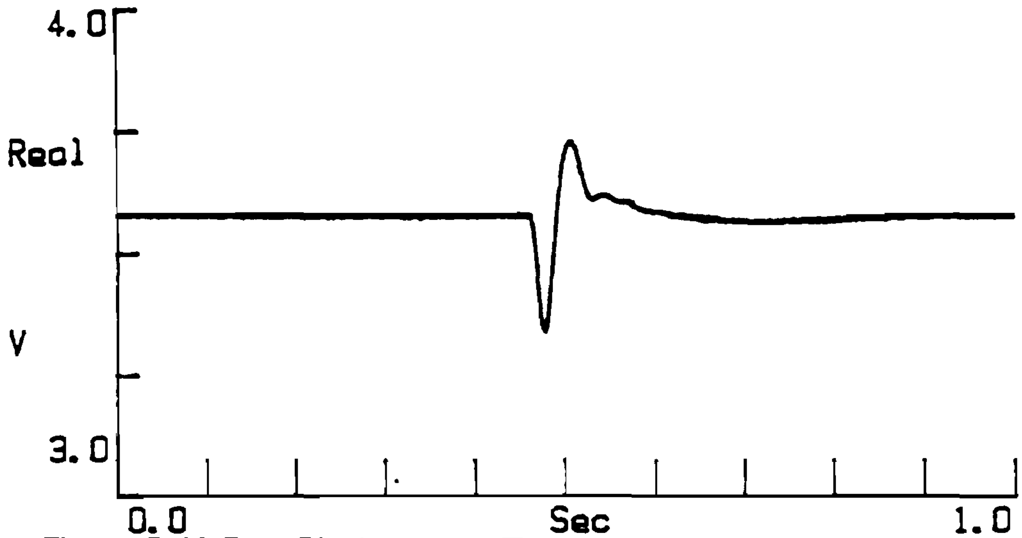


Figure D.29 Raw Displacement Time History of Proximeter Due to a Half-Sine Pulse Load

Figure D.30 Actual Displacement Time History of Proximeter

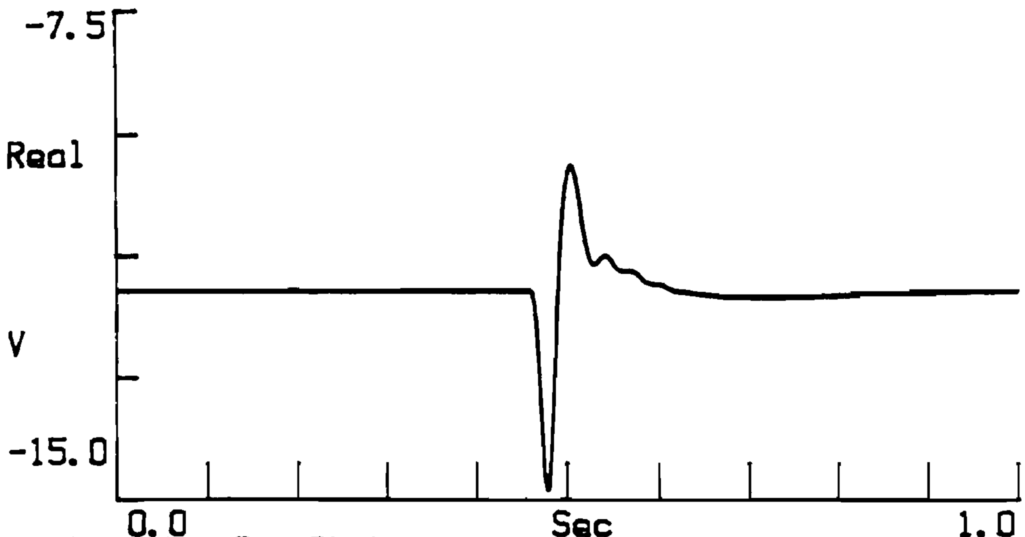


Figure D.31 Raw Displacement Time History of LVDT Due to a Half-Sine Pulse Load

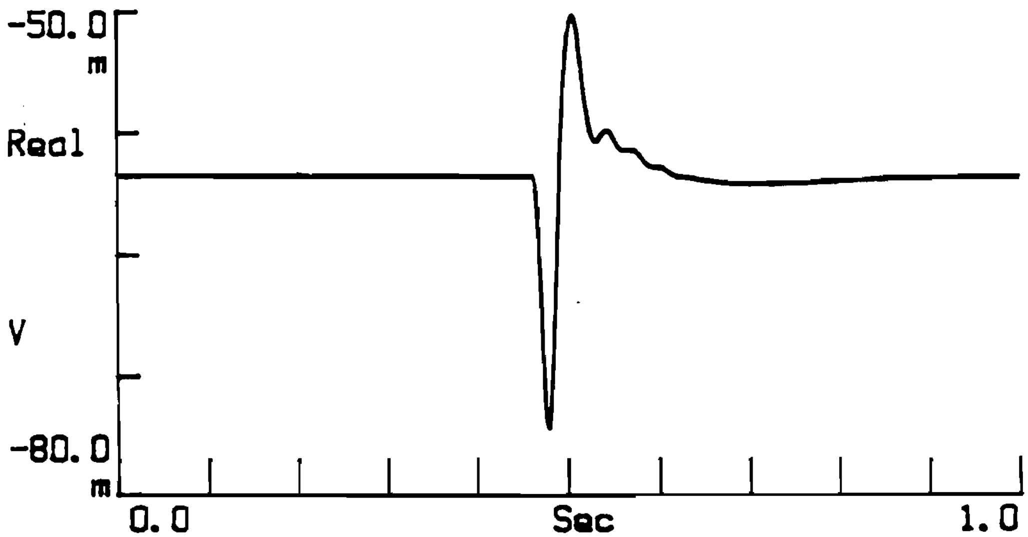


Figure D.32 Actual Displacement Time History of LVDT

Figure D.33 Raw Displacement Time History of Laser Due to a Half-Sine Pulse Load

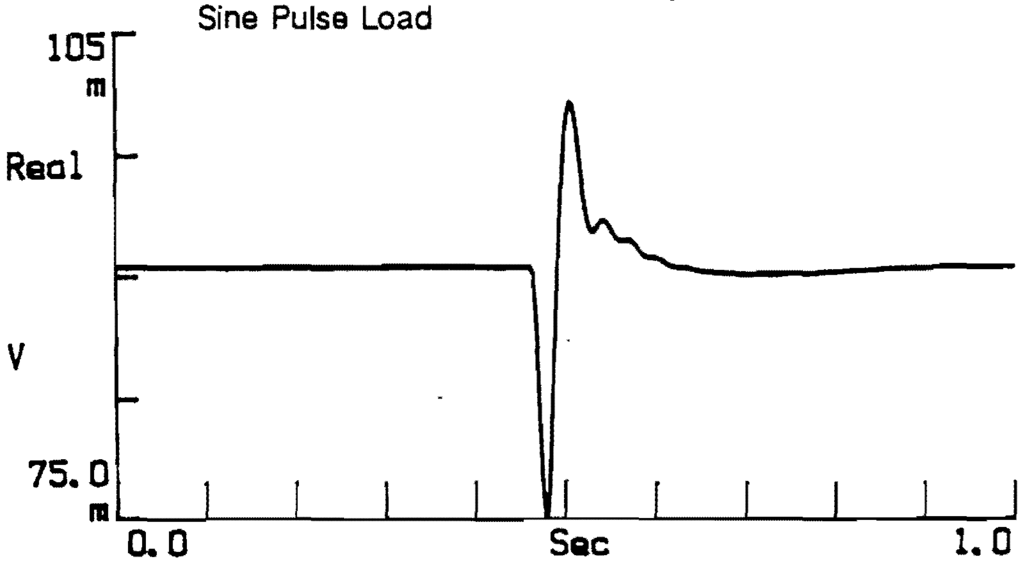


Figure D.34 Actual Displacement Time History of Laser

APPENDIX E

RAW DATA FOR EVALUATION OF EACH SENSOR FOR STEADY-STATE MOTION

Table E.1 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 1 mil

Date of Experiment: 10.02.89
Frequency Used : 05 Hz

Diskette No.: 67
Source Level: 0.020 Volts

File	Device Used		Deflection (mil)		Difference
No.	Channel 1	Channel 2	Channel 1	Channel 2	(percent)+
1	Acc 1	Geo 1	1.48	1.51	-1.75
3	Prox	Acc 2	1.53	1.53	-0.13
5	LVDT	Acc 2	1.49	1.51	-1.34
7	Geo 2	Geo 1	1.50	1.50	-0.07
9	Prox	Geo 2	1.53	1.49	2.71
11	LVDT	Acc 1	1.50	1.47	2.33
13	Prox	LVDT	1.53	1.49	2.61
15	LVDT	Acc 1	1.51	1.48	1.99
17	Acc 1	Geo 2	1.50	1.49	0.40
19	Prox	Geo 1	1.53	1.51	1.50
21	Acc 1	Geo 1	1.49	1.51	-1.34
23	LVDT	Prox	1.50	1.53	-2.00
25	Geo 2	Acc 1	1.52	1.51	0.66
27	Prox	Acc 1	1.54	1.49	3.12
29	Acc 1	Acc 2	1.48	1.52	-2.70
31	Acc 2	Prox	1.54	1.53	0.46
33	Prox	Geo 2	1.54	1.50	2.34
35	Acc 2	Geo 2	1.52	1.51	0.66
37	Acc 1	Prox	1.50	1.54	-2.40
39	LVDT	Geo 1	1.51	1.52	-0.93
41	Acc 2	Geo 1	1.56	1.53	1.99
43	LVDT	Acc 2	1.51	1.54	-1.99
45	Geo 2	Geo 1	1.53	1.52	0.33
47	Acc 2	Geo 2	1.54	1.51	2.21
49	Acc 1	Acc 2	1.50	1.53	-1.73
51	Acc 2	Geo 1	1.54	1.52	1.30
53	Prox	Geo 1	1.55	1.52	1.94
55	LVDT	Geo 2	1.52	1.51	0.59
57	LVDT	Geo 1	1.51	1.52	-0.93
59	Geo 2	LVDT	1.53	1.51	1.31

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.2 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.1)

Date of Experiment: 10.02.89 Diskette No.: 67
Frequency Used : 05 Hz Source Level: 0.020 Volts

File No.	Device Used		Deflection (mil)		Difference⁺ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	1.53	1.53	-0.13
9	Prox	Geo 2	1.53	1.49	2.71
13	Prox	LVDT	1.53	1.49	2.61
19	Prox	Geo 1	1.53	1.51	1.50
23	LVDT	Prox	1.50	1.53	1.96
27	Prox	Acc 1	1.54	1.49	3.12
31	Acc 2	Prox	1.54	1.53	-0.46
33	Prox	Geo 2	1.54	1.50	2.34
37	Acc 1	Prox	1.50	1.54	2.34
53	Prox	Geo 1	1.55	1.52	1.94

Table E.3 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.1)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelorometer 1	1.49	0.01	0.02
2	Accelorometer 2	1.53	0.01	0.02
3	Geophone 1	1.52	0.01	0.01
4	Geophone 2	1.51	0.01	0.02
5	Proximeter	1.53	0.01	0.00
6	L.V.D.T.	1.51	0.01	0.01

⁺Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.4 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 5 HZ and a Nominal Deflection of 5 mils

Date of Experiment: 9.5.89
Frequency Used : 05 Hz

Diskette No.: 35
Source Level: 0.045 Volts

File	Device Used		Deflection (mil)		Difference^{+}
No.	Channel 1	Channel 2	Channel 1	Channel 2	(percent)
1	Acc 1	Geo 1	4.51	4.51	0.00
3	Prox	Acc 2	4.50	4.52	-0.44
5	LVDT	Acc 2	4.48	4.55	-1.56
7	Geo 2	Geo 1	4.45	4.53	-1.80
9	Prox	Geo 2	4.49	4.41	1.78
11	LVDT	Acc 1	4.48	4.46	0.45
13	Prox	LVDT	4.52	4.47	1.11
15	LVDT	Acc 1	4.50	4.47	0.58
17	Acc 1	Geo 2	4.45	4.46	-0.22
19	Prox	Geo 1	4.54	4.55	-0.22
21	Acc 1	Geo 1	4.47	4.55	-1.79
23	LVDT	Prox	4.52	4.53	-0.22
25	Geo 2	Acc 1	4.50	4.51	-0.22
27	Prox	Acc 1	4.57	4.51	1.31
29	Acc 1	Acc 2	4.47	4.61	-3.13
31	Acc 2	Prox	4.55	4.55	0.00
33	Prox	Geo 2	4.58	4.50	1.75
35	Acc 2	Geo 2	4.57	4.51	1.31
37	Acc 1	Prox	4.52	4.57	-1.11
39	LVDT	Geo 1	4.56	4.62	-1.32
41	Acc 2	Geo 1	4.65	4.61	0.86
43	LVDT	Acc 2	4.57	4.63	-1.31
45	Geo 2	Geo 1	4.54	4.62	-1.76
47	Acc 2	Geo 2	4.65	4.53	2.58
49	Acc 1	Acc 2	4.57	4.63	-1.31
51	Acc 2	Geo 1	4.65	4.62	0.65
53	Prox	Geo 1	4.61	4.62	-0.22
55	LVDT	Geo 2	4.58	4.54	0.87
57	LVDT	Geo 1	4.57	4.62	-1.09
59	Geo 2	LVDT	4.57	4.55	0.44

$^{+}$Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.5 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.4)

Date of Experiment: 9.5.89
Frequency Used : 05 Hz

Diskette No.: 35
Source Level: 0.045 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	4.50	4.52	-0.44
9	Prox	Geo 2	4.49	4.41	1.78
13	Prox	LVDT	4.52	4.47	1.11
19	Prox	Geo 1	4.54	4.55	-0.22
23	LVDT	Prox	4.52	4.53	0.22
27	Prox	Acc 1	4.57	4.51	1.31
31	Acc 2	Prox	4.55	4.55	0.00
33	Prox	Geo 2	4.58	4.50	1.75
37	Acc 1	Prox	4.52	4.57	1.09
53	Prox	Geo 1	4.61	4.62	-0.22

Table E.6 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.4)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	4.49	0.03	0.12
2	Accelerometer 2	4.60	0.05	0.22
3	Geophone 1	4.59	0.04	0.18
4	Geophone 2	4.50	0.05	0.21
5	Proximeter	4.55	0.04	0.13
6	L.V.D.T.	4.53	0.04	0.17

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.7 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 10 mils

Date of Experiment: 10.05.89
Frequency Used : 05 Hz

Diskette No.: 68
Source Level: 0.095 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference+ (percent)
1	Acc 1	Geo 1	10.88	10.80	0.75
3	Prox	Acc 2	11.17	11.05	1.07
5	LVDT	Acc 2	10.96	11.13	-1.55
7	Geo 2	Geo 1	10.82	10.85	-0.28
9	Prox	Geo 2	11.22	10.76	4.10
11	LVDT	Acc 1	10.95	10.96	-0.09
13	Prox	LVDT	11.23	10.89	3.03
15	LVDT	Acc 1	10.96	10.97	-0.09
17	Acc 1	Geo 2	11.04	10.79	2.31
19	Prox	Geo 1	11.24	10.87	3.29
21	Acc 1	Geo 1	11.08	10.88	1.81
23	LVDT	Prox	10.99	11.18	-1.77
25	Geo 2	Acc 1	10.86	10.98	-1.06
27	Prox	Acc 1	11.24	10.99	2.22
29	Acc 1	Acc 2	11.07	11.13	-0.50
31	Acc 2	Prox	11.24	11.19	0.49
33	Prox	Geo 2	11.26	10.82	3.89
35	Acc 2	Geo 2	11.24	10.82	3.74
37	Acc 1	Prox	11.09	11.19	-0.90
39	LVDT	Geo 1	11.01	10.90	1.00
41	Acc 2	Geo 1	11.22	10.91	2.76
43	LVDT	Acc 2	11.02	11.15	-1.18
45	Geo 2	Geo 1	10.90	10.92	-0.18
47	Acc 2	Geo 2	11.23	10.84	3.47
49	Acc 1	Acc 2	11.11	11.16	-0.45
51	Acc 2	Geo 1	11.24	10.93	2.76
53	Prox	Geo 1	11.28	10.93	3.10
55	LVDT	Geo 2	11.04	10.85	1.72
57	LVDT	Geo 1	11.04	10.94	0.91
59	Geo 2	LVDT	10.92	10.99	-0.64

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.8 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.7)

Date of Experiment: 10.05.89 Diskette No.: 68
Frequency Used : 05 Hz Source Level: 0.095 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
3	Prox	Acc 2	11.17	11.05	1.07
9	Prox	Geo 2	11.22	10.76	4.10
13	Prox	LVDT	11.23	10.89	3.03
19	Prox	Geo 1	11.24	10.87	3.29
23	LVDT	Prox	10.99	11.18	1.74
27	Prox	Acc 1	11.24	10.99	2.22
31	Acc 2	Prox	11.24	11.19	-0.49
33	Prox	Geo 2	11.26	10.82	3.89
37	Acc 1	Prox	11.09	11.19	0.89
53	Prox	Geo 1	11.28	10.93	3.10

Table E.9 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.7)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelorometer 1	11.02	0.07	0.48
2	Accelorometer 2	11.18	0.06	0.39
3	Geophone 1	10.89	0.04	0.18
4	Geophone 2	10.84	0.05	0.21
5	Proximeter	11.22	0.03	0.12
6	L.V.D.T.	10.98	0.04	0.19

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.10 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.5.89
Frequency Used : 05 Hz

Diskette No.: 36
Source Level: 0.140 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	18.71	18.71	0.00
3	Prox	Acc 2	18.97	18.84	0.69
5	LVDT	Acc 2	18.71	18.88	-0.91
7	Geo 2	Geo 1	18.34	18.76	-2.29
9	Prox	Geo 2	18.97	18.23	3.88
11	LVDT	Acc 1	18.73	18.69	0.21
13	Prox	LVDT	18.88	18.63	1.30
15	LVDT	Acc 1	18.73	18.71	0.11
17	Acc 1	Geo 2	18.83	18.31	2.76
19	Prox	Geo 1	18.86	18.79	0.37
21	Acc 1	Geo 1	18.78	18.79	-0.05
23	LVDT	Prox	18.76	18.80	-0.21
25	Geo 2	Acc 1	18.41	18.71	-1.63
27	Prox	Acc 1	18.91	18.75	0.85
29	Acc 1	Acc 2	18.84	18.96	-0.64
31	Acc 2	Prox	19.05	18.79	1.36
33	Prox	Geo 2	18.89	18.32	3.02
35	Acc 2	Geo 2	19.03	18.33	3.68
37	Acc 1	Prox	18.83	18.79	0.21
39	LVDT	Geo 1	18.80	18.91	-0.59
41	Acc 2	Geo 1	19.05	18.87	0.97
43	LVDT	Acc 2	18.81	19.04	-1.22
45	Geo 2	Geo 1	18.39	18.81	-2.28
47	Acc 2	Geo 2	19.04	18.33	3.73
49	Acc 1	Acc 2	18.84	18.98	-0.72
51	Acc 2	Geo 1	19.07	18.87	1.05
53	Prox	Geo 1	18.91	18.86	0.26
55	LVDT	Geo 2	18.81	18.40	2.20
57	LVDT	Geo 1	18.84	18.93	-0.48
59	Geo 2	LVDT	18.50	18.74	-1.30

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.11 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.10)

Date of Experiment: 9.5.89
Frequency Used : 05 Hz

Diskette No.: 36
Source Level: 0.140 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	18.97	18.84	0.69
9	Prox	Geo 2	18.97	18.23	3.88
13	Prox	LVDT	18.88	18.63	1.30
19	Prox	Geo 1	18.86	18.79	0.37
23	LVDT	Prox	18.76	18.80	0.21
27	Prox	Acc 1	18.91	18.75	0.85
31	Acc 2	Prox	19.05	18.79	-1.38
33	Prox	Geo 2	18.89	18.32	3.02
37	Acc 1	Prox	18.83	18.79	-0.21
53	Prox	Geo 1	18.91	18.86	0.26

Table E.12 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.10)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	18.77	0.06	0.35
2	Accelerometer 2	18.99	0.07	0.56
3	Geophone 1	18.83	0.07	0.43
4	Geophone 2	18.36	0.07	0.47
5	Proximeter	18.88	0.06	0.40
6	L.V.D.T.	18.76	0.06	0.34

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.13 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 25 mils

Date of Experiment: 10.05.89 Diskette No.: 69
Frequency Used : 05 Hz Source Level: 0.185 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	25.82	25.31	1.99
3	Prox	Acc 2	25.88	25.93	-0.21
5	LVDT	Acc 2	25.69	25.95	-1.03
7	Geo 2	Geo 1	25.35	25.32	0.12
9	Prox	Geo 2	25.90	25.24	2.54
11	LVDT	Acc 1	25.71	25.74	-0.12
13	Prox	LVDT	25.91	25.57	1.31
15	LVDT	Acc 1	25.72	25.75	-0.12
17	Acc 1	Geo 2	25.89	25.26	2.43
19	Prox	Geo 1	25.83	25.36	1.82
21	Acc 1	Geo 1	25.94	25.44	1.94
23	LVDT	Prox	25.81	25.85	-0.14
25	Geo 2	Acc 1	25.47	25.81	-1.33
27	Prox	Acc 1	26.01	25.84	0.65
29	Acc 1	Acc 2	25.99	26.08	-0.35
31	Acc 2	Prox	26.20	25.87	1.26
33	Prox	Geo 2	26.02	25.38	2.46
35	Acc 2	Geo 2	26.22	25.38	3.20
37	Acc 1	Prox	25.99	25.89	0.38
39	LVDT	Geo 1	25.86	25.49	1.43
41	Acc 2	Geo 1	26.23	25.49	2.82
43	LVDT	Acc 2	25.86	26.09	-0.89
45	Geo 2	Geo 1	25.53	25.51	0.08
47	Acc 2	Geo 2	26.24	25.42	3.12
49	Acc 1	Acc 2	26.05	26.14	-0.35
51	Acc 2	Geo 1	26.26	25.52	2.82
53	Prox	Geo 1	26.05	25.51	2.07
55	LVDT	Geo 2	25.88	25.42	1.78
57	LVDT	Geo 1	25.88	25.52	1.39
59	Geo 2	LVDT	25.54	25.74	-0.78

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.14 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.13)

Date of Experiment: 10.05.89 Diskette No.: 69
Frequency Used : 05 Hz Source Level: 0.185 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	25.88	25.93	-0.21
9	Prox	Geo 2	25.90	25.24	2.54
13	Prox	LVDT	25.91	25.57	1.31
19	Prox	Geo 1	25.83	25.36	1.82
23	LVDT	Prox	25.81	25.85	0.14
27	Prox	Acc 1	26.01	25.84	0.65
31	Acc 2	Prox	26.20	25.87	-1.28
33	Prox	Geo 2	26.02	25.38	2.46
37	Acc 1	Prox	25.99	25.89	-0.39
53	Prox	Geo 1	26.05	25.51	2.07

Table E.15 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.13)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	25.88	0.10	1.03
2	Accelerometer 2	26.13	0.11	1.28
3	Geophone 1	25.45	0.08	0.66
4	Geophone 2	25.40	0.10	0.91
5	Proximeter	25.92	0.07	0.55
6	L.V.D.T.	25.77	0.10	0.96

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.16 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 1 mil

Date of Experiment: 10.06.89 Diskette No.: 70
Frequency Used : 10 Hz Source Level: 0.015 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	1.30	1.30	-0.23
3	Prox	Acc 2	1.31	1.33	-1.53
5	LVDT	Acc 2	1.28	1.33	-3.91
7	Geo 2	Geo 1	1.35	1.31	3.11
9	Prox	Geo 2	1.32	1.34	-1.52
11	LVDT	Acc 1	1.29	1.29	0.23
13	Prox	LVDT	1.32	1.29	2.27
15	LVDT	Acc 1	1.29	1.29	0.08
17	Acc 1	Geo 2	1.30	1.34	-3.08
19	Prox	Geo 1	1.32	1.31	0.76
21	Acc 1	Geo 1	1.30	1.31	-0.77
23	LVDT	Prox	1.30	1.31	-1.16
25	Geo 2	Acc 1	1.35	1.30	3.70
27	Prox	Acc 1	1.32	1.30	1.52
29	Acc 1	Acc 2	1.31	1.35	-2.67
31	Acc 2	Prox	1.36	1.31	3.46
33	Prox	Geo 2	1.32	1.34	-1.52
35	Acc 2	Geo 2	1.36	1.35	0.66
37	Acc 1	Prox	1.31	1.32	-0.46
39	LVDT	Geo 1	1.30	1.31	-1.16
41	Acc 2	Geo 1	1.35	1.32	2.52
43	LVDT	Acc 2	1.30	1.35	-4.25
45	Geo 2	Geo 1	1.35	1.32	2.52
47	Acc 2	Geo 2	1.36	1.35	0.74
49	Acc 1	Acc 2	1.31	1.35	-3.05
51	Acc 2	Geo 1	1.36	1.32	2.94
53	Prox	Geo 1	1.33	1.32	0.45
55	LVDT	Geo 2	1.30	1.35	-3.96
57	LVDT	Geo 1	1.29	1.32	-2.09
59	Geo 2	LVDT	1.35	1.29	4.44

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.17 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.16)

Date of Experiment: 10.06.89 Diskette No.: 70
Frequency Used : 10 Hz Source Level: 0.015 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
3	Prox	Acc 2	1.31	1.33	-1.53
9	Prox	Geo 2	1.32	1.34	-1.52
13	Prox	LVDT	1.32	1.29	2.27
19	Prox	Geo 1	1.32	1.31	0.76
23	LVDT	Prox	1.30	1.31	1.15
27	Prox	Acc 1	1.32	1.30	1.52
31	Acc 2	Prox	1.36	1.31	-3.59
33	Prox	Geo 2	1.32	1.34	-1.52
37	Acc 1	Prox	1.31	1.32	0.46
53	Prox	Geo 1	1.33	1.32	0.45

Table E.18 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.16)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	1.30	0.01	0.01
2	Accelerometer 2	1.35	0.01	0.01
3	Geophone 1	1.31	0.01	0.00
4	Geophone 2	1.35	0.00	0.00
5	Proximeter	1.32	0.01	0.00
6	L.V.D.T.	1.29	0.00	0.00

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.19 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.4.89
Frequency Used : 10 Hz

Diskette No.: 33
Source Level: 0.045 Volts

File	Device Used		Deflection (mil)		Difference
No.	Channel 1	Channel 2	Channel 1	Channel 2	(percent)+
1	Acc 1	Geo 1	4.80	4.79	0.21
3	Prox	Acc 2	4.88	4.92	-0.82
5	LVDT	Acc 2	4.75	4.93	-3.79
7	Geo 2	Geo 1	4.82	4.82	0.00
9	Prox	Geo 2	4.92	4.80	2.44
11	LVDT	Acc 1	4.77	4.84	-1.47
13	Prox	LVDT	4.92	4.75	3.46
15	LVDT	Acc 1	4.77	4.83	-1.26
17	Acc 1	Geo 2	4.88	4.81	1.43
19	Prox	Geo 1	4.93	4.85	1.62
21	Acc 1	Geo 1	4.86	4.84	0.41
23	LVDT	Prox	4.79	4.92	-2.71
25	Geo 2	Acc 1	4.85	4.86	-0.21
27	Prox	Acc 1	4.92	4.84	1.63
29	Acc 1	Acc 2	4.87	4.96	-1.85
31	Acc 2	Prox	4.95	4.88	1.41
33	Prox	Geo 2	4.86	4.78	1.65
35	Acc 2	Geo 2	4.91	4.77	2.85
37	Acc 1	Prox	4.78	4.82	-0.84
39	LVDT	Geo 1	4.80	4.88	-1.67
41	Acc 2	Geo 1	4.96	4.86	2.02
43	LVDT	Acc 2	4.82	4.97	-3.11
45	Geo 2	Geo 1	4.87	4.87	0.00
47	Acc 2	Geo 2	4.97	4.83	2.82
49	Acc 1	Acc 2	4.87	4.96	-1.85
51	Acc 2	Geo 1	4.98	4.88	2.01
53	Prox	Geo 1	4.97	4.88	1.81
55	LVDT	Geo 2	4.80	4.86	-1.31
57	LVDT	Geo 1	4.80	4.87	-1.52
59	Geo 2	LVDT	4.88	4.79	1.84

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.20 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.19)

Date of Experiment: 9.4.89 Diskette No.: 33
Frequency Used : 10 Hz Source Level: 0.045 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	4.88	4.92	-0.82
9	Prox	Geo 2	4.92	4.80	2.44
13	Prox	LVDT	4.92	4.75	3.46
19	Prox	Geo 1	4.93	4.85	1.62
23	LVDT	Prox	4.79	4.92	2.64
27	Prox	Acc 1	4.92	4.84	1.63
31	Acc 2	Prox	4.95	4.88	-1.43
33	Prox	Geo 2	4.86	4.78	1.65
37	Acc 1	Prox	4.78	4.82	0.83
53	Prox	Geo 1	4.97	4.88	1.81

Table E.21 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.19)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	4.84	0.03	0.09
2	Accelerometer 2	4.95	0.02	0.05
3	Geophone 1	4.85	0.03	0.08
4	Geophone 2	4.83	0.04	0.13
5	Proximeter	4.90	0.04	0.16
6	L.V.D.T.	4.78	0.02	0.05

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.22 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 10 mils

Date of Experiment: 10.06.89
Frequency Used : 10 Hz

Diskette No.: 71
Source Level: 0.09 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	10.64	10.52	1.13
3	Prox	Acc 2	10.80	10.77	0.28
5	LVDT	Acc 2	10.51	10.77	-2.47
7	Geo 2	Geo 1	10.57	10.53	0.38
9	Prox	Geo 2	10.81	10.52	2.68
11	LVDT	Acc 1	10.53	10.59	-0.57
13	Prox	LVDT	10.82	10.48	3.14
15	LVDT	Acc 1	10.54	10.60	-0.57
17	Acc 1	Geo 2	10.68	10.53	1.40
19	Prox	Geo 1	10.83	10.55	2.59
21	Acc 1	Geo 1	10.69	10.55	1.31
23	LVDT	Prox	10.55	10.78	-2.18
25	Geo 2	Acc 1	10.60	10.64	-0.38
27	Prox	Acc 1	10.83	10.64	1.75
29	Acc 1	Acc 2	10.69	10.85	-1.50
31	Acc 2	Prox	10.91	10.77	1.28
33	Prox	Geo 2	10.84	10.56	2.58
35	Acc 2	Geo 2	10.91	10.56	3.21
37	Acc 1	Prox	10.70	10.78	-0.75
39	LVDT	Geo 1	10.56	10.58	-0.19
41	Acc 2	Geo 1	10.92	10.58	3.11
43	LVDT	Acc 2	10.56	10.87	-2.94
45	Geo 2	Geo 1	10.62	10.59	0.28
47	Acc 2	Geo 2	10.93	10.57	3.29
49	Acc 1	Acc 2	10.71	10.87	-1.49
51	Acc 2	Geo 1	10.93	10.59	3.11
53	Prox	Geo 1	10.87	10.59	2.58
55	LVDT	Geo 2	10.57	10.58	-0.09
57	LVDT	Geo 1	10.58	10.60	-0.19
59	Geo 2	LVDT	10.63	10.51	1.13

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.23 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.22)

Date of Experiment: 10.06.89 Diskette No.: 71
Frequency Used : 10 Hz Source Level: 0.09 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	10.80	10.77	0.28
9	Prox	Geo 2	10.81	10.52	2.68
13	Prox	LVDT	10.82	10.48	3.14
19	Prox	Geo 1	10.83	10.55	2.59
23	LVDT	Prox	10.55	10.78	2.13
27	Prox	Acc 1	10.83	10.64	1.75
31	Acc 2	Prox	10.91	10.77	-1.30
33	Prox	Geo 2	10.84	10.56	2.58
37	Acc 1	Prox	10.70	10.78	0.74
53	Prox	Geo 1	10.87	10.59	2.58

Table E.24 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.22)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	10.66	0.04	0.16
2	Accelerometer 2	10.87	0.06	0.33
3	Geophone 1	10.57	0.03	0.07
4	Geophone 2	10.57	0.03	0.11
5	Proximeter	10.81	0.03	0.09
6	L.V.D.T.	10.54	0.03	0.09

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.25 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.4.89
Frequency Used : 10 Hz

Diskette No.: 34
Source Level: 0.140 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	18.59	18.39	1.08
3	Prox	Acc 2	18.59	18.64	-0.27
5	LVDT	Acc 2	18.25	18.75	-2.74
7	Geo 2	Geo 1	18.23	18.35	-0.66
9	Prox	Geo 2	18.71	18.14	3.05
11	LVDT	Acc 1	18.26	18.49	-1.26
13	Prox	LVDT	18.49	18.17	1.73
15	LVDT	Acc 1	18.26	18.47	-1.15
17	Acc 1	Geo 2	18.63	18.20	2.31
19	Prox	Geo 1	18.53	18.41	0.65
21	Acc 1	Geo 1	18.57	18.37	1.08
23	LVDT	Prox	18.31	18.44	-0.71
25	Geo 2	Acc 1	18.22	18.42	-1.10
27	Prox	Acc 1	18.50	18.48	0.09
29	Acc 1	Acc 2	18.51	18.72	-1.13
31	Acc 2	Prox	18.77	18.38	2.08
33	Prox	Geo 2	18.54	18.12	2.27
35	Acc 2	Geo 2	18.88	18.19	3.65
37	Acc 1	Prox	18.58	18.41	0.91
39	LVDT	Geo 1	18.32	18.46	-0.76
41	Acc 2	Geo 1	18.92	18.46	2.43
43	LVDT	Acc 2	18.30	18.85	-3.01
45	Geo 2	Geo 1	18.25	18.34	-0.49
47	Acc 2	Geo 2	18.73	18.04	3.68
49	Acc 1	Acc 2	18.41	18.66	-1.36
51	Acc 2	Geo 1	18.74	18.24	2.67
53	Prox	Geo 1	18.59	18.48	0.59
55	LVDT	Geo 2	18.36	18.28	0.44
57	LVDT	Geo 1	18.34	18.50	-0.86
59	Geo 2	LVDT	18.38	18.25	0.71

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.26 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.25)

Date of Experiment: 9.4.89　　Diskette No.: 34
Frequency Used : 10 Hz　　Source Level: 0.140 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference+ (percent)
3	Prox	Acc 2	18.59	18.64	-0.27
9	Prox	Geo 2	18.71	18.14	3.05
13	Prox	LVDT	18.49	18.17	1.73
19	Prox	Geo 1	18.53	18.41	0.65
23	LVDT	Prox	18.31	18.44	0.70
27	Prox	Acc 1	18.50	18.48	0.09
31	Acc 2	Prox	18.77	18.38	-2.12
33	Prox	Geo 2	18.54	18.12	2.27
37	Acc 1	Prox	18.58	18.41	-0.92
53	Prox	Geo 1	18.59	18.48	0.59

Table E.27 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.25)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	18.52	0.07	0.50
2	Accelerometer 2	18.77	0.09	0.75
3	Geophone 1	18.40	0.07	0.56
4	Geophone 2	18.21	0.09	0.78
5	Proximeter	18.52	0.09	0.86
6	L.V.D.T.	18.28	0.05	0.28

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.28 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 25 mils

Date of Experiment: 10.06.89
Frequency Used : 10 Hz

Diskette No.: 73
Source Level: 0.19 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	25.76	25.44	1.24
3	Prox	Acc 2	25.57	26.04	-1.84
5	LVDT	Acc 2	25.42	26.05	-2.48
7	Geo 2	Geo 1	25.38	25.46	-0.32
9	Prox	Geo 2	25.59	25.25	1.33
11	LVDT	Acc 1	25.44	25.67	-0.90
13	Prox	LVDT	25.59	25.30	1.13
15	LVDT	Acc 1	25.45	25.69	-0.94
17	Acc 1	Geo 2	25.82	25.26	2.17
19	Prox	Geo 1	25.62	25.49	0.51
21	Acc 1	Geo 1	25.84	25.49	1.35
23	LVDT	Prox	25.47	25.48	-0.04
25	Geo 2	Acc 1	25.42	25.73	-1.22
27	Prox	Acc 1	25.63	25.73	-0.39
29	Acc 1	Acc 2	25.84	26.11	-1.04
31	Acc 2	Prox	26.24	25.49	2.86
33	Prox	Geo 2	25.65	25.31	1.33
35	Acc 2	Geo 2	26.23	25.30	3.55
37	Acc 1	Prox	25.87	25.50	1.43
39	LVDT	Geo 1	25.50	25.52	-0.08
41	Acc 2	Geo 1	26.25	25.53	2.74
43	LVDT	Acc 2	25.50	26.12	-2.45
45	Geo 2	Geo 1	25.45	25.53	-0.31
47	Acc 2	Geo 2	26.25	25.32	3.54
49	Acc 1	Acc 2	25.87	26.14	-1.04
51	Acc 2	Geo 1	26.25	25.54	2.70
53	Prox	Geo 1	25.67	25.55	0.47
55	LVDT	Geo 2	25.52	25.34	0.71
57	LVDT	Geo 1	25.53	25.56	-0.12
59	Geo 2	LVDT	25.48	25.38	0.39

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.29 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.28)

Date of Experiment: 10.06.89 Diskette No.: 73
Frequency Used : 10 Hz Source Level: 0.19 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	25.57	26.04	-1.84
9	Prox	Geo 2	25.59	25.25	1.33
13	Prox	LVDT	25.59	25.30	1.13
19	Prox	Geo 1	25.62	25.49	0.51
23	LVDT	Prox	25.47	25.48	0.04
27	Prox	Acc 1	25.63	25.73	-0.39
31	Acc 2	Prox	26.24	25.49	-2.94
33	Prox	Geo 2	25.65	25.31	1.33
37	Acc 1	Prox	25.87	25.50	-1.45
53	Prox	Geo 1	25.67	25.55	0.47

Table E.30 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.28)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	25.78	0.07	0.51
2	Accelerometer 2	26.17	0.08	0.66
3	Geophone 1	25.51	0.04	0.14
4	Geophone 2	25.35	0.07	0.56
5	Proximeter	25.58	0.06	0.42
6	L.V.D.T.	25.45	0.07	0.45

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.31 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 1 mil

Date of Experiment: 3.16.89
Frequency Used : 15 Hz

Diskette No.: 1&2
Source Level: 0.025 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 5	4.57	4.62	-1.09
3	Prox	Acc 2	4.58	4.63	-0.98
5	LVDT	Acc 2	4.69	4.63	1.39
7	Geo 6	Geo 5	4.69	4.63	1.39
9	Prox	Geo 6	4.55	4.63	-1.80
11	LVDT	Acc 1	4.54	4.63	-1.87
13	Prox	LVDT	4.68	4.63	1.07
15	LVDT	Acc 1	4.68	4.63	1.03
17	Acc 1	Geo 6	4.67	4.64	0.56
19	Prox	Geo 5	4.66	4.64	0.45
21	Acc 1	Geo 5	4.66	4.65	0.17
23	LVDT	Prox	4.66	4.66	0.00
25	Geo 6	Acc 1	4.58	4.65	-1.55
27	Prox	Acc 1	4.58	4.65	-1.55
29	Acc 1	Acc 2	4.69	4.65	0.85
31	Acc 2	Prox	4.69	4.66	0.64
33	Prox	Geo 6	4.56	4.66	-2.19
35	Acc 2	Geo 6	4.56	4.66	-2.19
37	Acc 1	Prox	4.55	4.66	-2.53
39	LVDT	Geo 5	4.55	4.66	-2.44
41	Acc 2	Geo 5	4.53	4.55	-0.33
43	LVDT	Acc 2	4.53	4.55	-0.42
45	Geo 6	Geo 5	4.55	4.64	-1.98
47	Acc 2	Geo 6	4.55	4.65	-2.13
49	Acc 1	Acc 2	4.69	4.57	2.64
51	Acc 2	Geo 5	4.70	4.58	2.55
53	Prox	Geo 5	4.70	4.66	0.96
55	LVDT	Geo 6	4.70	4.65	1.06
57	LVDT	Geo 5	4.61	4.65	-0.87
59	Geo 6	LVDT	4.60	4.65	-1.09

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.32 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.31)

Date of Experiment: 3.16.89
Frequency Used : 15 Hz

Diskette No.: 1&2
Source Level: 0.025 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	4.58	4.63	-0.98
9	Prox	Geo 6	4.55	4.63	-1.80
13	Prox	LVDT	4.68	4.63	1.07
19	Prox	Geo 5	4.66	4.64	0.45
23	LVDT	Prox	4.66	4.66	0.00
27	Prox	Acc 1	4.58	4.65	-1.55
31	Acc 2	Prox	4.69	4.66	-0.64
33	Prox	Geo 6	4.56	4.66	-2.19
37	Acc 1	Prox	4.55	4.66	2.47
53	Prox	Geo 5	4.70	4.66	0.96

Table E.33 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.31)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	4.64	0.05	0.20
2	Accelerometer 2	4.60	0.06	0.34
3	Geophone 5	4.63	0.03	0.12
4	Geophone 6	4.63	0.04	0.16
5	Proximeter	4.63	0.05	0.28
6	L.V.D.T.	4.62	0.06	0.37

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.34 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 3.16.89
Frequency Used : 15 Hz

Diskette No.: 1&2
Source Level: 0.04 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 5	7.93	8.02	-1.13
3	Prox	Acc 2	7.93	8.02	-1.08
5	LVDT	Acc 2	7.94	8.03	-1.08
7	Geo 6	Geo 5	7.88	7.97	-1.09
9	Prox	Geo 6	8.02	7.97	0.64
11	LVDT	Acc 1	8.12	8.07	0.62
13	Prox	LVDT	8.16	8.05	1.38
15	LVDT	Acc 1	8.14	8.04	1.28
17	Acc 1	Geo 6	7.93	8.06	-1.64
19	Prox	Geo 5	7.90	8.03	-1.67
21	Acc 1	Geo 5	8.08	8.00	0.99
23	LVDT	Prox	8.06	7.98	0.99
25	Geo 6	Acc 1	7.93	8.10	-2.14
27	Prox	Acc 1	7.97	8.14	-2.13
29	Acc 1	Acc 2	8.22	8.15	0.85
31	Acc 2	Prox	8.18	8.12	0.73
33	Prox	Geo 6	8.01	8.12	-1.40
35	Acc 2	Geo 6	8.04	8.14	-1.24
37	Acc 1	Prox	8.18	8.16	0.24
39	LVDT	Geo 5	8.16	8.15	0.17
41	Acc 2	Geo 5	8.21	7.94	3.29
43	LVDT	Acc 2	8.19	7.92	3.30
45	Geo 6	Geo 5	8.07	7.86	2.60
47	Acc 2	Geo 6	8.04	7.84	2.51
49	Acc 1	Acc 2	8.04	7.96	1.00
51	Acc 2	Geo 5	8.05	7.97	0.99
53	Prox	Geo 5	7.93	8.07	-1.77
55	LVDT	Geo 6	7.87	8.02	-1.91
57	LVDT	Geo 5	7.93	7.97	-0.50
59	Geo 6	LVDT	7.88	7.90	-0.25

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 5 & 6 ; LVDT Serial No.: 4745

Table E.35 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.34)

Date of Experiment: 3.16.89 Diskette No.: 1&2
Frequency Used : 15 Hz Source Level: 0.04 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	7.93	8.02	-1.08
9	Prox	Geo 6	8.02	7.97	0.64
13	Prox	LVDT	8.16	8.05	1.38
19	Prox	Geo 5	7.90	8.03	-1.67
23	LVDT	Prox	8.06	7.98	-1.00
27	Prox	Acc 1	7.97	8.14	-2.13
31	Acc 2	Prox	8.18	8.12	-0.74
33	Prox	Geo 6	8.01	8.12	-1.40
37	Acc 1	Prox	8.18	8.16	-0.25
53	Prox	Geo 5	7.93	8.07	-1.77

Table E.36 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.34)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	8.07	0.09	0.82
2	Accelerometer 2	8.06	0.09	0.79
3	Geophone 5	8.00	0.07	0.54
4	Geophone 6	7.99	0.10	1.03
5	Proximeter	8.02	0.09	0.84
6	L.V.D.T.	8.04	0.11	1.24

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.37 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 10 mils

Date of Experiment: 3.16.89 Diskette No.: 3
Frequency Used : 15 Hz Source Level: 0.05 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 5	10.35	10.28	0.72
3	Prox	Acc 2	10.38	10.05	3.18
5	LVDT	Acc 2	10.03	10.06	-0.29
7	Geo 6	Geo 5	10.30	10.21	0.87
9	Prox	Geo 6	10.37	10.24	1.29
11	LVDT	Acc 1	10.03	10.24	-2.04
13	Prox	LVDT	10.41	10.09	3.07
15	LVDT	Acc 1	10.06	10.26	-1.99
17	Acc 1	Geo 6	10.33	10.30	0.29
19	Prox	Geo 5	10.46	10.27	1.82
21	Acc 1	Geo 5	10.32	10.25	0.68
23	LVDT	Prox	10.07	10.36	-2.87
25	Geo 6	Acc 1	10.33	10.26	0.69
27	Prox	Acc 1	10.44	10.29	1.48
29	Acc 1	Acc 2	10.33	10.13	1.94
31	Acc 2	Prox	10.17	10.38	-2.06
33	Prox	Geo 6	10.41	10.26	1.44
35	Acc 2	Geo 6	10.15	10.27	-1.18
37	Acc 1	Prox	10.33	10.37	-0.39
39	LVDT	Geo 5	10.09	10.26	-1.68
41	Acc 2	Geo 5	10.21	10.26	-0.51
43	LVDT	Acc 2	10.09	10.13	-0.40
45	Geo 6	Geo 5	10.35	10.25	0.97
47	Acc 2	Geo 6	10.19	10.31	-1.18
49	Acc 1	Acc 2	10.31	10.10	2.01
51	Acc 2	Geo 5	10.19	10.26	-0.69
53	Prox	Geo 5	10.45	10.26	1.82
55	LVDT	Geo 6	10.09	10.30	-2.08
57	LVDT	Geo 5	10.09	10.25	-1.59
59	Geo 6	LVDT	10.37	10.06	2.99

+Difference=[Channel 1-Channel 2]*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.38 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.37)

Date of Experiment: 3.16.89 Diskette No.: 3
Frequency Used : 15 Hz Source Level: 0.05 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	10.38	10.05	3.18
9	Prox	Geo 6	10.37	10.24	1.29
13	Prox	LVDT	10.41	10.09	3.07
19	Prox	Geo 5	10.46	10.27	1.82
23	LVDT	Prox	10.07	10.36	2.79
27	Prox	Acc 1	10.44	10.29	1.48
31	Acc 2	Prox	10.17	10.38	2.02
33	Prox	Geo 6	10.41	10.26	1.44
37	Acc 1	Prox	10.33	10.37	0.39
53	Prox	Geo 5	10.45	10.26	1.82

Table E.39 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.37)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	10.30	0.04	0.13
2	Accelerometer 2	10.14	0.05	0.27
3	Geophone 5	10.25	0.02	0.03
4	Geophone 6	10.30	0.04	0.15
5	Proximeter	10.40	0.03	0.12
6	L.V.D.T.	10.07	0.02	0.05

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.40 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 3.25.89
Frequency Used : 15 Hz
Diskette No.: 4
Source Level: 0.075 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 5	14.88	15.01	-0.84
3	Prox	Acc 2	15.61	15.30	2.02
5	LVDT	Acc 2	15.21	15.52	-2.09
7	Geo 6	Geo 5	15.45	15.00	2.95
9	Prox	Geo 6	15.37	15.20	1.12
11	LVDT	Acc 1	14.91	14.81	0.70
13	Prox	LVDT	15.67	14.95	4.61
15	LVDT	Acc 1	15.10	15.00	0.66
17	Acc 1	Geo 6	14.96	15.45	-3.30
19	Prox	Geo 5	15.59	15.06	3.41
21	Acc 1	Geo 5	14.91	15.03	-0.79
23	LVDT	Prox	14.91	15.44	-3.58
25	Geo 6	Acc 1	15.56	14.91	4.21
27	Prox	Acc 1	15.63	14.92	4.56
29	Acc 1	Acc 2	14.85	15.20	-2.35
31	Acc 2	Prox	15.25	15.39	-0.93
33	Prox	Geo 6	15.64	15.51	0.88
35	Acc 2	Geo 6	15.28	15.36	-0.51
37	Acc 1	Prox	15.03	15.57	-3.59
39	LVDT	Geo 5	14.95	15.03	-0.58
41	Acc 2	Geo 5	15.34	15.04	1.97
43	LVDT	Acc 2	14.97	15.28	-2.11
45	Geo 6	Geo 5	15.74	15.16	3.64
47	Acc 2	Geo 6	15.47	15.57	-0.66
49	Acc 1	Acc 2	14.96	15.32	-2.38
51	Acc 2	Geo 5	15.75	15.44	1.98
53	Prox	Geo 5	15.76	15.25	3.23
55	LVDT	Geo 6	14.95	15.43	-3.18
57	LVDT	Geo 5	14.99	15.08	-0.57
59	Geo 6	LVDT	15.55	14.91	4.13

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.41 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.40)

Date of Experiment: 3.25.89
Frequency Used : 15 Hz

Diskette No.: 4
Source Level: 0.075 Volts

File No.	Device Used: Channel 1	Device Used: Channel 2	Deflection (mil): Channel 1	Deflection (mil): Channel 2	Difference (percent)+
3	Prox	Acc 2	15.61	15.30	2.02
9	Prox	Geo 6	15.37	15.20	1.12
13	Prox	LVDT	15.67	14.95	4.61
19	Prox	Geo 5	15.59	15.06	3.41
23	LVDT	Prox	14.91	15.44	3.46
27	Prox	Acc 1	15.63	14.92	4.56
31	Acc 2	Prox	15.25	15.39	0.92
33	Prox	Geo 6	15.64	15.51	0.88
37	Acc 1	Prox	15.03	15.57	3.47
53	Prox	Geo 5	15.76	15.25	3.23

Table E.42 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.40)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	14.92	0.06	0.39
2	Accelerometer 2	15.37	0.16	2.47
3	Geophone 5	15.11	0.13	1.80
4	Geophone 6	15.48	0.14	1.83
5	Proximeter	15.57	0.12	1.44
6	L.V.D.T.	14.98	0.09	0.84

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.43 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 10.06.89
Frequency Used : 20 Hz

Diskette No.: 72
Source Level: 0.05 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)$^+$
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	5.26	5.17	1.71
3	Prox	Acc 2	5.32	5.35	-0.56
5	LVDT	Acc 2	5.18	5.35	-3.28
7	Geo 2	Geo 1	5.23	5.18	0.96
9	Prox	Geo 2	5.32	5.20	2.26
11	LVDT	Acc 1	5.19	5.24	-0.96
13	Prox	LVDT	5.33	5.15	3.38
15	LVDT	Acc 1	5.18	5.24	-1.16
17	Acc 1	Geo 2	5.27	5.21	1.14
19	Prox	Geo 1	5.33	5.18	2.81
21	Acc 1	Geo 1	5.27	5.18	1.71
23	LVDT	Prox	5.18	5.30	-2.32
25	Geo 2	Acc 1	5.24	5.25	-0.19
27	Prox	Acc 1	5.33	5.25	1.50
29	Acc 1	Acc 2	5.27	5.37	-1.90
31	Acc 2	Prox	5.40	5.31	1.67
33	Prox	Geo 2	5.34	5.22	2.25
35	Acc 2	Geo 2	5.40	5.21	3.52
37	Acc 1	Prox	5.28	5.30	-0.38
39	LVDT	Geo 1	5.18	5.19	-0.19
41	Acc 2	Geo 1	5.40	5.19	3.89
43	LVDT	Acc 2	5.19	5.38	-3.66
45	Geo 2	Geo 1	5.25	5.19	1.14
47	Acc 2	Geo 2	5.40	5.22	3.33
49	Acc 1	Acc 2	5.28	5.38	-1.89
51	Acc 2	Geo 1	5.41	5.19	4.07
53	Prox	Geo 1	5.34	5.20	2.72
55	LVDT	Geo 2	5.20	5.22	-0.38
57	LVDT	Geo 1	5.20	5.19	0.19
59	Geo 2	LVDT	5.24	5.16	1.53

$^+$Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.44 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.43)

Date of Experiment: 10.06.89 Diskette No.: 72
Frequency Used : 20 Hz Source Level: 0.05 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	5.32	5.35	-0.56
9	Prox	Geo 2	5.32	5.20	2.26
13	Prox	LVDT	5.33	5.15	3.38
19	Prox	Geo 1	5.33	5.18	2.81
23	LVDT	Prox	5.18	5.30	2.26
27	Prox	Acc 1	5.33	5.25	1.50
31	Acc 2	Prox	5.40	5.31	-1.69
33	Prox	Geo 2	5.34	5.22	2.25
37	Acc 1	Prox	5.28	5.30	0.38
53	Prox	Geo 1	5.34	5.20	2.72

Table E.45 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.43)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	5.26	0.01	0.02
2	Accelerometer 2	5.38	0.02	0.04
3	Geophone 1	5.19	0.01	0.01
4	Geophone 2	5.22	0.01	0.02
5	Proximeter	5.32	0.01	0.02
6	L.V.D.T.	5.18	0.02	0.02

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.46 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 10 mils

Date of Experiment: 4.1.89
Frequency Used : 20 Hz

Diskette No.: 7
Source Level: 0.065 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 5	10.38	10.39	-0.08
3	Prox	Acc 2	10.78	10.70	0.71
5	LVDT	Acc 2	10.38	10.58	-1.92
7	Geo 6	Geo 5	10.82	10.34	4.40
9	Prox	Geo 6	10.79	10.83	-0.40
11	LVDT	Acc 1	10.53	10.36	1.61
13	Prox	LVDT	10.87	10.51	3.31
15	LVDT	Acc 1	10.54	10.37	1.61
17	Acc 1	Geo 6	10.45	10.89	-4.16
19	Prox	Geo 5	10.81	10.40	3.84
21	Acc 1	Geo 5	10.42	10.43	-0.10
23	LVDT	Prox	10.50	10.76	-2.44
25	Geo 6	Acc 1	10.95	10.40	5.02
27	Prox	Acc 1	10.91	10.41	4.58
29	Acc 1	Acc 2	10.45	10.77	-3.06
31	Acc 2	Prox	10.82	10.81	0.09
33	Prox	Geo 6	10.77	10.78	-0.09
35	Acc 2	Geo 6	10.87	10.92	-0.46
37	Acc 1	Prox	10.47	10.85	-3.63
39	LVDT	Geo 5	10.62	10.50	1.13
41	Acc 2	Geo 5	10.93	10.55	3.48
43	LVDT	Acc 2	10.62	10.82	-1.88
45	Geo 6	Geo 5	11.02	10.53	4.45
47	Acc 2	Geo 6	10.83	10.88	-0.46
49	Acc 1	Acc 2	10.52	10.85	-3.14
51	Acc 2	Geo 5	10.87	10.49	3.50
53	Prox	Geo 5	10.81	10.40	3.79
55	LVDT	Geo 6	10.46	10.76	-2.87
57	LVDT	Geo 5	10.68	10.57	1.03
59	Geo 6	LVDT	11.10	10.66	3.96

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.47 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.46)

Date of Experiment: 4.1.89
Frequency Used : 20 Hz

Diskette No.: 7
Source Level: 0.065 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	10.78	10.70	0.71
9	Prox	Geo 6	10.79	10.83	-0.40
13	Prox	LVDT	10.87	10.51	3.31
19	Prox	Geo 5	10.81	10.40	3.84
23	LVDT	Prox	10.50	10.76	2.38
27	Prox	Acc 1	10.91	10.41	4.58
31	Acc 2	Prox	10.82	10.81	-0.09
33	Prox	Geo 6	10.77	10.78	-0.09
37	Acc 1	Prox	10.47	10.85	3.50
53	Prox	Geo 5	10.81	10.40	3.79

Table E.48 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.46)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	10.42	0.05	0.22
2	Accelerometer 2	10.80	0.10	0.92
3	Geophone 5	10.46	0.07	0.54
4	Geophone 6	10.89	0.10	1.03
5	Proximeter	10.82	0.05	0.21
6	L.V.D.T.	10.55	0.09	0.80

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.49 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 4.1.89
Frequency Used : 20 Hz

Diskette No.: 8
Source Level: 0.08 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 5	13.34	13.35	-0.07
3	Prox	Acc 2	13.90	13.77	0.94
5	LVDT	Acc 2	13.52	13.77	-1.85
7	Geo 6	Geo 5	14.01	13.35	4.71
9	Prox	Geo 6	13.89	13.92	-0.22
11	LVDT	Acc 1	13.50	13.25	1.85
13	Prox	LVDT	13.89	13.43	3.31
15	LVDT	Acc 1	13.50	13.26	1.78
17	Acc 1	Geo 6	13.32	13.91	-4.43
19	Prox	Geo 5	13.91	13.35	4.03
21	Acc 1	Geo 5	13.34	13.35	-0.07
23	LVDT	Prox	13.53	13.85	-2.37
25	Geo 6	Acc 1	14.01	13.28	5.21
27	Prox	Acc 1	13.90	13.27	4.53
29	Acc 1	Acc 2	13.37	13.81	-3.29
31	Acc 2	Prox	13.85	13.83	0.14
33	Prox	Geo 6	13.92	13.94	-0.14
35	Acc 2	Geo 6	13.84	13.91	-0.51
37	Acc 1	Prox	13.34	13.83	-3.67
39	LVDT	Geo 5	13.54	13.36	1.33
41	Acc 2	Geo 5	13.85	13.37	3.47
43	LVDT	Acc 2	13.52	13.77	-1.85
45	Geo 6	Geo 5	13.99	13.33	4.72
47	Acc 2	Geo 6	13.85	13.93	-0.58
49	Acc 1	Acc 2	13.35	13.79	-3.30
51	Acc 2	Geo 5	13.89	13.38	3.67
53	Prox	Geo 5	13.94	13.37	4.09
55	LVDT	Geo 6	13.55	13.95	-2.95
57	LVDT	Geo 5	13.57	13.39	1.33
59	Geo 6	LVDT	14.03	13.48	3.92

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.50 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.49)

Date of Experiment: 4.1.89 Diskette No.: 8
Frequency Used : 20 Hz Source Level: 0.08 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	13.90	13.77	0.94
9	Prox	Geo 6	13.89	13.92	-0.22
13	Prox	LVDT	13.89	13.43	3.31
19	Prox	Geo 5	13.91	13.35	4.03
23	LVDT	Prox	13.53	13.85	2.31
27	Prox	Acc 1	13.90	13.27	4.53
31	Acc 2	Prox	13.85	13.83	-0.14
33	Prox	Geo 6	13.92	13.94	-0.14
37	Acc 1	Prox	13.34	13.83	3.54
53	Prox	Geo 5	13.94	13.37	4.09

Table E.51 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.49)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	13.31	0.04	0.17
2	Accelerometer 2	13.82	0.04	0.16
3	Geophone 5	13.36	0.02	0.03
4	Geophone 6	13.96	0.04	0.19
5	Proximeter	13.89	0.04	0.13
6	L.V.D.T.	13.51	0.04	0.14

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.52 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 25 mils

Date of Experiment: 10.06.89 Diskette No.: 74
Frequency Used : 20 Hz Source Level: 0.21 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	23.02	22.50	2.26
3	Prox	Acc 2	22.66	23.22	-2.47
5	LVDT	Acc 2	22.56	23.22	-2.93
7	Geo 2	Geo 1	22.56	22.49	0.31
9	Prox	Geo 2	22.67	22.44	1.01
11	LVDT	Acc 1	22.59	22.90	-1.37
13	Prox	LVDT	22.67	22.45	0.97
15	LVDT	Acc 1	22.58	22.89	-1.37
17	Acc 1	Geo 2	23.02	22.45	2.48
19	Prox	Geo 1	22.67	22.50	0.75
21	Acc 1	Geo 1	23.03	22.51	2.26
23	LVDT	Prox	22.58	22.54	0.18
25	Geo 2	Acc 1	22.57	22.90	-1.46
27	Prox	Acc 1	22.67	22.90	-1.01
29	Acc 1	Acc 2	23.02	23.23	-0.91
31	Acc 2	Prox	23.36	22.53	3.55
33	Prox	Geo 2	22.66	22.45	0.93
35	Acc 2	Geo 2	23.36	22.46	3.85
37	Acc 1	Prox	23.02	22.53	2.13
39	LVDT	Geo 1	22.60	22.51	0.40
41	Acc 2	Geo 1	23.36	22.51	3.64
43	LVDT	Acc 2	22.61	23.24	-2.79
45	Geo 2	Geo 1	22.59	22.51	0.35
47	Acc 2	Geo 2	23.36	22.46	3.85
49	Acc 1	Acc 2	23.03	23.25	-0.96
51	Acc 2	Geo 1	23.37	22.51	3.68
53	Prox	Geo 1	22.67	22.51	0.71
55	LVDT	Geo 2	22.63	22.47	0.71
57	LVDT	Geo 1	22.63	22.51	0.53
59	Geo 2	LVDT	22.59	22.51	0.35

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.53 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.52)

Date of Experiment: 10.06.89 Diskette No.: 74
Frequency Used : 20 Hz Source Level: 0.21 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	22.66	23.22	-2.47
9	Prox	Geo 2	22.67	22.44	1.01
13	Prox	LVDT	22.67	22.45	0.97
19	Prox	Geo 1	22.67	22.50	0.75
23	LVDT	Prox	22.58	22.54	-0.18
27	Prox	Acc 1	22.67	22.90	-1.01
31	Acc 2	Prox	23.36	22.53	-3.68
33	Prox	Geo 2	22.66	22.45	0.93
37	Acc 1	Prox	23.02	22.53	-2.17
53	Prox	Geo 1	22.67	22.51	0.71

Table E.54 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.52)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelorometer 1	22.97	0.06	0.38
2	Accelorometer 2	23.30	0.07	0.43
3	Geophone 1	22.51	0.01	0.00
4	Geophone 2	22.50	0.06	0.37
5	Proximeter	22.63	0.06	0.38
6	L.V.D.T.	22.57	0.05	0.28

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.55 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 30 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 4.5.89
Frequency Used : 30 Hz

Diskette No.: 12
Source Level: 0.055 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 5	4.03	4.00	0.82
3	Prox	Acc 2	3.95	3.98	-0.97
5	LVDT	Acc 2	3.94	4.00	-1.55
7	Geo 6	Geo 5	4.02	3.99	0.78
9	Prox	Geo 6	3.95	3.99	-1.07
11	LVDT	Acc 1	3.91	3.98	-1.72
13	Prox	LVDT	3.94	3.88	1.45
15	LVDT	Acc 1	3.90	3.97	-1.68
17	Acc 1	Geo 6	3.97	3.96	0.25
19	Prox	Geo 5	3.91	3.94	-0.58
21	Acc 1	Geo 5	3.96	3.93	0.78
23	LVDT	Prox	3.84	3.84	0.09
25	Geo 6	Acc 1	3.87	3.91	-1.03
27	Prox	Acc 1	3.87	3.91	-1.03
29	Acc 1	Acc 2	3.95	3.90	1.20
31	Acc 2	Prox	3.92	3.88	0.90
33	Prox	Geo 6	3.85	3.88	-0.78
35	Acc 2	Geo 6	3.92	3.90	0.49
37	Acc 1	Prox	3.92	3.83	2.35
39	LVDT	Geo 5	3.80	3.85	-1.40
41	Acc 2	Geo 5	3.87	3.86	0.25
43	LVDT	Acc 2	3.81	3.85	-1.00
45	Geo 6	Geo 5	3.80	3.85	-1.24
47	Acc 2	Geo 6	3.88	3.86	0.53
49	Acc 1	Acc 2	3.91	3.86	1.32
51	Acc 2	Geo 5	3.88	3.87	0.30
53	Prox	Geo 5	3.84	3.89	-1.19
55	LVDT	Geo 6	3.83	3.87	-1.04
57	LVDT	Geo 5	3.86	3.91	-1.45
59	Geo 6	LVDT	3.88	3.80	2.06

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 5 & 6 ; LVDT Serial No.: 4745

Table E.56 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.55)

Date of Experiment: 4.5.89 Diskette No.: 12
Frequency Used : 30 Hz Source Level: 0.055 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	3.95	3.98	-0.97
9	Prox	Geo 6	3.95	3.99	-1.07
13	Prox	LVDT	3.94	3.88	1.45
19	Prox	Geo 5	3.91	3.94	-0.58
23	LVDT	Prox	3.84	3.84	-0.09
27	Prox	Acc 1	3.87	3.91	-1.03
31	Acc 2	Prox	3.92	3.88	-0.91
33	Prox	Geo 6	3.85	3.88	-0.78
37	Acc 1	Prox	3.92	3.83	-2.40
53	Prox	Geo 5	3.84	3.89	-1.19

Table E.57 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.55)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	3.95	0.04	0.13
2	Accelerometer 2	3.91	0.05	0.24
3	Geophone 5	3.91	0.05	0.27
4	Geophone 6	3.90	0.06	0.40
5	Proximeter	3.89	0.04	0.20
6	L.V.D.T.	3.86	0.05	0.22

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.58 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 30 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 4.8.89
Frequency Used : 30 Hz

Diskette No.: 14
Source Level: 0.205 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 5	15.75	15.51	1.52
3	Prox	Acc 2	15.05	15.08	-0.20
5	LVDT	Acc 2	15.23	14.98	1.65
7	Geo 6	Geo 5	15.12	15.54	-2.78
9	Prox	Geo 6	15.16	15.06	0.66
11	LVDT	Acc 1	15.27	15.66	-2.55
13	Prox	LVDT	15.09	15.35	-1.72
15	LVDT	Acc 1	15.31	15.61	-1.96
17	Acc 1	Geo 6	15.71	14.97	4.71
19	Prox	Geo 5	15.00	15.43	-2.89
21	Acc 1	Geo 5	15.56	15.33	1.48
23	LVDT	Prox	15.23	14.87	2.36
25	Geo 6	Acc 1	14.87	15.45	-3.90
27	Prox	Acc 1	14.97	15.49	-3.51
29	Acc 1	Acc 2	15.54	14.91	4.05
31	Acc 2	Prox	15.04	14.89	1.00
33	Prox	Geo 6	14.99	14.89	0.67
35	Acc 2	Geo 6	15.14	14.97	1.12
37	Acc 1	Prox	15.56	14.88	4.37
39	LVDT	Geo 5	14.99	15.09	-0.67
41	Acc 2	Geo 5	14.84	15.16	-2.16
43	LVDT	Acc 2	15.29	14.97	2.09
45	Geo 6	Geo 5	14.83	15.23	-2.70
47	Acc 2	Geo 6	15.02	14.90	0.80
49	Acc 1	Acc 2	15.45	14.65	5.18
51	Acc 2	Geo 5	14.74	15.24	-3.39
53	Prox	Geo 5	14.72	15.20	-3.26
55	LVDT	Geo 6	15.03	14.62	2.73
57	LVDT	Geo 5	14.91	15.14	-1.54
59	Geo 6	LVDT	14.60	14.85	-1.71

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 5 & 6 ; LVDT Serial No.: 4745

Table E.59 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.58)

Date of Experiment: 4.8.89 Diskette No.: 14
Frequency Used : 30 Hz Source Level: 0.205 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	15.05	15.08	-0.20
9	Prox	Geo 6	15.16	15.06	0.66
13	Prox	LVDT	15.09	15.35	-1.72
19	Prox	Geo 5	15.00	15.43	-2.89
23	LVDT	Prox	15.23	14.87	-2.42
27	Prox	Acc 1	14.97	15.49	-3.51
31	Acc 2	Prox	15.04	14.89	-1.01
33	Prox	Geo 6	14.99	14.89	0.67
37	Acc 1	Prox	15.56	14.88	-4.57
53	Prox	Geo 5	14.72	15.20	-3.26

Table E.60 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.58)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	15.58	0.10	0.97
2	Accelerometer 2	14.94	0.15	2.13
3	Geophone 5	15.29	0.15	2.26
4	Geophone 6	14.88	0.16	2.55
5	Proximeter	14.96	0.12	1.44
6	L.V.D.T.	15.15	0.17	3.00

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.61 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 30 Hz and a Nominal Deflection of 25 mils

Date of Experiment: 4.8.89
Frequency Used : 30 Hz

Diskette No.: 15
Source Level: 0.305 Volts

File No.	Device Used		Deflection (mil)		Difference[+] (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 5	23.03	22.65	1.65
3	Prox	Acc 2	22.03	21.99	0.18
5	LVDT	Acc 2	22.45	21.73	3.21
7	Geo 6	Geo 5	22.70	22.44	1.15
9	Prox	Geo 6	22.12	22.32	-0.90
11	LVDT	Acc 1	22.63	22.63	0.00
13	Prox	LVDT	21.97	22.51	-2.46
15	LVDT	Acc 1	22.66	22.70	-0.18
17	Acc 1	Geo 6	22.85	22.34	2.23
19	Prox	Geo 5	22.02	22.49	-2.13
21	Acc 1	Geo 5	22.86	22.49	1.62
23	LVDT	Prox	22.57	21.78	3.50
25	Geo 6	Acc 1	22.31	22.58	-1.21
27	Prox	Acc 1	22.20	22.84	-2.88
29	Acc 1	Acc 2	22.74	21.93	3.56
31	Acc 2	Prox	22.01	21.87	0.64
33	Prox	Geo 6	22.02	22.21	-0.86
35	Acc 2	Geo 6	21.92	22.09	-0.78
37	Acc 1	Prox	22.68	21.85	3.66
39	LVDT	Geo 5	22.51	22.29	0.98
41	Acc 2	Geo 5	21.95	22.28	-1.50
43	LVDT	Acc 2	22.49	21.81	3.02
45	Geo 6	Geo 5	22.36	22.39	-0.13
47	Acc 2	Geo 6	22.07	22.24	-0.77
49	Acc 1	Acc 2	22.66	21.82	3.71
51	Acc 2	Geo 5	22.01	22.36	-1.59
53	Prox	Geo 5	22.03	22.38	-1.59
55	LVDT	Geo 6	22.59	22.21	1.68
57	LVDT	Geo 5	22.55	22.33	0.98
59	Geo 6	LVDT	22.29	22.44	-0.67

[+]Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 5 & 6 ; LVDT Serial No.: 4745

Table E.62 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.61)

Date of Experiment: 4.8.89 Diskette No.: 15
Frequency Used : 30 Hz Source Level: 0.305 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	22.03	21.99	0.18
9	Prox	Geo 6	22.12	22.32	-0.90
13	Prox	LVDT	21.97	22.51	-2.46
19	Prox	Geo 5	22.02	22.49	-2.13
23	LVDT	Prox	22.57	21.78	-3.63
27	Prox	Acc 1	22.20	22.84	-2.88
31	Acc 2	Prox	22.01	21.87	-0.64
33	Prox	Geo 6	22.02	22.21	-0.86
37	Acc 1	Prox	22.68	21.85	-3.80
53	Prox	Geo 5	22.03	22.38	-1.59

Table E.63 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.61)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	22.76	0.13	1.67
2	Accelerometer 2	21.92	0.10	1.03
3	Geophone 5	22.41	0.11	1.13
4	Geophone 6	22.31	0.15	2.29
5	Proximeter	21.99	0.12	1.44
6	L.V.D.T.	22.54	0.07	0.48

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 5 & 6 ; LVDT Serial No.: 4745

Table E.64 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 1 mil

Date of Experiment: 9.3.89
Frequency Used : 40 Hz

Diskette No.: 28
Source Level: 0.045 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	1.39	1.36	2.16
3	Prox	Acc 2	1.37	1.43	-4.38
5	LVDT	Acc 2	1.36	1.43	-5.15
7	Geo 2	Geo 1	1.39	1.35	2.88
9	Prox	Geo 2	1.36	1.38	-1.47
11	LVDT	Acc 1	1.35	1.37	-1.48
13	Prox	LVDT	1.37	1.35	1.46
15	LVDT	Acc 1	1.35	1.37	-1.48
17	Acc 1	Geo 2	1.38	1.38	0.00
19	Prox	Geo 1	1.35	1.35	0.00
21	Acc 1	Geo 1	1.38	1.35	2.17
23	LVDT	Prox	1.36	1.35	0.74
25	Geo 2	Acc 1	1.39	1.38	0.72
27	Prox	Acc 1	1.36	1.38	-1.47
29	Acc 1	Acc 2	1.38	1.43	-3.62
31	Acc 2	Prox	1.43	1.35	5.59
33	Prox	Geo 2	1.35	1.38	-2.22
35	Acc 2	Geo 2	1.43	1.38	3.50
37	Acc 1	Prox	1.38	1.34	2.90
39	LVDT	Geo 1	1.36	1.36	0.00
41	Acc 2	Geo 1	1.43	1.35	5.59
43	LVDT	Acc 2	1.36	1.42	-4.41
45	Geo 2	Geo 1	1.39	1.35	2.88
47	Acc 2	Geo 2	1.43	1.38	3.50
49	Acc 1	Acc 2	1.38	1.43	-3.62
51	Acc 2	Geo 1	1.43	1.35	5.59
53	Prox	Geo 1	1.35	1.35	0.00
55	LVDT	Geo 2	1.36	1.38	-1.47
57	LVDT	Geo 1	1.36	1.35	0.74
59	Geo 2	LVDT	1.40	1.36	2.51

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.65 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.64)

Date of Experiment: 9.3.89
Frequency Used : 40 Hz

Diskette No.: 28
Source Level: 0.045 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	1.37	1.43	-4.38
9	Prox	Geo 2	1.36	1.38	-1.47
13	Prox	LVDT	1.37	1.35	1.46
19	Prox	Geo 1	1.35	1.35	0.00
23	LVDT	Prox	1.36	1.35	-0.74
27	Prox	Acc 1	1.36	1.38	-1.47
31	Acc 2	Prox	1.43	1.35	-5.93
33	Prox	Geo 2	1.35	1.38	-2.22
37	Acc 1	Prox	1.38	1.34	-2.99
53	Prox	Geo 1	1.35	1.35	0.00

Table E.66 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.64)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	1.38	0.01	0.00
2	Accelerometer 2	1.43	0.00	0.00
3	Geophone 1	1.35	0.00	0.00
4	Geophone 2	1.38	0.01	0.00
5	Proximeter	1.36	0.01	0.01
6	L.V.D.T.	1.36	0.00	0.00

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.67 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.4.89
Frequency Used : 40 Hz

Diskette No.: 29
Source Level: 0.175 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	5.17	5.06	2.13
3	Prox	Acc 2	5.07	5.33	-5.13
5	LVDT	Acc 2	5.09	5.33	-4.72
7	Geo 2	Geo 1	5.21	5.07	2.69
9	Prox	Geo 2	5.06	5.18	-2.37
11	LVDT	Acc 1	5.09	5.14	-0.98
13	Prox	LVDT	5.06	5.07	-0.20
15	LVDT	Acc 1	5.08	5.14	-1.18
17	Acc 1	Geo 2	5.17	5.18	-0.19
19	Prox	Geo 1	5.06	5.06	0.00
21	Acc 1	Geo 1	5.17	5.06	2.13
23	LVDT	Prox	5.09	5.03	1.18
25	Geo 2	Acc 1	5.21	5.14	1.34
27	Prox	Acc 1	5.05	5.15	-1.98
29	Acc 1	Acc 2	5.17	5.32	-2.90
31	Acc 2	Prox	5.37	5.09	5.21
33	Prox	Geo 2	5.14	5.16	-0.39
35	Acc 2	Geo 2	5.38	5.17	3.90
37	Acc 1	Prox	5.16	5.08	1.55
39	LVDT	Geo 1	5.08	5.05	0.59
41	Acc 2	Geo 1	5.38	5.06	5.95
43	LVDT	Acc 2	5.07	5.35	-5.52
45	Geo 2	Geo 1	5.20	5.05	2.83
47	Acc 2	Geo 2	5.38	5.18	3.72
49	Acc 1	Acc 2	5.15	5.35	-3.88
51	Acc 2	Geo 1	5.38	5.06	5.95
53	Prox	Geo 1	5.12	5.06	1.17
55	LVDT	Geo 2	5.08	5.17	-1.77
57	LVDT	Geo 1	5.08	5.05	0.59
59	Geo 2	LVDT	5.20	5.05	2.85

+Difference={Channel 1–Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.68 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.67)

Date of Experiment: 9.4.89 Diskette No.: 29
Frequency Used : 40 Hz Source Level: 0.175 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	5.07	5.33	-5.13
9	Prox	Geo 2	5.06	5.18	-2.37
13	Prox	LVDT	5.06	5.07	-0.20
19	Prox	Geo 1	5.06	5.06	0.00
23	LVDT	Prox	5.09	5.03	-1.19
27	Prox	Acc 1	5.05	5.15	-1.98
31	Acc 2	Prox	5.37	5.09	-5.50
33	Prox	Geo 2	5.14	5.16	-0.39
37	Acc 1	Prox	5.16	5.08	-1.57
53	Prox	Geo 1	5.12	5.06	1.17

Table E.69 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.67)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	5.16	0.01	0.02
2	Accelerometer 2	5.36	0.02	0.05
3	Geophone 1	5.06	0.01	0.00
4	Geophone 2	5.19	0.02	0.03
5	Proximeter	5.08	0.03	0.10
6	L.V.D.T.	5.08	0.01	0.01

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.70 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 10 mils

Date of Experiment: 9.4.89
Frequency Used : 40 Hz

Diskette No.: 30
Source Level: 0.365 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	10.60	10.37	2.17
3	Prox	Acc 2	10.50	10.99	-4.67
5	LVDT	Acc 2	10.48	11.00	-4.96
7	Geo 2	Geo 1	10.68	10.38	2.81
9	Prox	Geo 2	10.51	10.62	-1.05
11	LVDT	Acc 1	10.46	10.55	-0.86
13	Prox	LVDT	10.51	10.40	1.05
15	LVDT	Acc 1	10.46	10.54	-0.76
17	Acc 1	Geo 2	10.60	10.62	-0.19
19	Prox	Geo 1	10.50	10.37	1.24
21	Acc 1	Geo 1	10.61	10.38	2.17
23	LVDT	Prox	10.45	10.43	0.19
25	Geo 2	Acc 1	10.67	10.52	1.41
27	Prox	Acc 1	10.48	10.51	-0.29
29	Acc 1	Acc 2	10.56	11.00	-4.16
31	Acc 2	Prox	11.05	10.45	5.43
33	Prox	Geo 2	10.56	10.61	-0.47
35	Acc 2	Geo 2	11.06	10.62	3.98
37	Acc 1	Prox	10.53	10.46	0.66
39	LVDT	Geo 1	10.42	10.31	1.06
41	Acc 2	Geo 1	11.03	10.31	6.53
43	LVDT	Acc 2	10.46	10.97	-4.88
45	Geo 2	Geo 1	10.66	10.32	3.19
47	Acc 2	Geo 2	11.04	10.60	3.99
49	Acc 1	Acc 2	10.54	10.97	-4.08
51	Acc 2	Geo 1	11.03	10.33	6.35
53	Prox	Geo 1	10.54	10.32	2.09
55	LVDT	Geo 2	10.46	10.62	-1.53
57	LVDT	Geo 1	10.45	10.32	1.24
59	Geo 2	LVDT	10.66	10.40	2.45

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.71 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.70)

Date of Experiment: 9.4.89 Diskette No.: 30
Frequency Used : 40 Hz Source Level: 0.365 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	10.50	10.99	-4.67
9	Prox	Geo 2	10.51	10.62	-1.05
13	Prox	LVDT	10.51	10.40	1.05
19	Prox	Geo 1	10.50	10.37	1.24
23	LVDT	Prox	10.45	10.43	-0.19
27	Prox	Acc 1	10.48	10.51	-0.29
31	Acc 2	Prox	11.05	10.45	-5.74
33	Prox	Geo 2	10.56	10.61	-0.47
37	Acc 1	Prox	10.53	10.46	-0.67
53	Prox	Geo 1	10.54	10.32	2.09

Table E.72 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.70)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	10.56	0.03	0.11
2	Accelerometer 2	11.01	0.03	0.09
3	Geophone 1	10.34	0.03	0.08
4	Geophone 2	10.64	0.03	0.07
5	Proximeter	10.49	0.04	0.14
6	L.V.D.T.	10.44	0.03	0.07

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.73 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 25 mils

Date of Experiment: 10.06.89
Frequency Used : 40 Hz

Diskette No.: 75
Source Level: 0.8 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	22.93	22.40	2.31
3	Prox	Acc 2	22.06	23.12	-4.81
5	LVDT	Acc 2	22.57	23.22	-2.88
7	Geo 2	Geo 1	22.50	22.39	0.49
9	Prox	Geo 2	22.07	22.38	-1.40
11	LVDT	Acc 1	22.57	22.78	-0.93
13	Prox	LVDT	22.06	22.50	-1.99
15	LVDT	Acc 1	22.63	22.78	-0.66
17	Acc 1	Geo 2	22.91	22.37	2.36
19	Prox	Geo 1	22.06	22.38	-1.45
21	Acc 1	Geo 1	22.89	22.37	2.27
23	LVDT	Prox	22.67	21.92	3.31
25	Geo 2	Acc 1	22.48	22.75	-1.20
27	Prox	Acc 1	22.04	22.76	-3.27
29	Acc 1	Acc 2	22.88	23.19	-1.35
31	Acc 2	Prox	23.33	21.92	6.04
33	Prox	Geo 2	22.04	22.35	-1.41
35	Acc 2	Geo 2	23.33	22.35	4.20
37	Acc 1	Prox	22.90	21.90	4.37
39	LVDT	Geo 1	22.66	22.35	1.37
41	Acc 2	Geo 1	23.32	22.35	4.16
43	LVDT	Acc 2	22.66	23.19	-2.34
45	Geo 2	Geo 1	22.47	22.35	0.53
47	Acc 2	Geo 2	23.32	22.35	4.16
49	Acc 1	Acc 2	22.89	23.19	-1.31
51	Acc 2	Geo 1	23.31	22.34	4.16
53	Prox	Geo 1	22.03	22.35	-1.45
55	LVDT	Geo 2	22.64	22.35	1.28
57	LVDT	Geo 1	22.64	22.34	1.33
59	Geo 2	LVDT	22.46	22.50	-0.18

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.74 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.73)

Date of Experiment: 10.06.89 Diskette No.: 75
Frequency Used : 40 Hz Source Level: 0.8 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
3	Prox	Acc 2	22.06	23.12	-4.81
9	Prox	Geo 2	22.07	22.38	-1.40
13	Prox	LVDT	22.06	22.50	-1.99
19	Prox	Geo 1	22.06	22.38	-1.45
23	LVDT	Prox	22.67	21.92	-3.42
27	Prox	Acc.1	22.04	22.76	-3.27
31	Acc 2	Prox	23.33	21.92	-6.43
33	Prox	Geo 2	22.04	22.35	-1.41
37	Acc 1	Prox	22.90	21.90	-4.57
53	Prox	Geo 1	22.03	22.35	-1.45

Table E.75 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.73)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	22.85	0.07	0.44
2	Accelerometer 2	23.25	0.07	0.55
3	Geophone 1	22.36	0.02	0.04
4	Geophone 2	22.41	0.06	0.36
5	Proximeter	22.01	0.06	0.42
6	L.V.D.T.	22.60	0.06	0.38

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.76 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 1 mil

Date of Experiment: 8.1.89 Diskette No.: 17
Frequency Used : 50 Hz Source Level: 0.075 Volts

File	Device Used		Deflection (mil)		Difference+
No.	Channel 1	Channel 2	Channel 1	Channel 2	(percent)
1	Acc 1	Geo 1	1.18	1.17	0.43
3	Prox	Acc 2	1.11	1.15	-3.51
5	LVDT	Acc 2	1.09	1.14	-4.98
7	Geo 2	Geo 1	1.16	1.19	-2.16
9	Prox	Geo 2	1.11	1.15	-3.60
11	LVDT	Acc 1	1.10	1.18	-7.48
13	Prox	LVDT	1.14	1.12	1.75
15	LVDT	Acc 1	1.12	1.20	-7.14
17	Acc 1	Geo 2	1.21	1.17	3.31
19	Prox	Geo 1	1.13	1.20	-6.19
21	Acc 1	Geo 1	1.20	1.20	0.17
23	LVDT	Prox	1.13	1.14	-0.45
25	Geo 2	Acc 1	1.20	1.22	-1.69
27	Prox	Acc 1	1.13	1.20	-5.95
29	Acc 1	Acc 2	1.19	1.16	2.82
31	Acc 2	Prox	1.18	1.12	4.68
33	Prox	Geo 2	1.12	1.16	-3.57
35	Acc 2	Geo 2	1.17	1.16	0.60
37	Acc 1	Prox	1.20	1.12	6.67
39	LVDT	Geo 1	1.14	1.19	-4.30
41	Acc 2	Geo 1	1.19	1.18	0.84
43	LVDT	Acc 2	1.14	1.19	-4.39
45	Geo 2	Geo 1	1.21	1.18	2.48
47	Acc 2	Geo 2	1.21	1.20	0.83
49	Acc 1	Acc 2	1.24	1.21	2.42
51	Acc 2	Geo 1	1.21	1.18	2.48
53	Prox	Geo 1	1.16	1.20	-3.45
55	LVDT	Geo 2	1.15	1.20	-4.35
57	LVDT	Geo 1	1.15	1.98	-72.20
59	Geo 2	LVDT	1.21	1.15	5.04

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.77 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.76)

Date of Experiment: 8.1.89
Frequency Used : 50 Hz

Diskette No.: 17
Source Level: 0.075 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	1.11	1.15	-3.51
9	Prox	Geo 2	1.11	1.15	-3.60
13	Prox	LVDT	1.14	1.12	1.75
19	Prox	Geo 1	1.13	1.20	-6.19
23	LVDT	Prox	1.13	1.14	0.44
27	Prox	Acc 1	1.13	1.20	-5.95
31	Acc 2	Prox	1.18	1.12	-4.91
33	Prox	Geo 2	1.12	1.16	-3.57
37	Acc 1	Prox	1.20	1.12	-7.14
53	Prox	Geo 1	1.16	1.20	-3.45

Table E.78 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.76)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelorometer 1	1.20	0.02	0.03
2	Accelorometer 2	1.18	0.02	0.06
3	Geophone 1	1.27	0.24	5.66
4	Geophone 2	1.18	0.02	0.05
5	Proximeter	1.13	0.01	0.02
6	L.V.D.T.	1.13	0.02	0.05

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.79 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 8.2.89
Frequency Used : 50 Hz

Diskette No.: 18
Source Level: 0.275 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	5.12	5.10	0.39
3	Prox	Acc 2	4.87	5.06	-3.90
5	LVDT	Acc 2	4.86	5.06	-4.12
7	Geo 2	Geo 1	5.09	5.10	-0.20
9	Prox	Geo 2	4.89	5.07	-3.79
11	LVDT	Acc 1	4.86	5.10	-4.94
13	Prox	LVDT	4.88	4.84	0.72
15	LVDT	Acc 1	4.81	5.03	-4.57
17	Acc 1	Geo 2	5.05	5.01	0.79
19	Prox	Geo 1	4.88	5.10	-4.59
21	Acc 1	Geo 1	5.10	5.08	0.39
23	LVDT	Prox	4.85	4.84	0.21
25	Geo 2	Acc 1	5.09	5.08	0.14
27	Prox	Acc 1	4.87	5.08	-4.38
29	Acc 1	Acc 2	5.12	5.07	0.91
31	Acc 2	Prox	5.09	4.83	5.03
33	Prox	Geo 2	4.87	5.07	-4.13
35	Acc 2	Geo 2	5.09	5.07	0.49
37	Acc 1	Prox	5.10	4.83	5.29
39	LVDT	Geo 1	4.87	5.09	-4.62
41	Acc 2	Geo 1	5.09	5.09	0.00
43	LVDT	Acc 2	4.86	5.06	-4.04
45	Geo 2	Geo 1	5.09	5.09	-0.02
47	Acc 2	Geo 2	5.09	5.06	0.59
49	Acc 1	Acc 2	5.11	5.07	0.84
51	Acc 2	Geo 1	5.10	5.10	0.00
53	Prox	Geo 1	4.87	5.09	-4.62
55	LVDT	Geo 2	4.85	5.05	-4.12
57	LVDT	Geo 1	4.86	5.08	-4.53
59	Geo 2	LVDT	5.09	4.84	4.89

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.80 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.79)

Date of Experiment: 8.2.89 Diskette No.: 18
Frequency Used : 50 Hz Source Level: 0.275 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
3	Prox	Acc 2	4.87	5.06	-3.90
9	Prox	Geo 2	4.89	5.07	-3.79
13	Prox	LVDT	4.88	4.84	0.72
19	Prox	Geo 1	4.88	5.10	-4.59
23	LVDT	Prox	4.85	4.84	-0.21
27	Prox	Acc 1	4.87	5.08	-4.38
31	Acc 2	Prox	5.09	4.83	-5.30
33	Prox	Geo 2	4.87	5.07	-4.13
37	Acc 1	Prox	5.10	4.83	-5.59
53	Prox	Geo 1	4.87	5.09	-4.62

Table E.81 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.79)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	5.09	0.03	0.08
2	Accelerometer 2	5.08	0.02	0.02
3	Geophone 1	5.09	0.01	0.01
4	Geophone 2	5.07	0.02	0.06
5	Proximeter	4.86	0.02	0.03
6	L.V.D.T.	4.85	0.02	0.02

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.82 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 10 mils

Date of Experiment: 8.2.89
Frequency Used : 50 Hz

Diskette No.: 19
Source Level: 0.525 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	9.75	9.69	0.62
3	Prox	Acc 2	9.32	9.66	-3.65
5	LVDT	Acc 2	9.29	9.66	-4.03
7	Geo 2	Geo 1	9.71	9.69	0.21
9	Prox	Geo 2	9.31	9.65	-3.65
11	LVDT	Acc 1	9.29	9.69	-4.31
13	Prox	LVDT	9.32	9.27	0.54
15	LVDT	Acc 1	9.30	9.69	-4.15
17	Acc 1	Geo 2	9.73	9.65	0.82
19	Prox	Geo 1	9.31	9.68	-3.97
21	Acc 1	Geo 1	9.74	9.68	0.58
23	LVDT	Prox	9.26	9.26	0.00
25	Geo 2	Acc 1	9.71	9.68	0.30
27	Prox	Acc 1	9.30	9.68	-4.08
29	Acc 1	Acc 2	9.73	9.66	0.72
31	Acc 2	Prox	9.72	9.25	4.79
33	Prox	Geo 2	9.31	9.66	-3.76
35	Acc 2	Geo 2	9.71	9.65	0.62
37	Acc 1	Prox	9.74	9.26	4.95
39	LVDT	Geo 1	9.26	9.68	-4.54
41	Acc 2	Geo 1	9.72	9.68	0.41
43	LVDT	Acc 2	9.27	9.67	-4.29
45	Geo 2	Geo 1	9.72	9.69	0.28
47	Acc 2	Geo 2	9.72	9.66	0.65
49	Acc 1	Acc 2	9.74	9.66	0.78
51	Acc 2	Geo 1	9.72	9.69	0.35
53	Prox	Geo 1	9.31	9.68	-3.97
55	LVDT	Geo 2	9.28	9.66	-4.07
57	LVDT	Geo 1	9.29	9.68	-4.24
59	Geo 2	LVDT	9.71	9.23	4.94

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.83 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.82)

Date of Experiment: 8.2.89
Frequency Used : 50 Hz

Diskette No.: 19
Source Level: 0.525 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	9.32	9.66	-3.65
9	Prox	Geo 2	9.31	9.65	-3.65
13	Prox	LVDT	9.32	9.27	0.54
19	Prox	Geo 1	9.31	9.68	-3.97
23	LVDT	Prox	9.26	9.26	0.00
27	Prox	Acc 1	9.30	9.68	-4.08
31	Acc 2	Prox	9.72	9.25	-5.03
33	Prox	Geo 2	9.31	9.66	-3.76
37	Acc 1	Prox	9.74	9.26	-5.21
53	Prox	Geo 1	9.31	9.68	-3.97

Table E.84 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.82)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	9.72	0.03	0.07
2	Accelerometer 2	9.69	0.03	0.08
3	Geophone 1	9.68	0.00	0.00
4	Geophone 2	9.68	0.03	0.08
5	Proximeter	9.29	0.03	0.07
6	L.V.D.T.	9.27	0.02	0.04

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.85 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 8.2.89 Diskette No.: 20
Frequency Used : 50 Hz Source Level: 1.15 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	20.54	20.41	0.63
3	Prox	Acc 2	19.98	20.37	-1.95
5	LVDT	Acc 2	19.77	20.37	-3.03
7	Geo 2	Geo 1	20.40	20.39	0.05
9	Prox	Geo 2	19.95	20.28	-1.65
11	LVDT	Acc 1	19.70	20.34	-3.25
13	Prox	LVDT	19.89	19.60	1.46
15	LVDT	Acc 1	19.70	20.34	-3.25
17	Acc 1	Geo 2	20.45	20.22	1.12
19	Prox	Geo 1	19.86	20.30	-2.22
21	Acc 1	Geo 1	20.42	20.29	0.64
23	LVDT	Prox	19.63	19.75	-0.61
25	Geo 2	Acc 1	20.30	20.30	0.00
27	Prox	Acc 1	19.85	20.30	-2.27
29	Acc 1	Acc 2	20.40	20.25	0.74
31	Acc 2	Prox	20.36	19.72	3.14
33	Prox	Geo 2	19.82	20.17	-1.74
35	Acc 2	Geo 2	20.34	20.16	0.89
37	Acc 1	Prox	20.37	19.71	3.24
39	LVDT	Geo 1	19.57	20.23	-3.39
41	Acc 2	Geo 1	20.31	20.22	0.44
43	LVDT	Acc 2	19.56	20.20	-3.27
45	Geo 2	Geo 1	20.22	20.21	0.06
47	Acc 2	Geo 2	20.29	20.10	0.94
49	Acc 1	Acc 2	20.33	20.16	0.84
51	Acc 2	Geo 1	20.27	20.18	0.46
53	Prox	Geo 1	19.75	20.17	-2.11
55	LVDT	Geo 2	19.51	20.08	-2.89
57	LVDT	Geo 1	19.50	20.15	-3.31
59	Geo 2	LVDT	20.18	19.39	3.90

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.86 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.85)

Date of Experiment: 8.2.89 Diskette No.: 20
Frequency Used : 50 Hz Source Level: 1.15 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference+ (percent)
3	Prox	Acc 2	19.98	20.37	-1.95
9	Prox	Geo 2	19.95	20.28	-1.65
13	Prox	LVDT	19.89	19.60	1.46
19	Prox	Geo 1	19.86	20.30	-2.22
23	LVDT	Prox	19.63	19.75	0.61
27	Prox	Acc 1	19.85	20.30	-2.27
31	Acc 2	Prox	20.36	19.72	-3.25
33	Prox	Geo 2	19.82	20.17	-1.74
37	Acc 1	Prox	20.37	19.71	-3.35
53	Prox	Geo 1	19.75	20.17	-2.11

Table E.87 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.85)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	20.38	0.07	0.51
2	Accelerometer 2	20.29	0.07	0.48
3	Geophone 1	20.25	0.09	0.76
4	Geophone 2	20.21	0.09	0.85
5	Proximeter	19.83	0.09	0.81
6	L.V.D.T.	19.59	0.11	1.13

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.88 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 25 mils

Date of Experiment: 8.3.89
Frequency Used : 50 Hz

Diskette No.: 21
Source Level: 1.6 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference[+] (percent)
1	Acc 1	Geo 1	26.92	26.66	0.96
3	Prox	Acc 2	26.32	26.68	-1.35
5	LVDT	Acc 2	25.59	26.63	-4.04
7	Geo 2	Geo 1	26.59	26.56	0.12
9	Prox	Geo 2	26.18	26.43	-0.96
11	LVDT	Acc 1	25.53	26.58	-4.11
13	Prox	LVDT	26.39	25.84	2.10
15	LVDT	Acc 1	25.93	26.77	-3.22
17	Acc 1	Geo 2	26.87	26.53	1.26
19	Prox	Geo 1	26.22	26.57	-1.33
21	Acc 1	Geo 1	26.82	26.55	1.01
23	LVDT	Prox	26.14	26.01	0.52
25	Geo 2	Acc 1	26.50	26.56	-0.24
27	Prox	Acc 1	26.09	26.54	-1.72
29	Acc 1	Acc 2	26.67	26.45	0.82
31	Acc 2	Prox	26.61	25.93	2.57
33	Prox	Geo 2	26.05	26.28	-0.88
35	Acc 2	Geo 2	26.58	26.26	1.19
37	Acc 1	Prox	26.63	25.89	2.78
39	LVDT	Geo 1	25.97	26.33	-1.39
41	Acc 2	Geo 1	26.52	26.32	0.75
43	LVDT	Acc 2	25.96	26.39	-1.64
45	Geo 2	Geo 1	26.32	26.29	0.11
47	Acc 2	Geo 2	26.50	26.18	1.21
49	Acc 1	Acc 2	26.56	26.35	0.79
51	Acc 2	Geo 1	26.47	26.27	0.75
53	Prox	Geo 1	25.92	26.26	-1.29
55	LVDT	Geo 2	25.88	26.16	-1.08
57	LVDT	Geo 1	25.82	26.23	-1.58
59	Geo 2	LVDT	26.25	25.67	2.20

[+]Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.89 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.88)

Date of Experiment: 8.3.89　　Diskette No.: 21
Frequency Used : 50 Hz　　Source Level: 1.6 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference+ (percent)
3	Prox	Acc 2	26.32	26.68	-1.35
9	Prox	Geo 2	26.18	26.43	-0.96
13	Prox	LVDT	26.39	25.84	2.10
19	Prox	Geo 1	26.22	26.57	-1.33
23	LVDT	Prox	26.14	26.01	-0.52
27	Prox	Acc 1	26.09	26.54	-1.72
31	Acc 2	Prox	26.61	25.93	-2.63
33	Prox	Geo 2	26.05	26.28	-0.88
37	Acc 1	Prox	26.63	25.89	-2.86
53	Prox	Geo 1	25.92	26.26	-1.29

Table E.90 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.88)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	26.69	0.13	1.80
2	Accelerometer 2	26.52	0.10	1.03
3	Geophone 1	26.40	0.15	2.35
4	Geophone 2	26.35	0.14	2.08
5	Proximeter	26.10	0.16	2.72
6	L.V.D.T.	25.83	0.18	3.19

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.91 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 1 mil

Date of Experiment: 8.26.89
Frequency Used : 75 Hz

Diskette No.: 22
Source Level: 0.155 Volts

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	1.19	1.16	2.52
3	Prox	Acc 2	1.17	1.21	-3.42
5	LVDT	Acc 2	1.16	1.21	-4.31
7	Geo 2	Geo 1	1.16	1.16	0.00
9	Prox	Geo 2	1.17	1.16	0.85
11	LVDT	Acc 1	1.15	1.18	-2.61
13	Prox	LVDT	1.17	1.14	2.56
15	LVDT	Acc 1	1.15	1.18	-2.61
17	Acc 1	Geo 2	1.19	1.16	2.52
19	Prox	Geo 1	1.17	1.16	0.85
21	Acc 1	Geo 1	1.19	1.16	2.52
23	LVDT	Prox	1.15	1.17	-1.74
25	Geo 2	Acc 1	1.16	1.19	-2.59
27	Prox	Acc 1	1.17	1.19	-1.71
29	Acc 1	Acc 2	1.19	1.21	-1.68
31	Acc 2	Prox	1.21	1.17	3.31
33	Prox	Geo 2	1.17	1.16	0.85
35	Acc 2	Geo 2	1.22	1.16	4.92
37	Acc 1	Prox	1.19	1.17	1.68
39	LVDT	Geo 1	1.15	1.16	-0.87
41	Acc 2	Geo 1	1.22	1.16	4.92
43	LVDT	Acc 2	1.16	1.21	-4.31
45	Geo 2	Geo 1	1.16	1.16	0.00
47	Acc 2	Geo 2	1.21	1.16	4.13
49	Acc 1	Acc 2	1.19	1.21	-1.68
51	Acc 2	Geo 1	1.21	1.16	4.13
53	Prox	Geo 1	1.17	1.16	0.85
55	LVDT	Geo 2	1.16	1.16	0.00
57	LVDT	Geo 1	1.16	1.16	0.00
59	Geo 2	LVDT	1.17	1.15	1.71

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.92 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.91)

Date of Experiment: 8.26.89   Diskette No.: 22
Frequency Used : 75 Hz   Source Level: 0.155 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	1.17	1.21	-3.42
9	Prox	Geo 2	1.17	1.16	0.85
13	Prox	LVDT	1.17	1.14	2.56
19	Prox	Geo 1	1.17	1.16	0.85
23	LVDT	Prox	1.15	1.17	1.71
27	Prox	Acc 1	1.17	1.19	-1.71
31	Acc 2	Prox	1.21	1.17	-3.42
33	Prox	Geo 2	1.17	1.16	0.85
37	Acc 1	Prox	1.19	1.17	-1.71
53	Prox	Geo 1	1.17	1.16	0.85

Table E.93 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.91)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	1.19	0.00	0.00
2	Accelerometer 2	1.21	0.00	0.00
3	Geophone 1	1.16	0.00	0.00
4	Geophone 2	1.16	0.00	0.00
5	Proximeter	1.17	0.00	0.00
6	L.V.D.T.	1.15	0.01	0.00

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ;   Prox. Serial No.: 18745
Geophone No.: 1 & 2 ;   LVDT Serial No.: 4745

Table E.94 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 8.26.89
Frequency Used : 75 Hz

Diskette No.: 23
Source Level: 0.700 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	5.15	5.00	2.91
3	Prox	Acc 2	5.08	5.25	-3.35
5	LVDT	Acc 2	5.02	5.24	-4.38
7	Geo 2	Geo 1	5.07	5.00	1.38
9	Prox	Geo 2	5.07	5.04	0.59
11	LVDT	Acc 1	5.02	5.11	-1.79
13	Prox	LVDT	5.06	4.92	2.77
15	LVDT	Acc 1	4.95	5.11	-3.23
17	Acc 1	Geo 2	5.14	5.04	1.95
19	Prox	Geo 1	5.06	4.99	1.38
21	Acc 1	Geo 1	5.14	4.99	2.92
23	LVDT	Prox	4.96	5.03	-1.41
25	Geo 2	Acc 1	5.07	5.11	-0.79
27	Prox	Acc 1	5.07	5.11	-0.79
29	Acc 1	Acc 2	5.14	5.24	-1.95
31	Acc 2	Prox	5.27	5.04	4.36
33	Prox	Geo 2	5.06	5.04	0.40
35	Acc 2	Geo 2	5.26	5.04	4.18
37	Acc 1	Prox	5.14	5.03	2.14
39	LVDT	Geo 1	4.95	4.99	-0.81
41	Acc 2	Geo 1	5.27	4.99	5.31
43	LVDT	Acc 2	4.94	5.23	-5.87
45	Geo 2	Geo 1	5.06	4.98	1.58
47	Acc 2	Geo 2	5.26	5.04	4.18
49	Acc 1	Acc 2	5.13	5.23	-1.95
51	Acc 2	Geo 1	5.26	4.98	5.32
53	Prox	Geo 1	5.03	4.96	1.39
55	LVDT	Geo 2	4.93	5.03	-2.03
57	LVDT	Geo 1	4.92	4.97	-1.02
59	Geo 2	LVDT	5.06	4.92	2.77

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.95 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.94)

Date of Experiment: 8.26.89 Diskette No.: 23
Frequency Used : 75 Hz Source Level: 0.700 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	5.08	5.25	-3.35
9	Prox	Geo 2	5.07	5.04	0.59
13	Prox	LVDT	5.06	4.92	2.77
19	Prox	Geo 1	5.06	4.99	1.38
23	LVDT	Prox	4.96	5.03	1.39
27	Prox	Acc 1	5.07	5.11	-0.79
31	Acc 2	Prox	5.27	5.04	-4.56
33	Prox	Geo 2	5.06	5.04	0.40
37	Acc 1	Prox	5.14	5.03	-2.19
53	Prox	Geo 1	5.03	4.96	1.39

Table E.96 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.94)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	5.13	0.02	0.02
2	Accelerometer 2	5.25	0.01	0.02
3	Geophone 1	4.99	0.01	0.01
4	Geophone 2	5.05	0.01	0.02
5	Proximeter	5.05	0.02	0.03
6	L.V.D.T.	4.95	0.04	0.13

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.97 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 10 mils

Date of Experiment: 8.26.89
Frequency Used : 75 Hz

Diskette No.: 24
Source Level: 1.5 Volts

File	Device Used		Deflection (mil)		Difference
No.	Channel 1	Channel 2	Channel 1	Channel 2	(percent)+
1	Acc 1	Geo 1	10.46	10.09	3.54
3	Prox	Acc 2	10.16	10.39	-2.26
5	LVDT	Acc 2	9.87	10.39	-5.27
7	Geo 2	Geo 1	10.08	10.06	0.20
9	Prox	Geo 2	10.13	10.02	1.09
11	LVDT	Acc 1	9.85	10.35	-5.08
13	Prox	LVDT	10.12	9.79	3.26
15	LVDT	Acc 1	9.85	10.34	-4.97
17	Acc 1	Geo 2	10.39	10.00	3.75
19	Prox	Geo 1	10.09	10.03	0.59
21	Acc 1	Geo 1	10.38	10.02	3.47
23	LVDT	Prox	9.81	10.03	-2.24
25	Geo 2	Acc 1	10.03	10.30	-2.69
27	Prox	Acc 1	10.07	10.30	-2.28
29	Acc 1	Acc 2	10.36	10.33	0.29
31	Acc 2	Prox	10.36	10.00	3.47
33	Prox	Geo 2	10.05	9.95	1.00
35	Acc 2	Geo 2	10.36	9.94	4.05
37	Acc 1	Prox	10.34	10.00	3.29
39	LVDT	Geo 1	9.78	9.99	-2.15
41	Acc 2	Geo 1	10.36	10.00	3.47
43	LVDT	Acc 2	9.77	10.29	-5.32
45	Geo 2	Geo 1	9.98	9.98	0.00
47	Acc 2	Geo 2	10.33	9.92	3.97
49	Acc 1	Acc 2	10.33	10.28	0.48
51	Acc 2	Geo 1	10.33	9.95	3.68
53	Prox	Geo 1	10.01	9.94	0.70
55	LVDT	Geo 2	9.70	9.90	-2.06
57	LVDT	Geo 1	9.72	9.95	-2.37
59	Geo 2	LVDT	9.97	9.65	3.21

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.98 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.97)

Date of Experiment: 8.26.89 Diskette No.: 24
Frequency Used : 75 Hz Source Level: 1.5 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	10.16	10.39	-2.26
9	Prox	Geo 2	10.13	10.02	1.09
13	Prox	LVDT	10.12	9.79	3.26
19	Prox	Geo 1	10.09	10.03	0.59
23	LVDT	Prox	9.81	10.03	2.19
27	Prox	Acc 1	10.07	10.30	-2.28
31	Acc 2	Prox	10.36	10.00	-3.60
33	Prox	Geo 2	10.05	9.95	1.00
37	Acc 1	Prox	10.34	10.00	-3.40
53	Prox	Geo 1	10.01	9.94	0.70

Table E.99 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.97)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	10.36	0.04	0.20
2	Accelerometer 2	10.34	0.04	0.13
3	Geophone 1	10.00	0.05	0.22
4	Geophone 2	9.98	0.05	0.27
5	Proximeter	10.07	0.05	0.30
6	L.V.D.T.	9.78	0.07	0.46

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.100 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 8.27.89
Frequency Used : 75 Hz

Diskette No.: 25
Source Level: 1.9 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	18.10	17.46	3.54
3	Prox	Acc 2	17.43	17.86	-2.47
5	LVDT	Acc 2	17.46	17.78	-1.83
7	Geo 2	Geo 1	17.17	17.20	-0.17
9	Prox	Geo 2	17.23	17.04	1.10
11	LVDT	Acc 1	17.34	17.68	-1.96
13	Prox	LVDT	17.19	17.21	-0.12
15	LVDT	Acc 1	17.26	17.62	-2.09
17	Acc 1	Geo 2	17.69	16.92	4.35
19	Prox	Geo 1	17.01	17.00	0.06
21	Acc 1	Geo 1	17.63	16.99	3.63
23	LVDT	Prox	17.13	16.95	1.05
25	Geo 2	Acc 1	16.89	17.47	-3.43
27	Prox	Acc 1	16.96	17.44	-2.83
29	Acc 1	Acc 2	17.52	17.40	0.68
31	Acc 2	Prox	17.49	16.82	3.83
33	Prox	Geo 2	16.90	16.71	1.12
35	Acc 2	Geo 2	17.45	16.69	4.36
37	Acc 1	Prox	17.45	16.77	3.90
39	LVDT	Geo 1	16.95	16.76	1.12
41	Acc 2	Geo 1	17.37	16.74	3.63
43	LVDT	Acc 2	16.92	17.25	-1.95
45	Geo 2	Geo 1	16.67	16.68	-0.06
47	Acc 2	Geo 2	17.30	16.55	4.34
49	Acc 1	Acc 2	17.32	17.18	0.81
51	Acc 2	Geo 1	17.26	16.61	3.77
53	Prox	Geo 1	16.68	16.59	0.54
55	LVDT	Geo 2	16.81	16.45	2.14
57	LVDT	Geo 1	16.79	16.54	1.49
59	Geo 2	LVDT	16.50	16.67	-1.03

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.101 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.100)

Date of Experiment: 8.27.89   Diskette No.: 25
Frequency Used : 75 Hz   Source Level: 1.9 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	17.43	17.86	-2.47
9	Prox	Geo 2	17.23	17.04	1.10
13	Prox	LVDT	17.19	17.21	-0.12
19	Prox	Geo 1	17.01	17.00	0.06
23	LVDT	Prox	17.13	16.95	-1.06
27	Prox	Acc 1	16.96	17.44	-2.83
31	Acc 2	Prox	17.49	16.82	-3.98
33	Prox	Geo 2	16.90	16.71	1.12
37	Acc 1	Prox	17.45	16.77	-4.05
53	Prox	Geo 1	16.68	16.59	0.54

Table E.102 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.100)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelorometer 1	17.59	0.20	4.15
2	Accelorometer 2	17.43	0.21	4.56
3	Geophone 1	16.86	0.28	8.07
4	Geophone 2	16.76	0.23	5.12
5	Proximeter	16.99	0.22	4.75
6	L.V.D.T.	17.05	0.25	6.25

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.103 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 100 Hz and a Nominal Deflection of 1 mil

Date of Experiment: 8.31.89
Frequency Used : 100 Hz

Diskette No.: 26
Source Level: 0.3 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	1.19	1.15	3.36
3	Prox	Acc 2	1.15	1.17	-1.74
5	LVDT	Acc 2	1.11	1.17	-5.41
7	Geo 2	Geo 1	1.13	1.15	-1.77
9	Prox	Geo 2	1.15	1.11	3.48
11	LVDT	Acc 1	1.11	1.19	-7.21
13	Prox	LVDT	1.15	1.10	4.35
15	LVDT	Acc 1	1.10	1.19	-8.18
17	Acc 1	Geo 2	1.19	1.12	5.88
19	Prox	Geo 1	1.15	1.15	0.00
21	Acc 1	Geo 1	1.19	1.15	3.36
23	LVDT	Prox	1.11	1.15	-3.60
25	Geo 2	Acc 1	1.13	1.19	-5.31
27	Prox	Acc 1	1.15	1.19	-3.48
29	Acc 1	Acc 2	1.19	1.17	1.68
31	Acc 2	Prox	1.18	1.15	2.54
33	Prox	Geo 2	1.16	1.12	3.45
35	Acc 2	Geo 2	1.18	1.12	5.08
37	Acc 1	Prox	1.19	1.15	3.36
39	LVDT	Geo 1	1.10	1.15	-4.55
41	Acc 2	Geo 1	1.18	1.15	2.54
43	LVDT	Acc 2	1.10	1.17	-6.36
45	Geo 2	Geo 1	1.13	1.15	-1.77
47	Acc 2	Geo 2	1.18	1.12	5.08
49	Acc 1	Acc 2	1.19	1.17	1.68
51	Acc 2	Geo 1	1.18	1.15	2.54
53	Prox	Geo 1	1.15	1.15	0.00
55	LVDT	Geo 2	1.11	1.12	-0.90
57	LVDT	Geo 1	1.11	1.15	-3.60
59	Geo 2	LVDT	1.13	1.10	2.65

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.104 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.103)

Date of Experiment: 8.31.89 Diskette No.: 26
Frequency Used : 100 Hz Source Level: 0.3 Volts

File No.	Device Used: Channel 1	Device Used: Channel 2	Deflection (mil): Channel 1	Deflection (mil): Channel 2	Difference+ (percent)
3	Prox	Acc 2	1.15	1.17	-1.74
9	Prox	Geo 2	1.15	1.11	3.48
13	Prox	LVDT	1.15	1.10	4.35
19	Prox	Geo 1	1.15	1.15	0.00
23	LVDT	Prox	1.11	1.15	3.48
27	Prox	Acc.1	1.15	1.19	-3.48
31	Acc 2	Prox	1.18	1.15	-2.61
33	Prox	Geo 2	1.16	1.12	3.45
37	Acc 1	Prox	1.19	1.15	-3.48
53	Prox	Geo 1	1.15	1.15	0.00

Table E.105 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.103)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelorometer 1	1.19	0.00	0.00
2	Accelorometer 2	1.18	0.00	0.00
3	Geophone 1	1.15	0.00	0.00
4	Geophone 2	1.12	0.01	0.00
5	Proximeter	1.15	0.00	0.00
6	L.V.D.T.	1.11	0.01	0.00

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table E.106 Testing Sequence Used in Deflection Measurements for a Steady-State Motion at a Frequency of 100 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 8.31.89
Frequency Used : 100 Hz

Diskette No.: 27
Source Level: 1.5 Volts

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	5.40	5.20	3.70
3	Prox	Acc 2	5.25	5.40	-2.86
5	LVDT	Acc 2	5.63	5.40	4.09
7	Geo 2	Geo 1	5.17	5.19	-0.39
9	Prox	Geo 2	5.23	5.14	1.72
11	LVDT	Acc 1	5.63	5.34	5.15
13	Prox	LVDT	5.24	5.58	-6.49
15	LVDT	Acc 1	5.62	5.34	4.98
17	Acc 1	Geo 2	5.37	5.12	4.66
19	Prox	Geo 1	5.23	5.17	1.15
21	Acc 1	Geo 1	5.36	5.17	3.54
23	LVDT	Prox	5.61	5.20	7.31
25	Geo 2	Acc 1	5.14	5.33	-3.70
27	Prox	Acc 1	5.23	5.32	-1.72
29	Acc 1	Acc 2	5.35	5.36	-0.19
31	Acc 2	Prox	5.39	5.19	3.71
33	Prox	Geo 2	5.22	5.11	2.11
35	Acc 2	Geo 2	5.39	5.10	5.38
37	Acc 1	Prox	5.35	5.18	3.18
39	LVDT	Geo 1	5.61	5.15	8.20
41	Acc 2	Geo 1	5.38	5.14	4.46
43	LVDT	Acc 2	5.60	5.35	4.46
45	Geo 2	Geo 1	5.12	5.14	-0.39
47	Acc 2	Geo 2	5.37	5.09	5.21
49	Acc 1	Acc 2	5.33	5.34	-0.19
51	Acc 2	Geo 1	5.37	5.13	4.47
53	Prox	Geo 1	5.20	5.13	1.35
55	LVDT	Geo 2	5.59	5.09	8.94
57	LVDT	Geo 1	5.59	5.13	8.23
59	Geo 2	LVDT	5.11	5.55	-8.61

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.107 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table E.106)

Date of Experiment: 8.31.89
Frequency Used : 100 Hz

Diskette No.: 27
Source Level: 1.5 Volts

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	5.25	5.40	-2.86
9	Prox	Geo 2	5.23	5.14	1.72
13	Prox	LVDT	5.24	5.58	-6.49
19	Prox	Geo 1	5.23	5.17	1.15
23	LVDT	Prox	5.61	5.20	-7.88
27	Prox	Acc 1	5.23	5.32	-1.72
31	Acc 2	Prox	5.39	5.19	-3.85
33	Prox	Geo 2	5.22	5.11	2.11
37	Acc 1	Prox	5.35	5.18	-3.28
53	Prox	Geo 1	5.20	5.13	1.35

Table E.108 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table E.106)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	5.35	0.02	0.05
2	Accelerometer 2	5.38	0.02	0.04
3	Geophone 1	5.16	0.02	0.06
4	Geophone 2	5.12	0.02	0.06
5	Proximeter	5.22	0.02	0.05
6	L.V.D.T.	5.60	0.02	0.05

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.109 Comparison of Deflection from Laser and Other Sensors for a Frequency of 2 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.13.89 Diskette No.: LAS31

Frequency Used : 02 Hz Source Level: 0.06 Volts

Test No.	Device Used: Channel 1*	Device Used: Channel 2	Deflection (mil): Channel 1	Deflection (mil): Channel 2	Difference (percent)+
1	Laser	Geo 1	6.02	5.37	10.80
2	Laser	Prox.	6.02	5.98	0.66
3	Laser	Acc 2	6.02	5.29	12.13
4	Laser	LVDT	6.00	5.93	1.17
5	Laser	Geo 2	5.98	5.41	9.53
6	Laser	Acc 1	5.96	5.25	11.91

* Average = 6.02 mil
Standard Deviation = 0.01 mil
Variance = 0.01 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table E.110 Comparison of Deflection from Laser and Other Sensors for a Frequency of 2 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.13.89 Diskette No.: LAS31

Frequency Used : 02 Hz Source Level: 0.150 Volts

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	18.12	16.66	8.06
2	Laser	Prox.	18.16	17.16	5.51
3	Laser	Acc 2	18.18	16.52	9.13
4	Laser	LVDT	18.15	18.07	0.44
5	Laser	Geo 2	18.09	17.86	1.27
6	Laser	Acc 1	18.02	16.44	8.77

* Average = 18.15 mil
Standard Deviation = 0.02 mil
Variance = 0.05 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.111 Comparison of Deflection from Laser and Other Sensors for a Frequency of 5 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.3.89 Diskette No.: LASE04

Frequency Used : 05 Hz Source Level: 0.045 Volts

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	4.70	4.79	-1.91
2	Laser	Prox.	4.74	4.74	0.00
3	Laser	Acc 2	4.74	4.83	-1.90
4	Laser	LVDT	4.77	4.77	0.00
5	Laser	Geo 2	4.77	4.71	1.26
6	Laser	Acc 1	4.78	4.74	0.84

* Average = 4.74 mil
Standard Deviation = 0.02 mil
Variance = 0.06 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.112 Comparison of Deflection from Laser and Other Sensors for a Frequency of 5 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.3.89 Diskette No.: LASE05

Frequency Used : 05 Hz Source Level: 0.135 Volts

Test No.	Device Used		Deflection (mil)		Difference
	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	18.60	18.38	1.18
2	Laser	Prox.	18.61	18.50	0.59
3	Laser	Acc 2	18.64	18.51	0.70
4	Laser	LVDT	18.87	18.48	2.07
5	Laser	Geo 2	18.68	18.08	3.21
6	Laser	Acc 1	18.69	18.45	1.28

* Average = 18.68 mil
Standard Deviation = 0.11 mil
Variance = 1.23 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.113 Comparison of Deflection from Laser and Other Sensors for a Frequency of 10 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.13.89   Diskette No.: LAS29

Frequency Used : 10 Hz   Source Level: 0.045 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.19	5.13	1.16
2	Laser	Prox.	5.20	5.12	1.54
3	Laser	Acc 2	5.19	5.23	-0.77
4	Laser	LVDT	5.19	5.12	1.35
5	Laser	Geo 2	5.19	5.13	1.16
6	Laser	Acc 1	5.20	5.08	2.23

* Average = 5.19 mil
Standard Deviation = 0.00 mil
Variance = 0.00 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.114 Comparison of Deflection from Laser and Other Sensors for a Frequency of 10 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.13.89 Diskette No.: LAS29

Frequency Used : 10 Hz Source Level: 0.140 Volts

Test No.	Device Used Channel 1*	Channel 2	Deflection (mil) Channel 1	Channel 2	Difference (percent)+
1	Laser	Geo 1	19.07	18.98	0.47
2	Laser	Prox.	19.16	18.99	0.89
3	Laser	Acc 2	19.16	19.45	-1.51
4	Laser	LVDT	19.17	19.20	-0.16
5	Laser	Geo 2	19.18	18.94	1.25
6	Laser	Acc 1	19.21	19.15	0.31

* Average = 19.14 mil
Standard Deviation = 0.04 mil
Variance = 0.16 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.115 Comparison of Deflection from Laser and Other Sensors for a Frequency of 15 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.13.89 Diskette No.: LAS29

Frequency Used : 15 Hz Source Level: 0.045 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.40	5.32	1.57
2	Laser	Prox.	5.42	5.32	1.85
3	Laser	Acc 2	5.41	5.45	-0.74
4	Laser	LVDT	5.40	5.32	1.48
5	Laser	Geo 2	5.39	5.31	1.48
6	Laser	Acc 1	5.39	5.32	1.30

* Average = 5.41 mil
Standard Deviation = 0.01 mil
Variance = 0.01 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.116 Comparison of Deflection from Laser and Other Sensors for a Frequency of 15 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.13.89 Diskette No.: LAS29

Frequency Used : 15 Hz Source Level: 0.140 Volts

Test No.	Device Used		Deflection (mil)		Difference
	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo. 1	18.33	18.22	0.58
2	Laser	Prox.	18.39	18.44	-0.27
3	Laser	Acc 2	18.37	18.76	-2.12
4	Laser	LVDT	18.37	18.43	-0.33
5	Laser	Geo 2	18.39	18.19	1.09
6	Laser	Acc 1	18.39	18.45	-0.33

* Average = 18.36 mil
Standard Deviation = 0.02 mil
Variance = 0.05 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.117 Comparison of Deflection from Laser and Other Sensors for a Frequency of 20 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.13.89 Diskette No.: LAS30

Frequency Used : 20 Hz Source Level: 0.05 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.44	5.33	2.02
2	Laser	Prox.	5.42	5.39	0.55
3	Laser	Acc 2	5.43	5.51	-1.57
4	Laser	LVDT	5.43	5.38	0.92
5	Laser	Geo 2	5.43	5.36	1.29
6	Laser	Acc 1	5.45	5.39	1.10

* Average = 5.43 mil
Standard Deviation = 0.01 mil
Variance = 0.01 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.118 Comparison of Deflection from Laser and Other Sensors for a Frequency of 20 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.13.89 Diskette No.: LAS30

Frequency Used : 20 Hz Source Level: 0.170 Volts

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	18.44	18.36	0.43
2	Laser	Prox.	18.43	18.64	-1.14
3	Laser	Acc 2	18.43	18.98	-2.98
4	Laser	LVDT	18.43	18.65	-1.19
5	Laser	Geo 2	18.46	18.36	0.52
6	Laser	Acc 1	18.46	18.65	-1.03

* Average = 18.43 mil
Standard Deviation = 0.00 mil
Variance = 0.00 percent

+Difference=(Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.119 Comparison of Deflection from Laser and Other Sensors for a Frequency of 30 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.3.89 Diskette No.: LASE02&0

Frequency Used : 30 Hz Source Level: 0.125 Volts

Test No.	Device Used		Deflection (mil)		Difference
	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	4.97	5.05	-1.61
2	Laser	Prox.	4.96	4.90	1.29
3	Laser	Acc 2	4.95	4.90	1.11
4	Laser	LVDT	4.97	4.76	4.23
5	Laser	Geo 2	4.97	4.80	3.42
6	Laser	Acc 1	4.98	5.15	-3.41

* Average = 4.96 mil
Standard Deviation = 0.01 mil
Variance = 0.01 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.120 Comparison of Deflection from Laser and Other Sensors for a Frequency of 30 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.3.89 Diskette No.: LASE03

Frequency Used : 30 Hz Source Level: 0.425 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	18.00	18.33	-1.83
2	Laser	Prox.	18.00	18.10	-0.56
3	Laser	Acc 2	18.00	18.10	-0.56
4	Laser	LVDT	18.01	17.82	1.05
5	Laser	Geo 2	18.02	17.64	2.11
6	Laser	Acc 1	18.00	18.81	-4.50

* Average = 18.00 mil
Standard Deviation = 0.00 mil
Variance = 0.00 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.121 Comparison of Deflection from Laser and Other Sensors for a Frequency of 40 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.3.89 Diskette No.: LASE02

Frequency Used : 40 Hz Source Level: 0.175 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.13	5.04	1.75
2	Laser	Prox.	5.13	5.01	2.34
3	Laser	Acc 2	5.13	5.32	-3.70
4	Laser	LVDT	5.13	5.02	2.14
5	Laser	Geo 2	5.15	5.16	-0.19
6	Laser	Acc 1	5.15	5.12	0.58

* Average = 5.13 mil
Standard Deviation = 0.00 mil
Variance = 0.00 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.122 Comparison of Deflection from Laser and Other Sensors for a Frequency of 40 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.3.89 Diskette No.: LASE02

Frequency Used : 40 Hz Source Level: 0.675 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	19.15	18.65	2.61
2	Laser	Prox.	19.18	18.58	3.13
3	Laser	Acc 2	19.22	19.72	-2.60
4	Laser	LVDT	19.19	18.85	1.77
5	Laser	Geo 2	19.20	19.00	1.04
6	Laser	Acc 1	19.21	19.01	1.04

* Average = 19.19 mil
Standard Deviation = 0.03 mil
Variance = 0.06 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.123 Comparison of Deflection from Laser and Other Sensors for a Frequency of 50 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.13.89 **Diskette No.: LAS30**

Frequency Used : 50 Hz Source Level: 0.275 Volts

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	5.10	4.99	2.16
2	Laser	Prox.	5.12	5.05	1.37
3	Laser	Acc 2	5.11	5.17	-1.17
4	Laser	LVDT	5.12	5.14	-0.39
5	Laser	Geo 2	5.13	4.98	2.92
6	Laser	Acc 1	5.11	5.11	0.00

* Average = 5.11 mil
Standard Deviation = 0.01 mil
Variance = 0.01 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.124 Comparison of Deflection from Laser and Other Sensors for a Frequency of 50 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.13.89 Diskette No.: LAS30

Frequency Used : 50 Hz Source Level: 1.1 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	18.82	18.67	0.77
2	Laser	Prox.	18.80	18.93	-0.69
3	Laser	Acc 2	18.77	19.46	-3.68
4	Laser	LVDT	18.75	19.49	-3.95
5	Laser	Geo 2	18.74	18.63	0.59
6	Laser	Acc 1	18.73	19.35	-3.31

* Average = 18.79 mil
Standard Deviation = 0.03 mil
Variance = 0.07 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.125 Comparison of Deflection from Laser and Other Sensors for a Frequency of 75 Hz and a Nominal Deflection of 5 mils

Date of Experiment: 9.1.89 Diskette No.: LASER01

Frequency Used : 75 Hz Source Level: 0.7 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	4.81	4.75	1.25
2	Laser	Prox.	4.84	4.77	1.45
3	Laser	Acc 2	4.82	4.93	-2.28
4	Laser	LVDT	4.87	4.64	4.72
5	Laser	Geo 2	4.85	4.72	2.68
6	Laser	Acc 1	4.87	4.90	-0.62

* Average = 4.84 mil
Standard Deviation = 0.02 mil
Variance = 0.05 percent

+Difference=(Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table E.126 Comparison of Deflection from Laser and Other Sensors for a Frequency of 75 Hz and a Nominal Deflection of 18 mils

Date of Experiment: 9.1.89 Diskette No.: LASER01

Frequency Used : 75 Hz Source Level: 1.9 Volts

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	17.95	17.51	2.45
2	Laser	Prox.	17.90	17.44	2.57
3	Laser	Acc 2	17.88	18.07	-1.06
4	Laser	LVDT	17.83	17.10	4.09
5	Laser	Geo 2	17.80	17.26	3.03
6	Laser	Acc 1	17.79	17.82	-0.17

* Average = 17.89 mil
Standard Deviation = 0.04 mil
Variance = 0.18 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

APPENDIX F

EVALUATION OF ACCURACY OF EACH SENSOR FOR STEADY-STATE MOTION

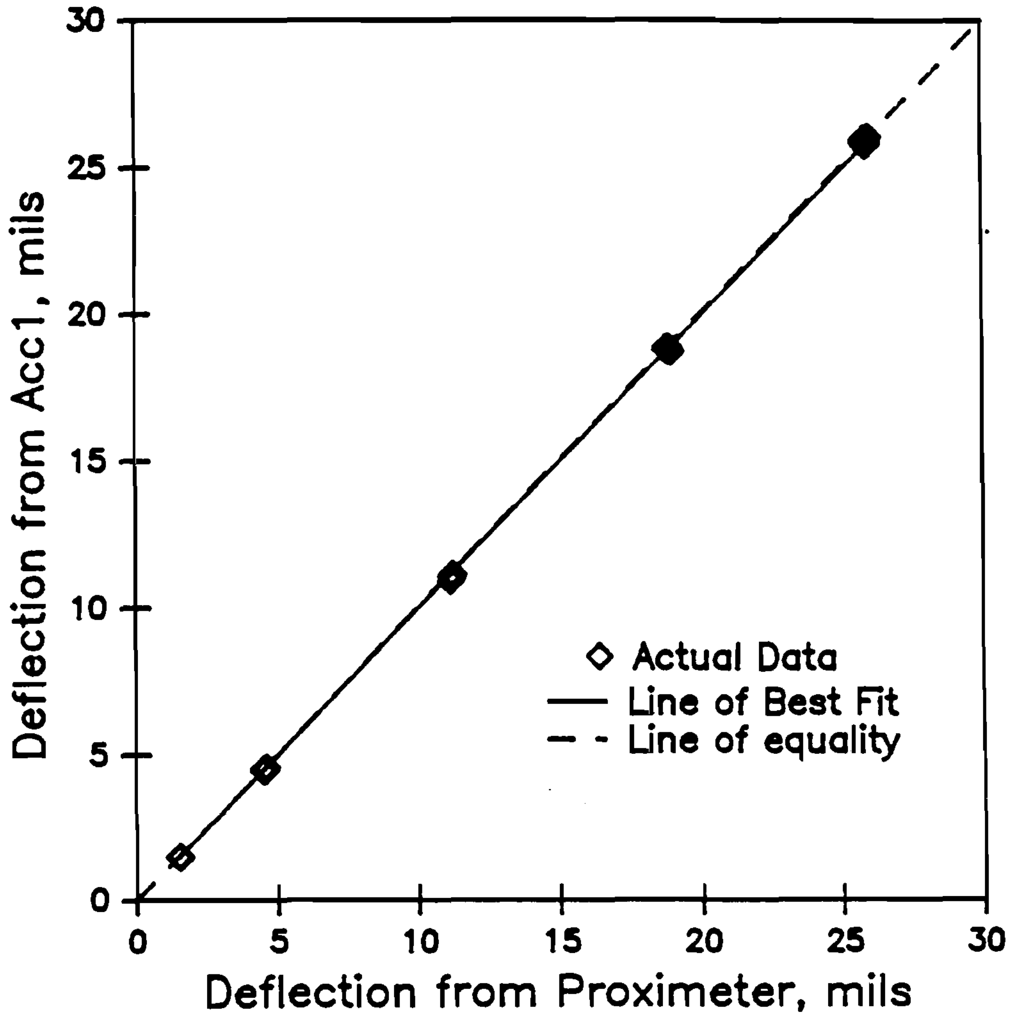


Figure F.1 Evaluation of Accuracy of Accelerometer 1 at Frequency of 5 Hz (Slope of Line is 0.99)

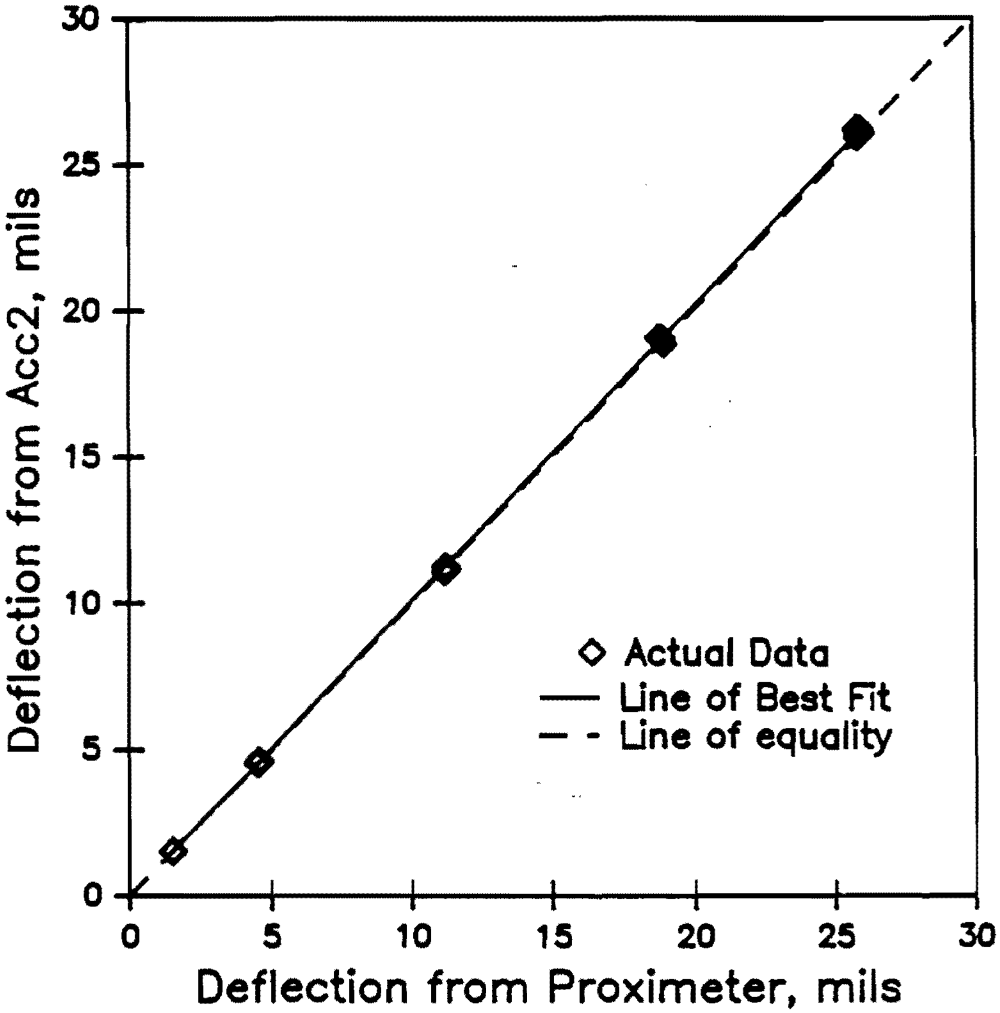


Figure F.2 Evaluation of Accuracy of Accelerometer 2 at Frequency of 5 Hz (Slope of Line is 1.00)

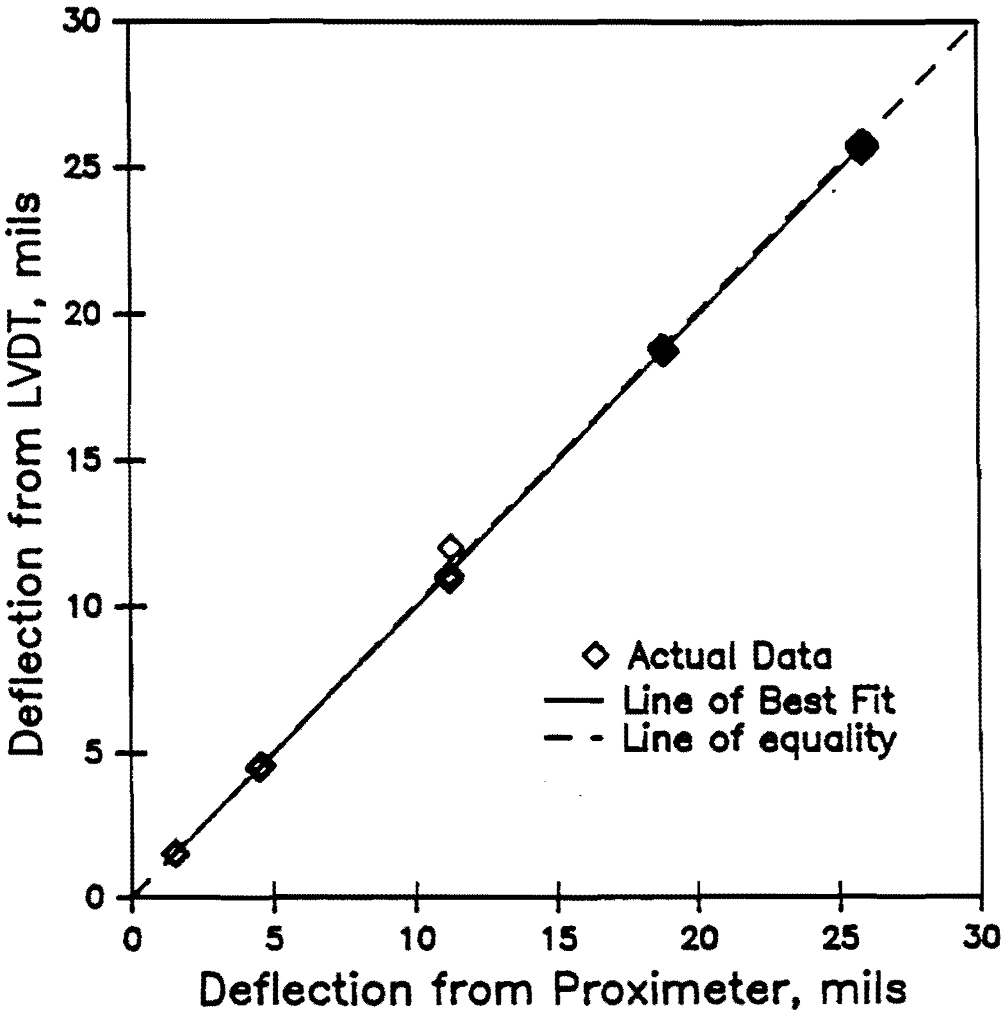


Figure F.3 Evaluation of Accuracy of LVDT at Frequency of 5 Hz (Slope of Line is 0.99)

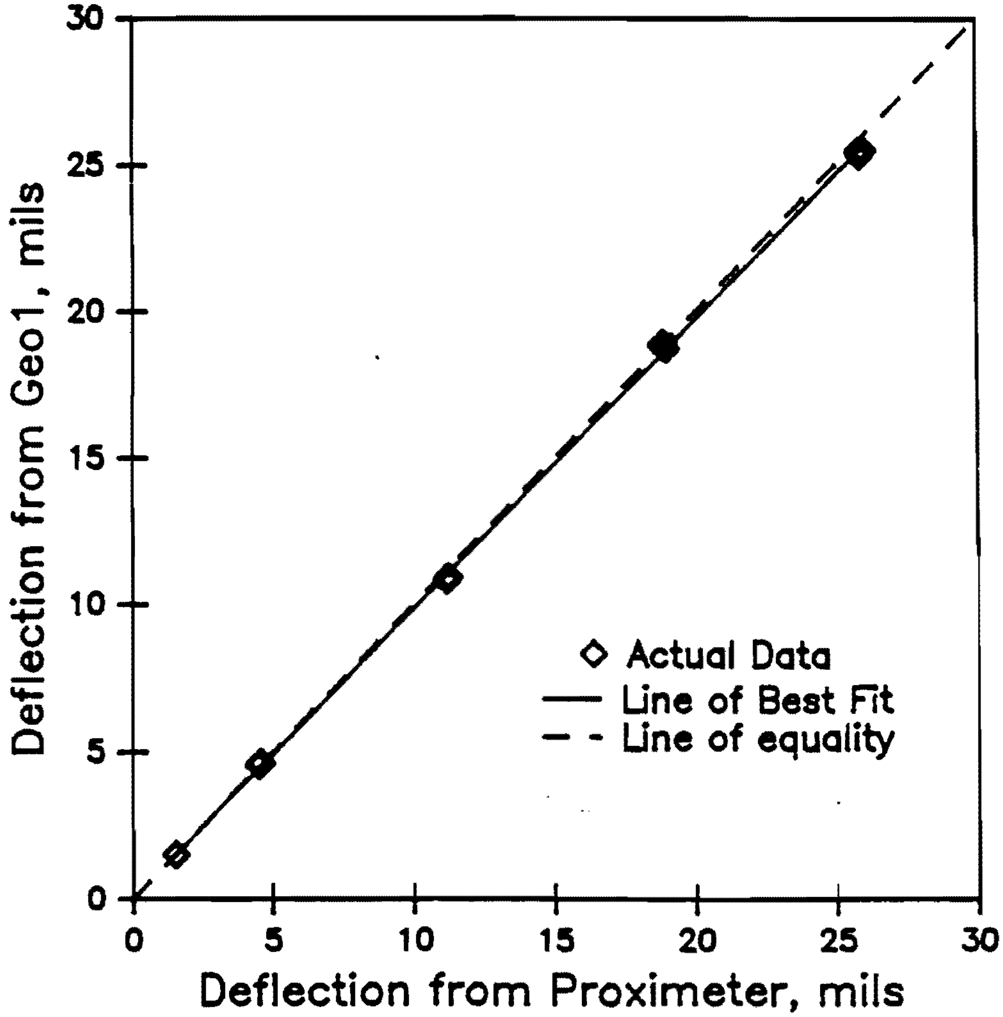


Figure F.4 Evaluation of Accuracy of Geophone 1 at Frequency of 5 Hz (Slope of Line is 0.99)

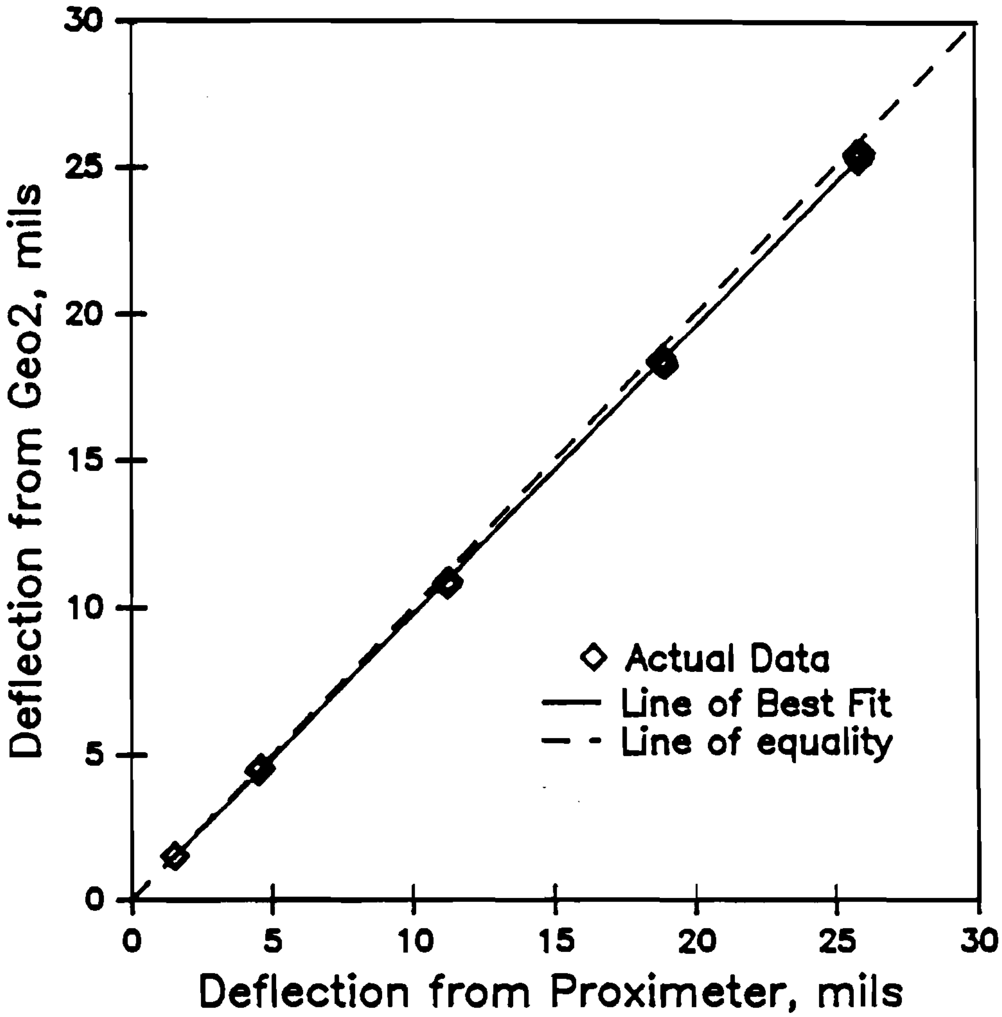


Figure F.5 Evaluation of Accuracy of Geophone 2 at Frequency of 5 Hz (Slope of Line is 0.98)

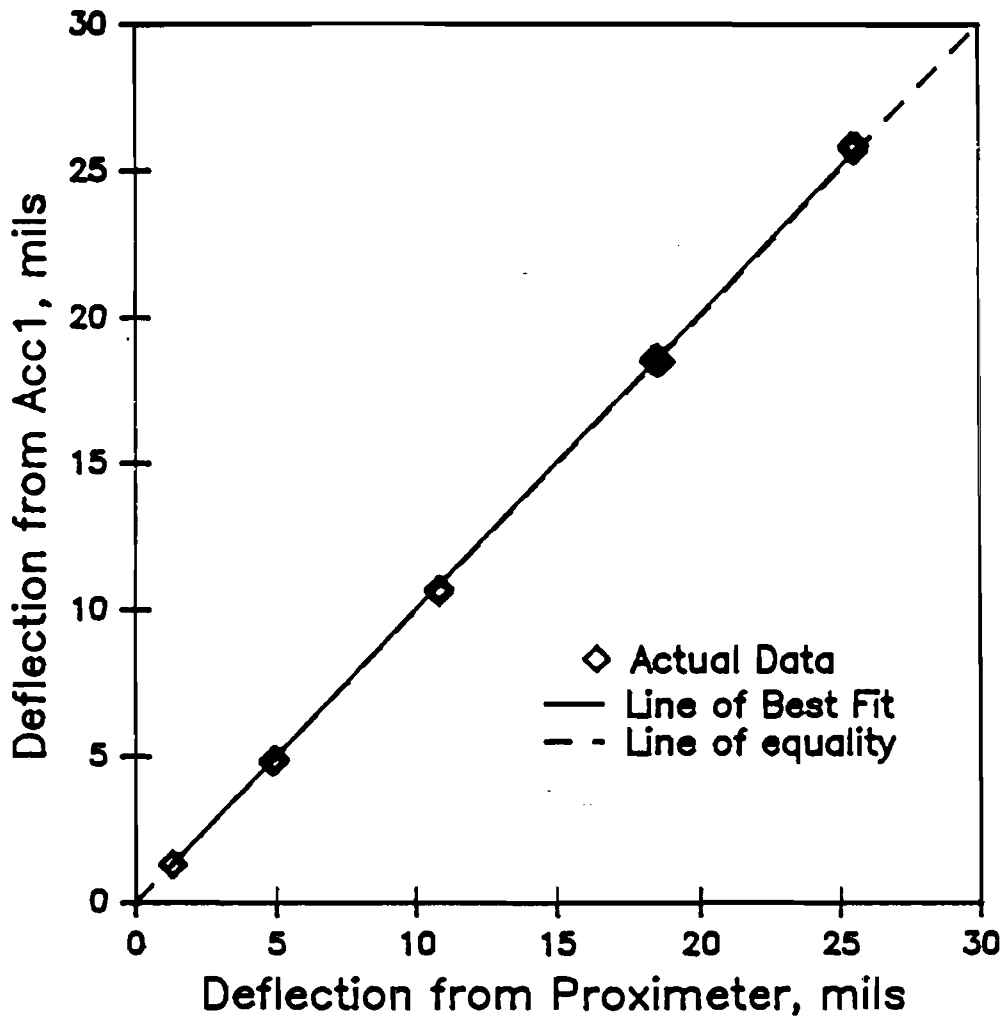


Figure F.6 Evaluation of Accuracy of Accelerometer 1 at Frequency of 10 Hz (Slope of Line is 1.00)

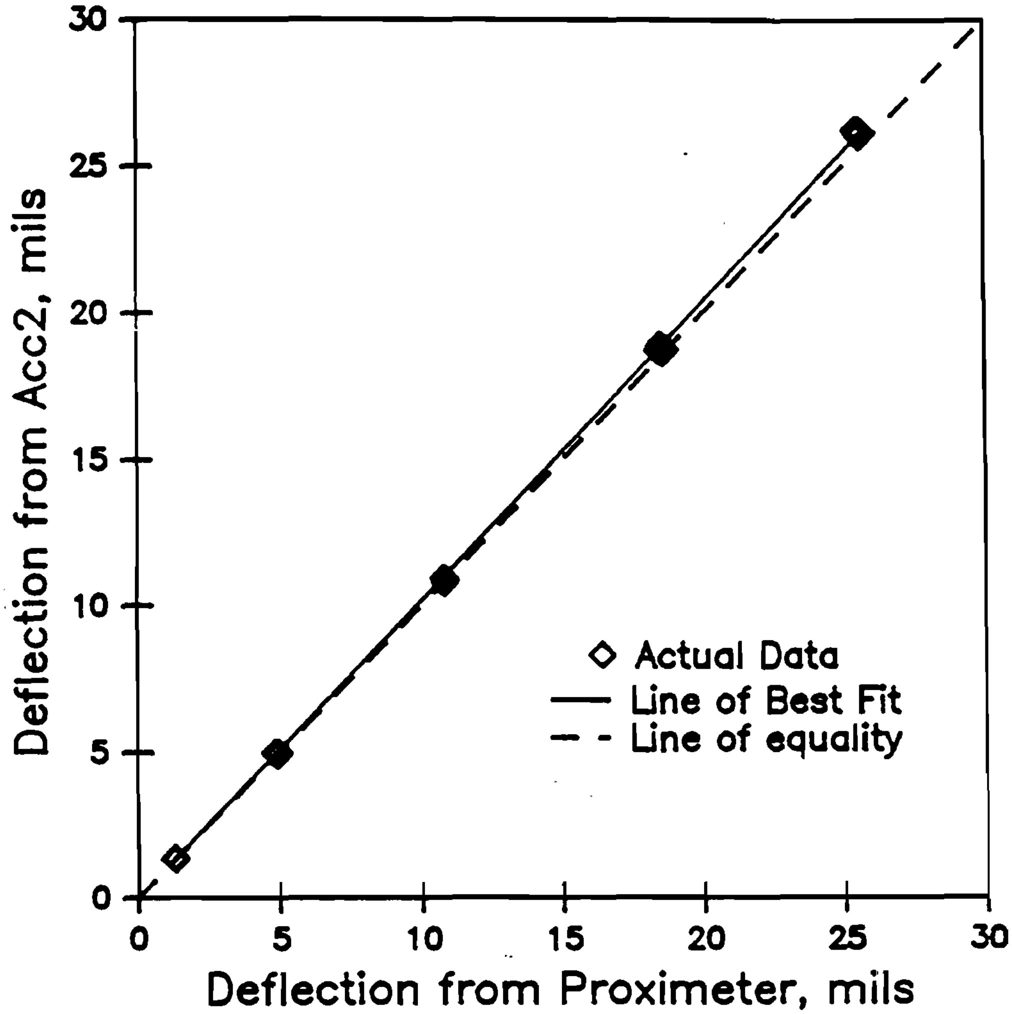


Figure F.7 Evaluation of Accuracy of Accelerometer 2 at Frequency of 10 Hz (Slope of Line is 1.02)

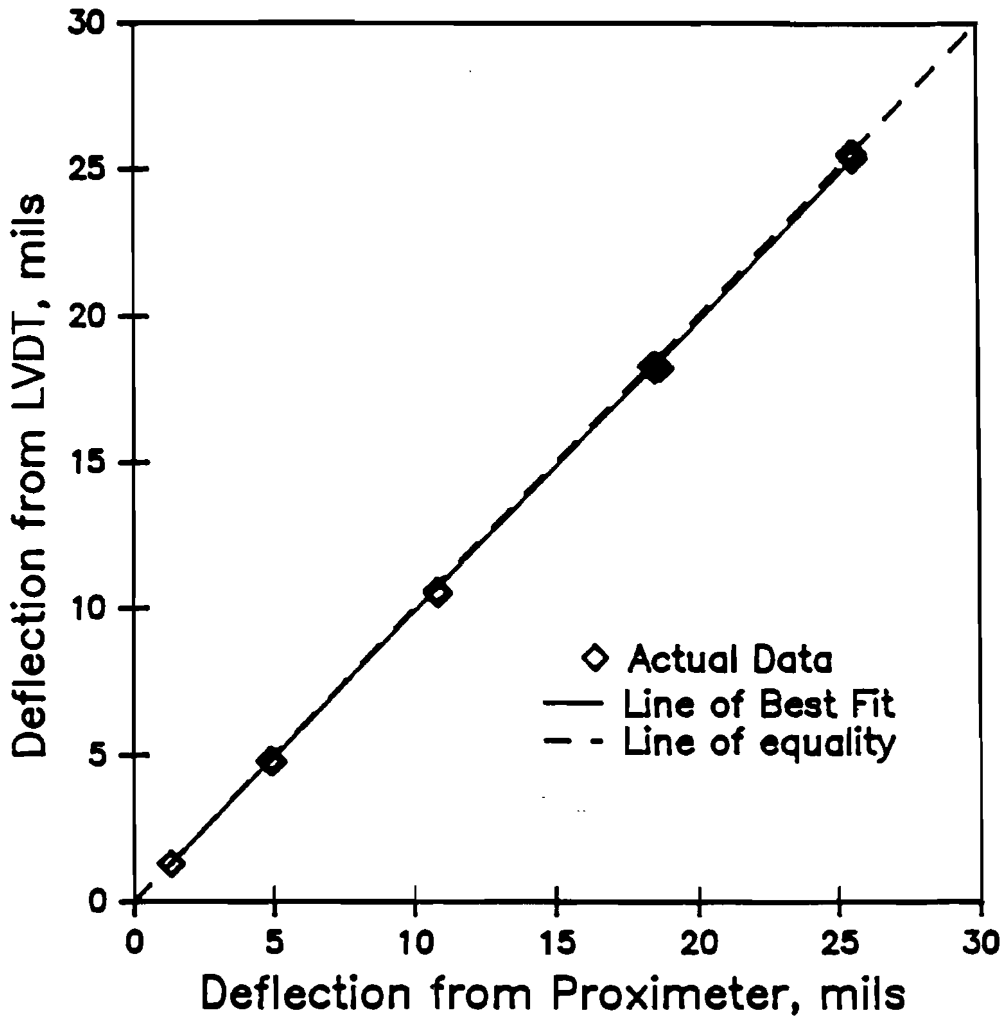


Figure F.8 Evaluation of Accuracy of LVDT at Frequency of 10 Hz (Slope of Line is 0.99)

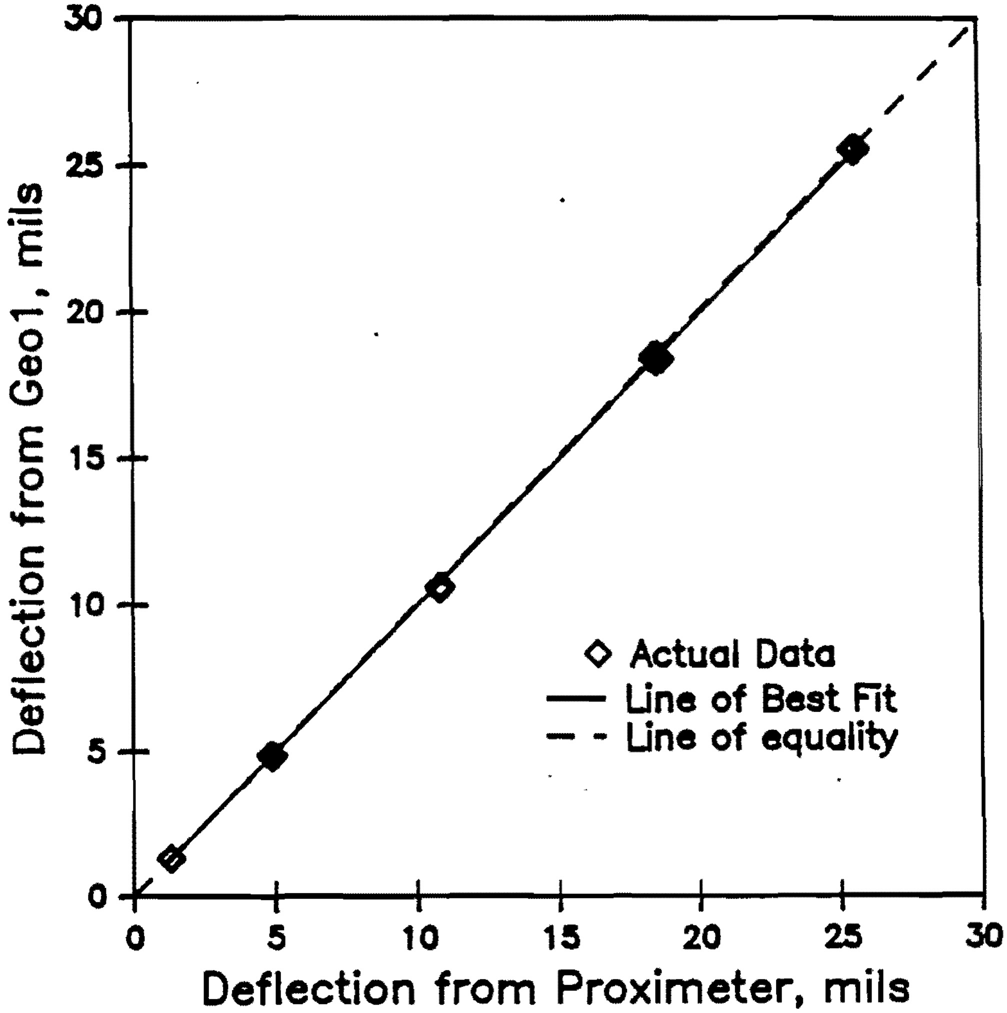


Figure F.9 Evaluation of Accuracy of Geophone 1 at Frequency of 10 Hz (Slope of Line is 0.99)

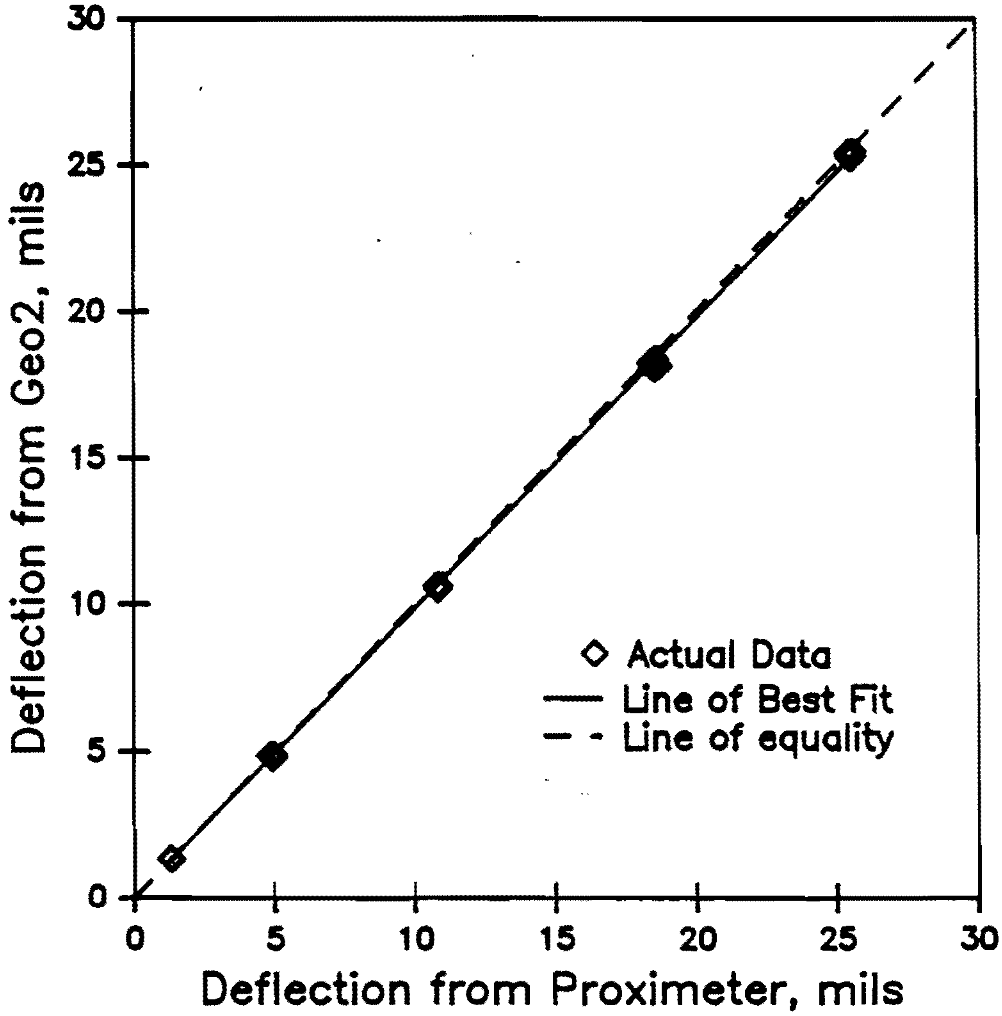


Figure F.10 Evaluation of Accuracy of Geophone 2 at Frequency of 10 Hz (Slope of Line is 0.99)

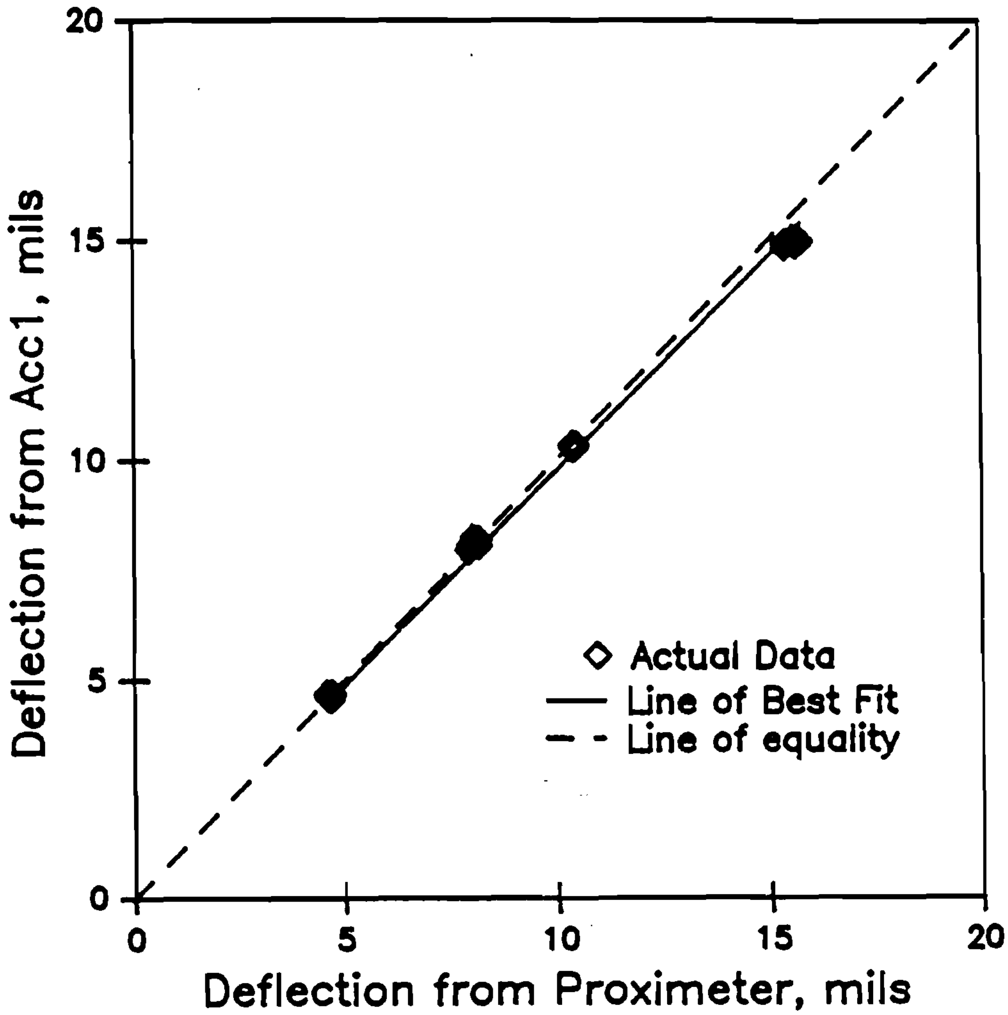


Figure F.11 Evaluation of Accuracy of Accelerometer 1 at Frequency of 15 Hz (Slope of Line is 0.98)

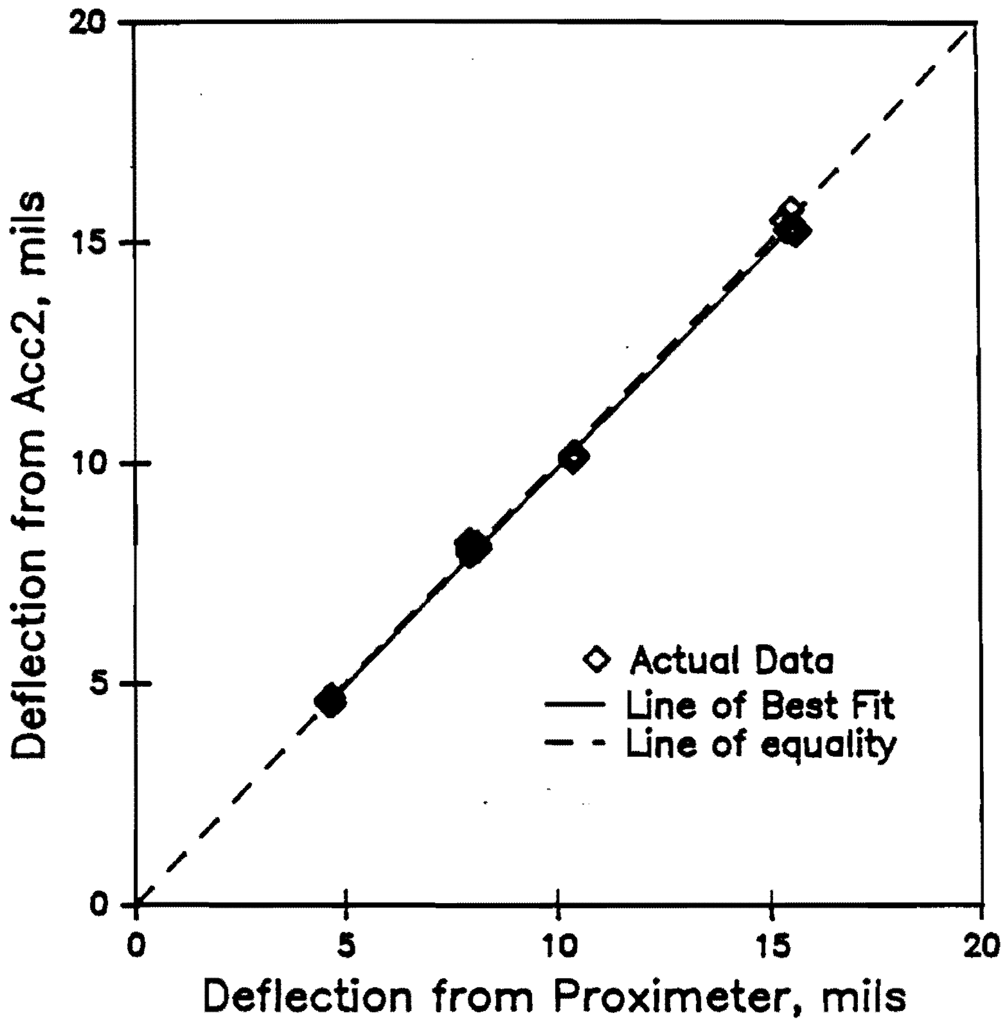


Figure F.12 Evaluation of Accuracy of Accelerometer 2 at Frequency of 15 Hz (Slope of Line is 0.99)

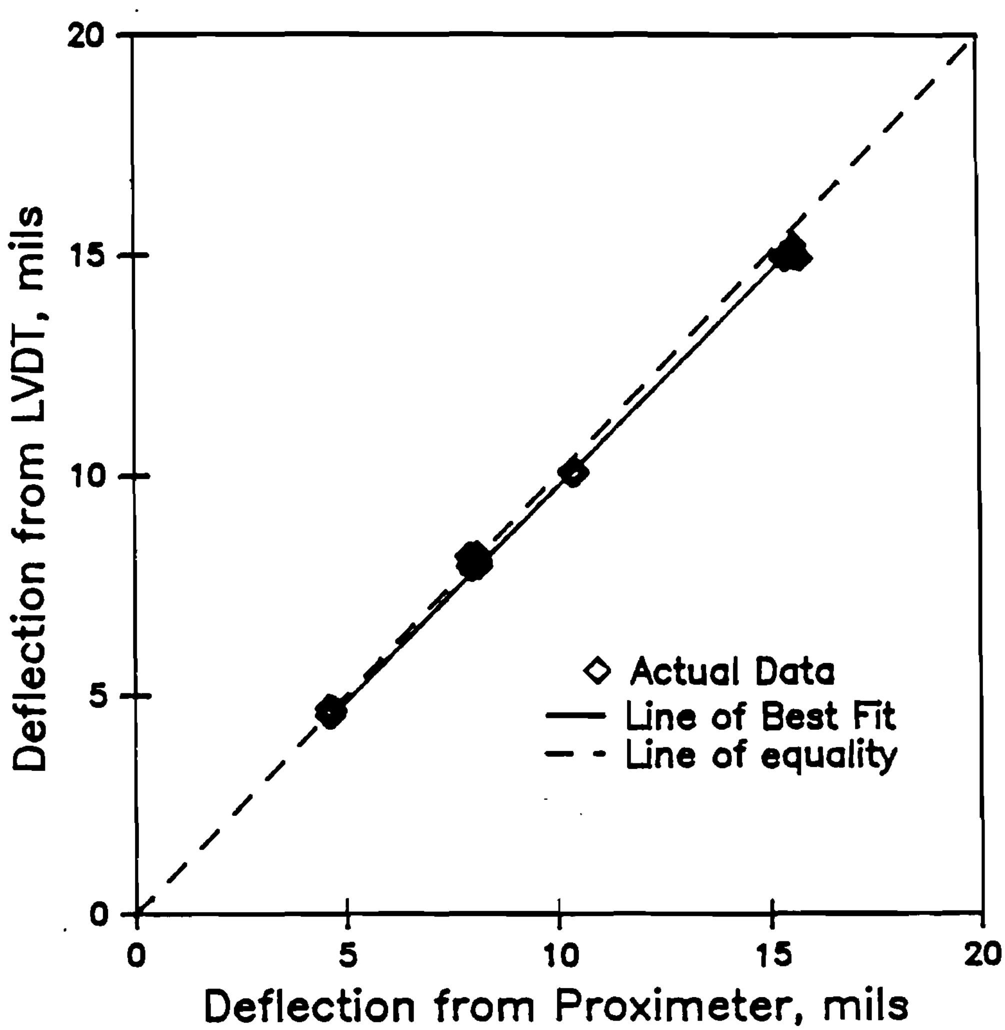


Figure F.13 Evaluation of Accuracy of LVDT at Frequency of 15 Hz (Slope of Line is 0.97)

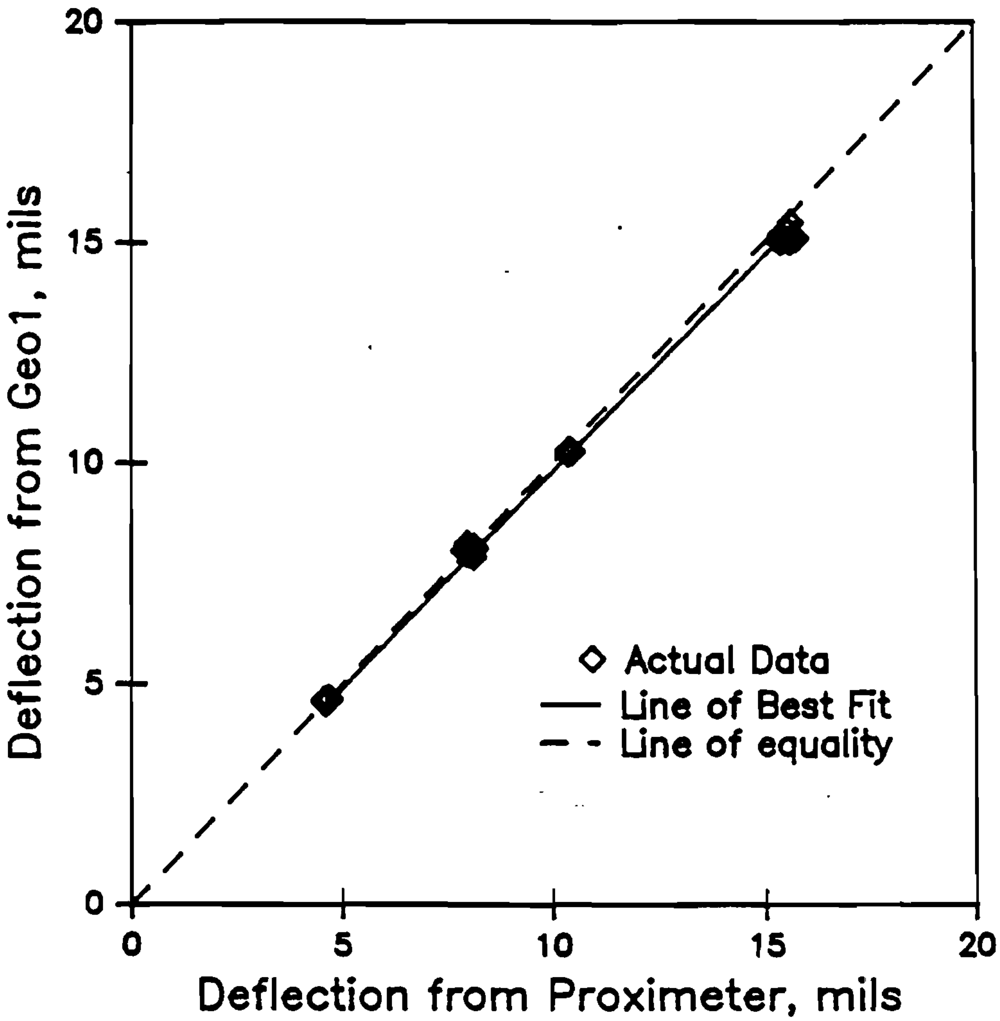


Figure F.14 Evaluation of Accuracy of Geophone 1 at Frequency of 15 Hz (Slope of Line is 0.98)

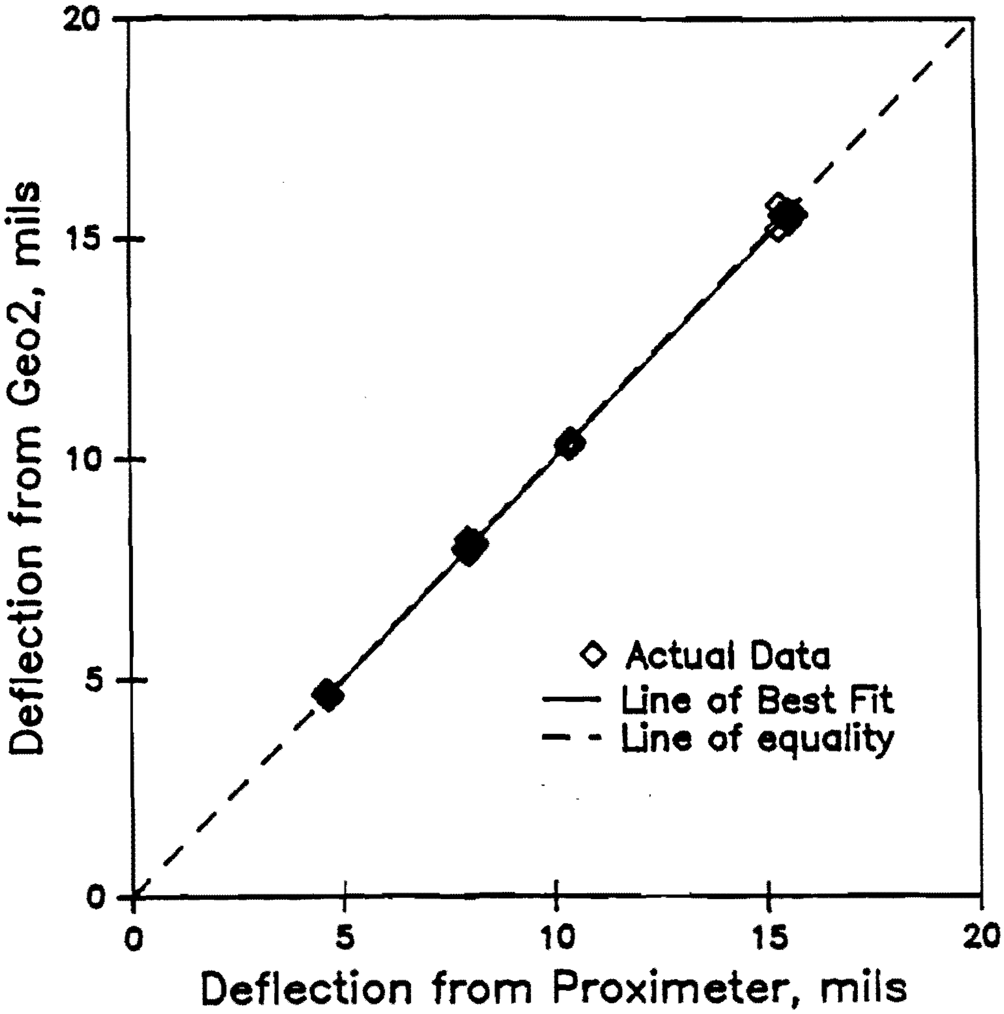


Figure F.15 Evaluation of Accuracy of Geophone 2 at Frequency of 15 Hz (Slope of Line is 0.99)

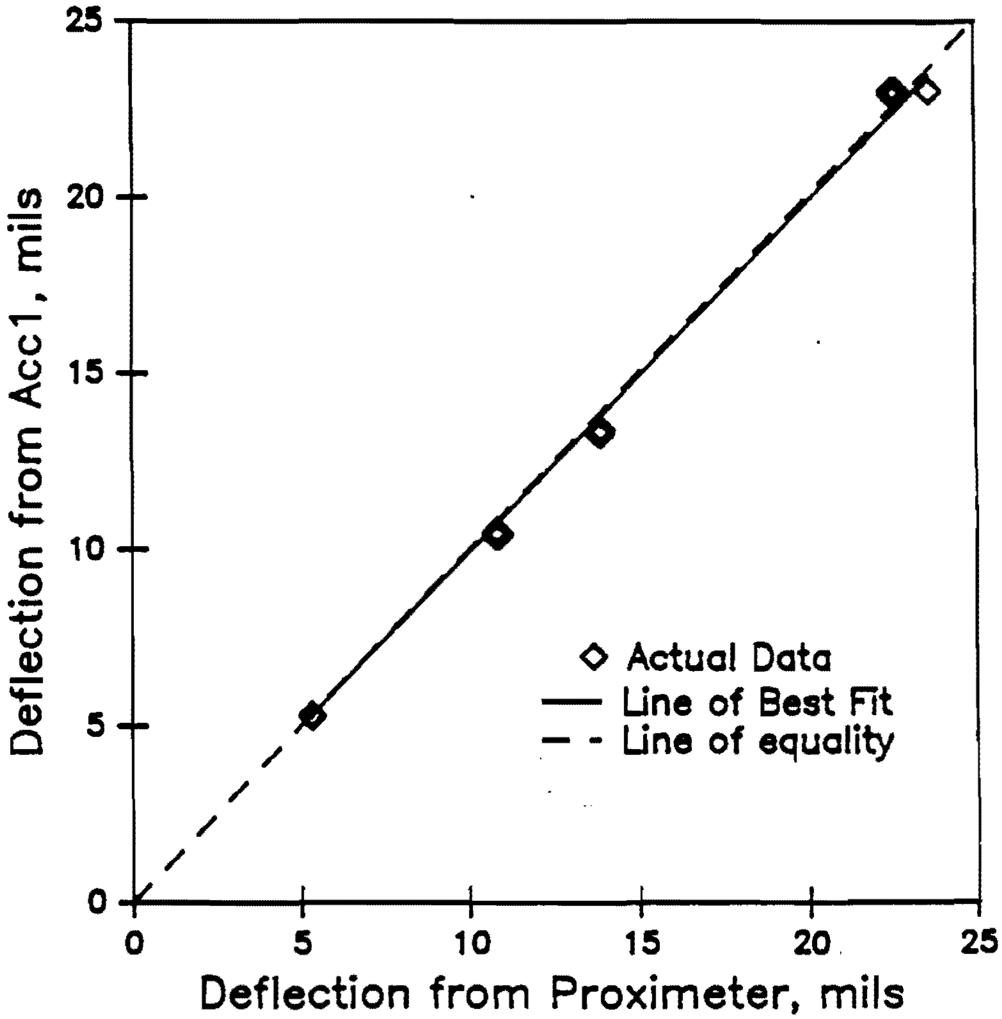


Figure F.16 Evaluation of Accuracy of Accelerometer 1 at Frequency of 20 Hz (Slope of Line is 0.99)

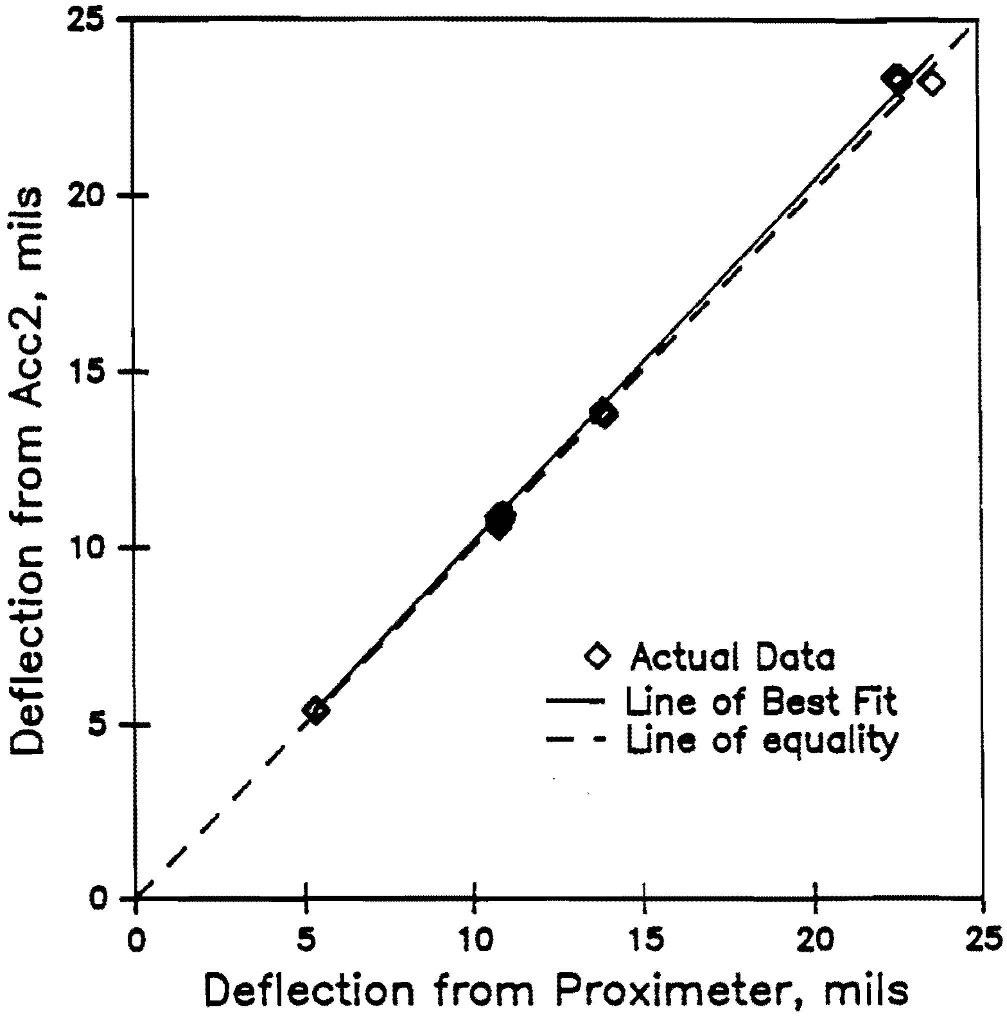


Figure F.17 Evaluation of Accuracy of Accelerometer 2 at Frequency of 20 Hz (Slope of Line is 1.01)

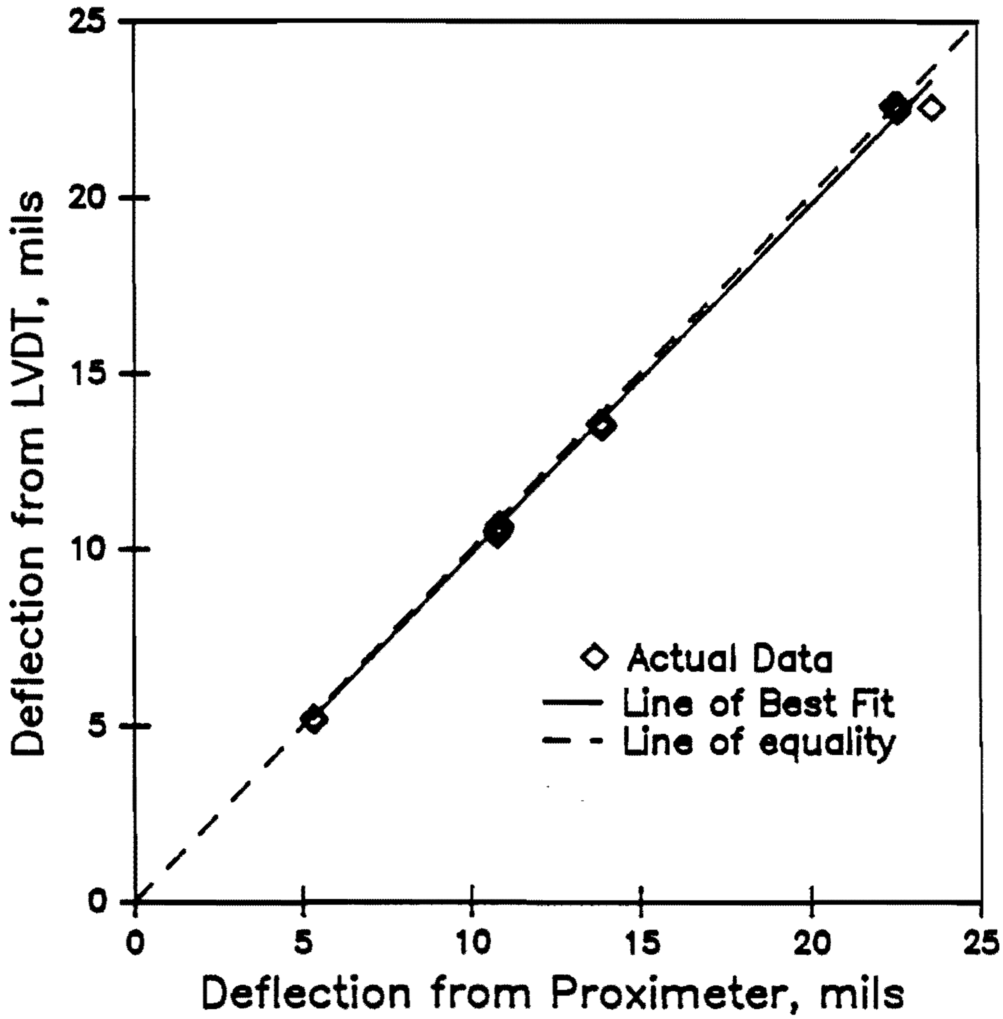


Figure F.18 Evaluation of Accuracy of LVDT at Frequency of 20 Hz (Slope of Line is 0.99)

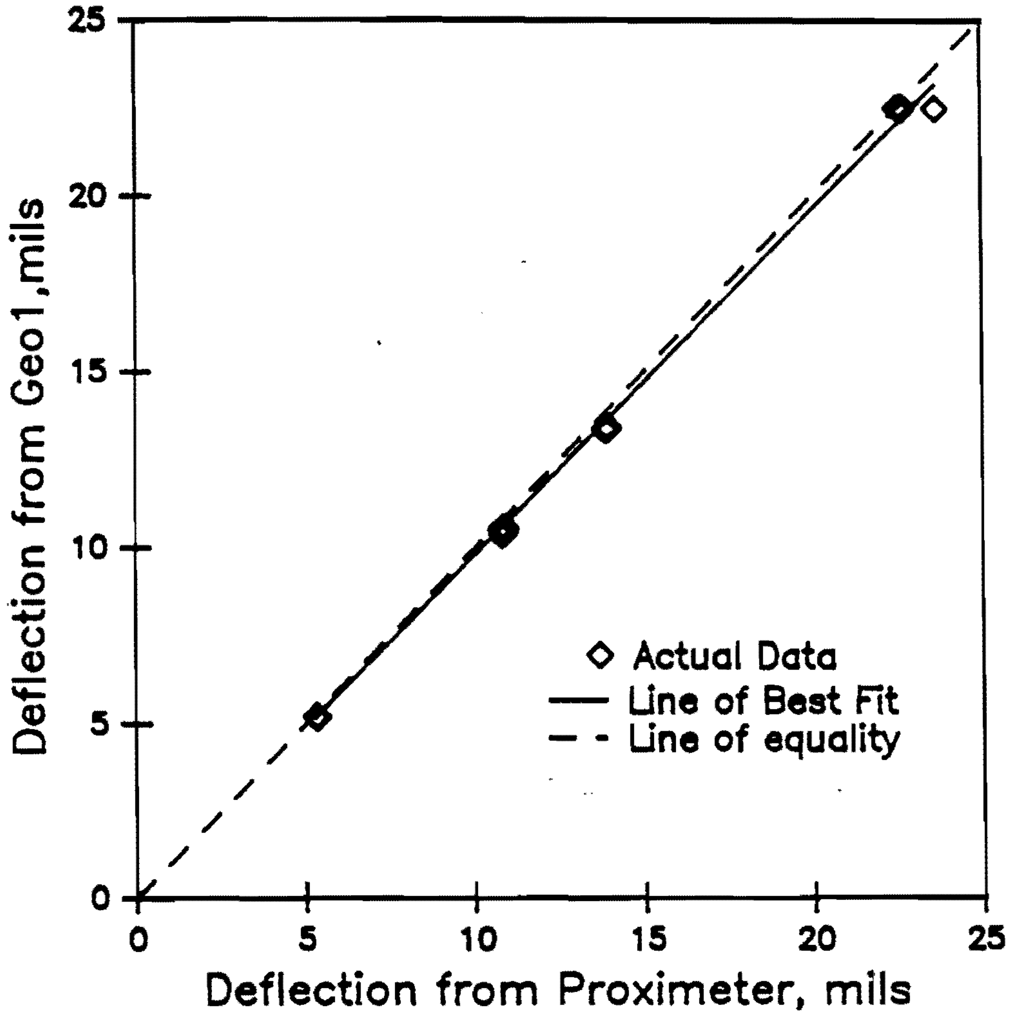


Figure F.19 Evaluation of Accuracy of Geophone 1 at Frequency of 20 Hz (Slope of Line is 0.98)

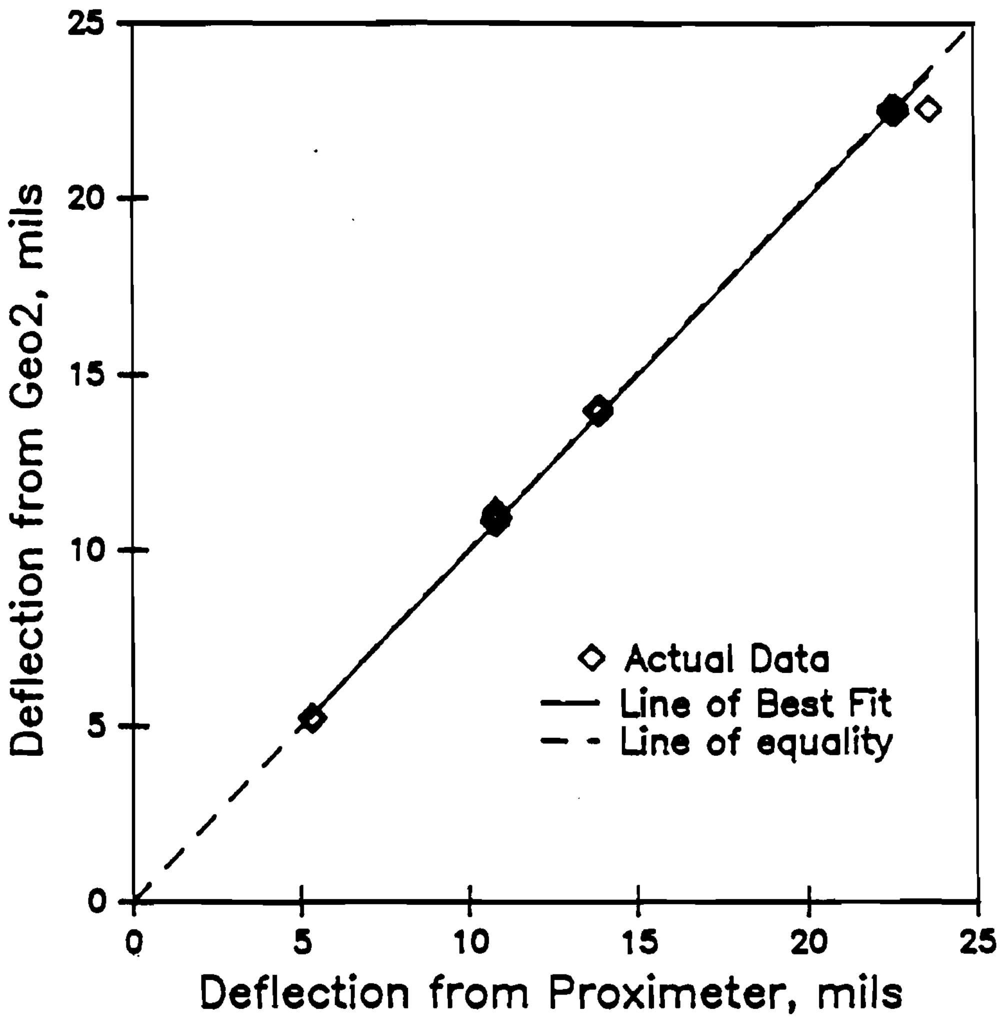


Figure F.20 Evaluation of Accuracy of Geophone 2 at Frequency of 20 Hz (Slope of Line is 1.00)

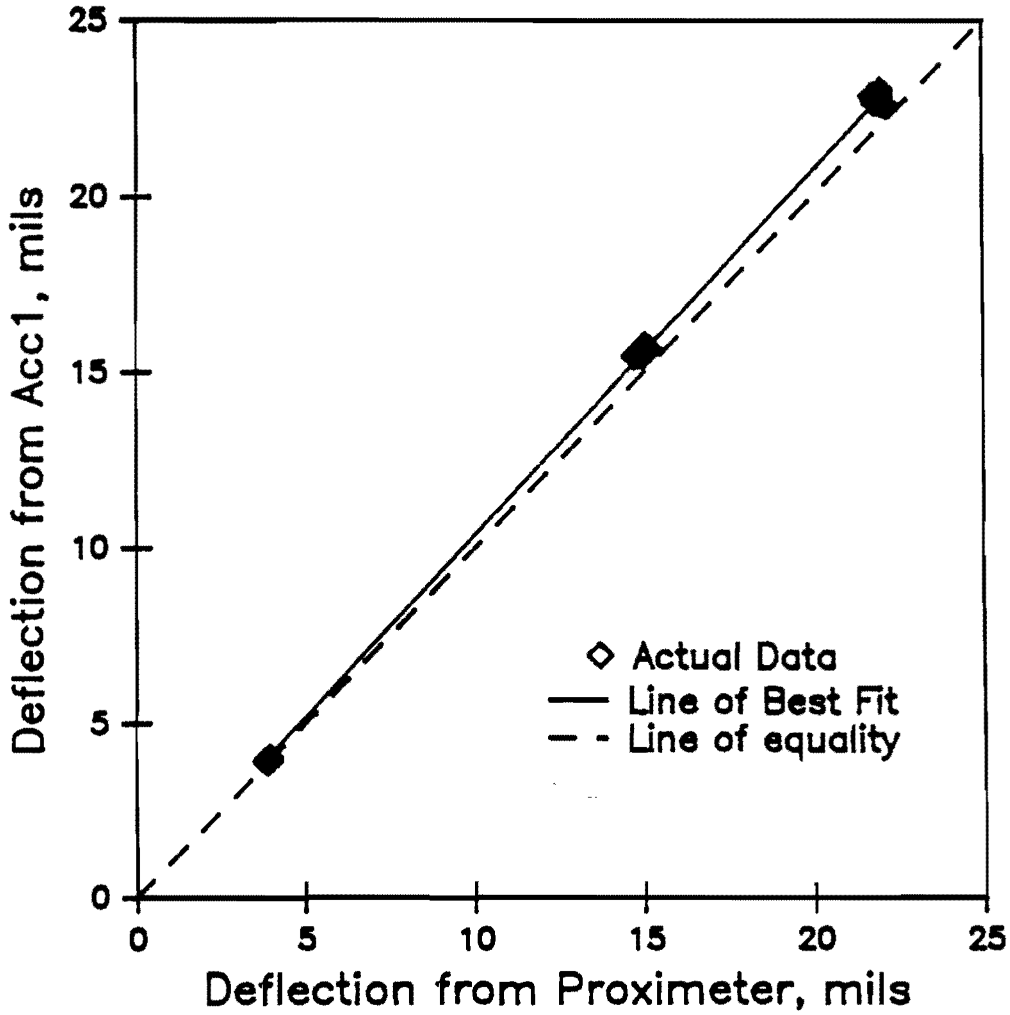


Figure F.21 Evaluation of Accuracy of Accelerometer 1 at Frequency of 30 Hz (Slope of Line is 1.04)

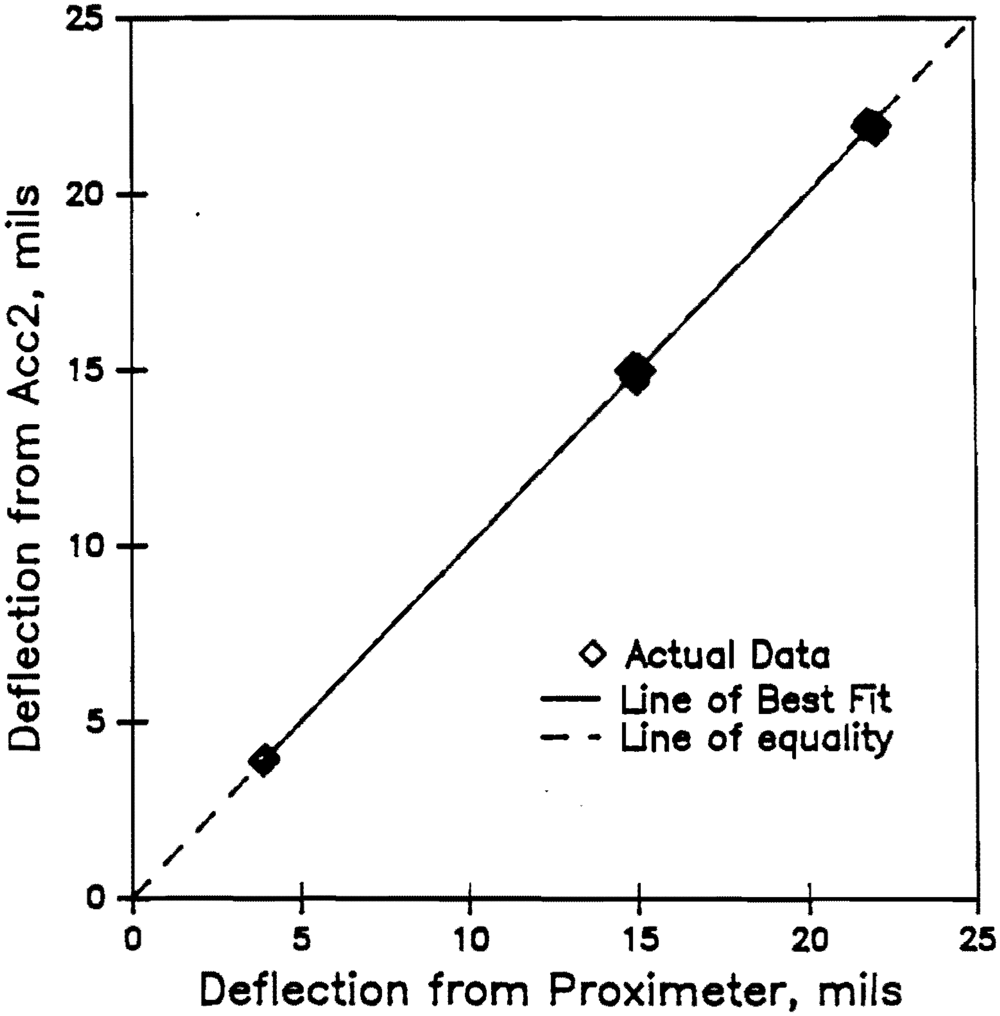


Figure F.22 Evaluation of Accuracy of Accelerometer 2 at Frequency of 30 Hz (Slope of Line is 0.99)

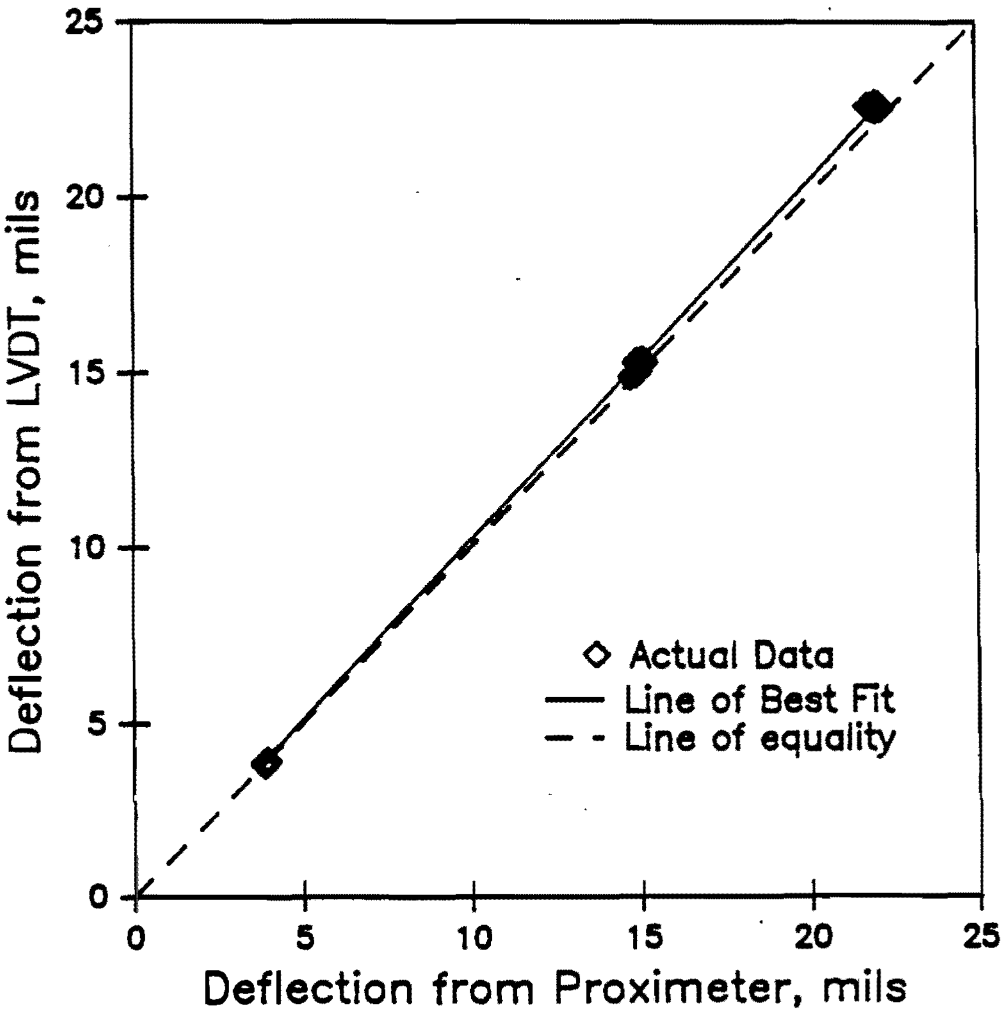


Figure F.23 Evaluation of Accuracy of LVDT at Frequency of 30 Hz (Slope of Line is 1.02)

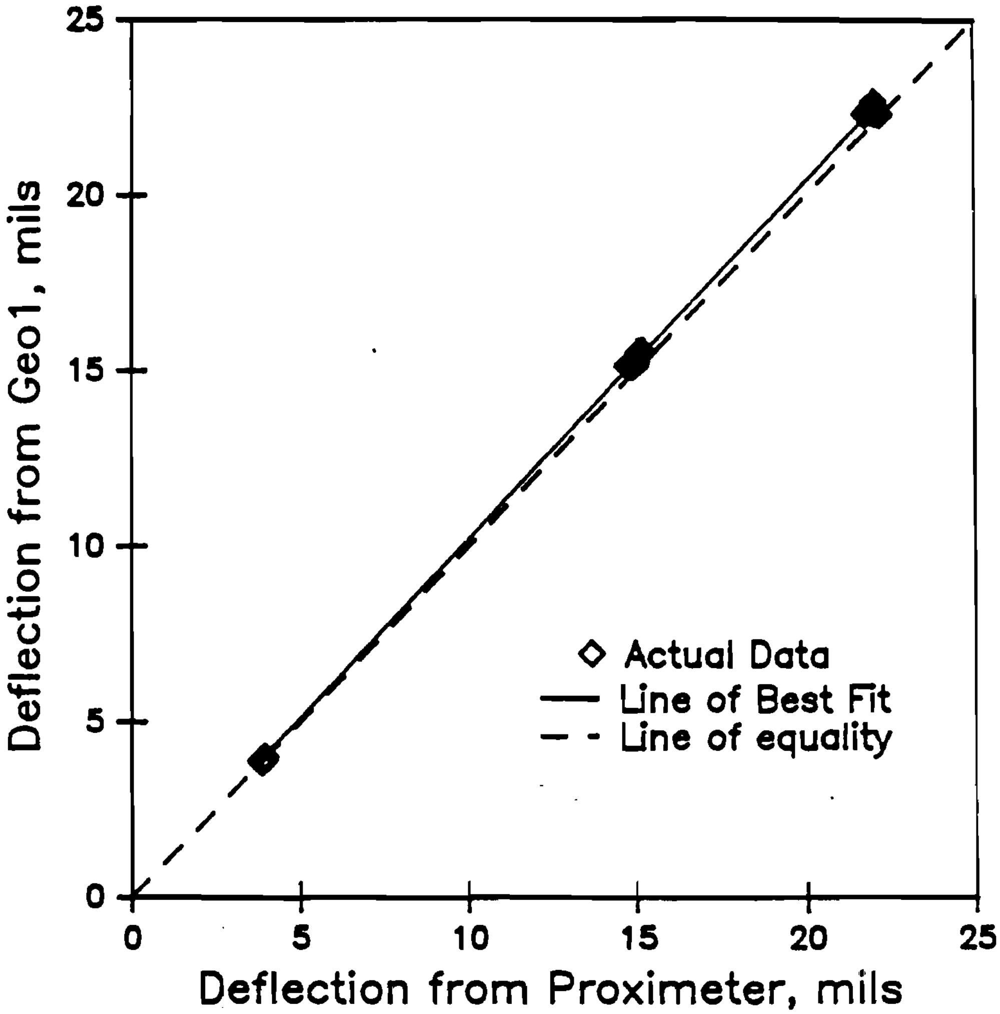


Figure F.24 Evaluation of Accuracy of Geophone 1 at Frequency of 30 Hz (Slope of Line is 1.02)

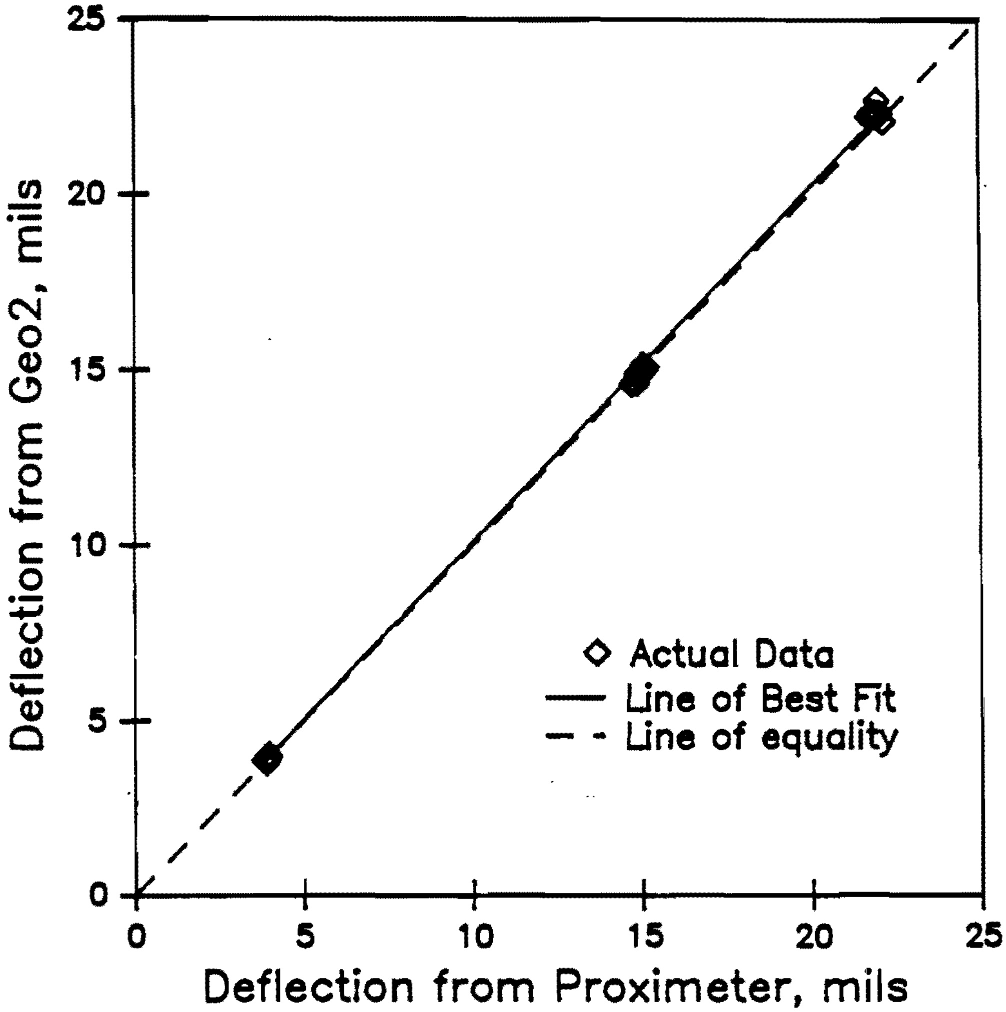


Figure F.25 Evaluation of Accuracy of Geophone 2 at Frequency of 30 Hz (Slope of Line is 1.01)

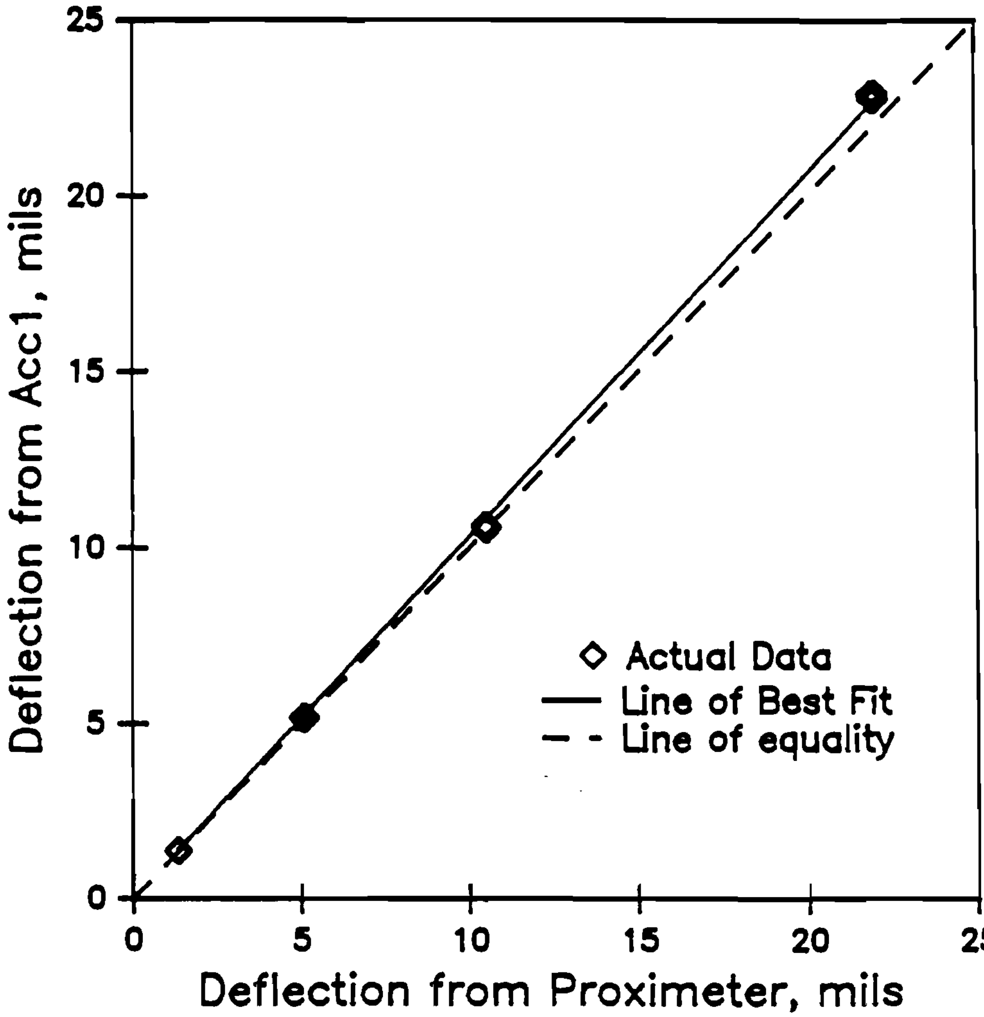


Figure F.26 Evaluation of Accuracy of Accelerometer 1 at Frequency of 40 Hz (Slope of Line is 1.03)

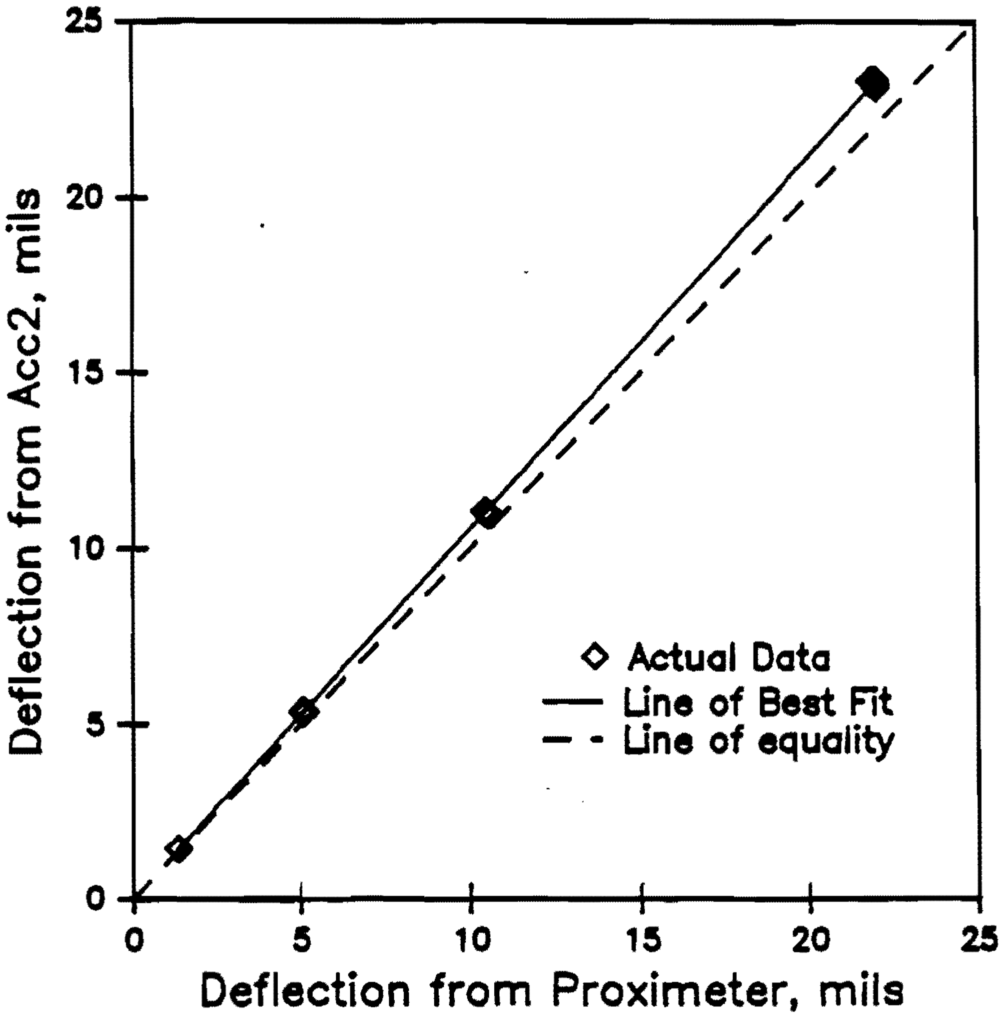


Figure F.27 Evaluation of Accuracy of Accelerometer 2 at Frequency of 40 Hz (Slope of Line is 1.06)

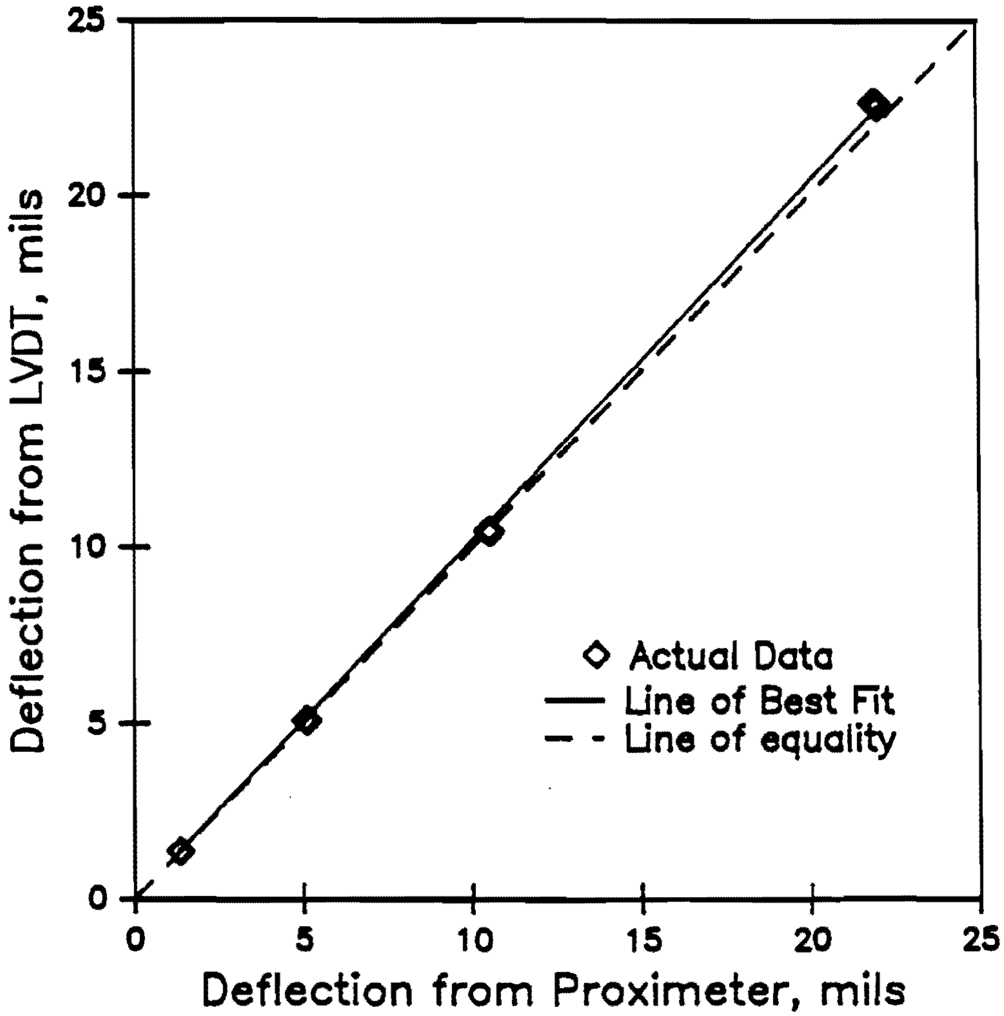


Figure F.28 Evaluation of Accuracy of LVDT at Frequency of 40 Hz (Slope of Line is 1.02)

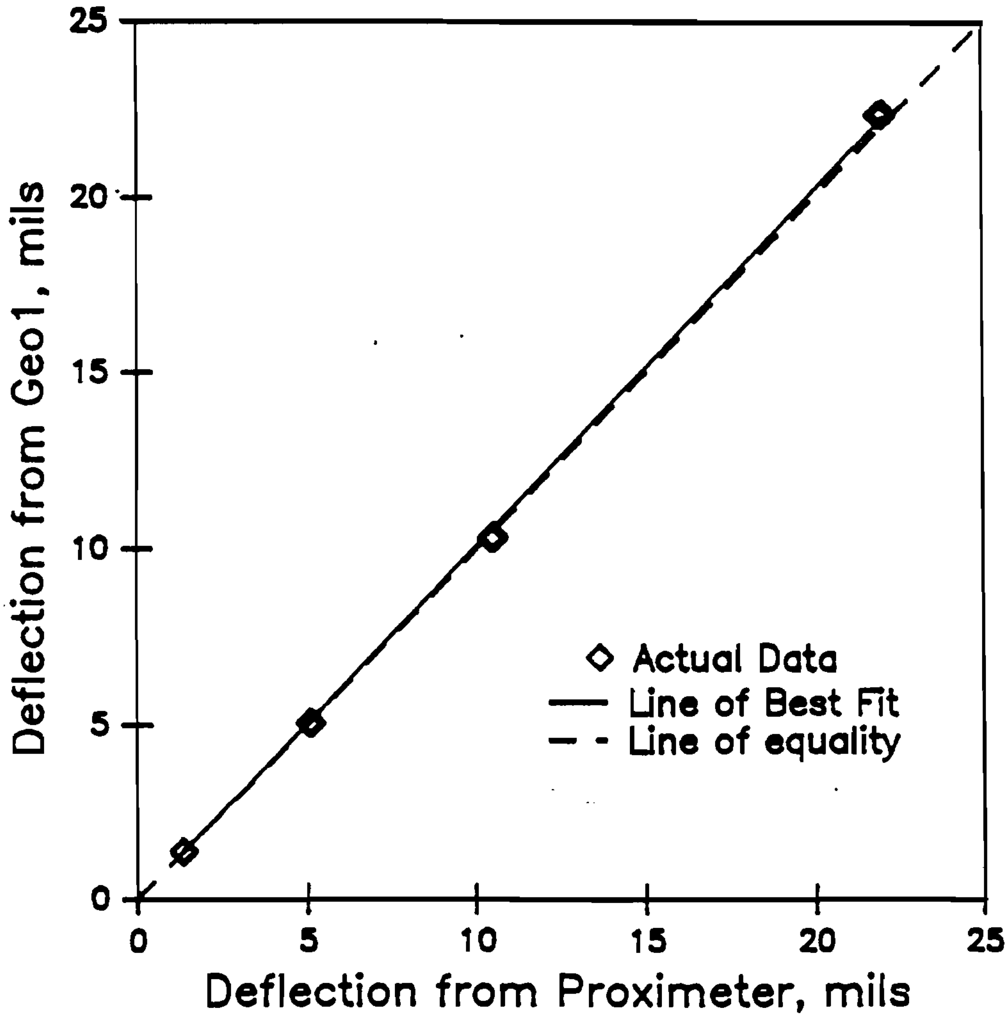


Figure F.29 Evaluation of Accuracy of Geophone 1 at Frequency of 40 Hz (Slope of Line is 1.01)

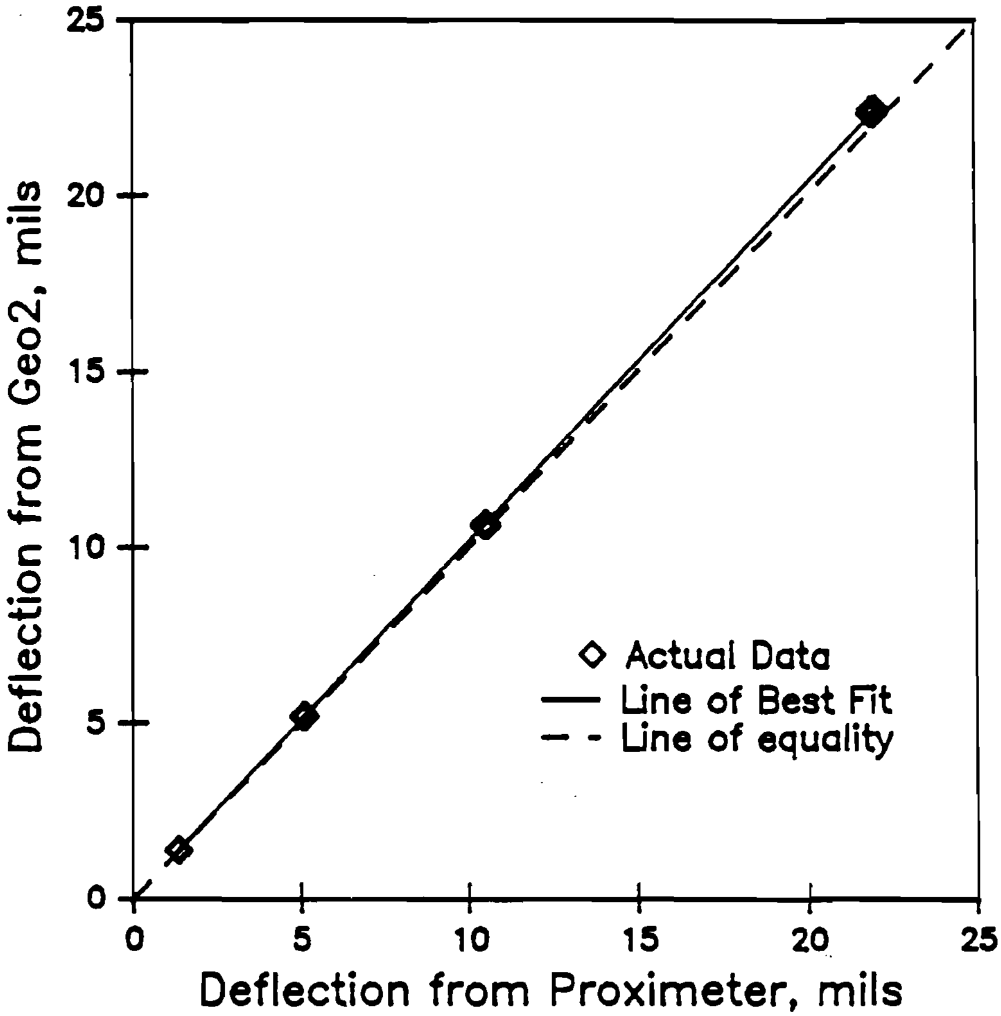


Figure F.30 Evaluation of Accuracy of Geophone 2 at Frequency of 40 Hz (Slope of Line is 1.02)

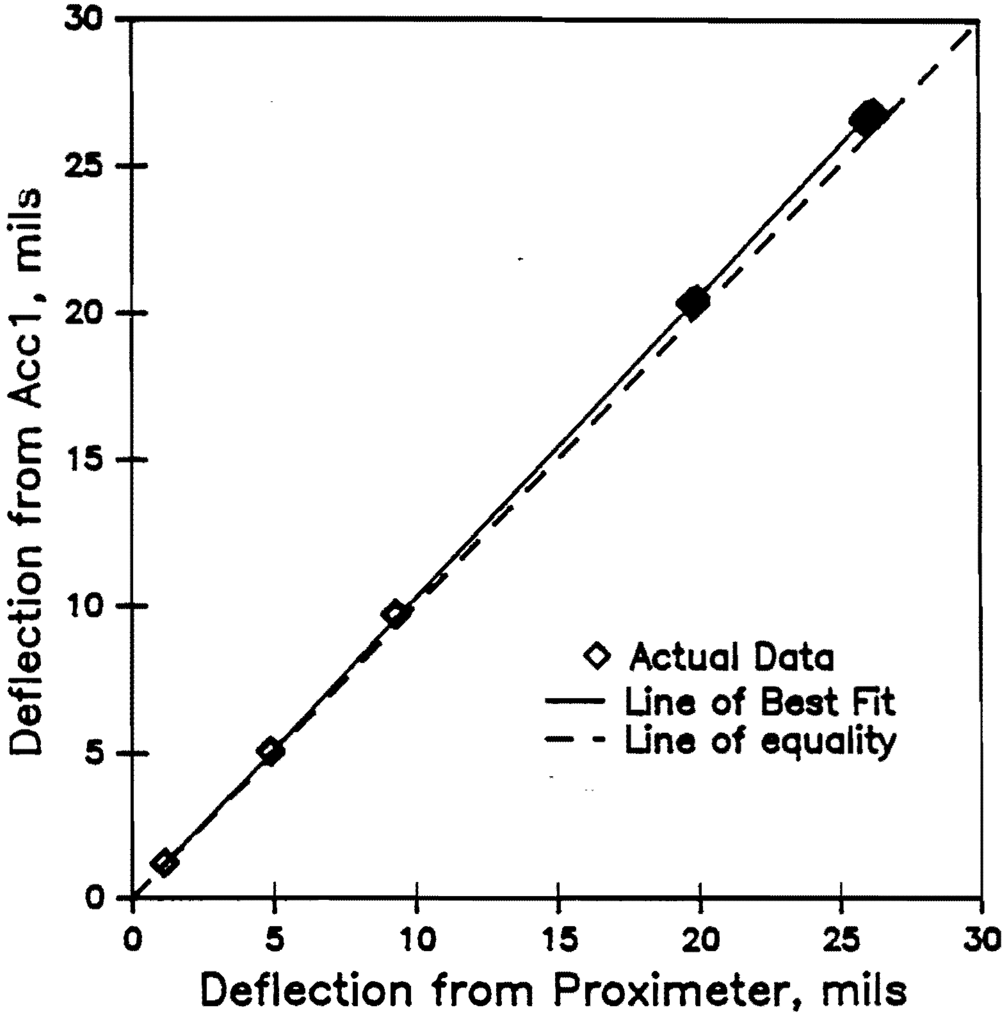


Figure F.31 Evaluation of Accuracy of Accelerometer 1 at Frequency of 50 Hz (Slope of Line is 1.03)

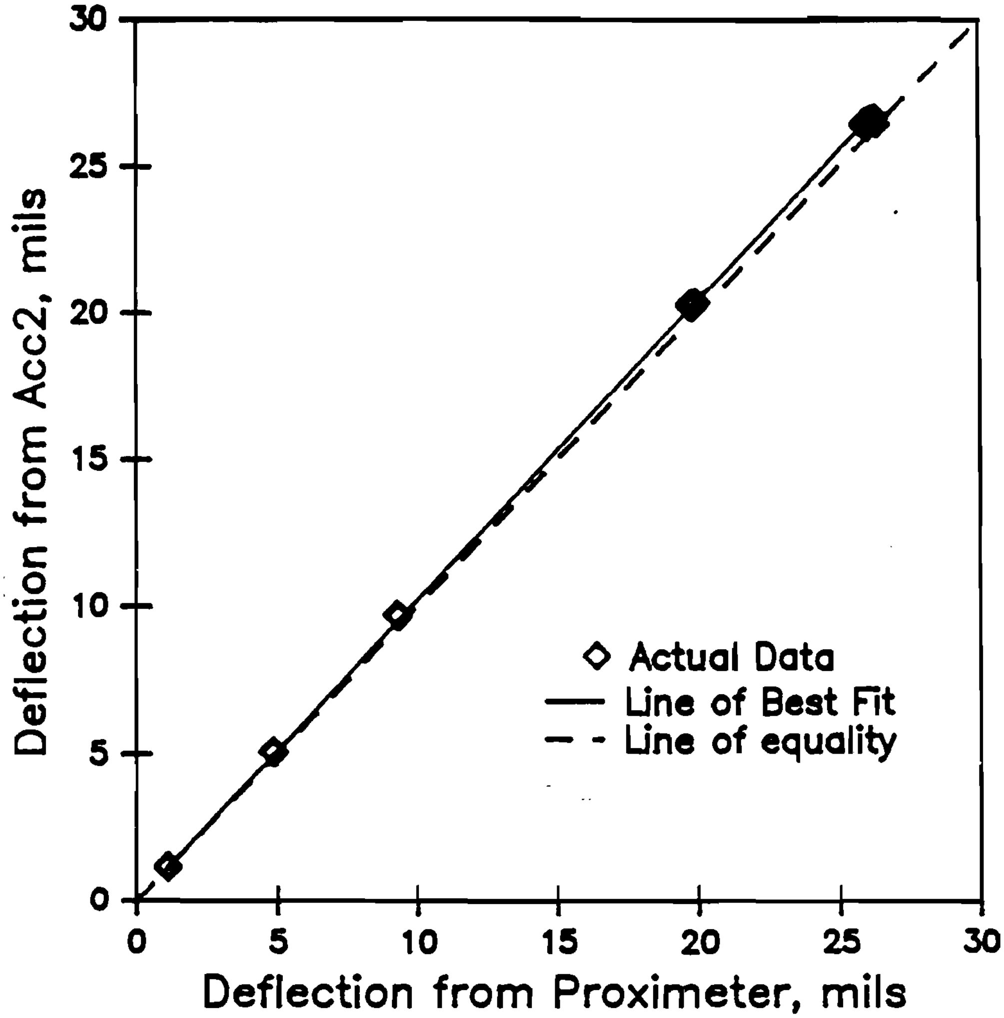


Figure F.32 Evaluation of Accuracy of Accelerometer 2 at Frequency of 50 Hz (Slope of Line is 1.02)

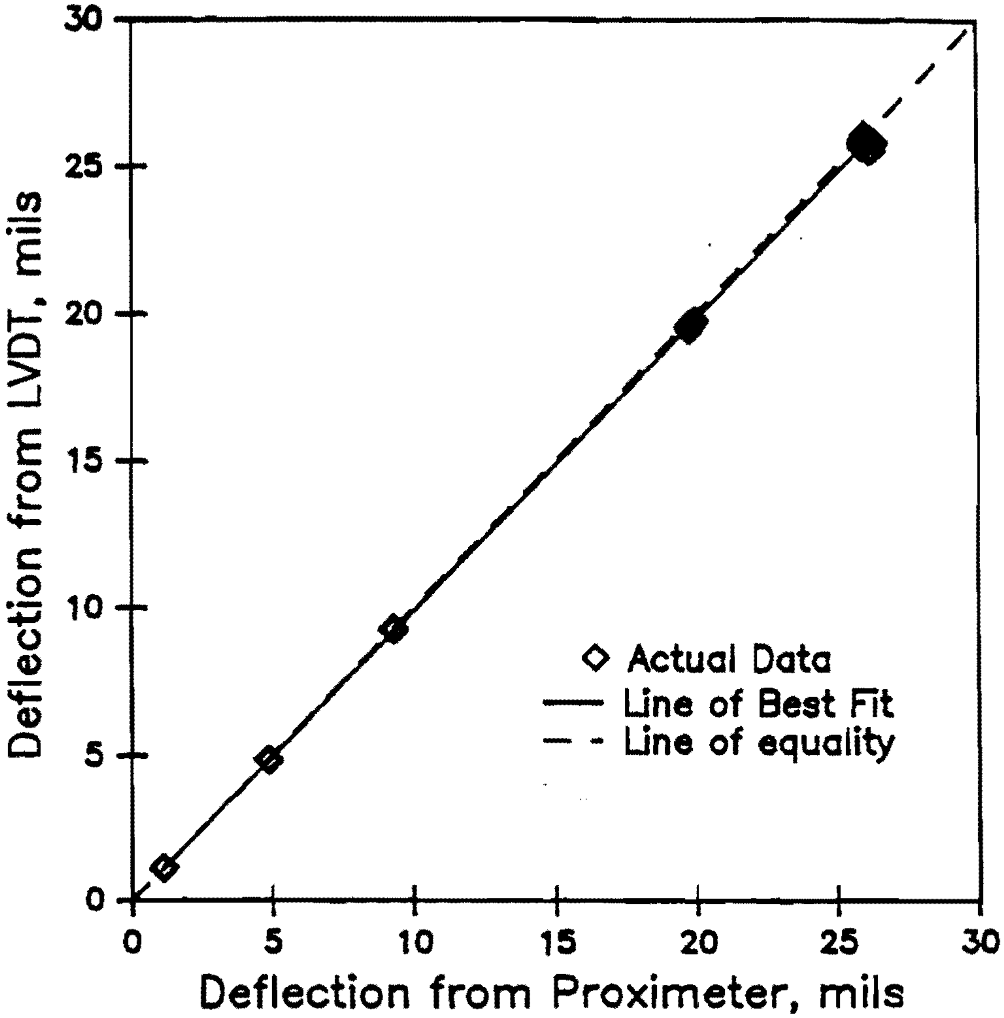


Figure F.33 Evaluation of Accuracy of LVDT at Frequency of 50 Hz (Slope of Line is 0.99)

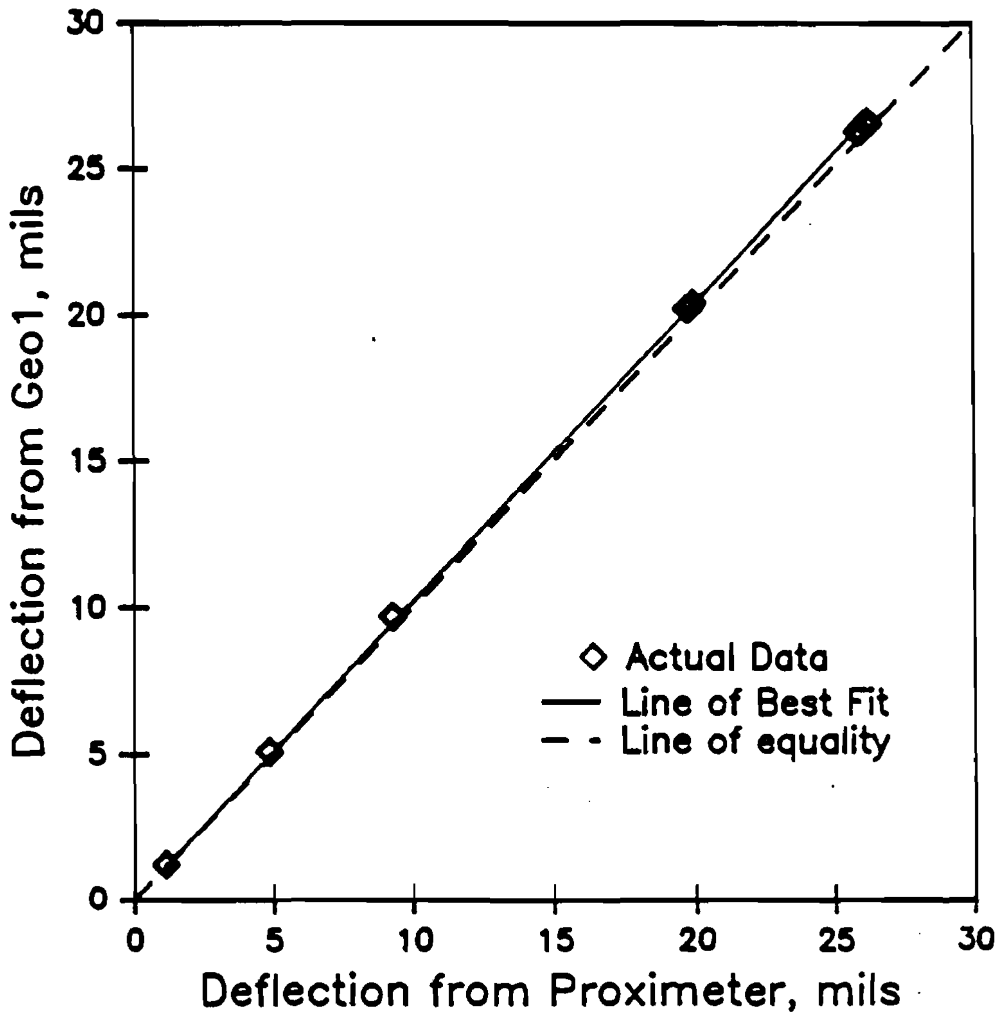


Figure F.34 Evaluation of Accuracy of Geophone 1 at Frequency of 50 Hz (Slope of Line is 1.02)

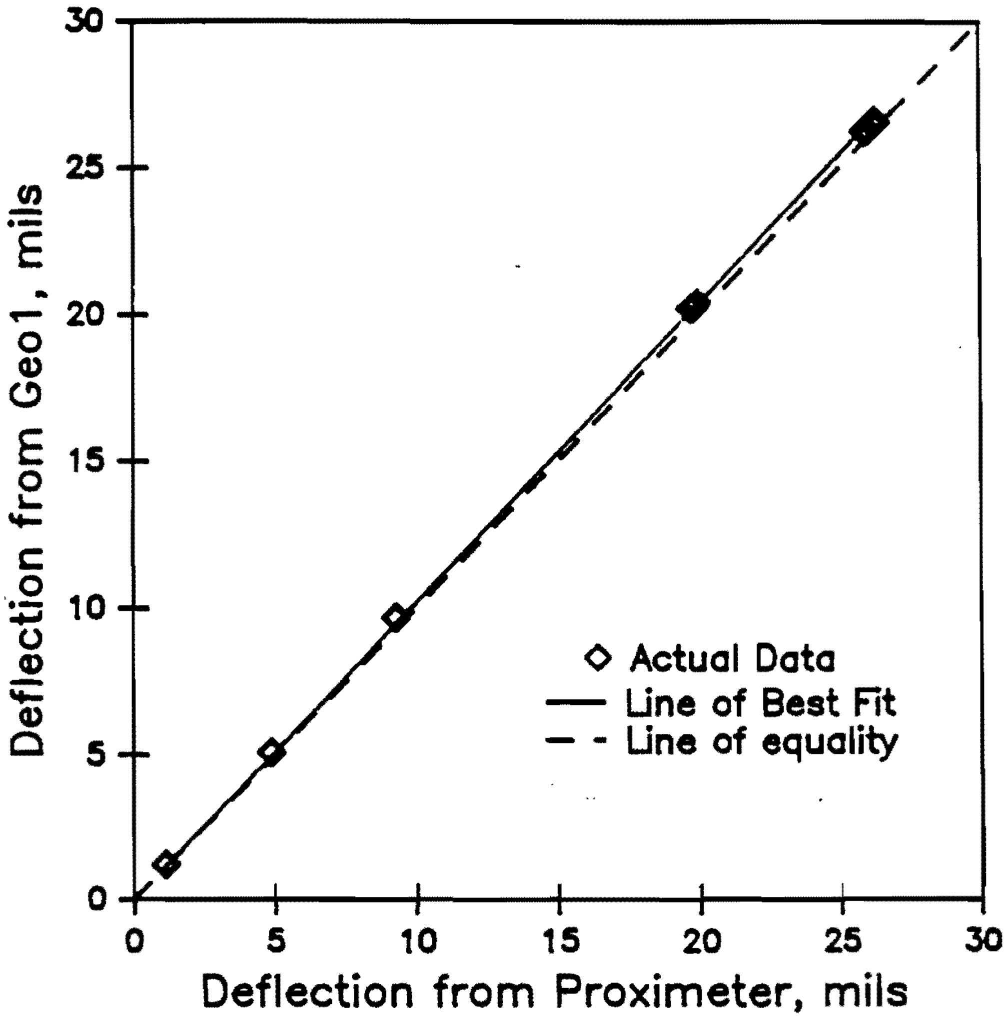


Figure F.35 Evaluation of Accuracy of Geophone 2 at Frequency of 50 Hz (Slope of Line is 1.02)

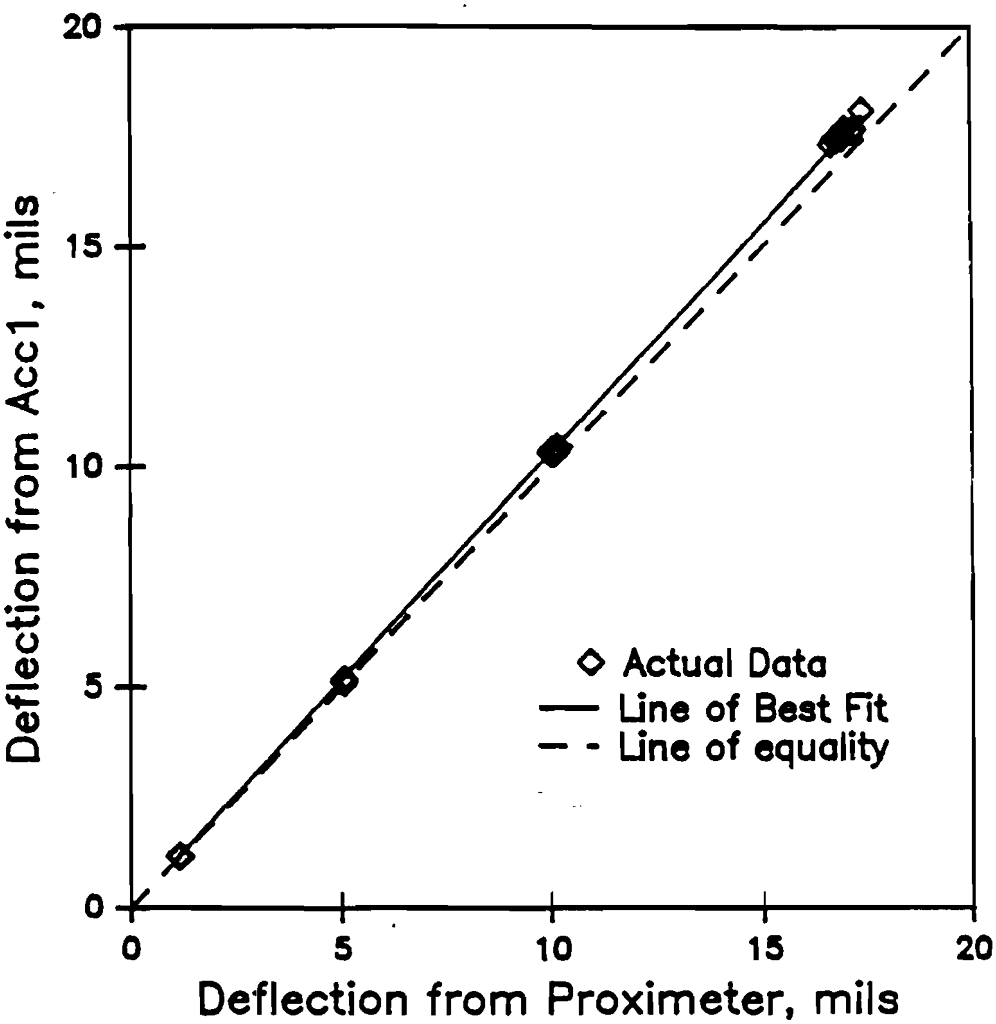


Figure F.36 Evaluation of Accuracy of Accelerometer 1 at Frequency of 75 Hz (Slope of Line is 1.03)

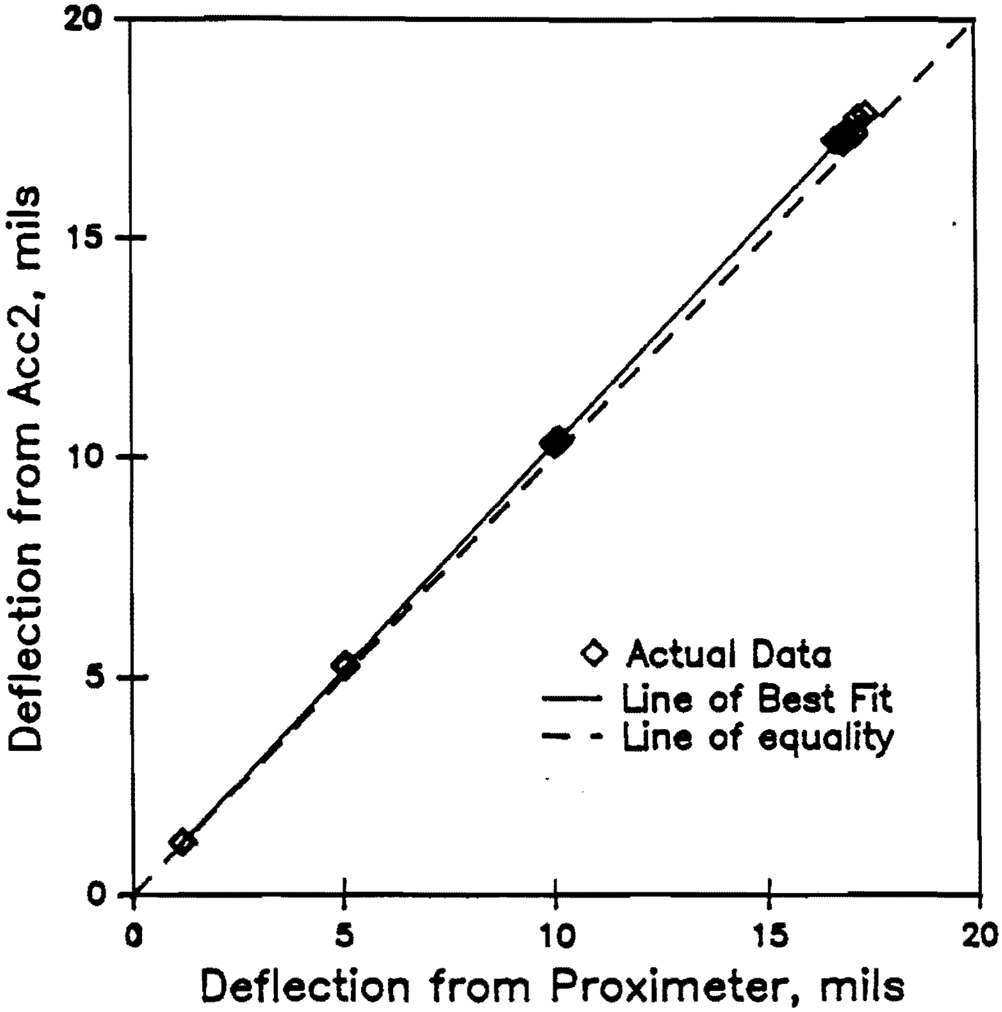


Figure F.37 Evaluation of Accuracy of Accelerometer 2 at Frequency of 75 Hz (Slope of Line is 1.03)

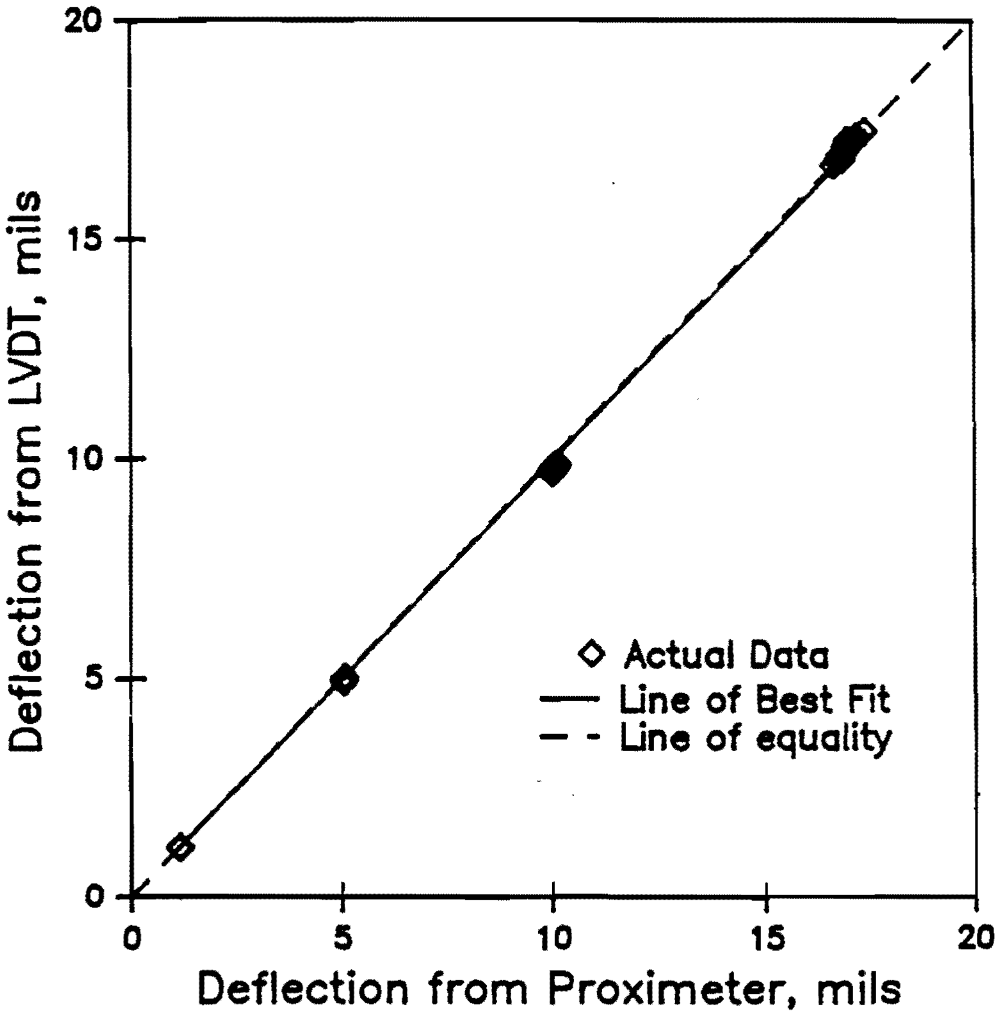


Figure F.38 Evaluation of Accuracy of LVDT at Frequency of 75 Hz (Slope of Line is 0.99)

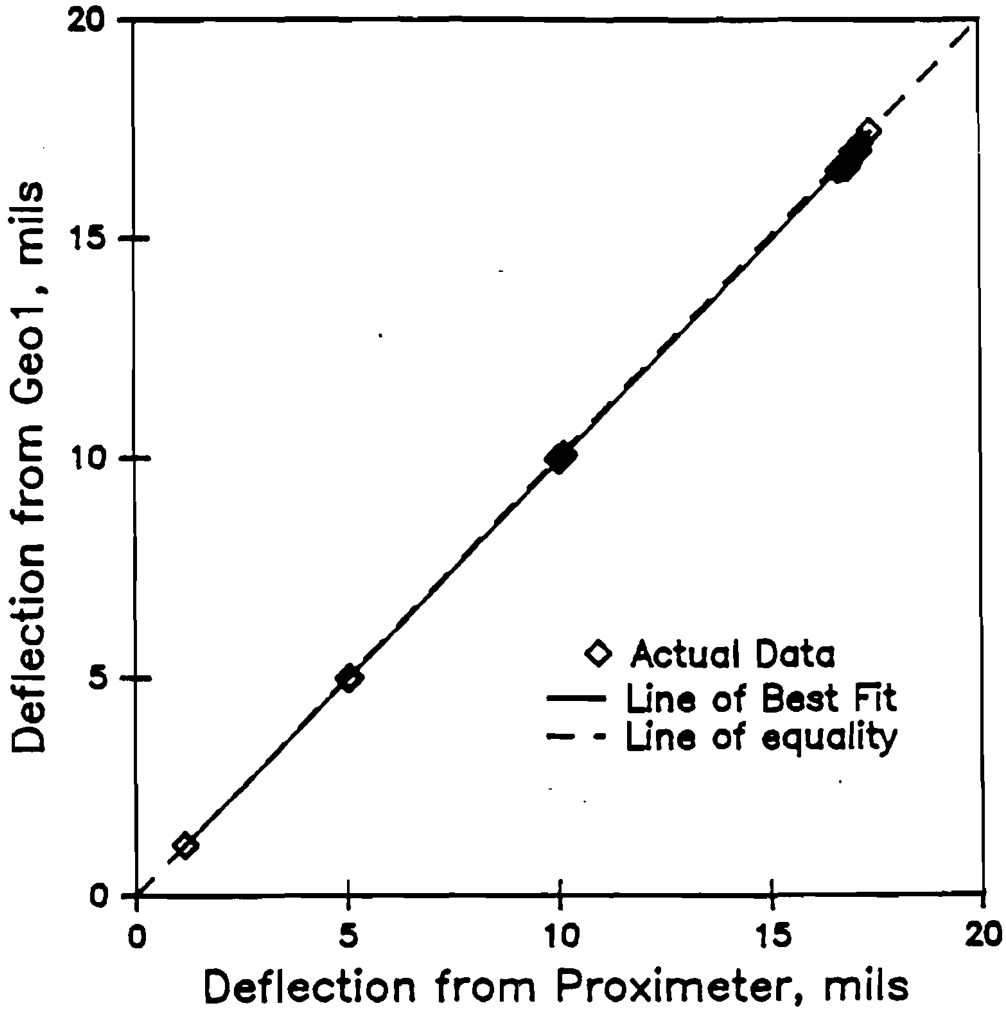


Figure F.39 Evaluation of Accuracy of Geophone 1 at Frequency of 75 Hz (Slope of Line is 0.99)

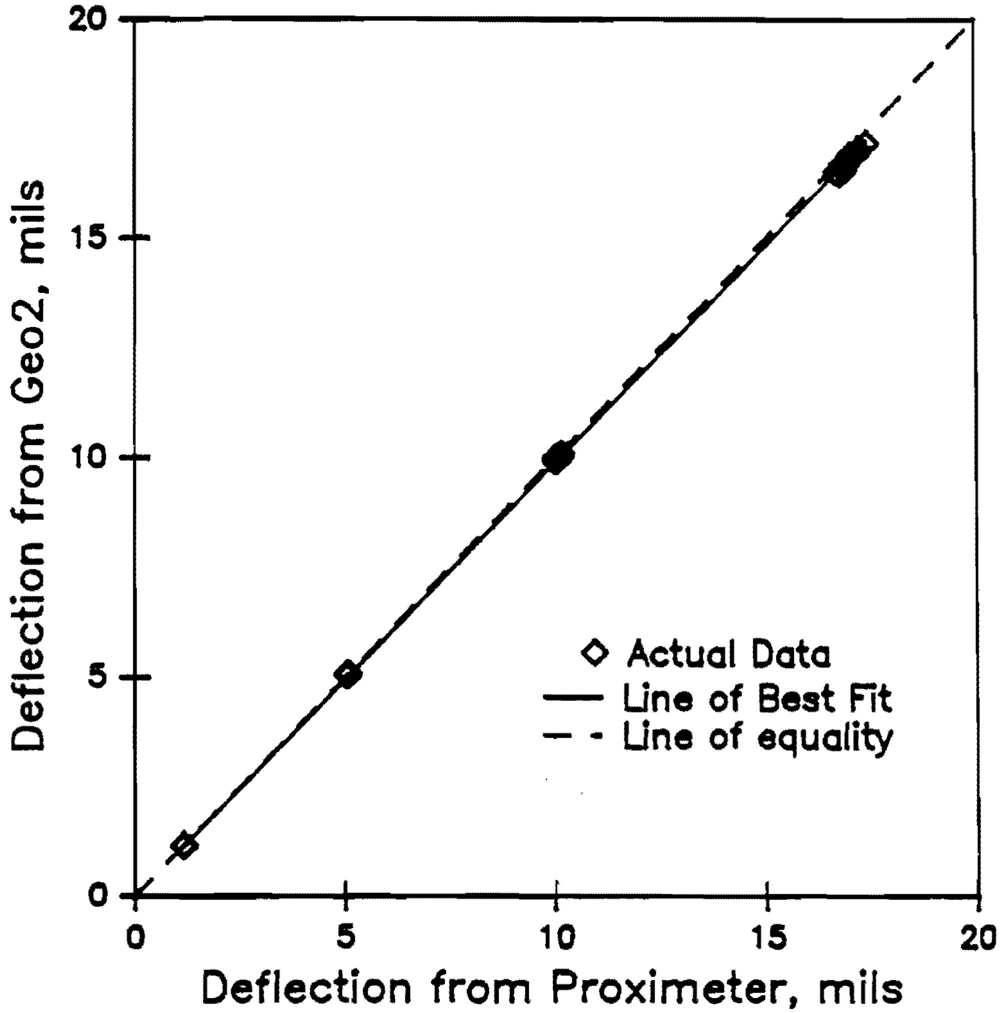


Figure F.40 Evaluation of Accuracy of Geophone 2 at Frequency of 75 Hz (Slope of Line is 0.99)

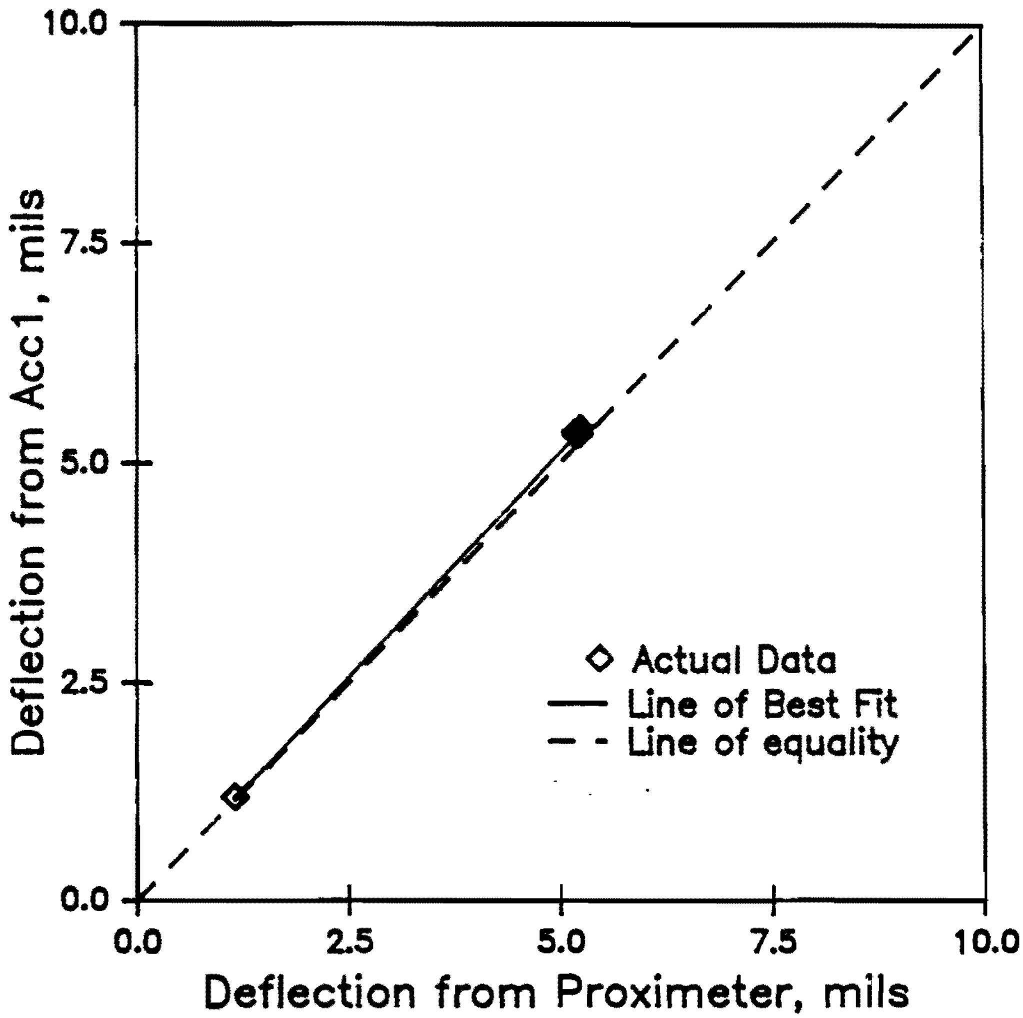


Figure F.41 Evaluation of Accuracy of Accelerometer 1 at Frequency of 100 Hz (Slope of Line is 1.03)

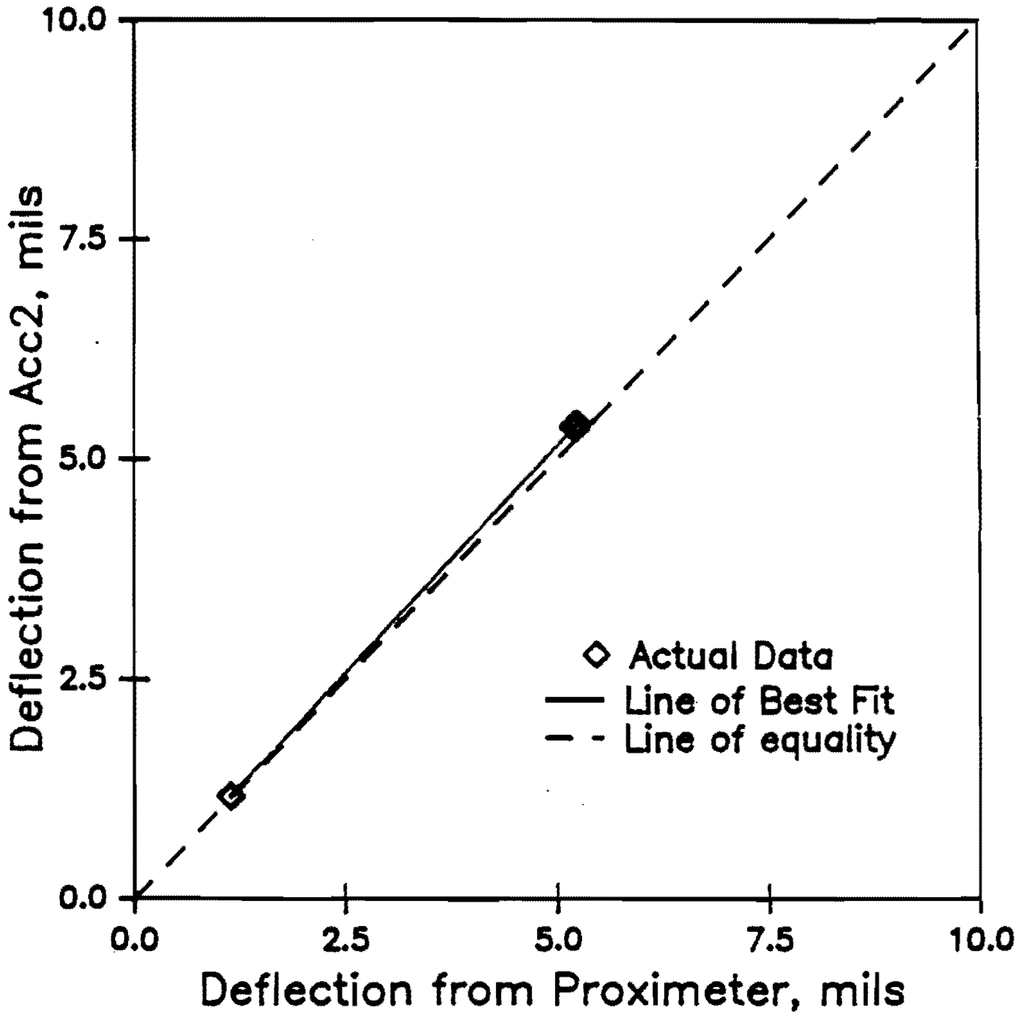


Figure F.42 Evaluation of Accuracy of Accelerometer 2 at Frequency of 100 Hz (Slope of Line is 1.03)

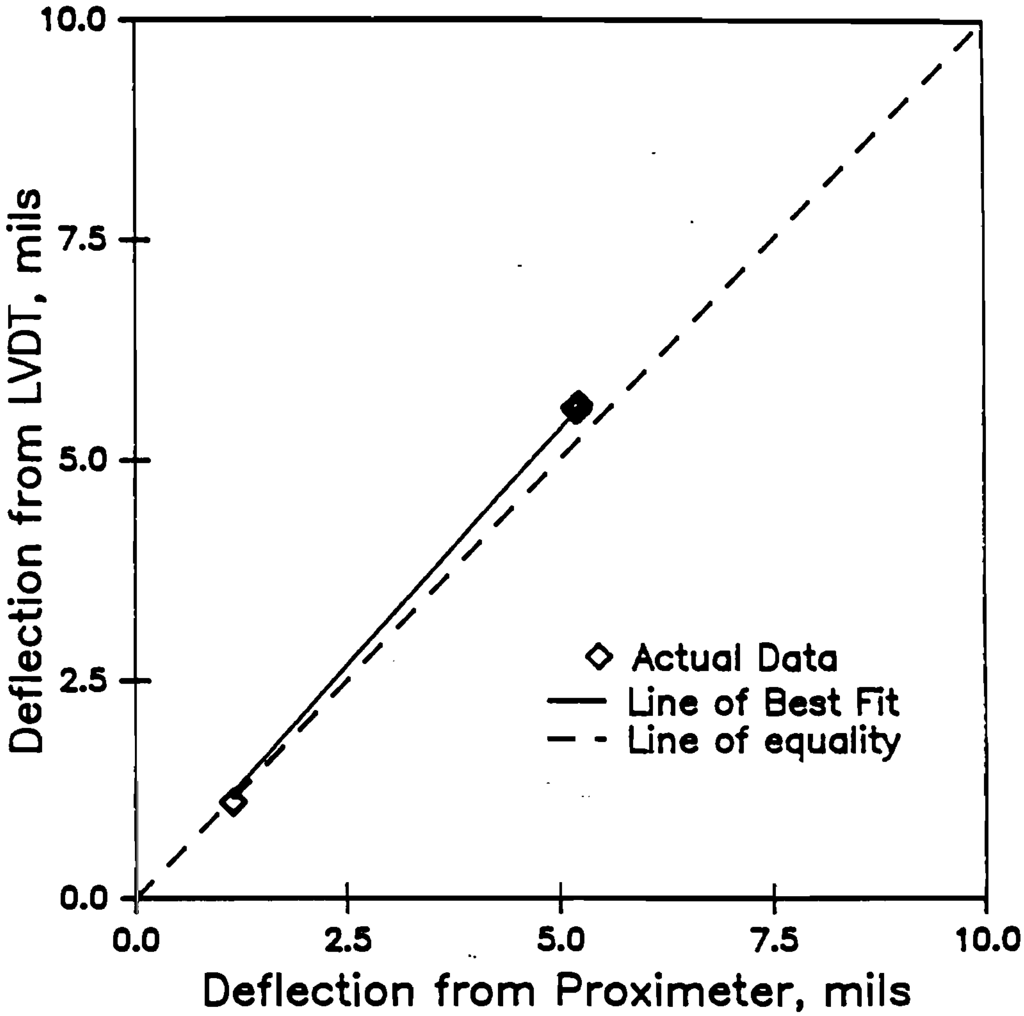


Figure F.43 Evaluation of Accuracy of LVDT at Frequency of 100 Hz (Slope of Line is 1.07)

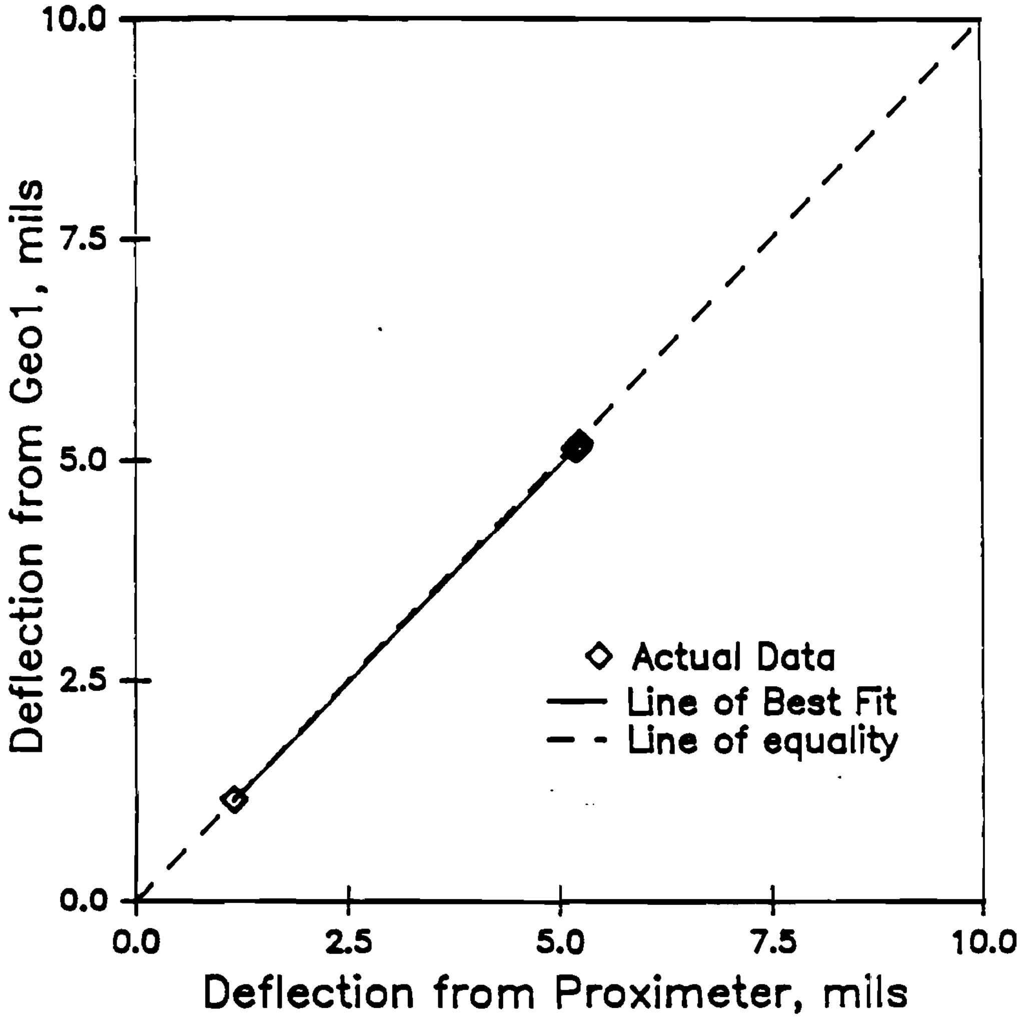


Figure F.44 Evaluation of Accuracy of Geophone 1 at Frequency of 100 Hz (Slope of Line is 0.99)

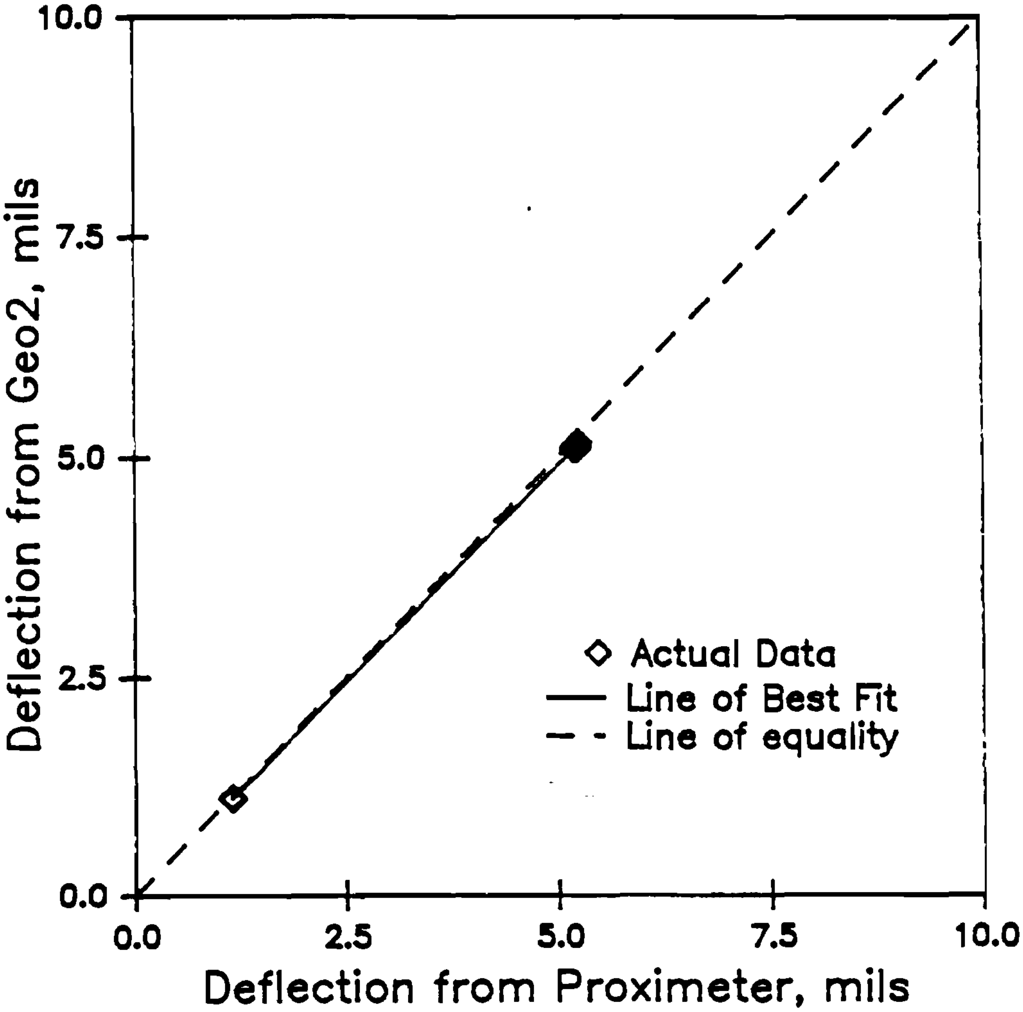


Figure F.45 Evaluation of Accuracy of Geophone 2 at Frequency of 100 Hz (Slope of Line is 0.98)

APPENDIX G

EVALUATION OF PRECISION OF EACH SENSOR FOR STEADY-STATE MOTION

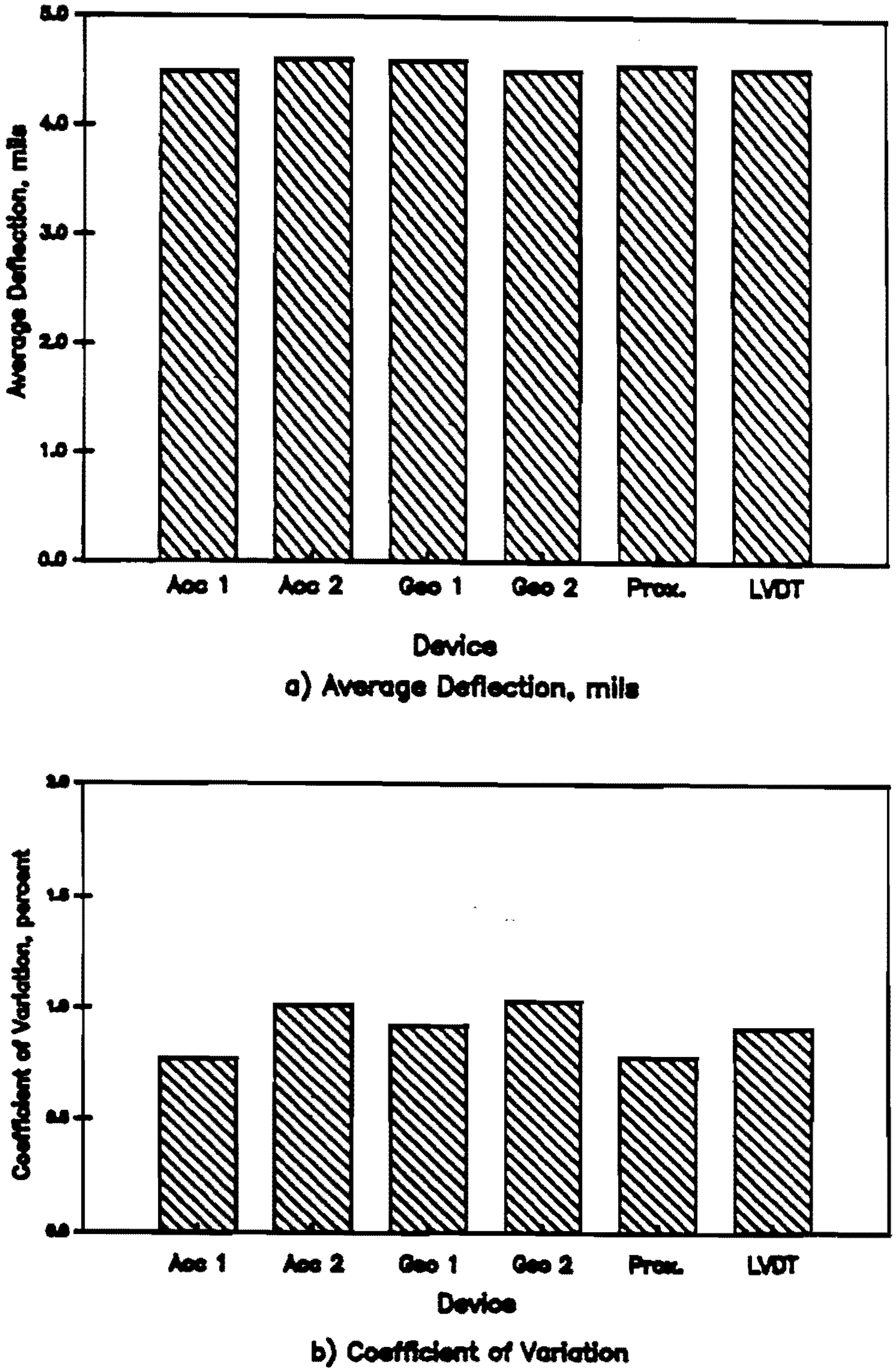
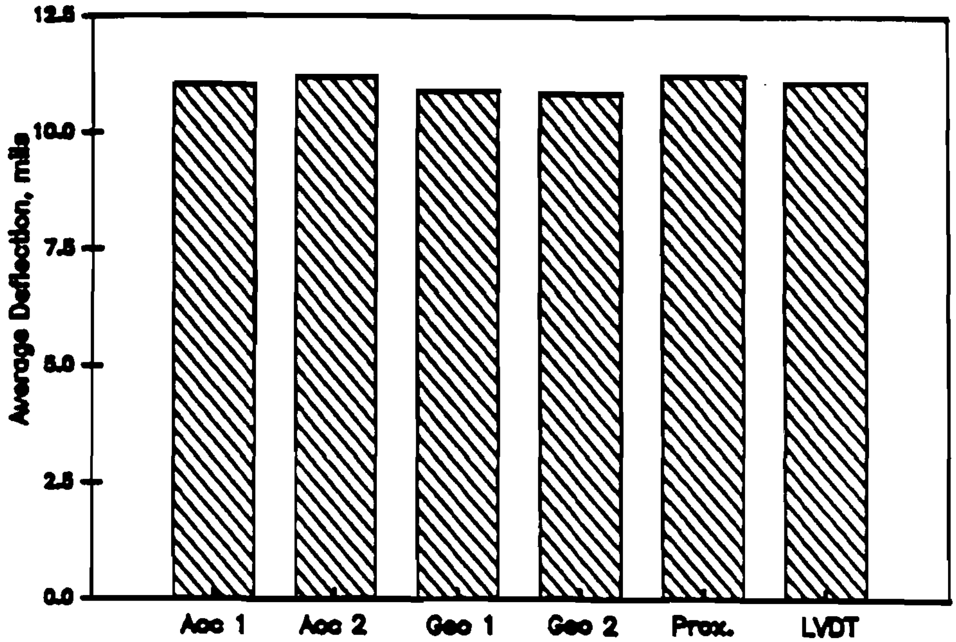
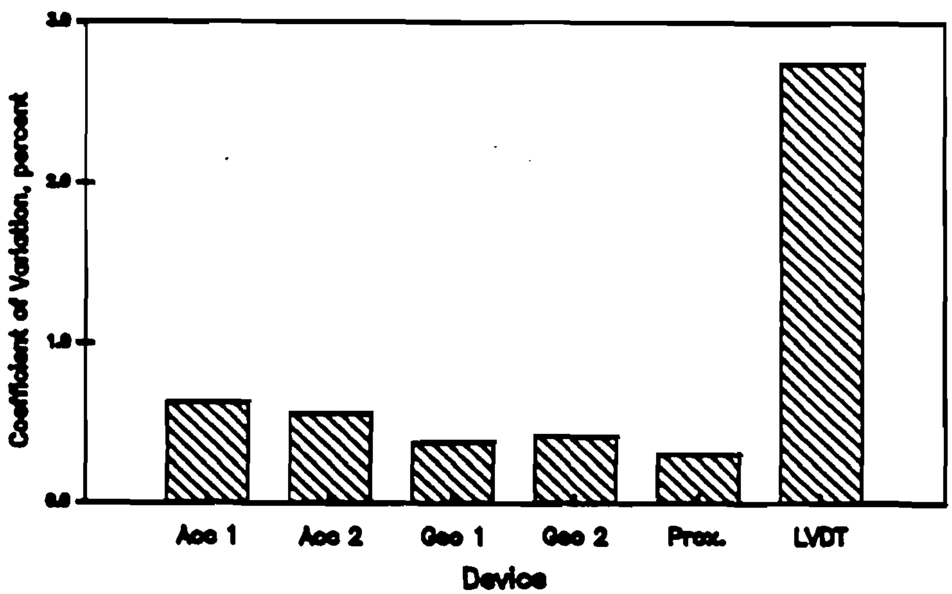


Figure G.1 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 1.5 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure G.2 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 5.0 mils (without Laser)

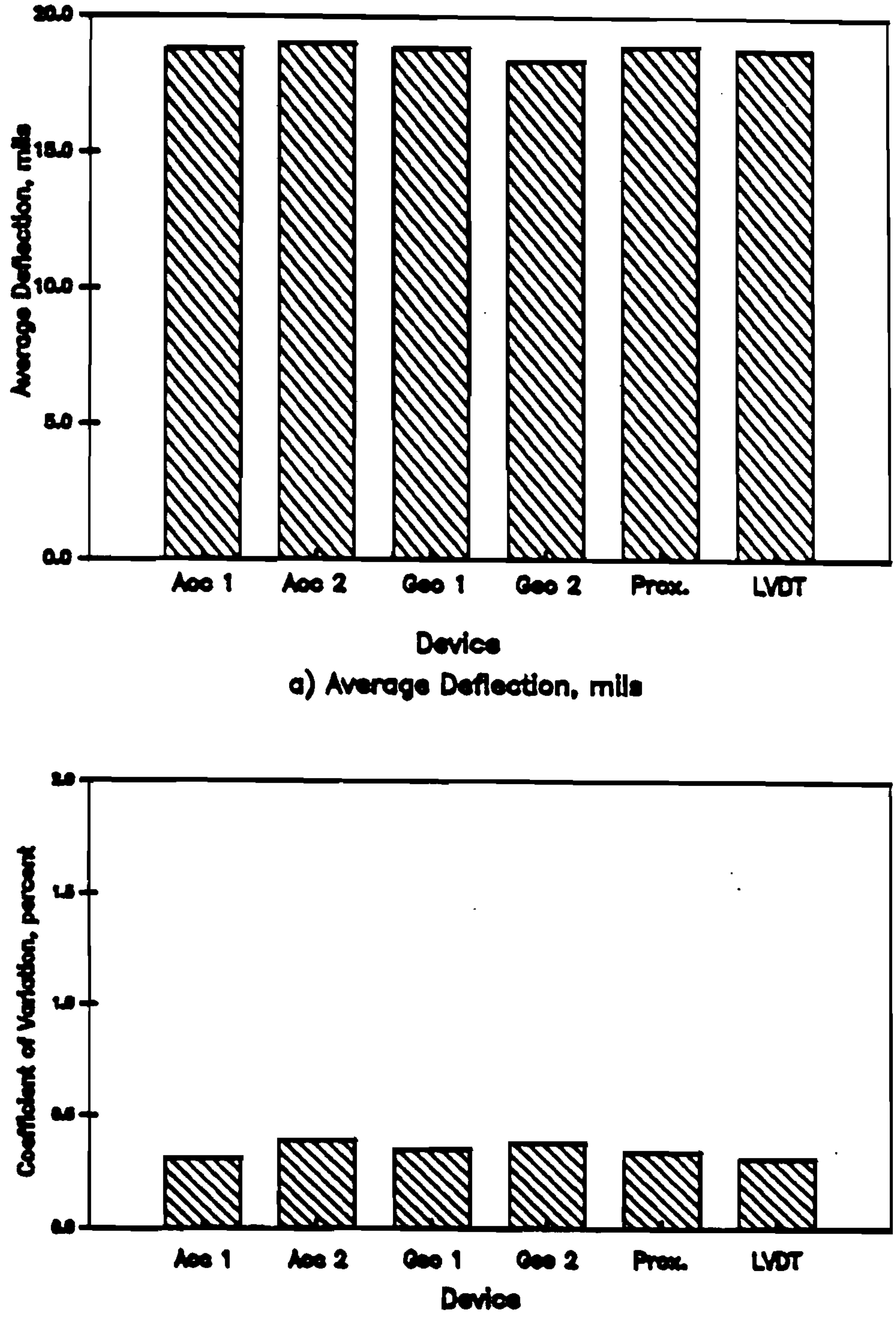


Figure G.3 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 10.0 mils (without Laser)

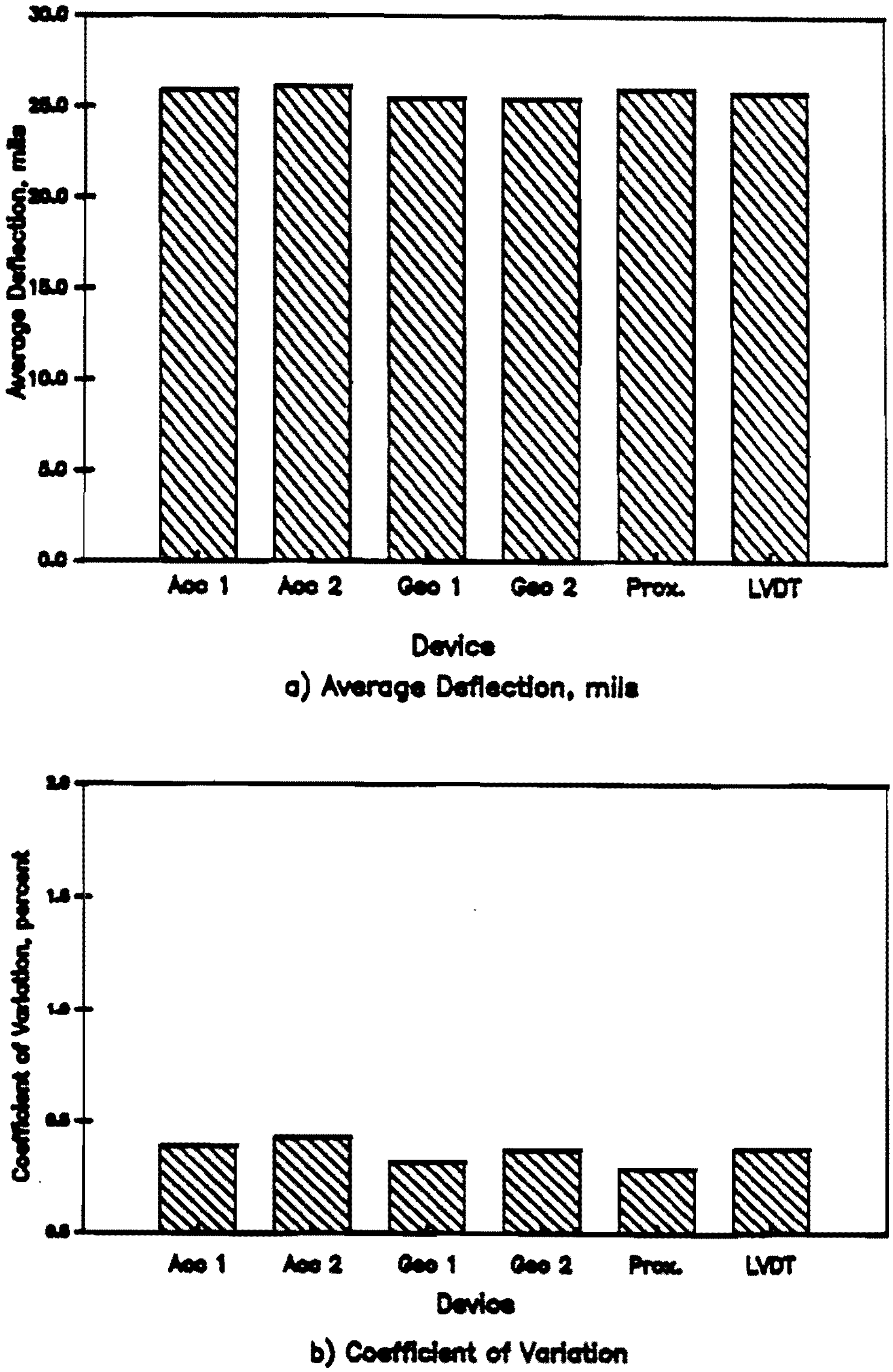
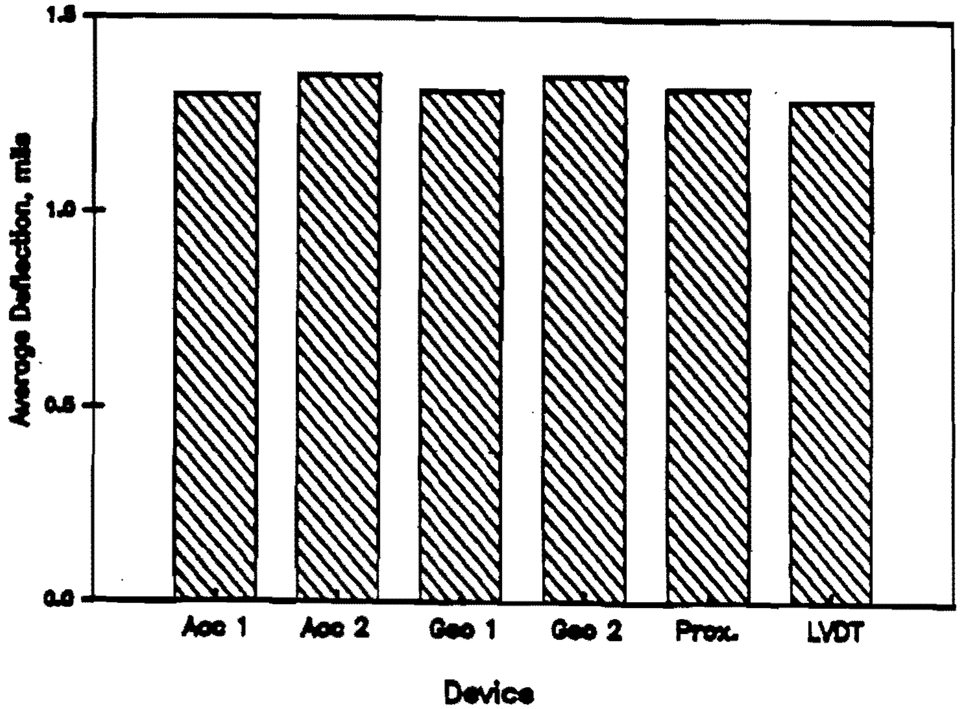
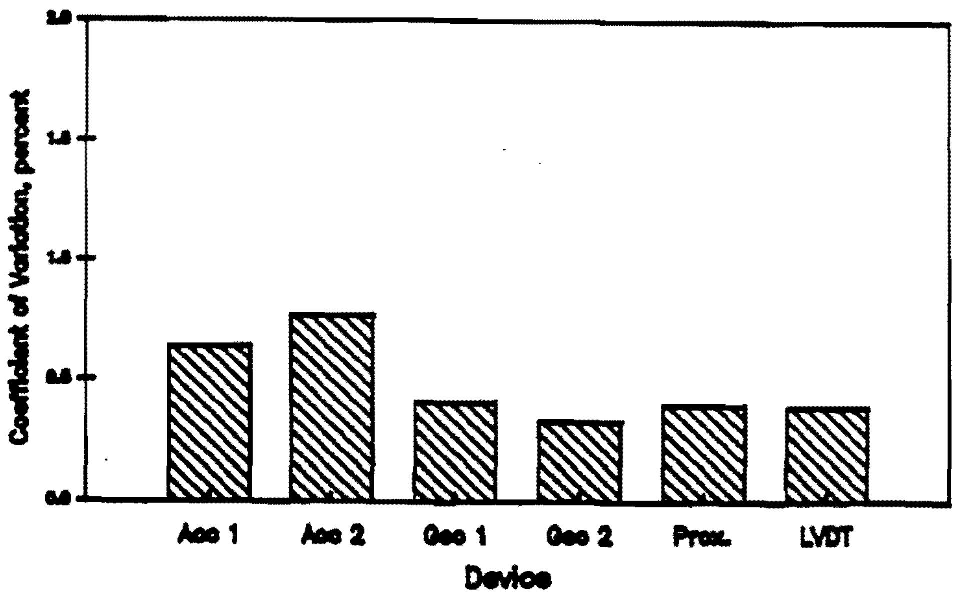


Figure G.4 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 15.0 mils (without Laser)

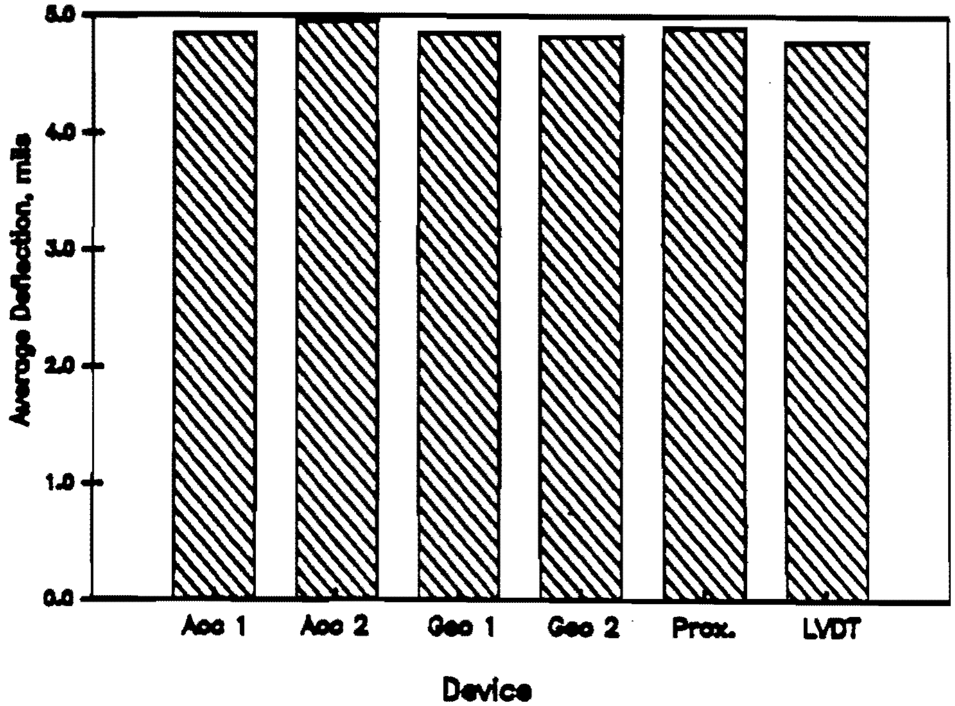


a) Average Deflection, mils

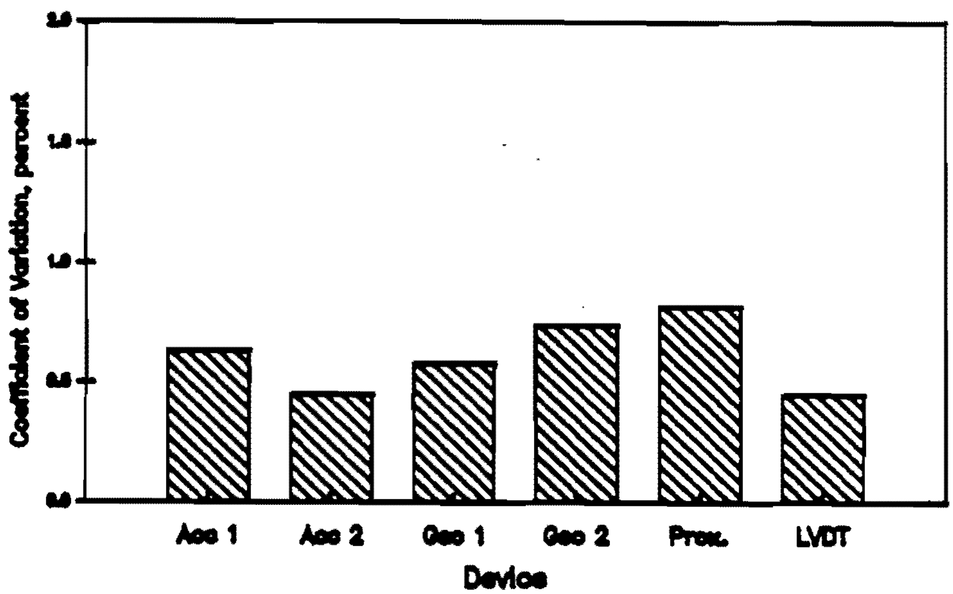


b) Coefficient of Variation

Figure G.5 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 25.0 mils (without Laser)

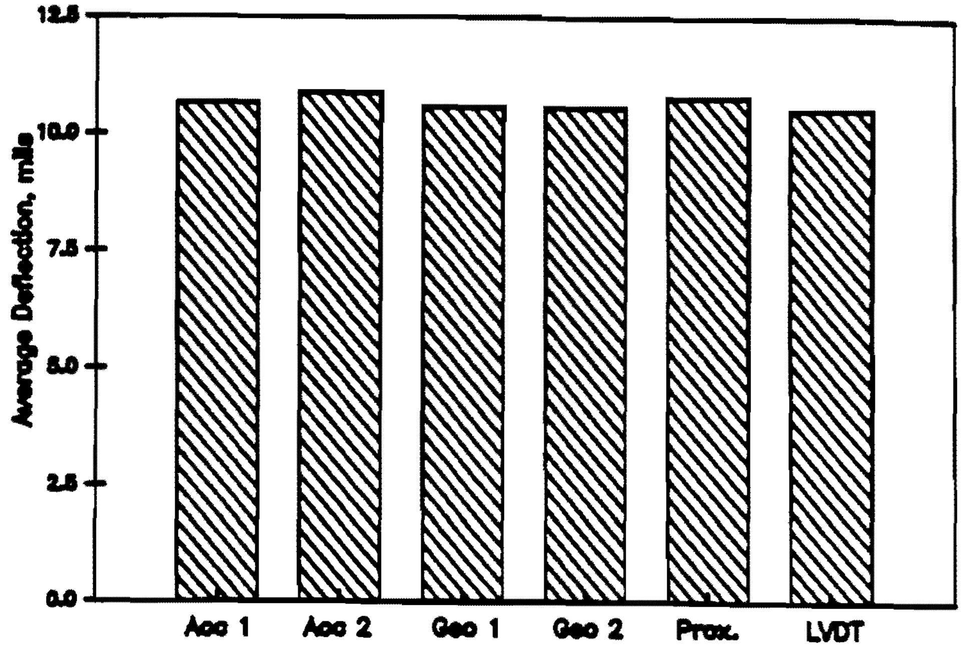


a) Average Deflection, mils

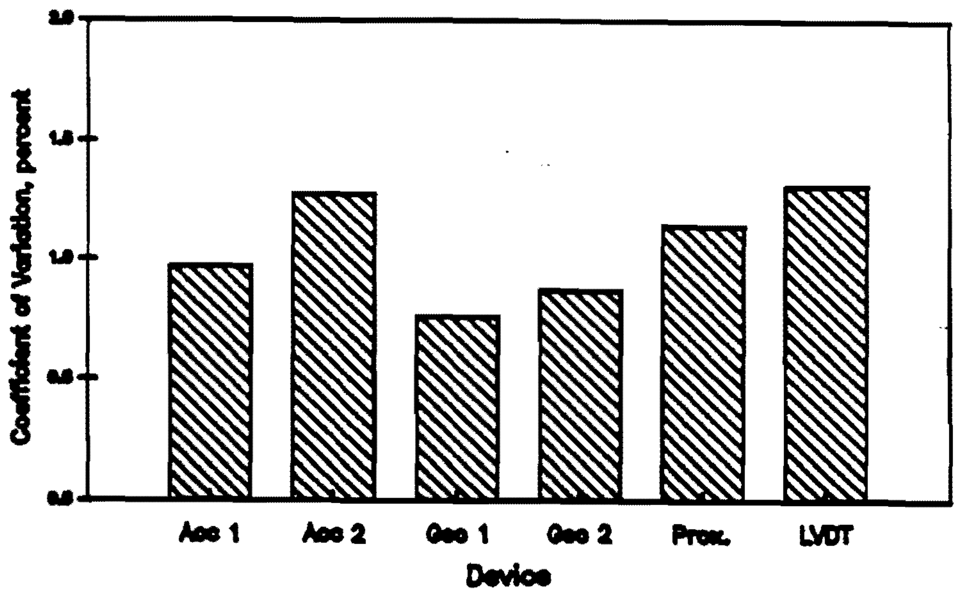


b) Coefficient of Variation

Figure G.6 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 1.5 mils (without Laser)

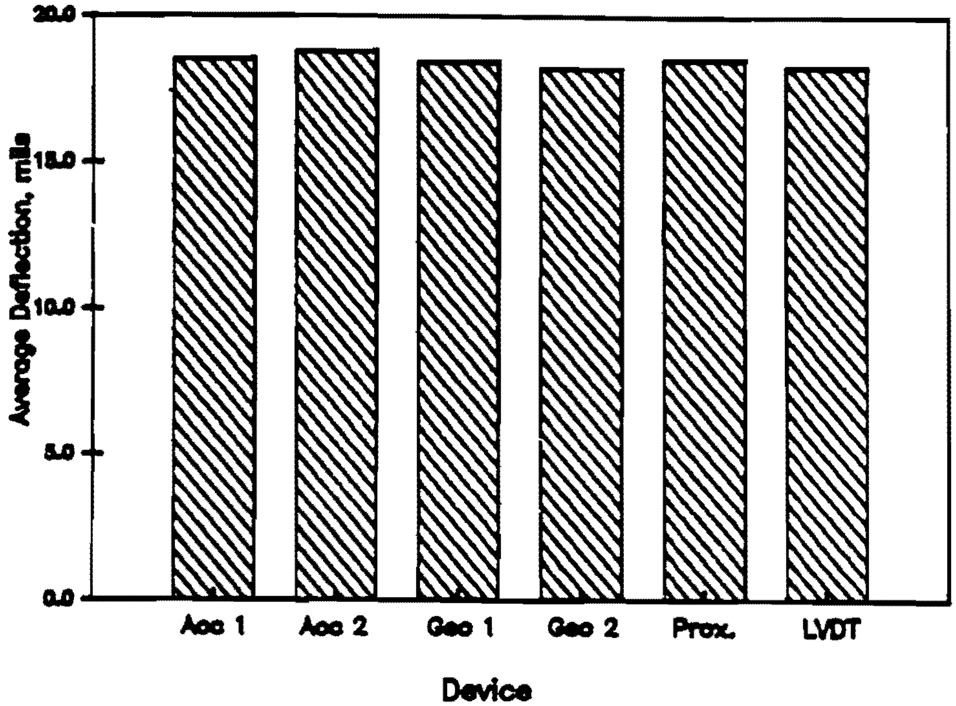


a) Average Deflection, mils

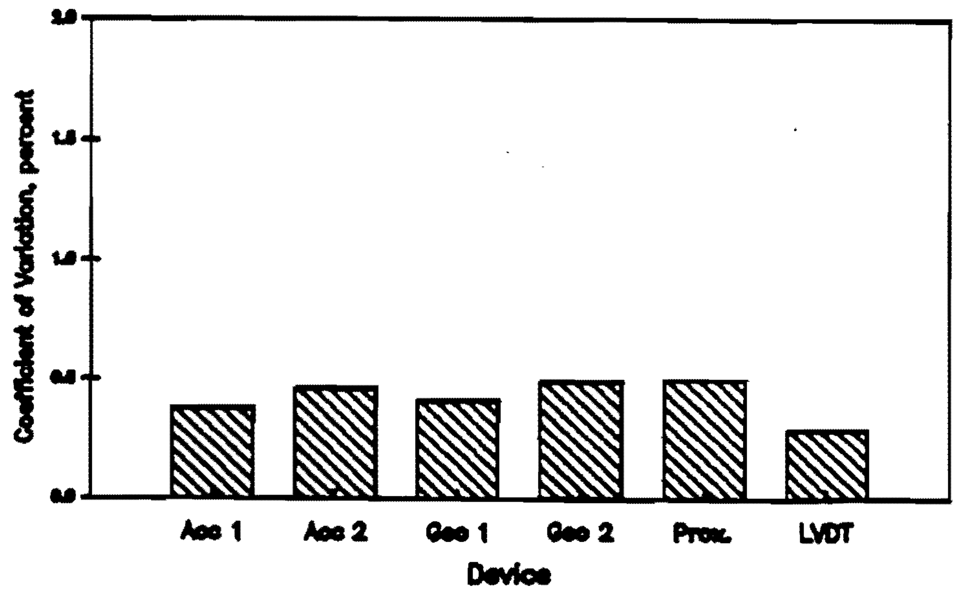


b) Coefficient of Variation

Figure G.7 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 5.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure G.8 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 10.0 mils (without Laser)

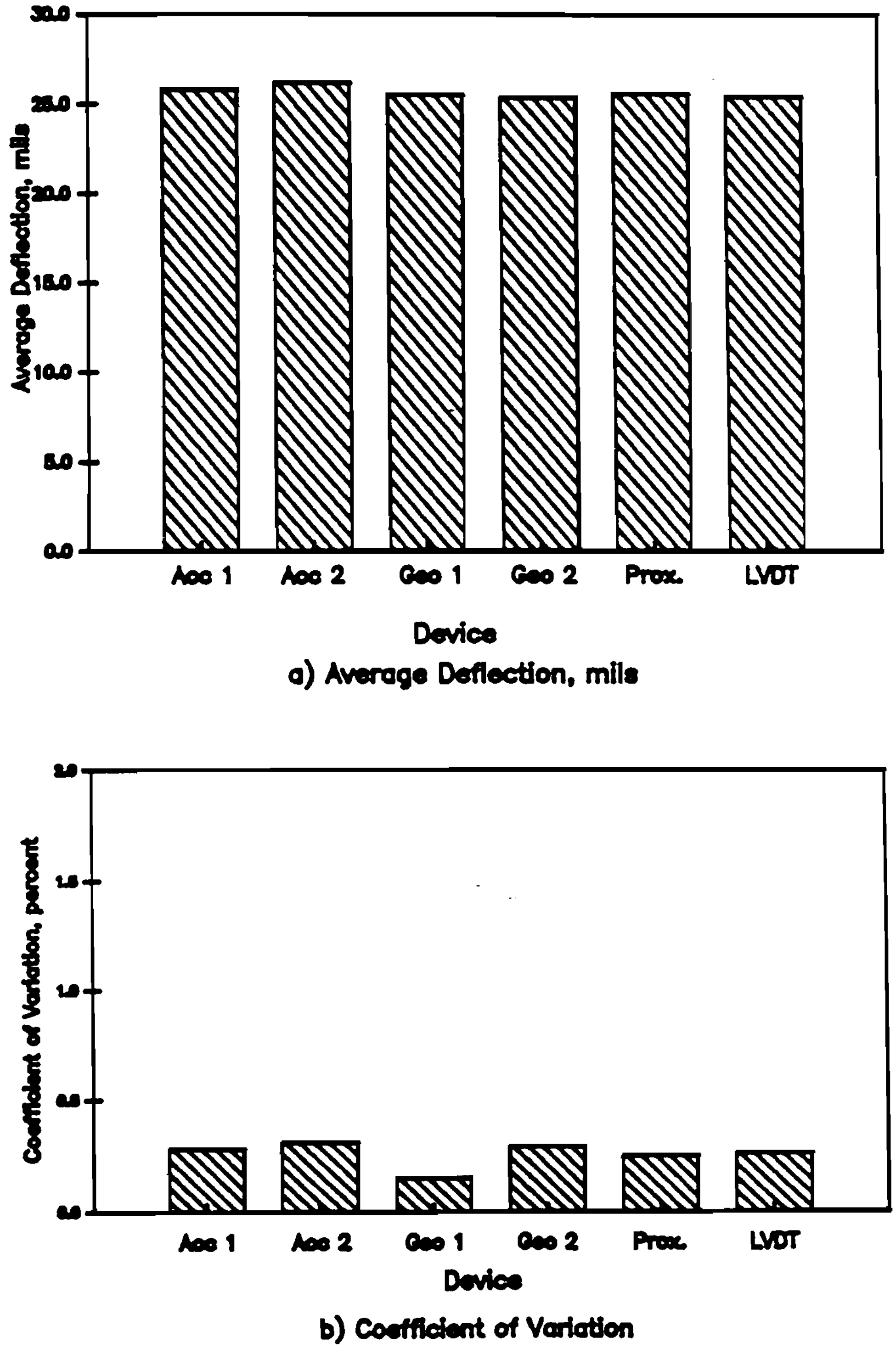
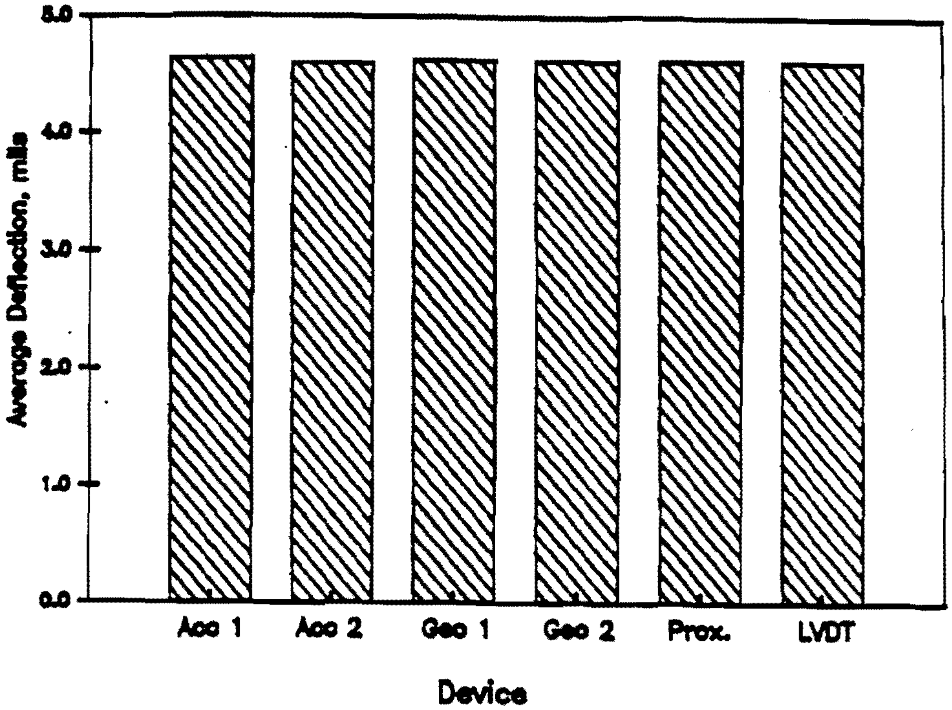
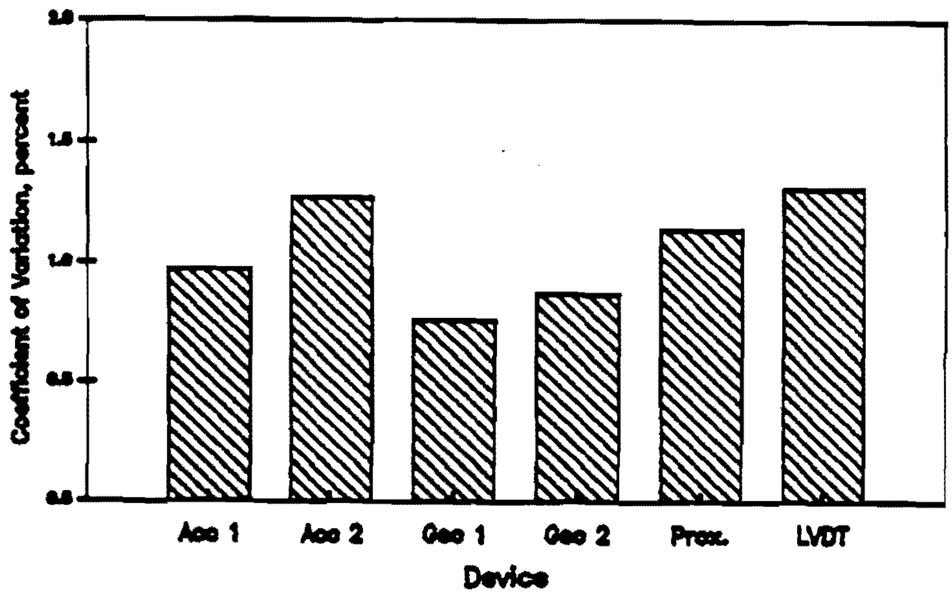


Figure G.9 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 15.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure G.10 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 25.0 mils (without Laser)

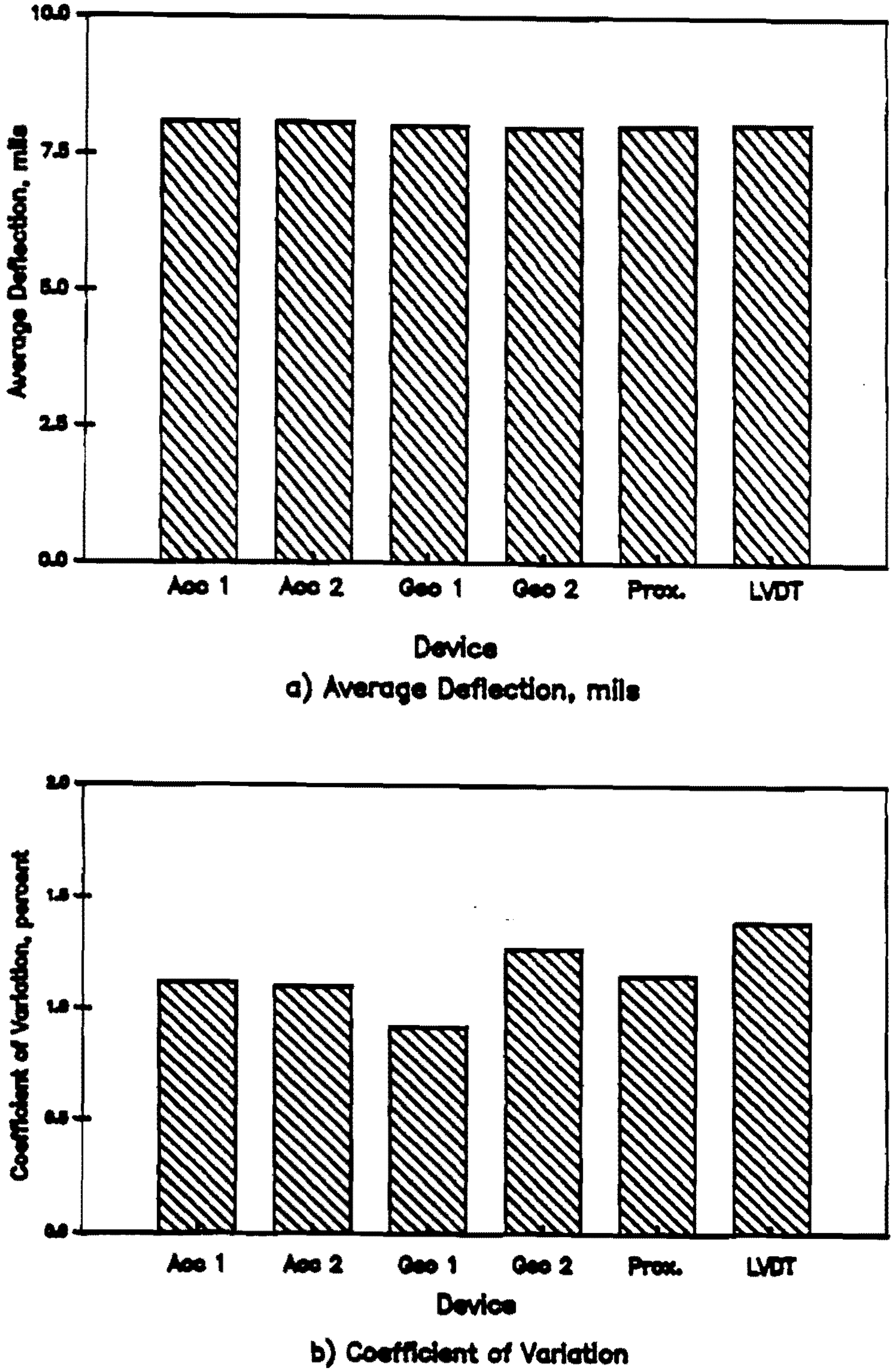


Figure G.11 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 5.0 mils (without Laser)

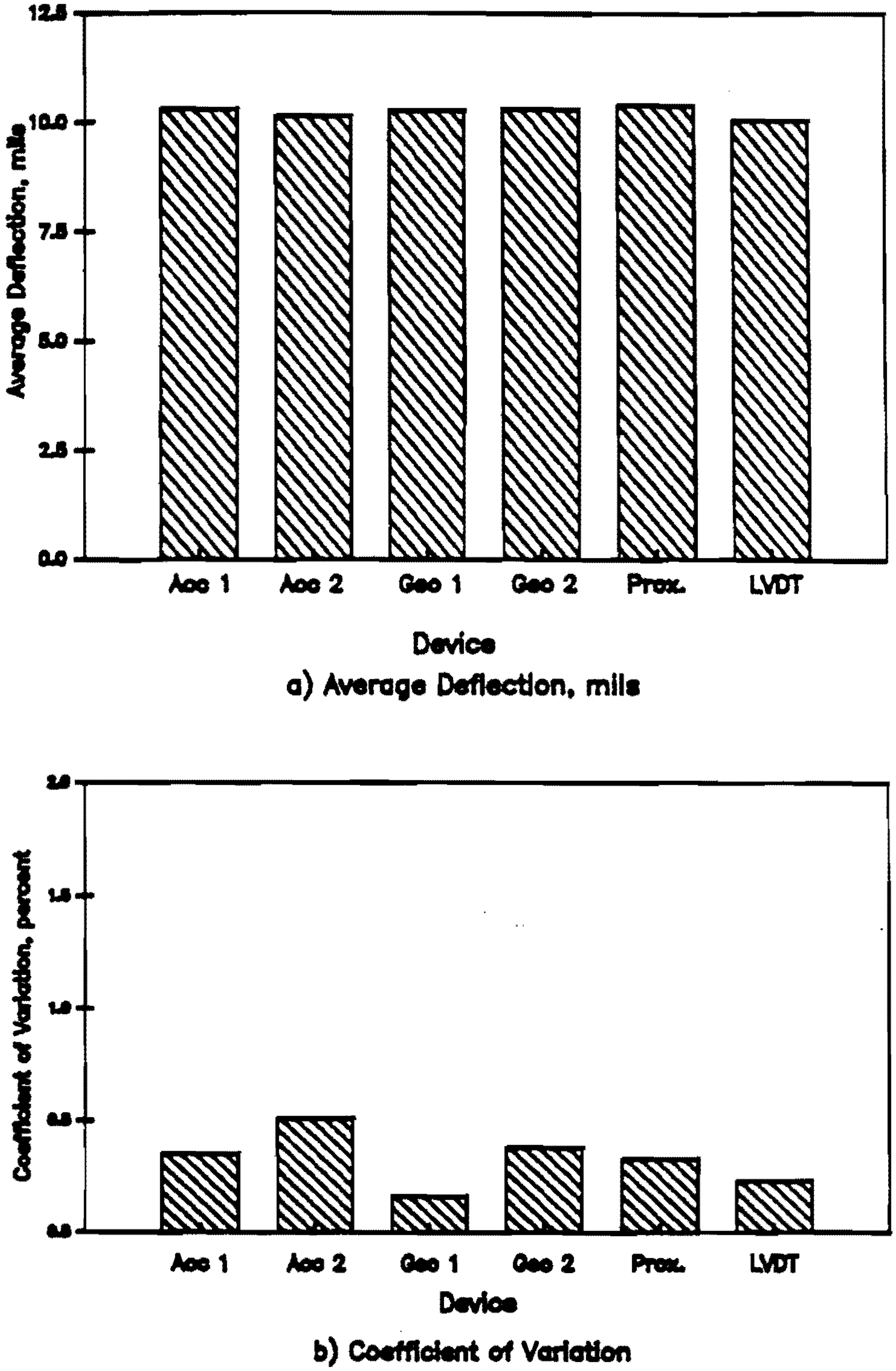


Figure G.12 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 7.5 mils (without Laser)

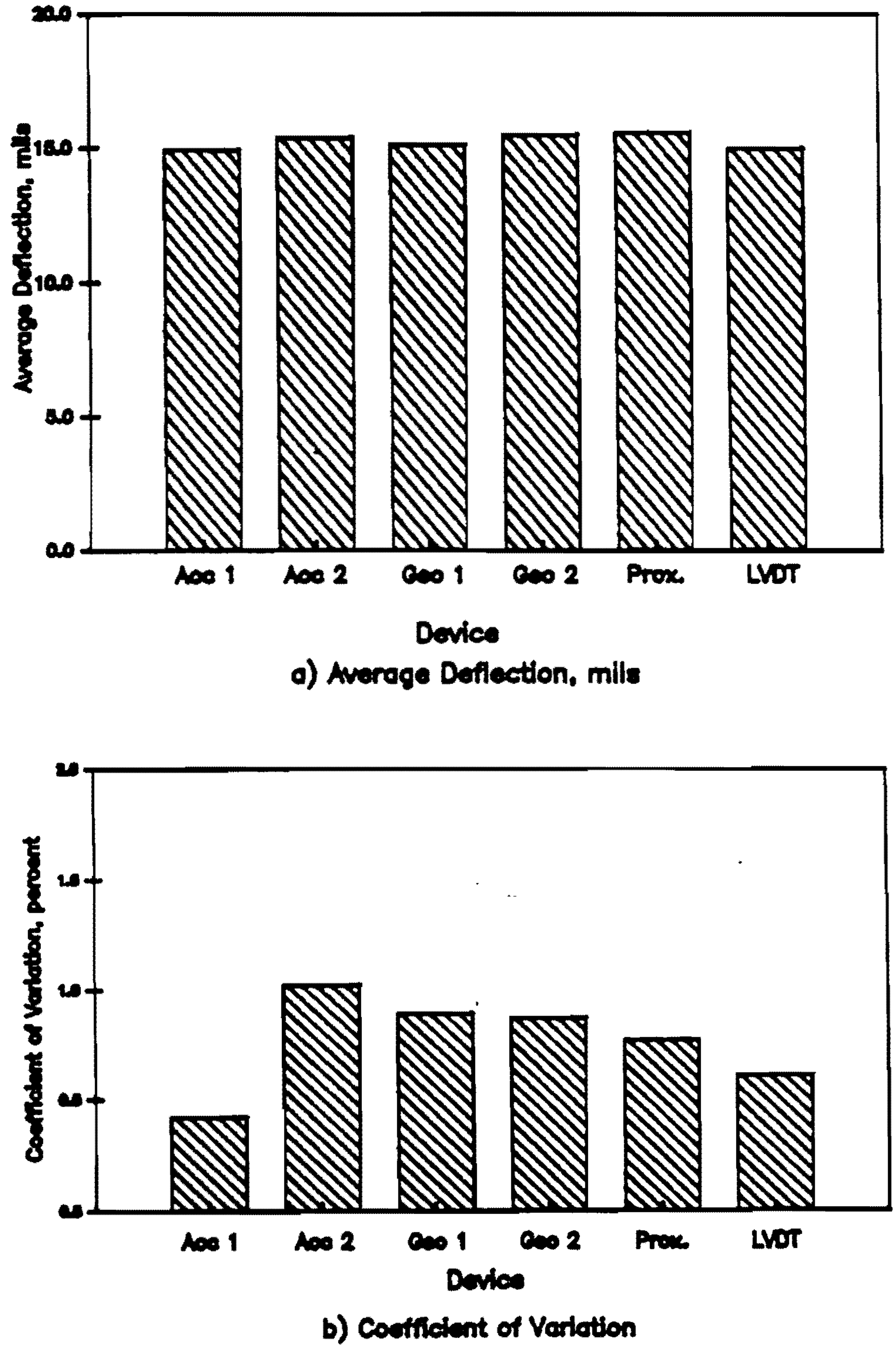
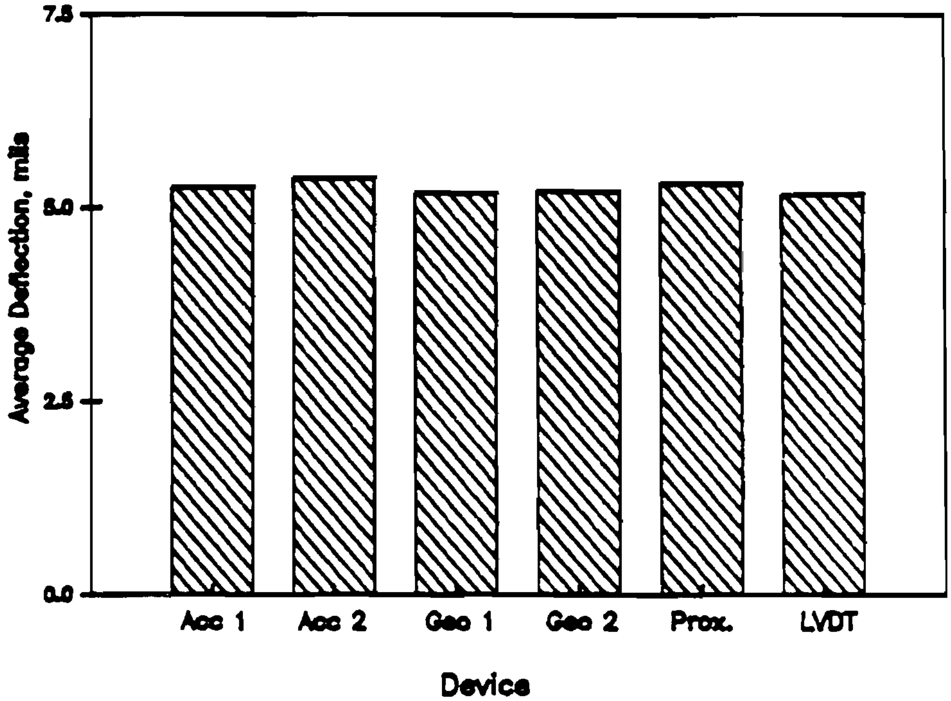
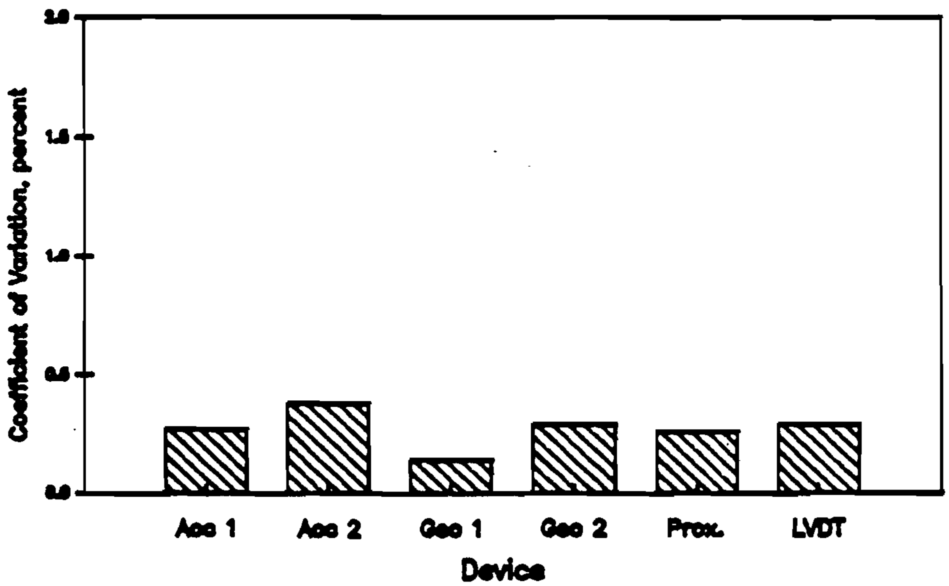


Figure G.13 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 10.0 mils (without Laser)

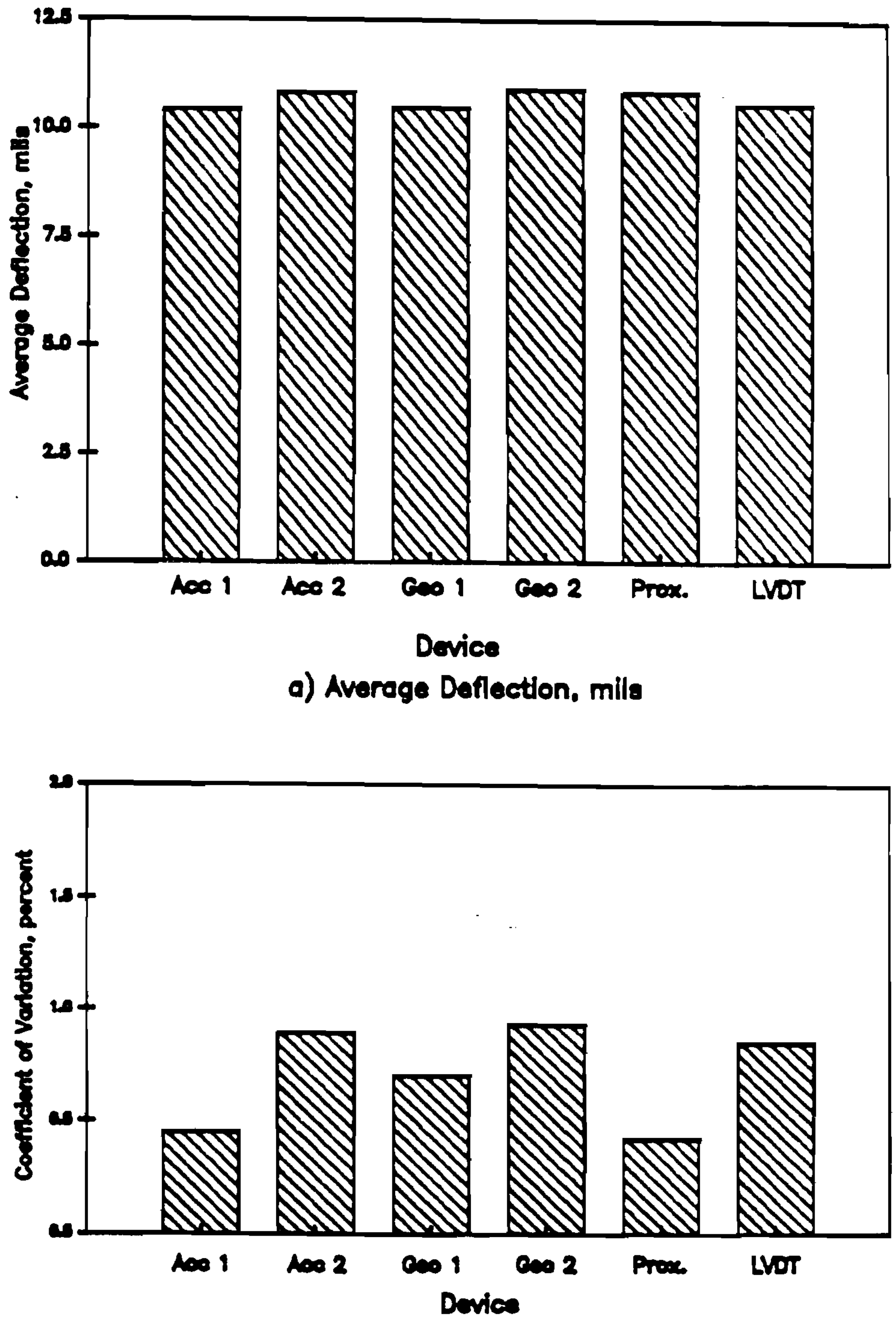


a) Average Deflection, mils



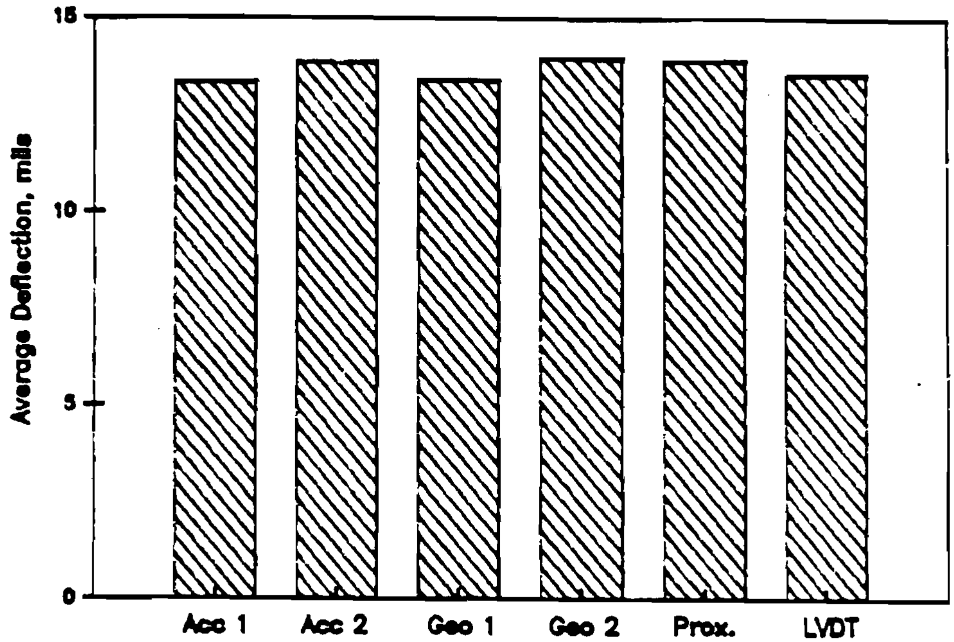
b) Coefficient of Variation

Figure G.14 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 15.0 mils (without Laser)

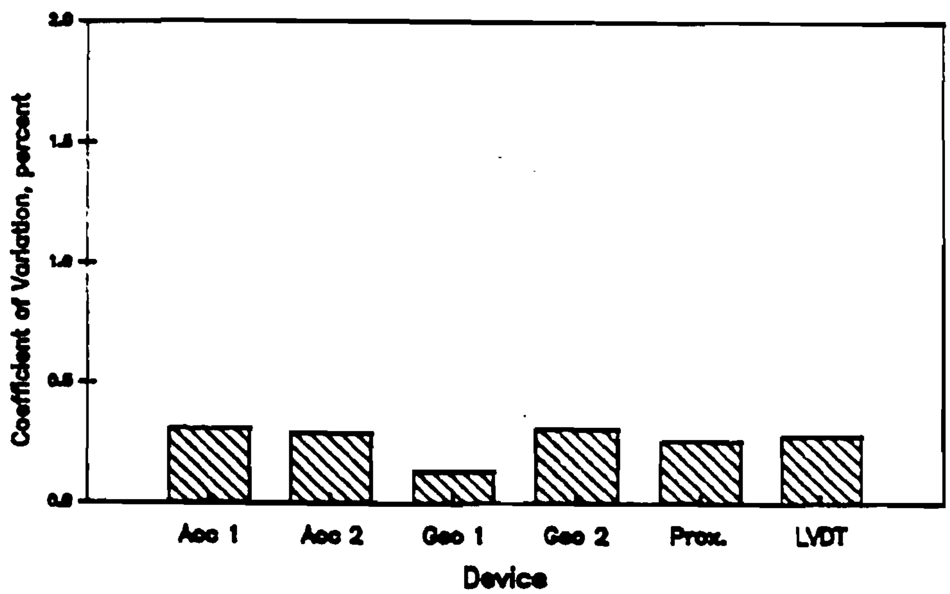


b) Coefficient of Variation

Figure G.15 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 5.0 mils (without Laser)

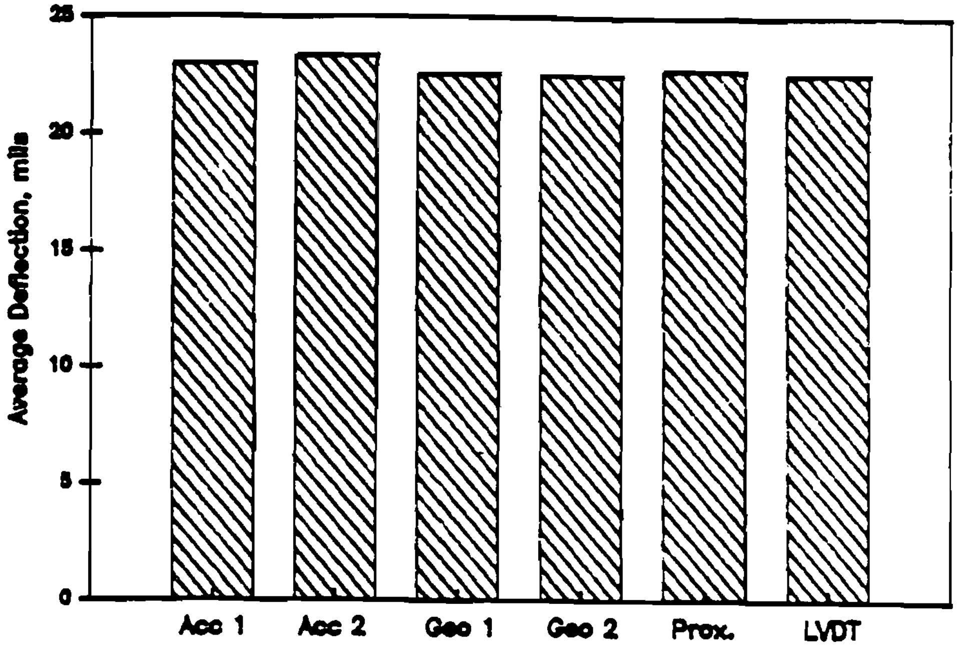


a) Average Deflection, mils

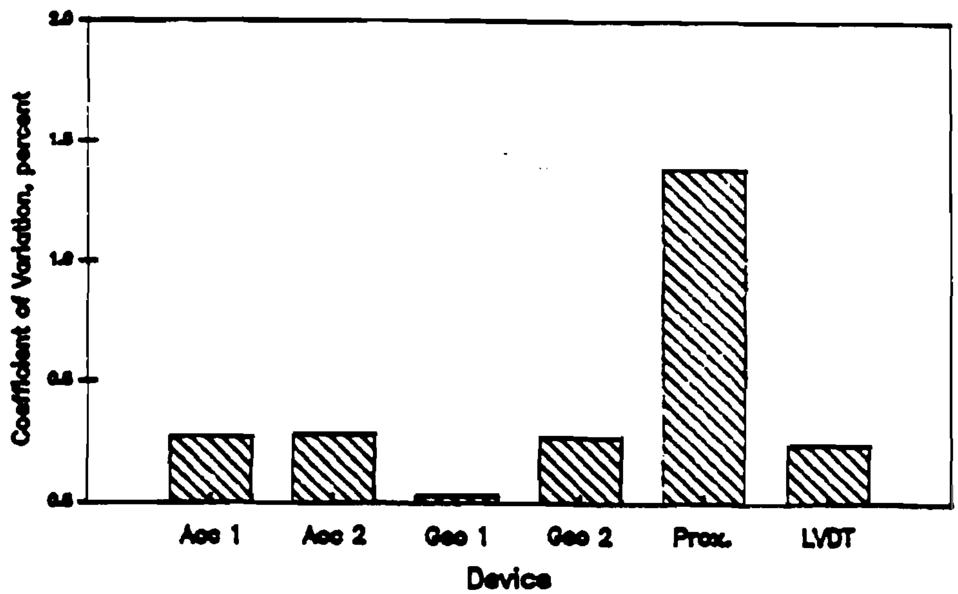


b) Coefficient of Variation

Figure G.16 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 10.0 mils (without Laser)

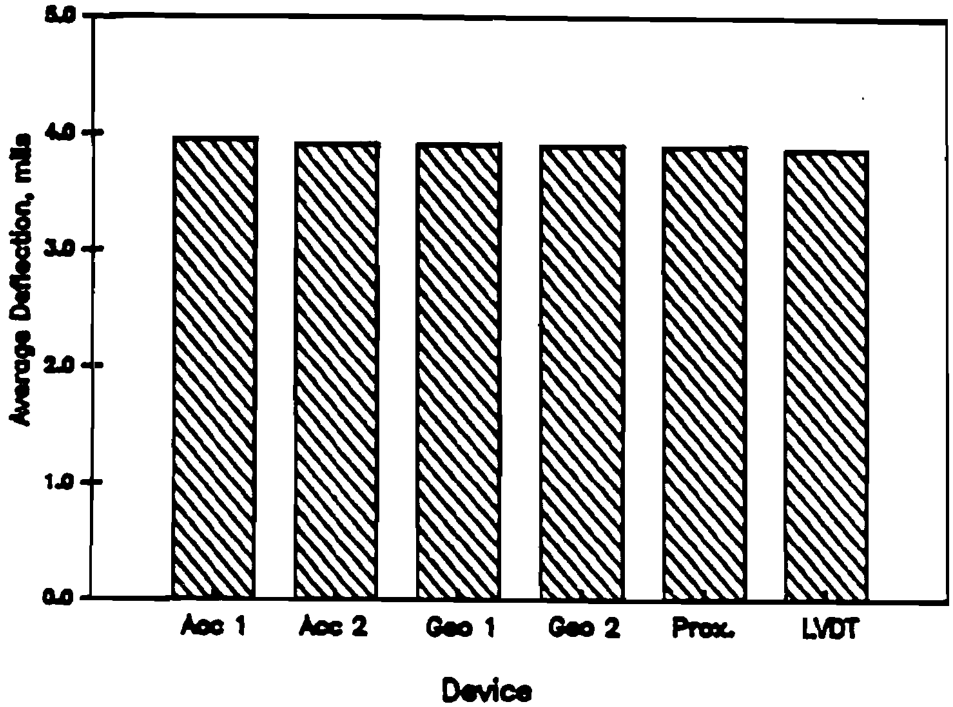


a) Average Deflection, mils

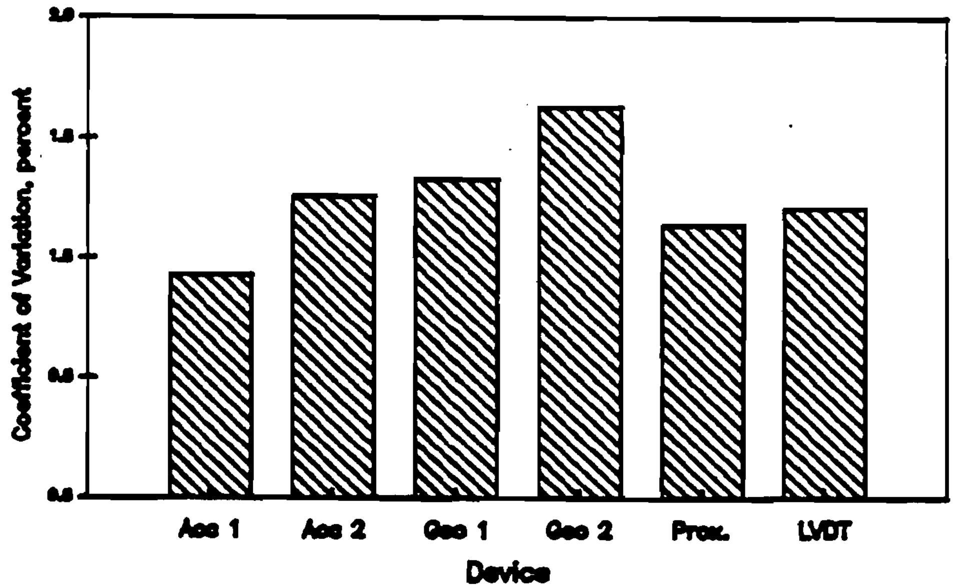


b) Coefficient of Variation

Figure G.17 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 15.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure G.18 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 20.0 mils (without Laser)

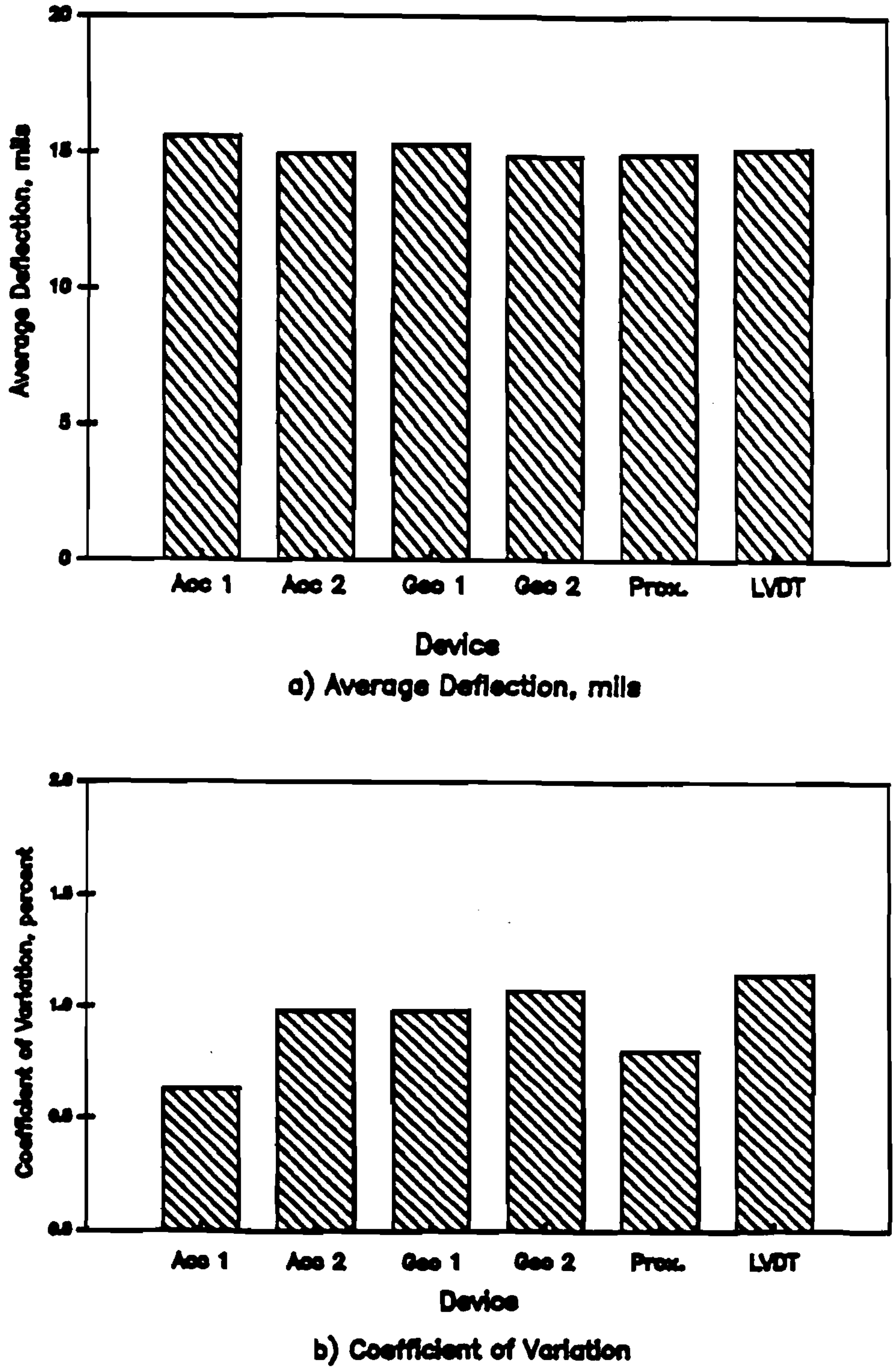


Figure G.19 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 30 Hz and a Nominal Deflection of 4.0 mils (without Laser)

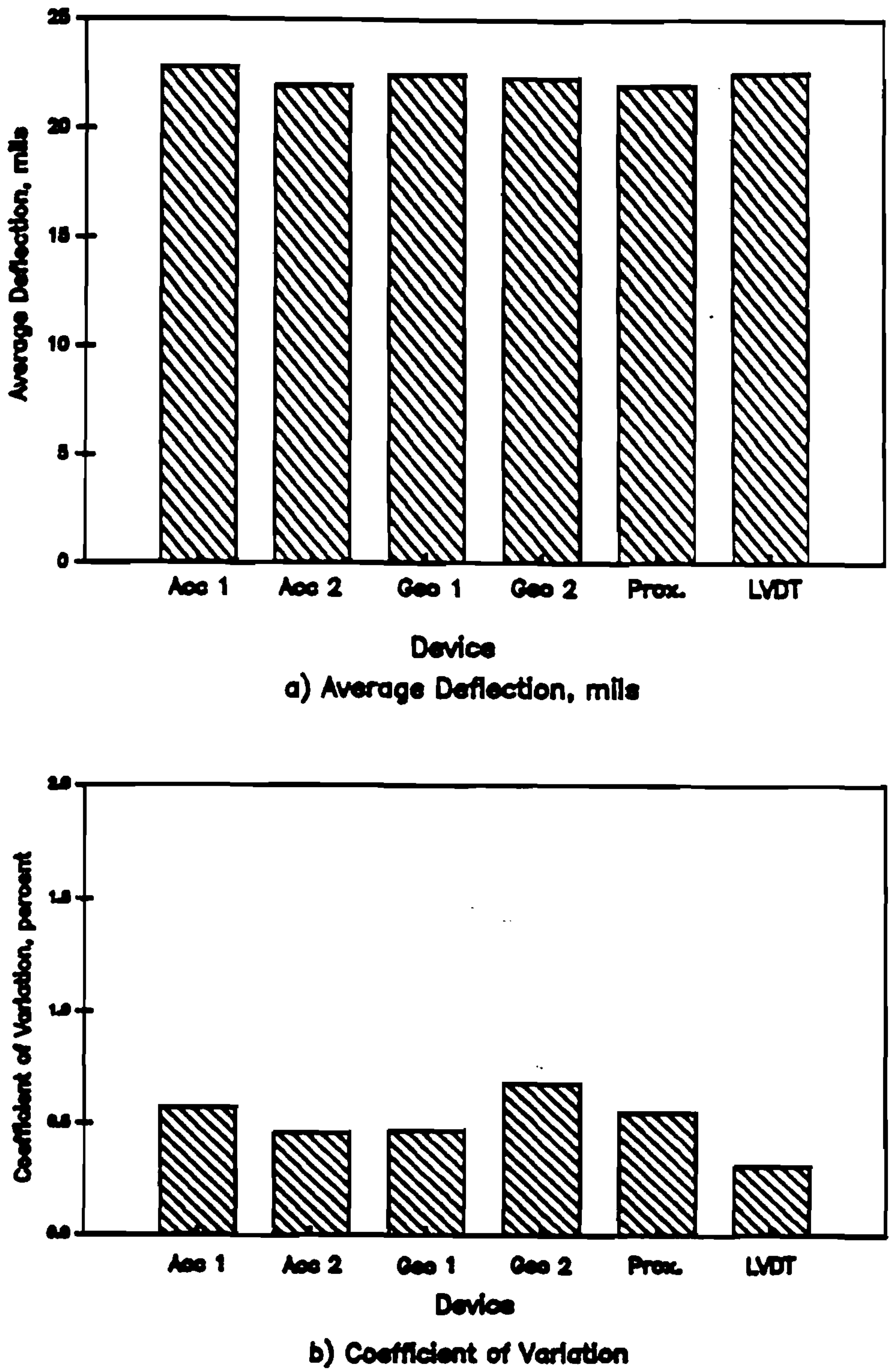
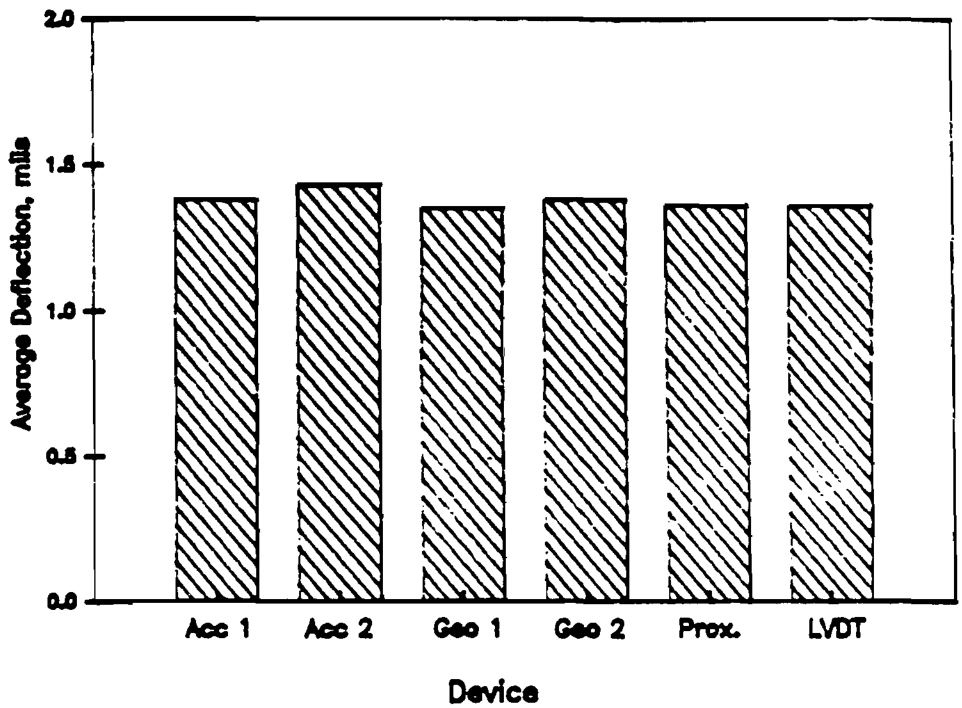
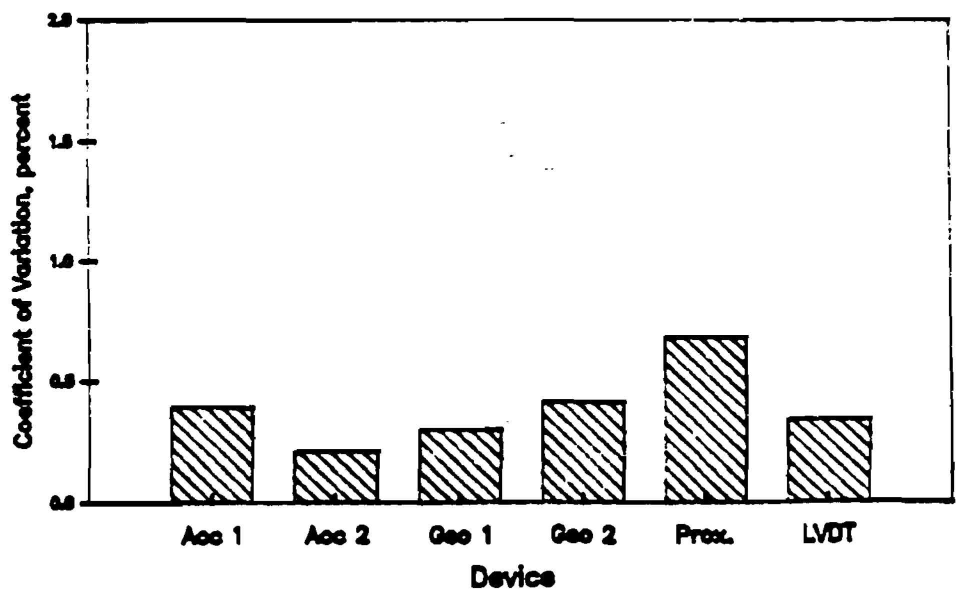


Figure G.20 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 30 Hz and a Nominal Deflection of 15.0 mils (without Laser)

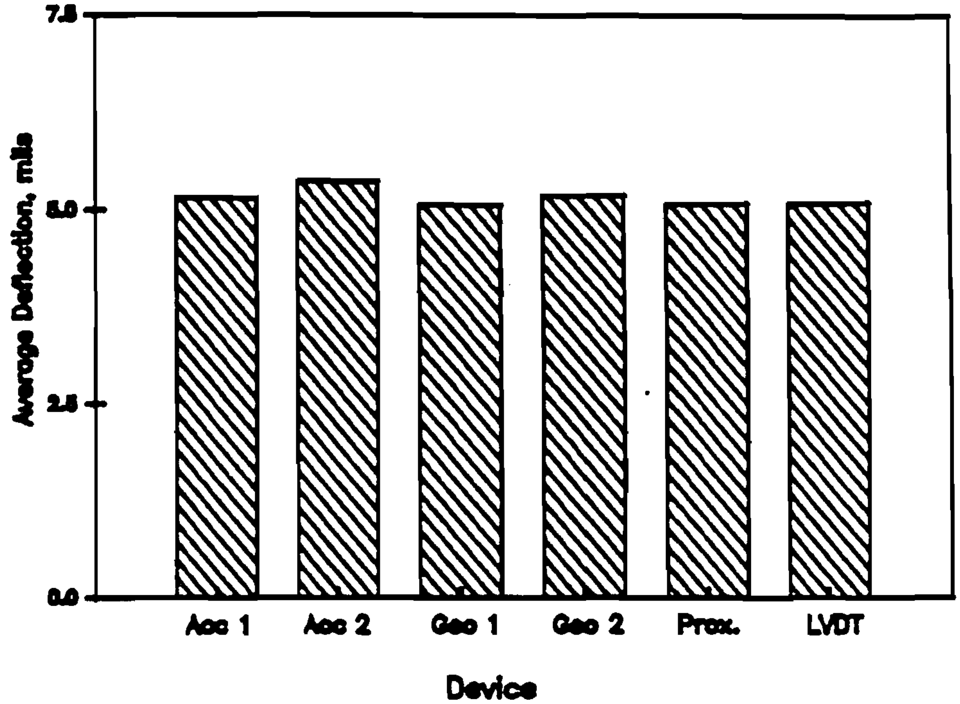


a) Average Deflection, mils

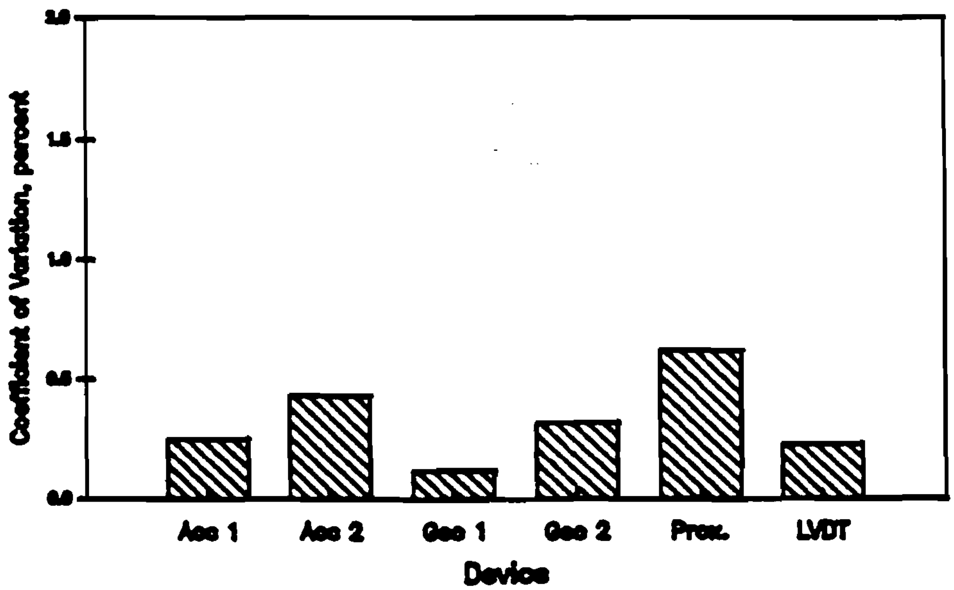


b) Coefficient of Variation

Figure G.21 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 30 Hz and a Nominal Deflection of 20.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure G.22 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 1.5 mils (without Laser)

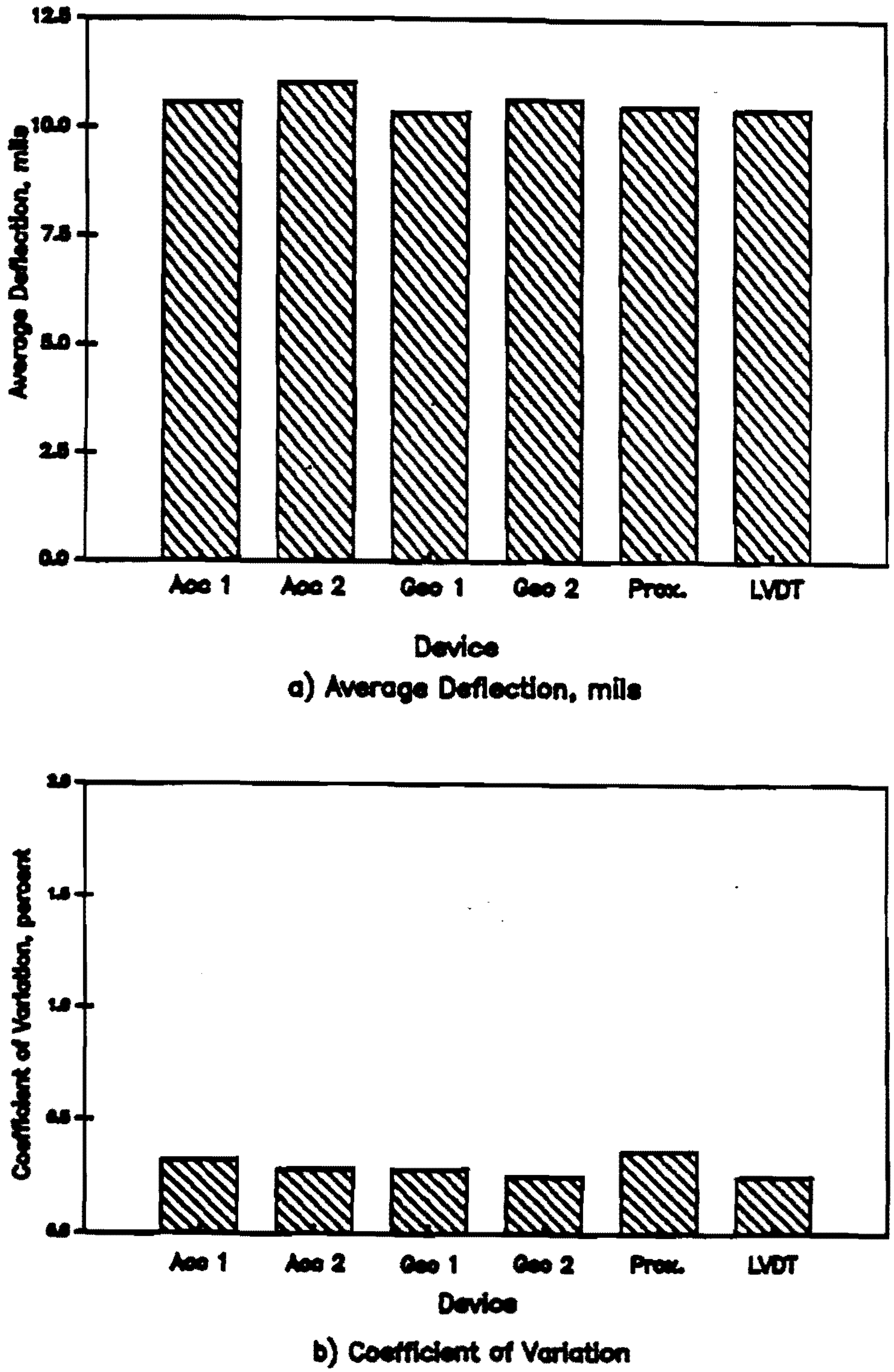
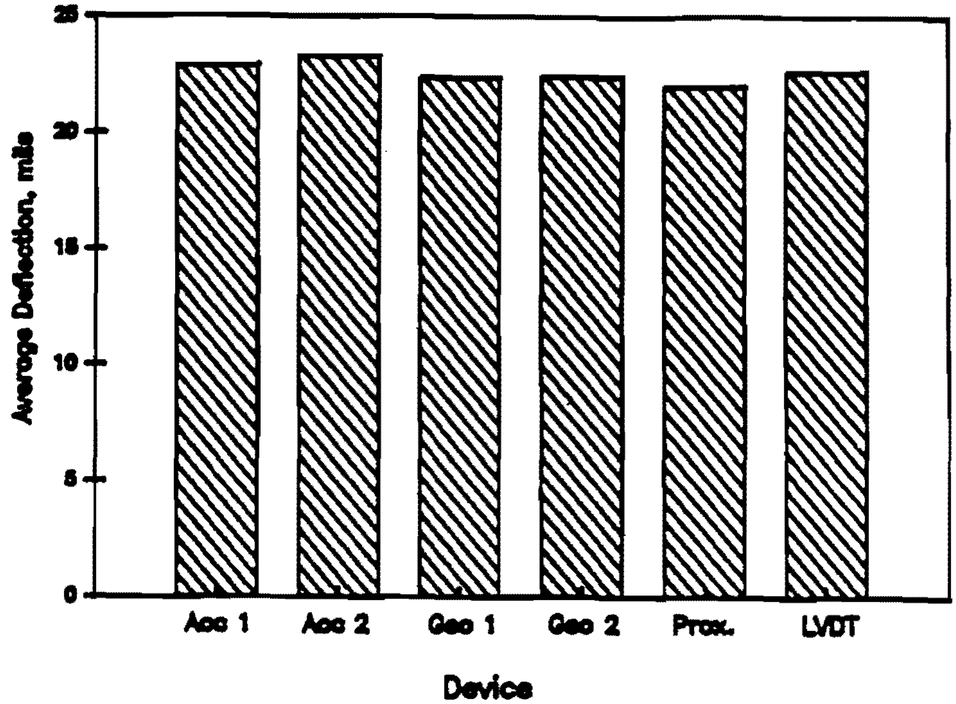
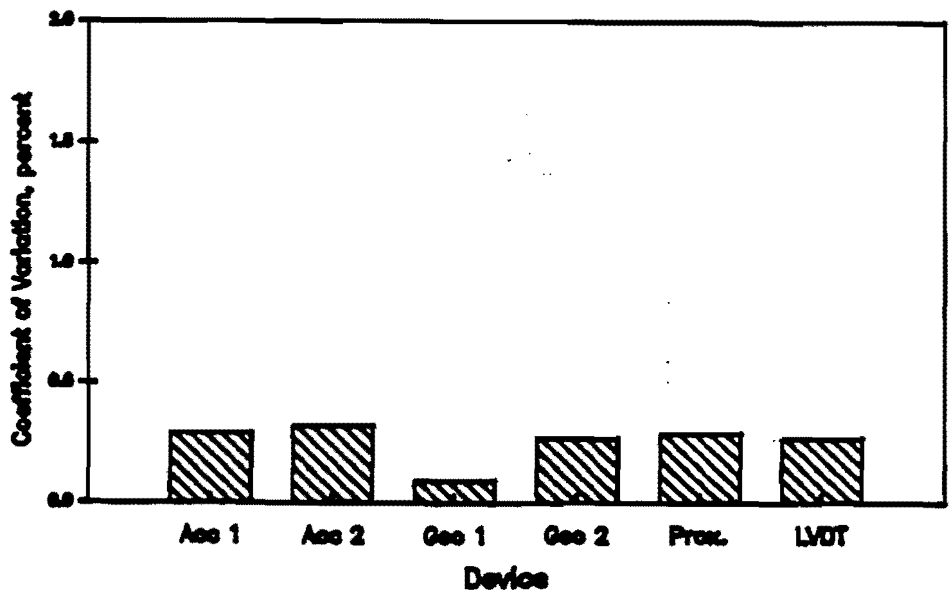


Figure G.23 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 5.0 mils (without Laser)

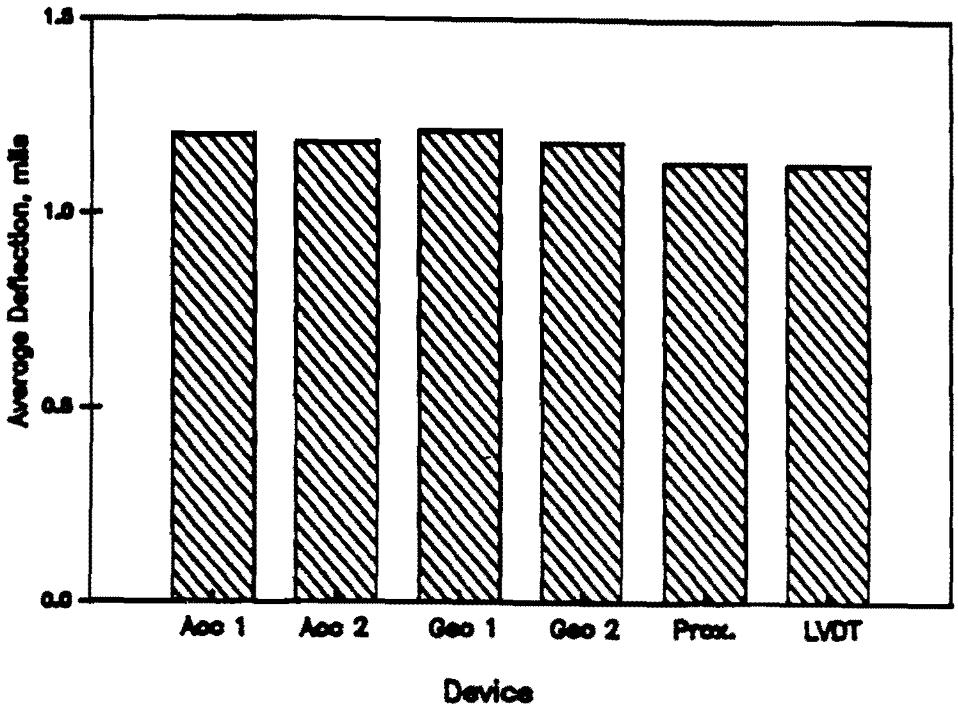


a) Average Deflection, mils

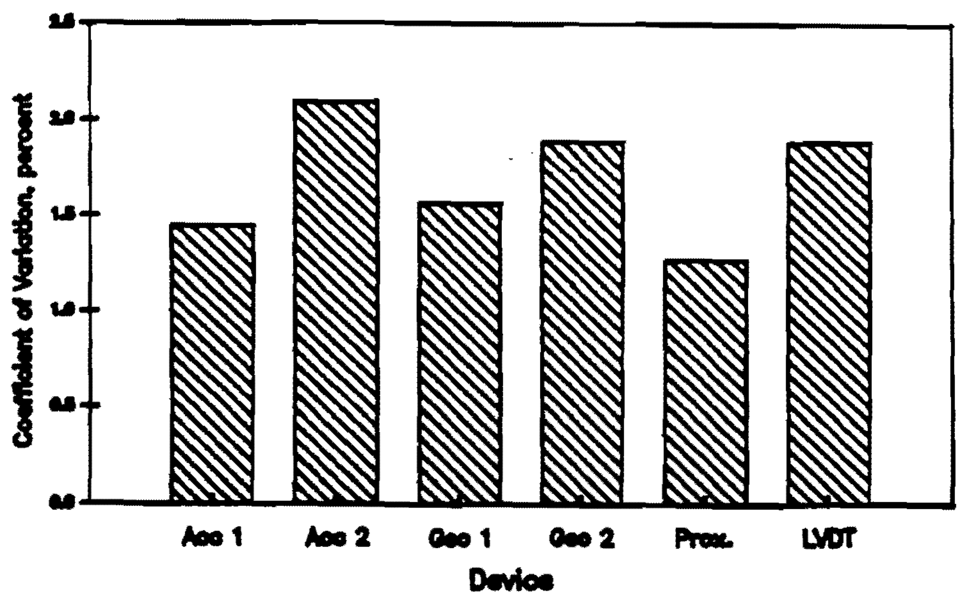


b) Coefficient of Variation

Figure G.24 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 10.0 mils (without Laser)

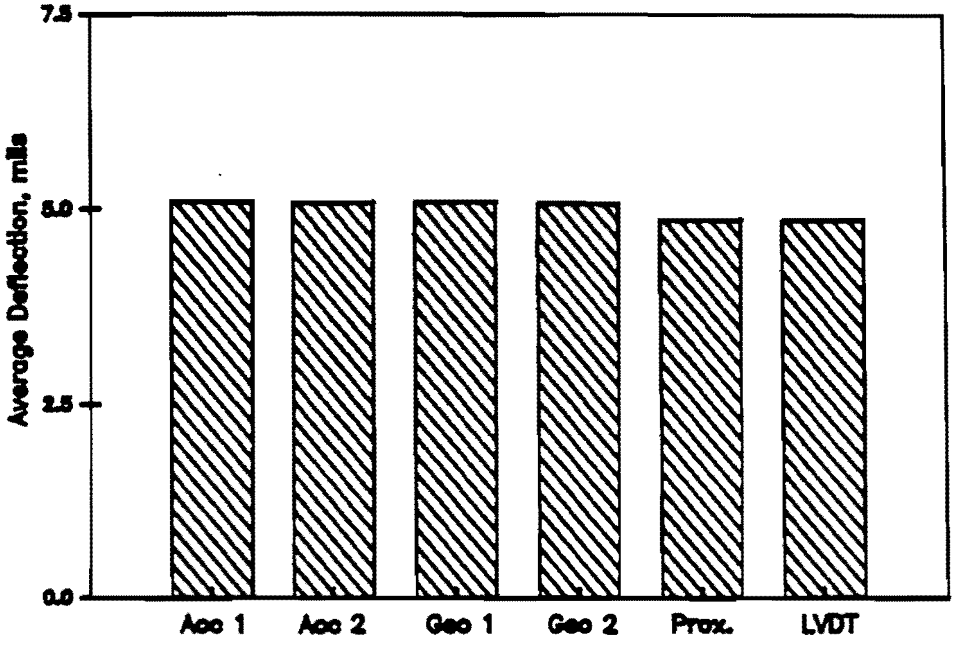


a) Average Deflection, mils

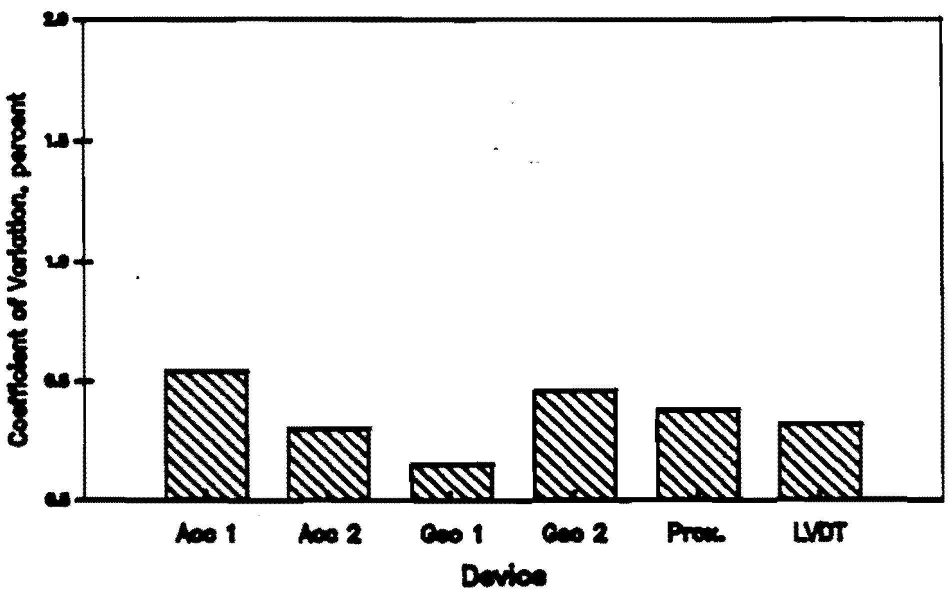


b) Coefficient of Variation

Figure G.25 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 20.0 mils (without Laser)

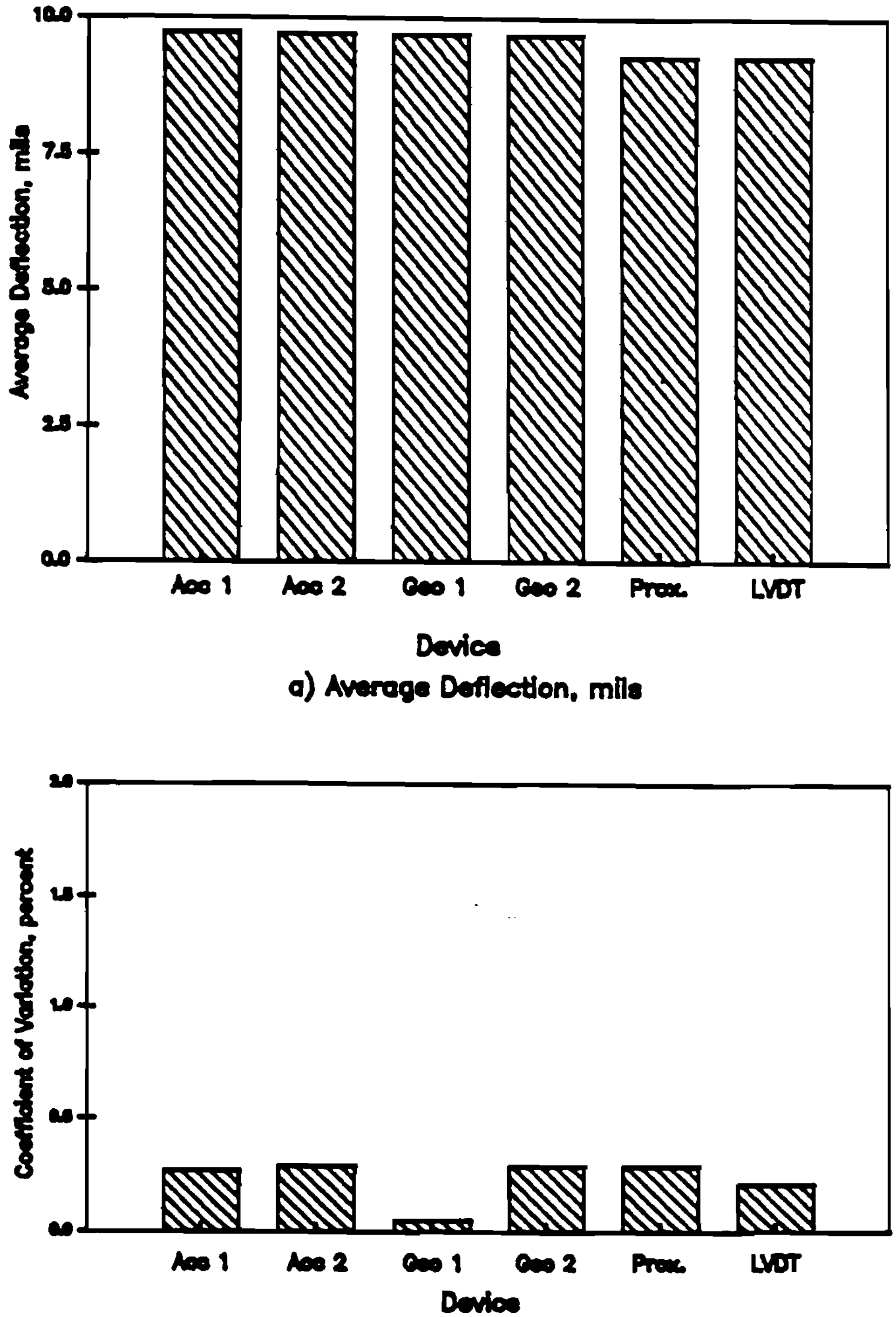


a) Average Deflection, mils



b) Coefficient of Variation

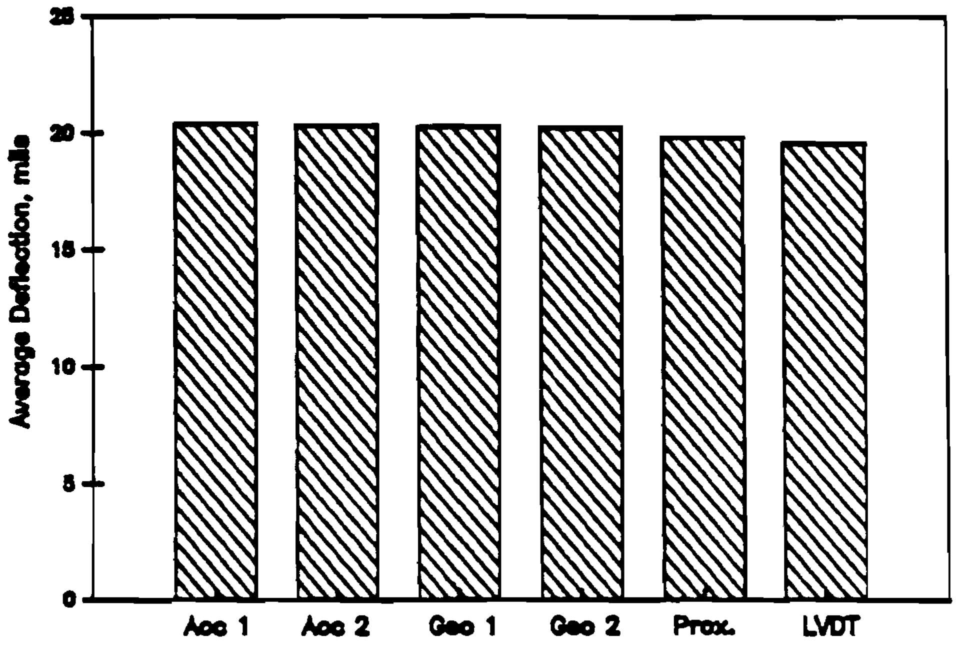
Figure G.26 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 1.0 mils (without Laser)



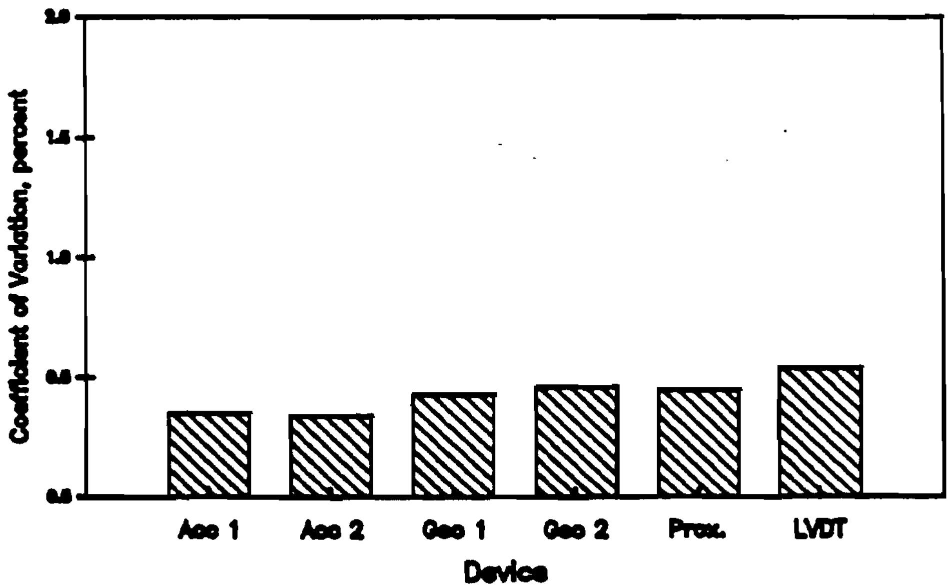
a) Average Deflection, mils

b) Coefficient of Variation

Figure G.27 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 5.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure G.28 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 10.0 mils (without Laser)

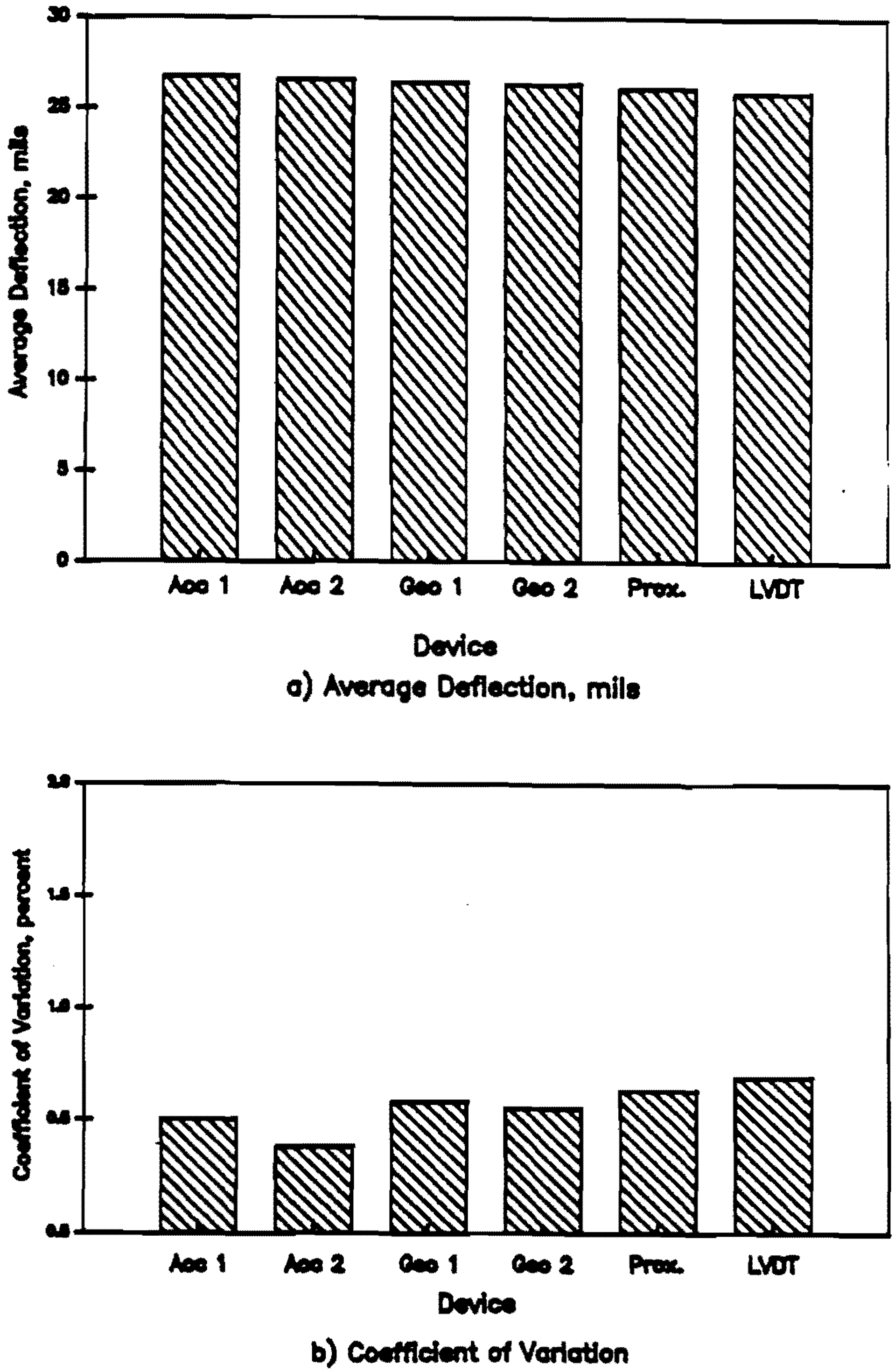
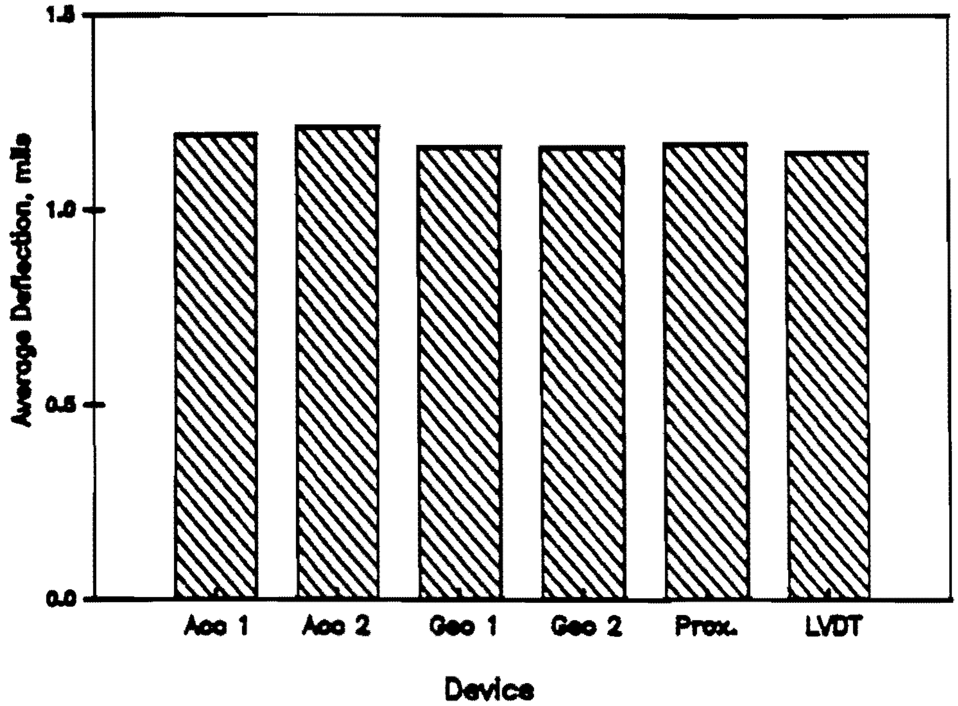
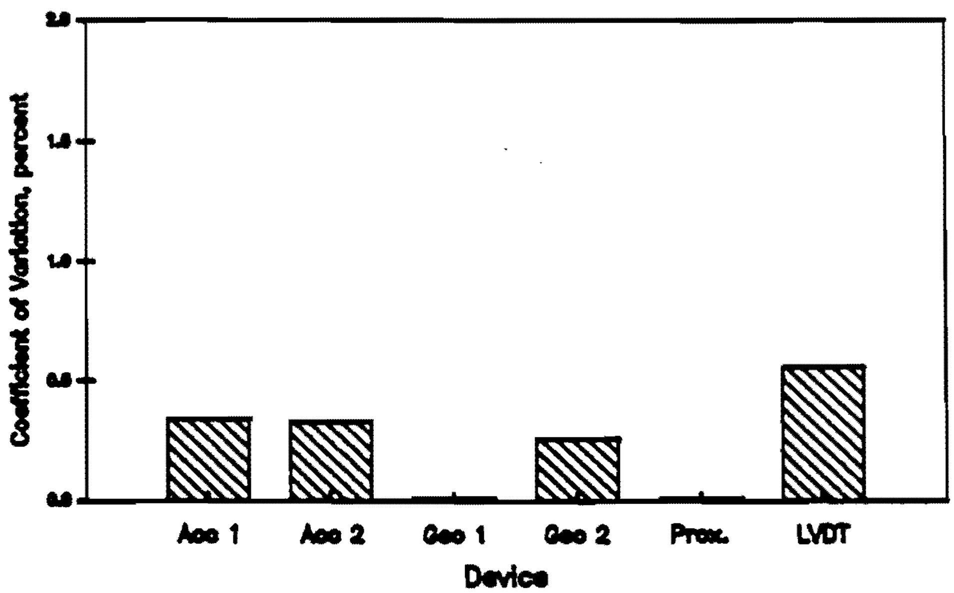


Figure G.29 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 20.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure G.30 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 25.0 mils (without Laser)

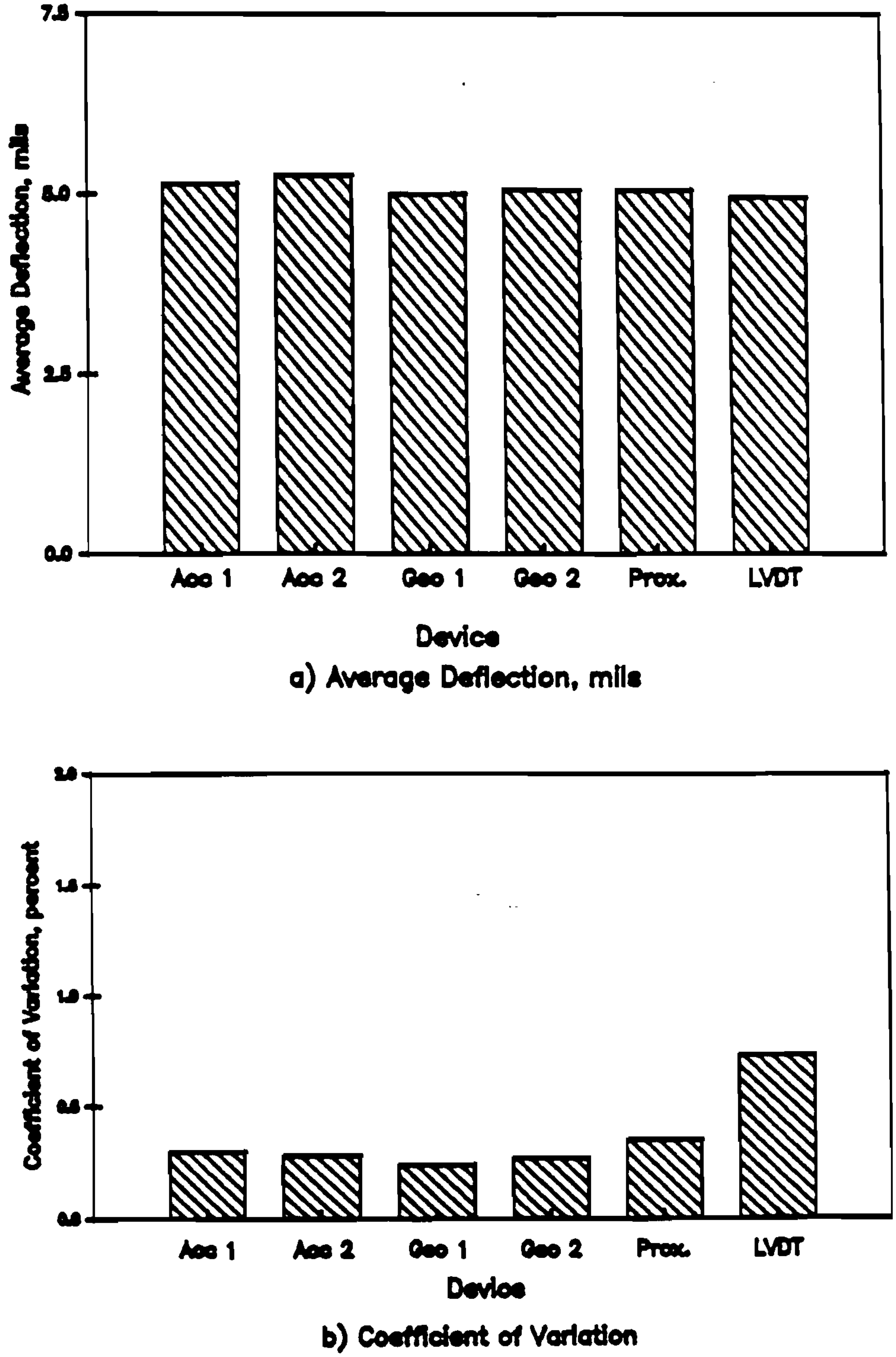
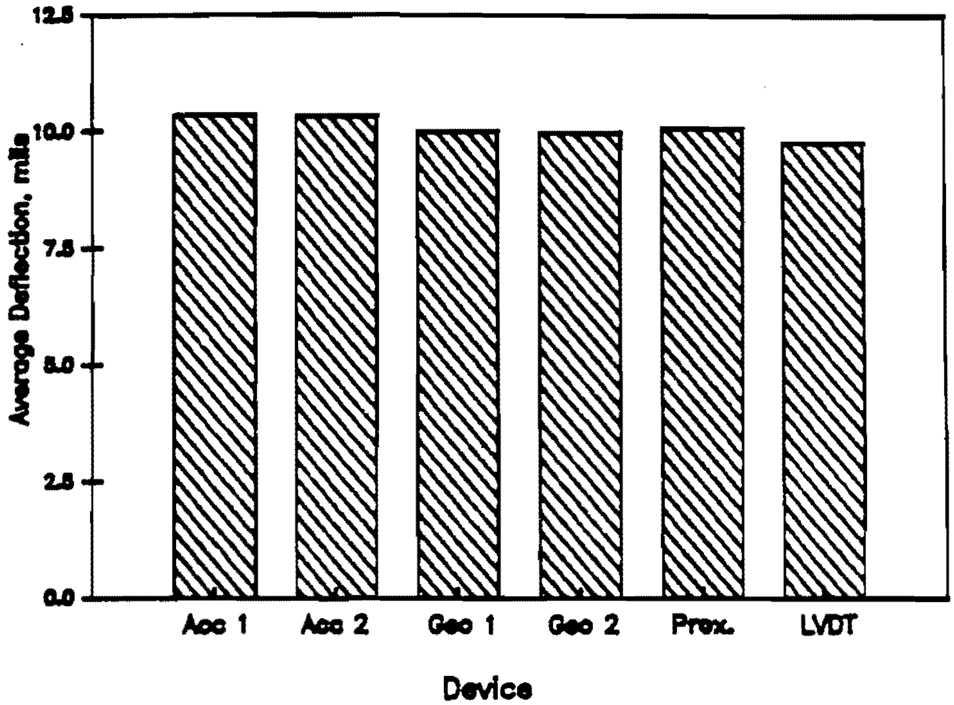
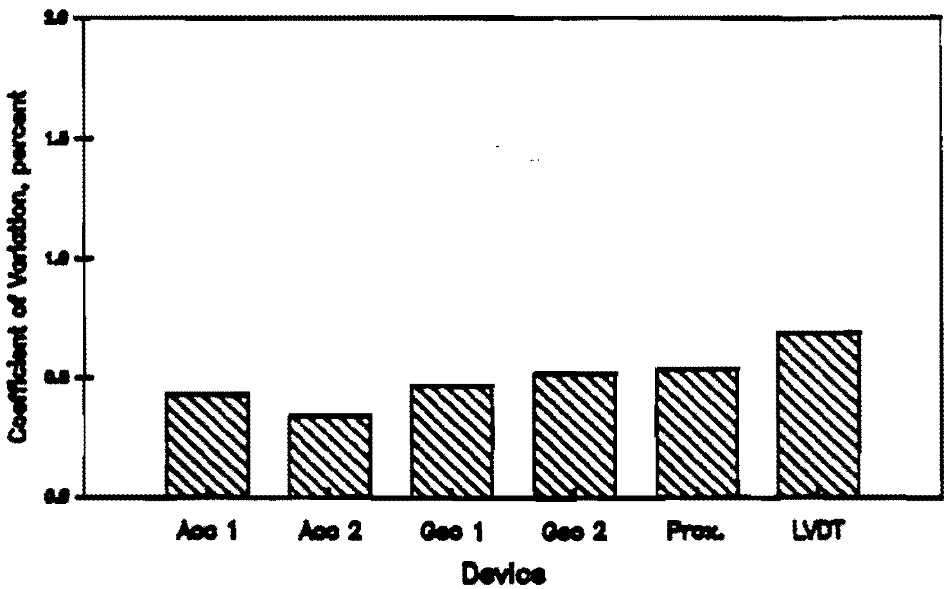


Figure G.31 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 1.0 mils (without Laser)

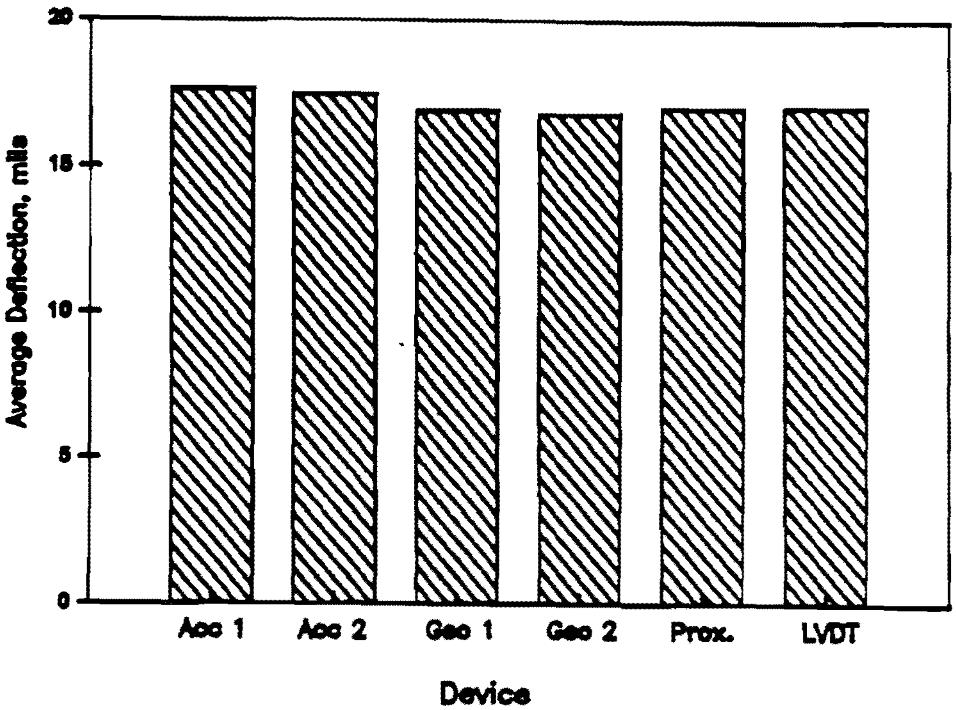


a) Average Deflection, mils

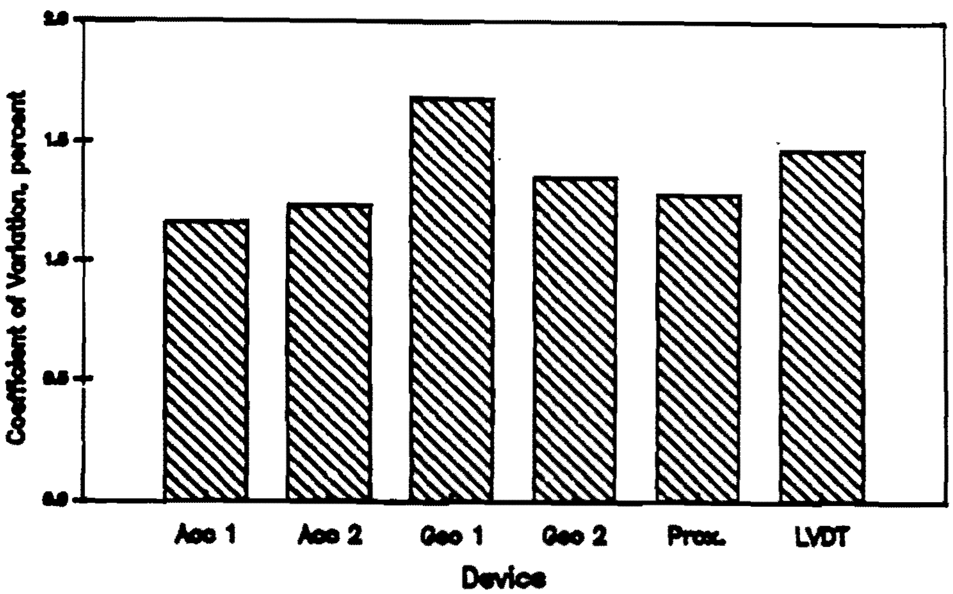


b) Coefficient of Variation

Figure G.32 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 5.0 mils (without Laser)

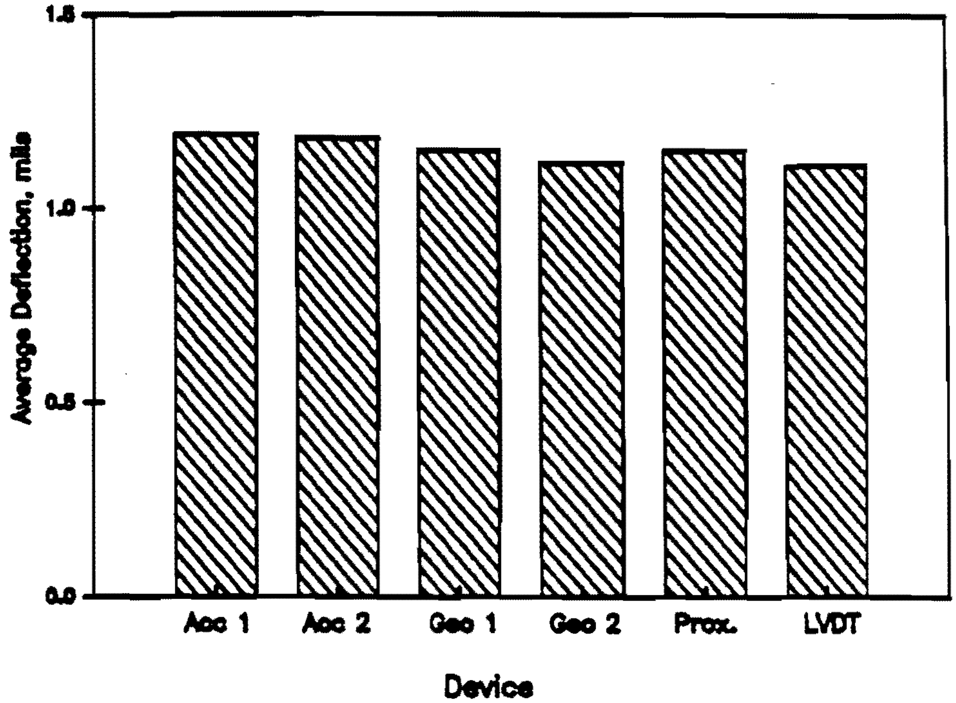


a) Average Deflection, mils

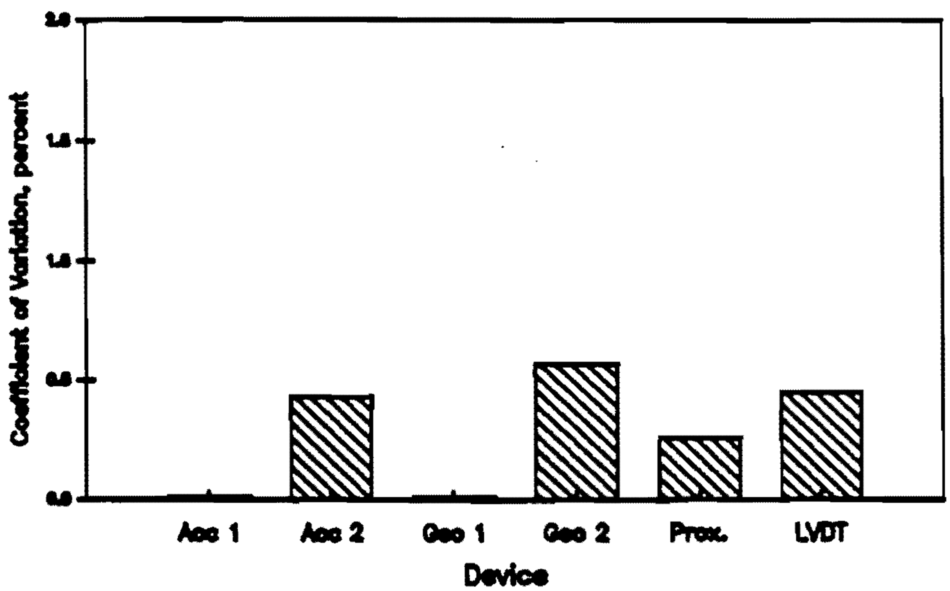


b) Coefficient of Variation

Figure G.33 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 10.0 mils (without Laser)

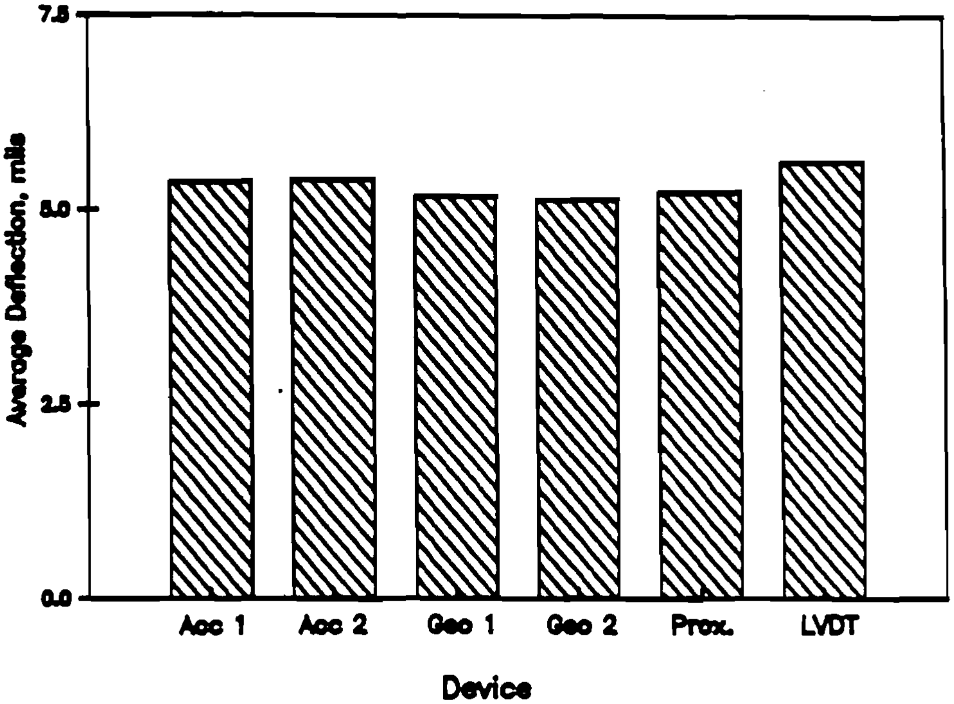


a) Average Deflection, mils

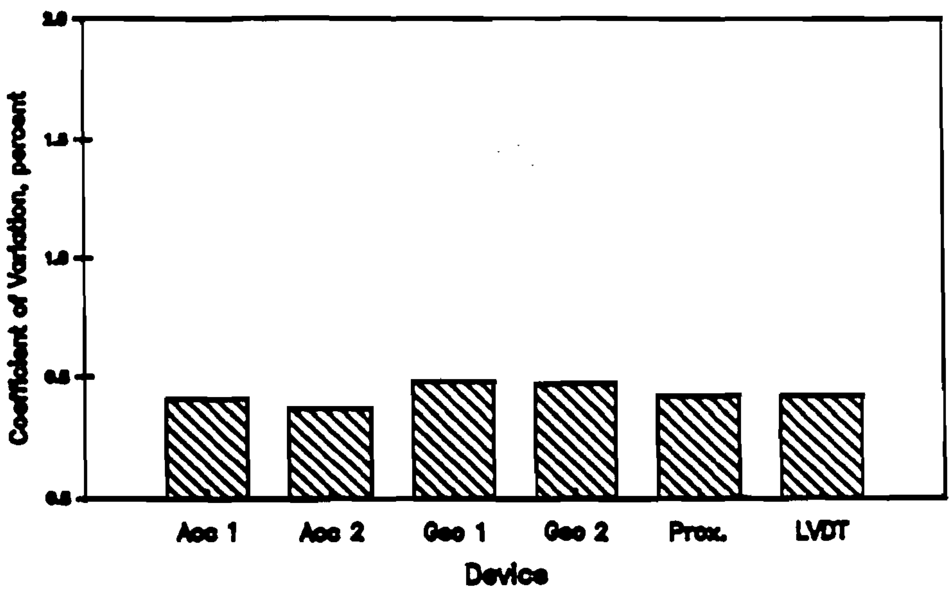


b) Coefficient of Variation

Figure G.34 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 15.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure G.35 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 100 Hz and a Nominal Deflection of 1.0 mils (without Laser)

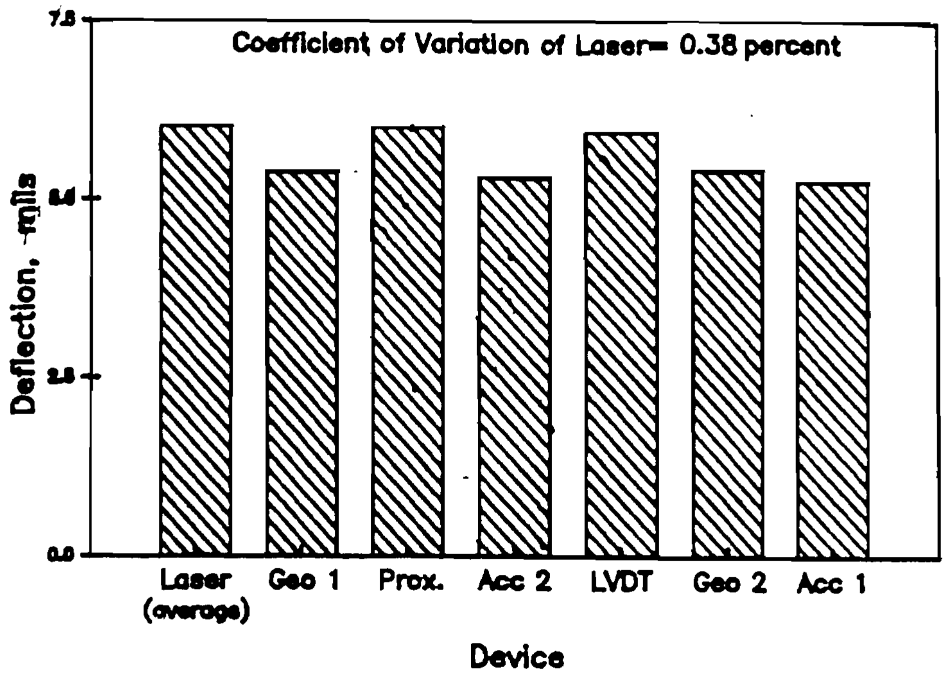


Figure G.36 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 2 Hz and a Nominal Deflection of 5 mils (with Laser)

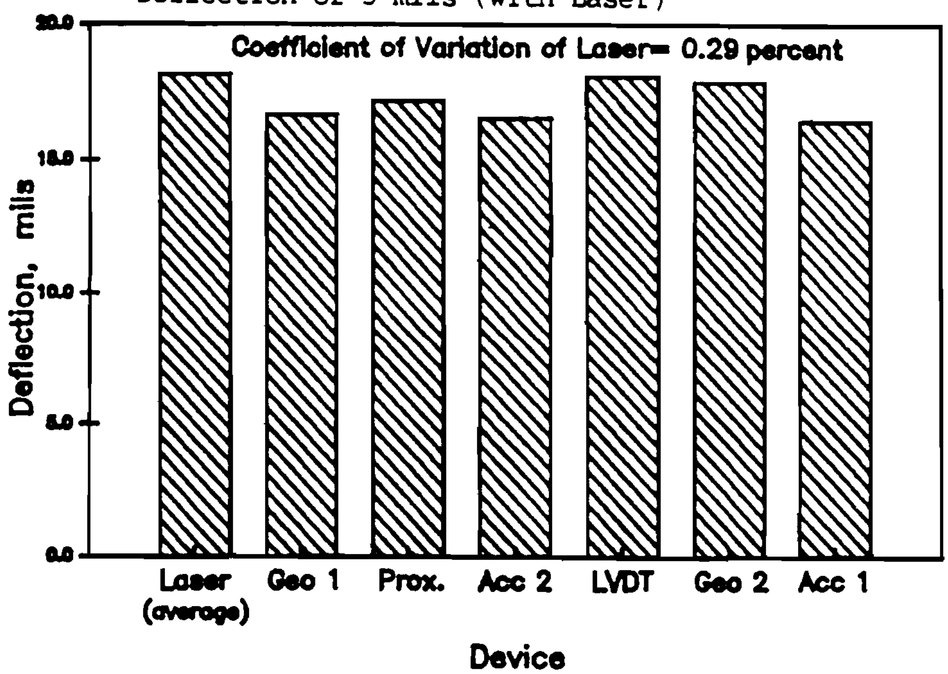


Figure G.37 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 2 Hz and a Nominal Deflection of 18.0 mils (with Laser)

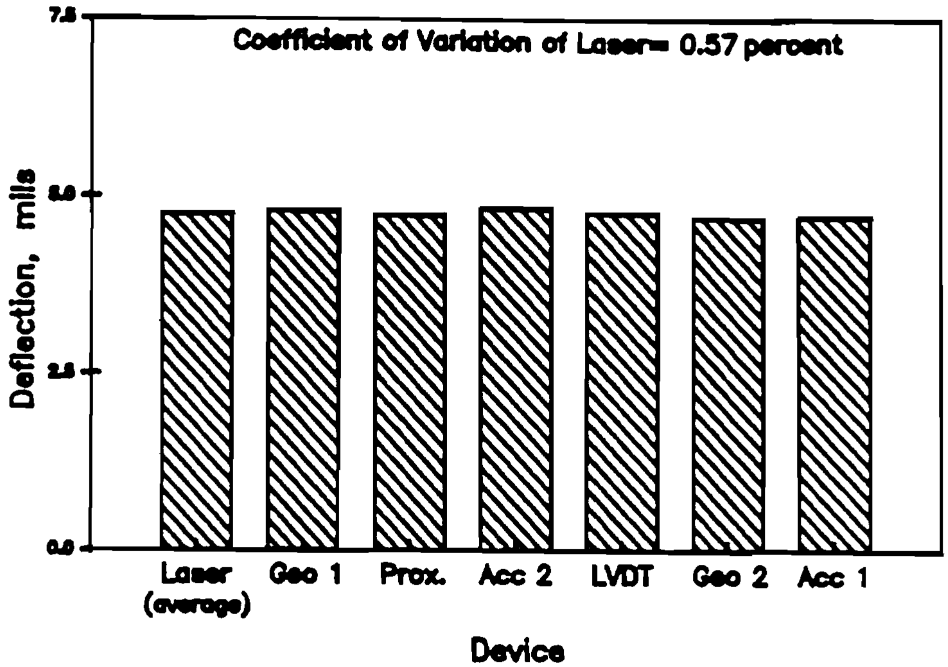


Figure G.38 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 5 mils (with Laser)

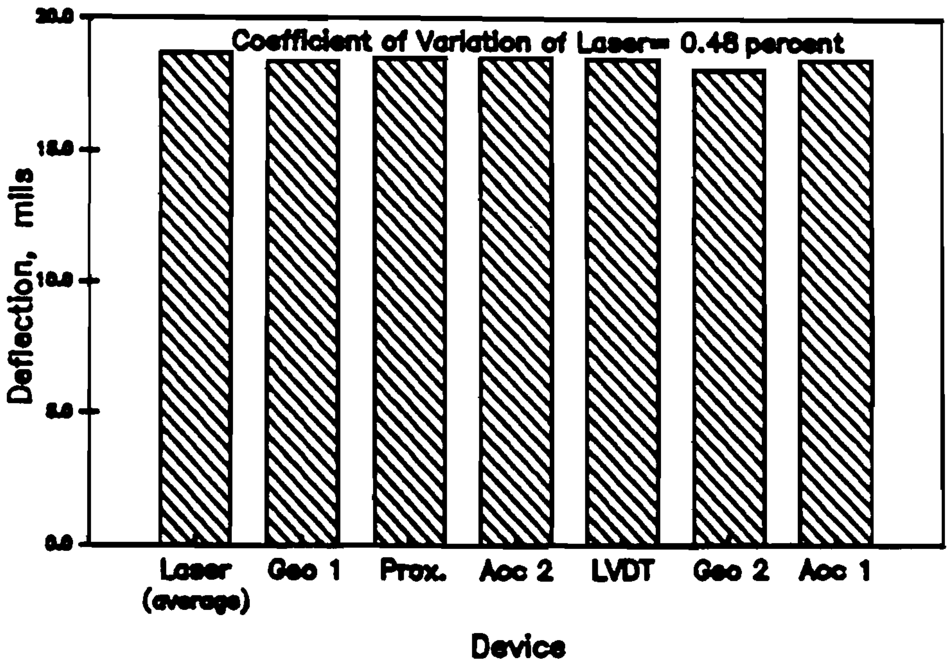


Figure G.39 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 5 Hz and a Nominal Deflection of 18.0 mils (with Laser)

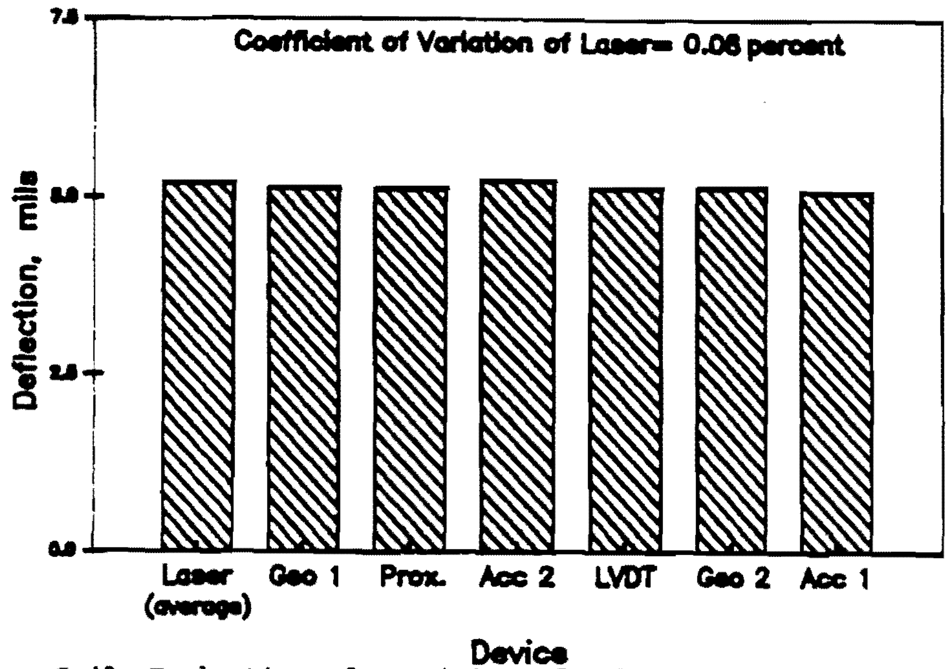


Figure G.40 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 5 mils (with Laser)

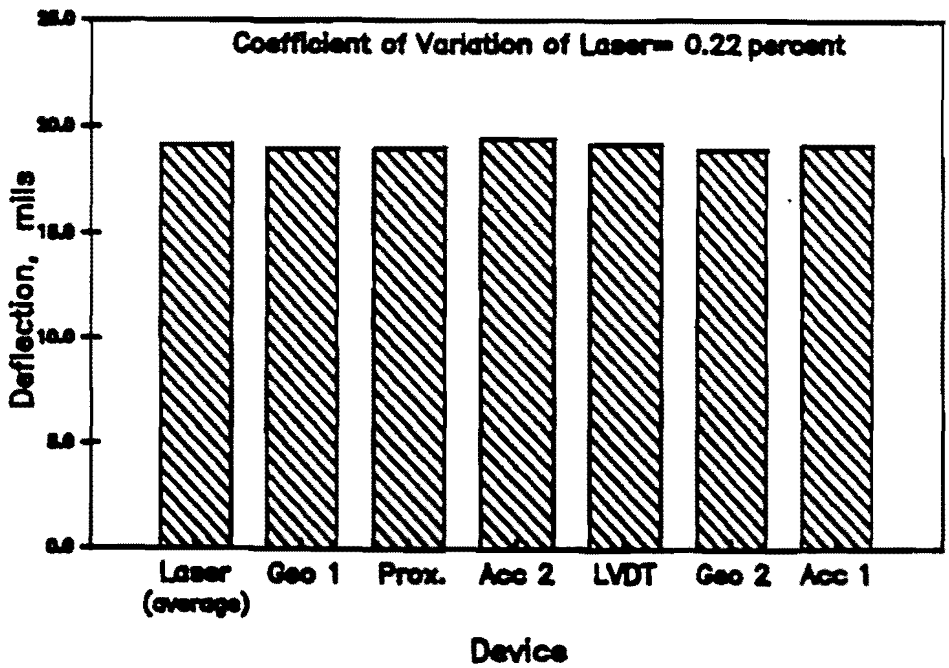


Figure G.41 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 10 Hz and a Nominal Deflection of 18.0 mils (with Laser)

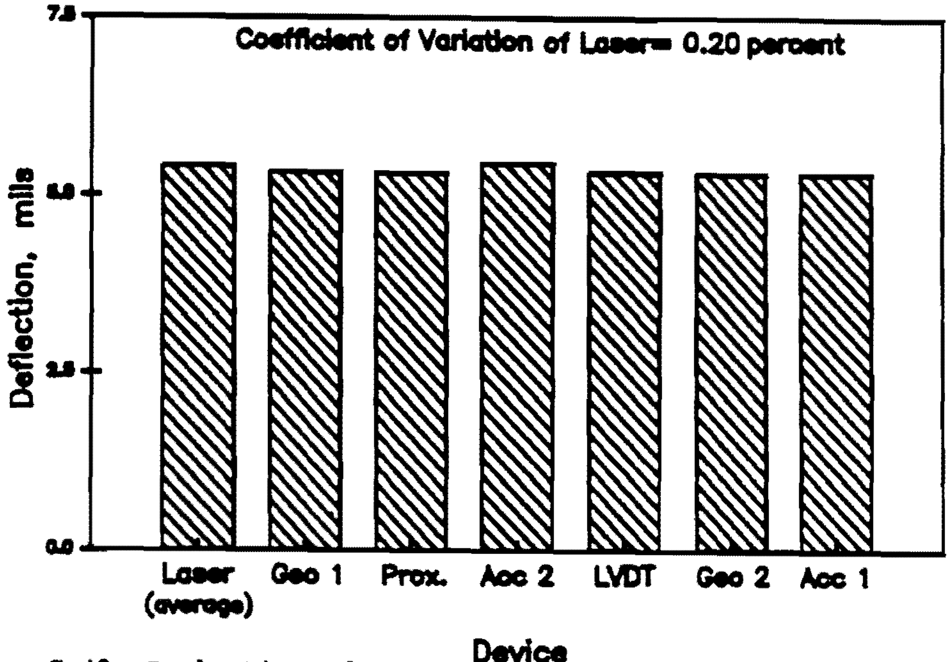


Figure G.42 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 5 mils (with Laser)

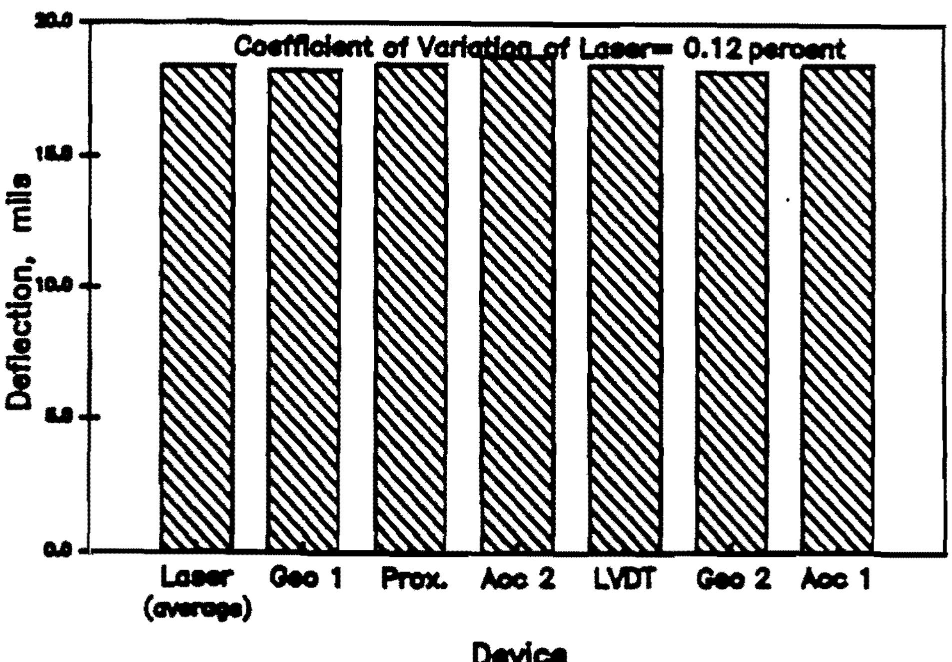


Figure G.41 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 15 Hz and a Nominal Deflection of 18.0 mils (with Laser)

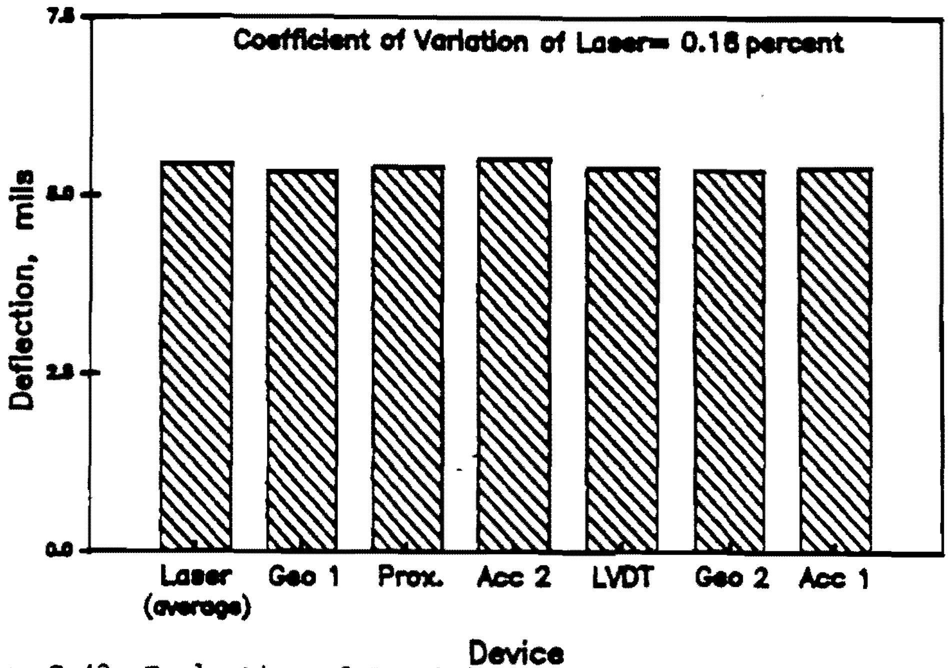


Figure G.42 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 5 mils (with Laser)

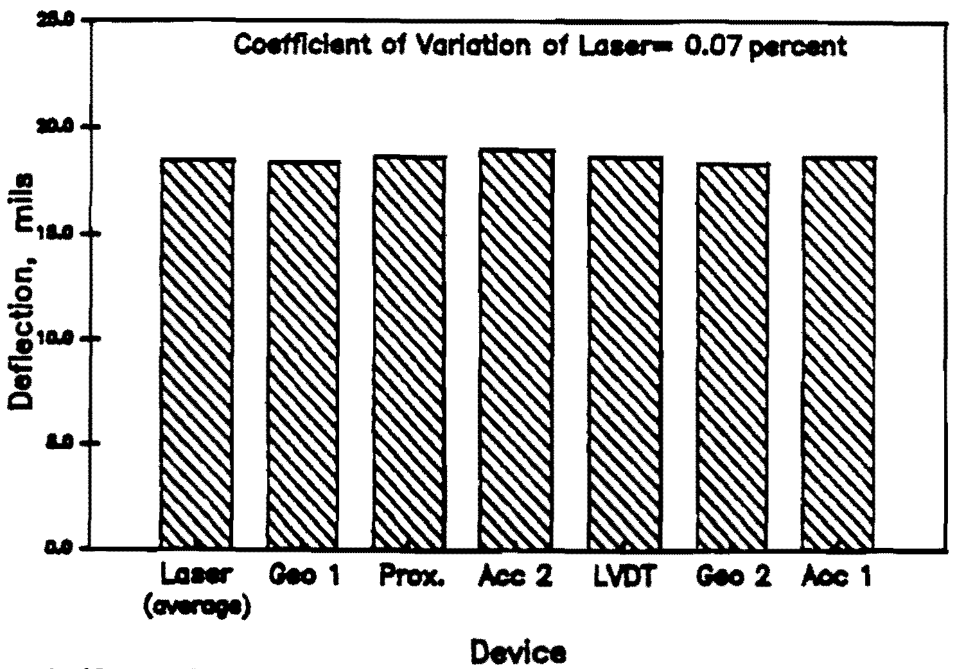


Figure G.43 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 20 Hz and a Nominal Deflection of 18.0 mils (with Laser)

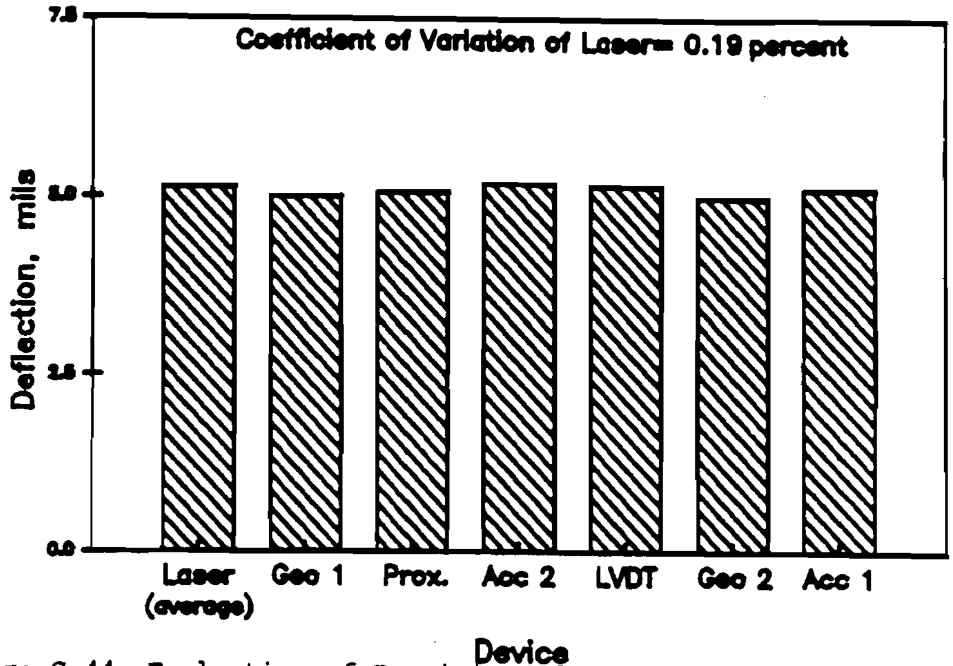


Figure G.44 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 30 Hz and a Nominal Deflection of 5 mils (with Laser)

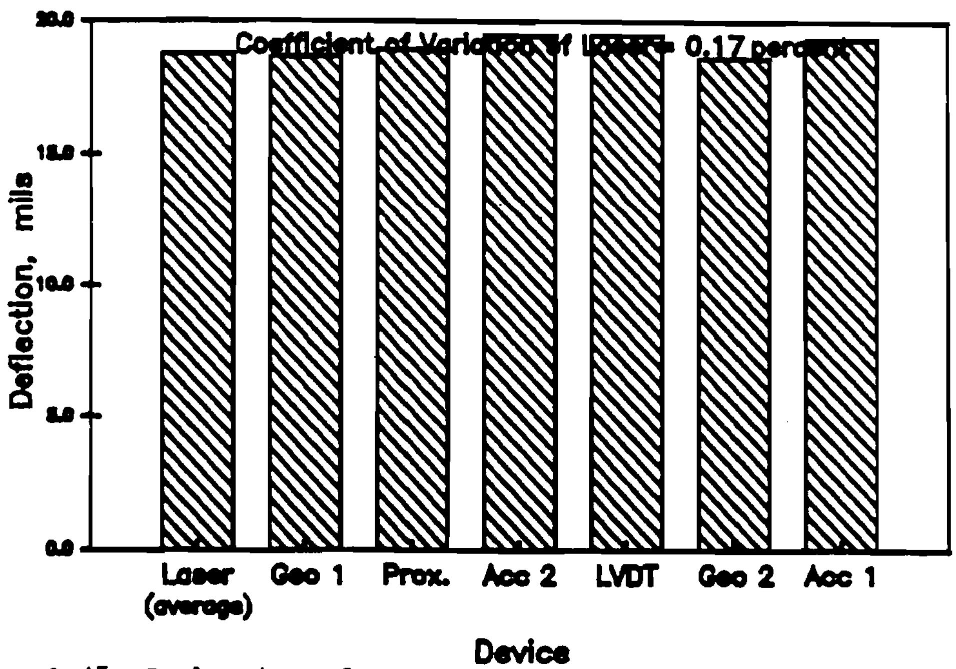


Figure G.45 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 30 Hz and a Nominal Deflection of 18.0 mils (with Laser)

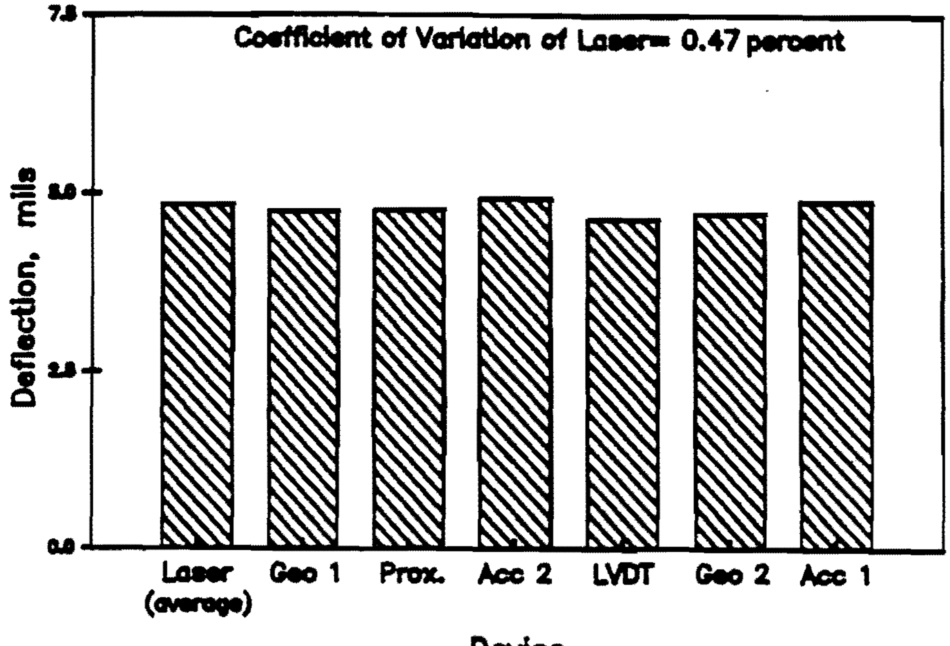


Figure G.46 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 5 mils (with Laser)

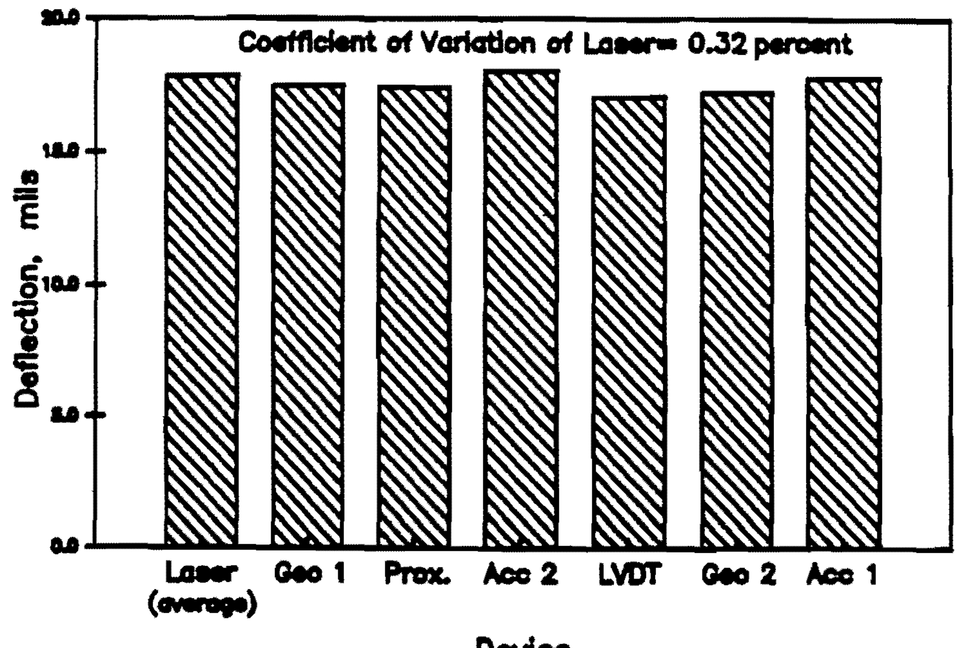


Figure G.47 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 40 Hz and a Nominal Deflection of 18.0 mils (with Laser)

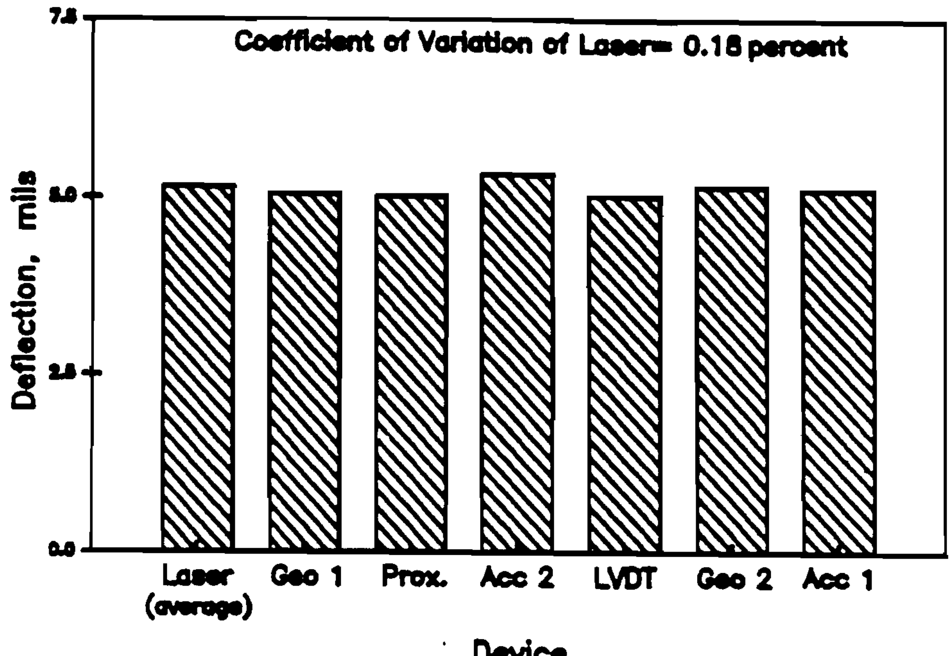


Figure G.48 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 5 mils (with Laser)

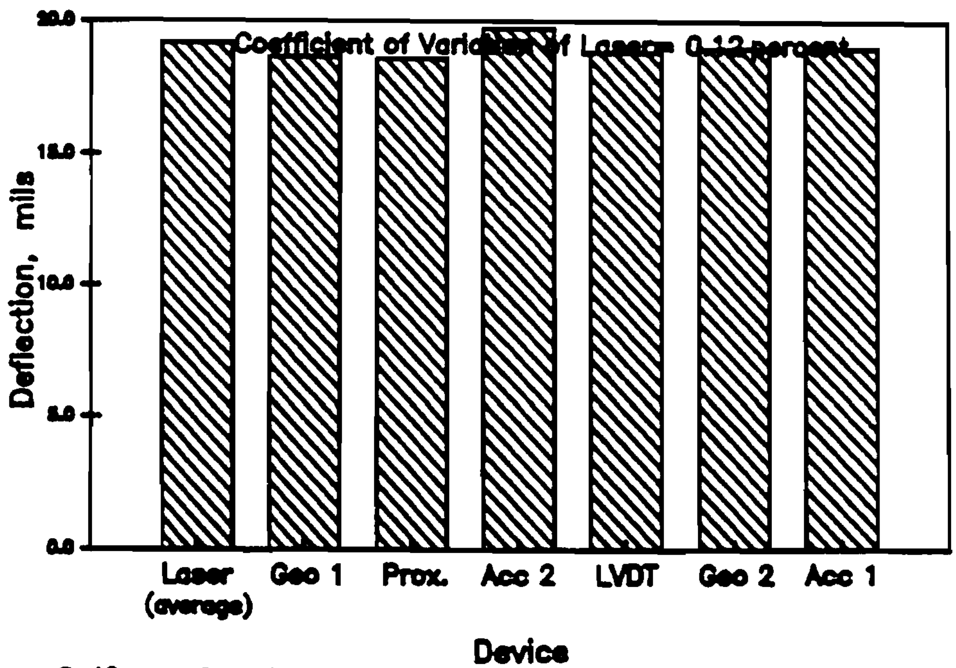


Figure G.49 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 50 Hz and a Nominal Deflection of 18.0 mils (with Laser)

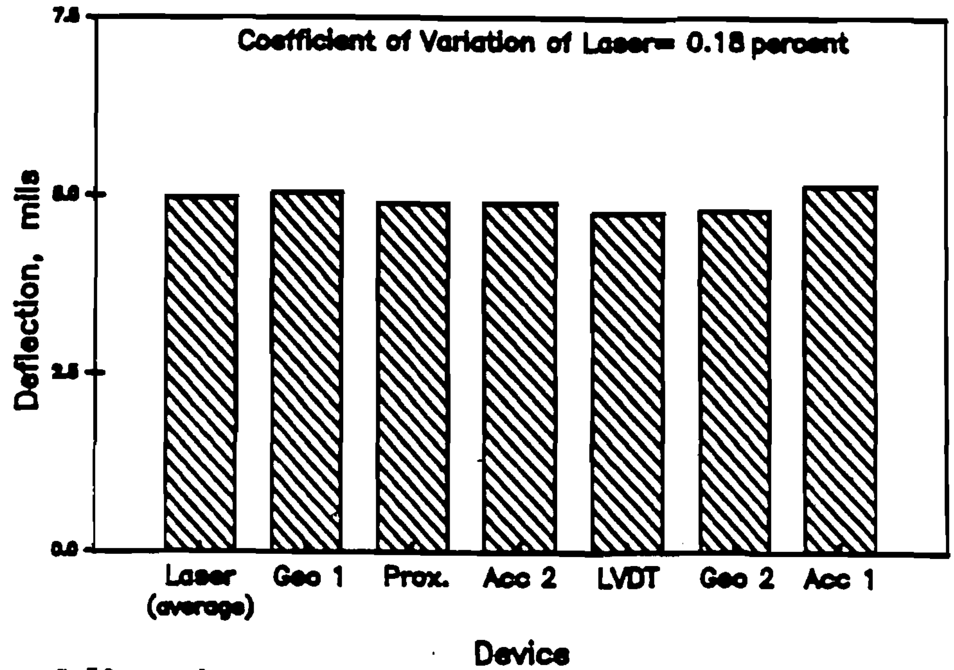


Figure G.50 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 5 mils (with Laser)

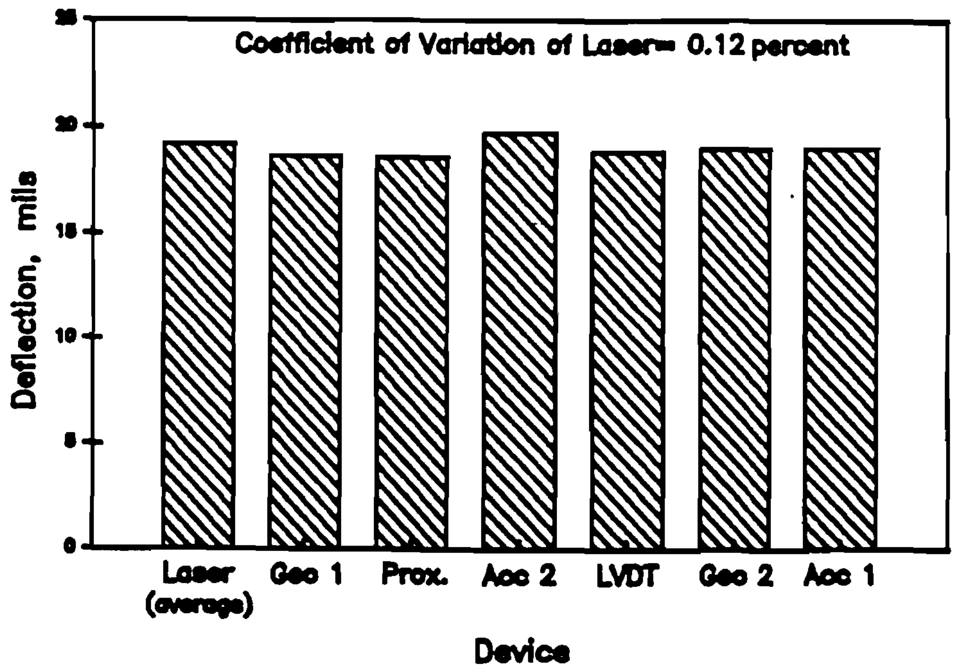


Figure G.51 Evaluation of Precision of All Sensors for Steady-State Motion at a Frequency of 75 Hz and a Nominal Deflection of 18.0 mils (with Laser)

APPENDIX H

RAW DATA FOR EVALUATION OF EACH SENSOR FOR IMPULSE MOTION

Table H.2 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.1)

Date of Experiment: 9.30.89 Diskette No.: 46
Type of Signal : Half Sine Source Level: 0.03025 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	5.20	5.21	-0.17
9	Prox	Geo 2	5.25	5.17	1.54
13	Prox	LVDT	5.26	5.11	2.68
19	Prox	Geo 1	5.27	5.16	2.11
23	LVDT	Prox	5.10	5.20	1.94
27	Prox	Acc 1	5.26	5.01	4.62
31	Acc 2	Prox	5.36	5.21	-2.86
33	Prox	Geo 2	5.25	5.15	1.83
37	Acc 1	Prox	5.31	5.21	-1.96
53	Prox	Geo 1	5.27	5.27	0.02

Table H.3 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.1)

Table 4.10 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table 4.8)

Test No.	Device Used	Average Deflection (mils)	Standard Deviation (mils)	Variance (percent)
1	Accelorometer 1	5.23	0.13	1.59
2	Accelorometer 2	5.40	0.26	6.90
3	Geophone 1	5.18	0.04	0.19
4	Geophone 2	5.22	0.05	0.25
5	Proximeter	5.24	0.03	0.07
6	L.V.D.T.	5.13	0.03	0.11

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.4 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 25 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.30.89 Diskette No.: 47
Type of Signal : Half Sine Source Level: 0.088 Volts
Pulse Width: 025 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	14.79	14.80	-0.07
3	Prox	Acc 2	15.16	15.55	-2.57
5	LVDT	Acc 2	14.76	15.03	-1.83
7	Geo 2	Geo 1	14.85	14.75	0.67
9	Prox	Geo 2	15.15	14.80	2.31
11	LVDT	Acc 1	14.75	15.15	-2.71
13	Prox	LVDT	15.21	14.69	3.42
15	LVDT	Acc 1	14.77	14.94	-1.15
17	Acc 1	Geo 2	14.92	14.84	0.54
19	Prox	Geo 1	15.23	14.76	3.09
21	Acc 1	Geo 1	15.04	14.80	1.60
23	LVDT	Prox	14.79	15.12	-2.23
25	Geo 2	Acc 1	15.00	15.06	-0.40
27	Prox	Acc 1	15.19	14.98	1.38
29	Acc 1	Acc 2	15.05	14.97	0.53
31	Acc 2	Prox	15.14	15.15	-0.07
33	Prox	Geo 2	15.23	14.94	1.90
35	Acc 2	Geo 2	15.18	14.80	2.50
37	Acc 1	Prox	14.77	15.12	-2.37
39	LVDT	Geo 1	14.84	14.77	0.47
41	Acc 2	Geo 1	15.13	14.78	2.31
43	LVDT	Acc 2	14.77	15.31	-3.66
45	Geo 2	Geo 1	14.98	14.79	1.27
47	Acc 2	Geo 2	14.96	14.85	0.74
49	Acc 1	Acc 2	14.69	14.98	-1.97
51	Acc 2	Geo 1	15.01	14.78	1.53
53	Prox	Geo 1	15.26	14.79	3.08
55	LVDT	Geo 2	14.85	14.81	0.27
57	LVDT	Geo 1	14.75	14.77	-0.14
59	Geo 2	LVDT	14.88	14.75	0.87

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.5 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.4)

Date of Experiment: 9.30.89 Diskette No.: 47
Type of Signal : Half Sine Source Level: 0.088 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	15.16	15.55	-2.57
9	Prox	Geo 2	15.15	14.80	2.31
13	Prox	LVDT	15.21	14.69	3.42
19	Prox	Geo 1	15.23	14.76	3.09
23	LVDT	Prox	14.79	15.12	2.18
27	Prox	Acc 1	15.19	14.98	1.38
31	Acc 2	Prox	15.14	15.15	0.07
33	Prox	Geo 2	15.23	14.94	1.90
37	Acc 1	Prox	14.77	15.12	2.31
53	Prox	Geo 1	15.26	14.79	3.08

Table H.6 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.4)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	14.94	0.14	1.96
2	Accelerometer 2	15.13	0.18	3.13
3	Geophone 1	14.78	0.02	0.02
4	Geophone 2	14.88	0.07	0.49
5	Proximeter	15.18	0.05	0.22
6	L.V.D.T.	14.77	0.04	0.19

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.7 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 25 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.30.89 Diskette No.: 48
Type of Signal : Half Sine Source Level: 0.1485 Volts
Pulse Width: 025 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	25.56	25.27	1.13
3	Prox	Acc 2	26.08	25.55	2.03
5	LVDT	Acc 2	25.39	25.30	0.35
7	Geo 2	Geo 1	25.45	25.36	0.35
9	Prox	Geo 2	26.13	25.28	3.25
11	LVDT	Acc 1	25.36	24.23	4.46
13	Prox	LVDT	26.05	25.27	2.99
15	LVDT	Acc 1	25.44	24.35	4.28
17	Acc 1	Geo 2	25.47	25.28	0.75
19	Prox	Geo 1	26.14	25.26	3.37
21	Acc 1	Geo 1	25.73	25.26	1.83
23	LVDT	Prox	25.37	25.94	-2.25
25	Geo 2	Acc 1	25.36	25.61	-0.99
27	Prox	Acc 1	26.12	25.45	2.57
29	Acc 1	Acc 2	25.40	26.04	-2.52
31	Acc 2	Prox	25.92	25.99	-0.27
33	Prox	Geo 2	26.12	25.21	3.48
35	Acc 2	Geo 2	26.07	25.31	2.92
37	Acc 1	Prox	25.22	25.98	-3.01
39	LVDT	Geo 1	25.43	25.35	0.31
41	Acc 2	Geo 1	26.28	25.30	3.73
43	LVDT	Acc 2	25.42	26.32	-3.54
45	Geo 2	Geo 1	25.44	25.26	0.71
47	Acc 2	Geo 2	26.27	25.36	3.46
49	Acc 1	Acc 2	25.74	25.98	-0.93
51	Acc 2	Geo 1	25.97	25.30	2.58
53	Prox	Geo 1	26.14	25.34	3.06
55	LVDT	Geo 2	25.44	25.33	0.43
57	LVDT	Geo 1	25.43	25.30	0.51
59	Geo 2	LVDT	25.37	25.33	0.16

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.8 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.7)

Date of Experiment: 9.30.89 Diskette No.: 48
Type of Signal : Half Sine Source Level: 0.1485 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	26.08	25.55	2.03
9	Prox	Geo 2	26.13	25.28	3.25
13	Prox	LVDT	26.05	25.27	2.99
19	Prox	Geo 1	26.14	25.26	3.37
23	LVDT	Prox	25.37	25.94	2.20
27	Prox	Acc 1	26.12	25.45	2.57
31	Acc 2	Prox	25.92	25.99	0.27
33	Prox	Geo 2	26.12	25.21	3.48
37	Acc 1	Prox	25.22	25.98	2.93
53	Prox	Geo 1	26.14	25.34	3.06

Table H.9 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.7)

Test No.	Device Used	Average Deflection (mils)	Standard Deviation (mils)	Variance (percent)
1	Accelerometer 1	25.28	0.51	26.52
2	Accelerometer 2	25.97	0.31	9.51
3	Geophone 1	25.30	0.04	0.13
4	Geophone 2	25.34	0.07	0.49
5	Proximeter	26.07	0.07	0.50
6	L.V.D.T.	25.39	0.05	0.28

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.10 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.30.89 Diskette No.: 43
Type of Signal : Half Sine Source Level: 0.022 Volts
Pulse Width: 050 ms.

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	4.84	4.68	3.28
3	Prox	Acc 2	4.79	4.78	0.10
5	LVDT	Acc 2	4.65	4.74	-1.91
7	Geo 2	Geo 1	4.77	4.71	1.32
9	Prox	Geo 2	4.80	4.72	1.60
11	LVDT	Acc 1	4.69	4.59	2.05
13	Prox	LVDT	4.80	4.67	2.61
15	LVDT	Acc 1	4.69	4.68	0.26
17	Acc 1	Geo 2	4.41	4.70	-6.46
19	Prox	Geo 1	4.77	4.71	1.34
21	Acc 1	Geo 1	4.75	4.67	1.68
23	LVDT	Prox	4.69	4.77	-1.75
25	Geo 2	Acc 1	4.84	4.49	7.29
27	Prox	Acc 1	4.81	4.57	4.95
29	Acc 1	Acc 2	4.75	4.82	-1.54
31	Acc 2	Prox	4.83	4.75	1.64
33	Prox	Geo 2	4.77	4.70	1.47
35	Acc 2	Geo 2	4.88	4.70	3.65
37	Acc 1	Prox	5.21	4.78	8.29
39	LVDT	Geo 1	4.63	4.70	-1.34
41	Acc 2	Geo 1	4.82	4.75	1.27
43	LVDT	Acc 2	4.65	5.32	-14.42
45	Geo 2	Geo 1	4.81	4.68	2.66
47	Acc 2	Geo 2	5.08	4.66	8.28
49	Acc 1	Acc 2	4.89	5.35	-9.43
51	Acc 2	Geo 1	4.73	4.73	-0.02
53	Prox	Geo 1	4.79	4.72	1.34
55	LVDT	Geo 2	4.67	4.71	-0.94
57	LVDT	Geo 1	4.61	4.70	-1.89
59	Geo 2	LVDT	4.76	4.66	2.18

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.11 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.10)

Date of Experiment: 9.30.89 Diskette No.: 43
Type of Signal : Half Sine Source Level: 0.022 Volts
Pulse Width:050 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	4.79	4.78	0.10
9	Prox	Geo 2	4.80	4.72	1.60
13	Prox	LVDT	4.80	4.67	2.61
19	Prox	Geo 1	4.77	4.71	1.34
23	LVDT	Prox	4.69	4.77	1.72
27	Prox	Acc 1	4.81	4.57	4.95
31	Acc 2	Prox	4.83	4.75	-1.66
33	Prox	Geo 2	4.77	4.70	1.47
37	Acc 1	Prox	5.21	4.78	-9.04
53	Prox	Geo 1	4.79	4.72	1.34

Table H.12 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.10)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	4.72	0.22	4.75
2	Accelerometer 2	4.94	0.22	4.84
3	Geophone 1	4.71	0.02	0.06
4	Geophone 2	4.74	0.05	0.29
5	Proximeter	4.78	0.02	0.03
6	L.V.D.T.	4.66	0.02	0.06

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.13 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.30.89 Diskette No.: 44
Type of Signal : Half Sine Source Level: 0.066 Volts
Pulse Width: 050 ms.

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	15.06	14.95	0.73
3	Prox	Acc 2	15.32	15.30	0.13
5	LVDT	Acc 2	14.85	15.77	-6.20
7	Geo 2	Geo 1	14.97	14.96	0.07
9	Prox	Geo 2	15.29	14.84	2.94
11	LVDT	Acc 1	14.85	14.93	-0.54
13	Prox	LVDT	15.35	14.80	3.58
15	LVDT	Acc 1	14.98	15.08	-0.67
17	Acc 1	Geo 2	15.12	14.93	1.26
19	Prox	Geo 1	15.32	14.93	2.55
21	Acc 1	Geo 1	15.04	15.03	0.07
23	LVDT	Prox	14.89	15.25	-2.42
25	Geo 2	Acc 1	14.95	15.16	-1.40
27	Prox	Acc 1	15.29	14.62	4.38
29	Acc 1	Acc 2	15.10	15.06	0.26
31	Acc 2	Prox	15.22	15.20	0.13
33	Prox	Geo 2	15.33	15.03	1.96
35	Acc 2	Geo 2	15.42	15.05	2.40
37	Acc 1	Prox	15.49	15.25	1.55
39	LVDT	Geo 1	14.95	15.07	-0.80
41	Acc 2	Geo 1	15.71	15.00	4.52
43	LVDT	Acc 2	14.91	15.86	-6.37
45	Geo 2	Geo 1	15.10	15.08	0.13
47	Acc 2	Geo 2	15.95	15.04	5.71
49	Acc 1	Acc 2	14.82	15.33	-3.44
51	Acc 2	Geo 1	15.70	15.03	4.27
53	Prox	Geo 1	15.36	15.10	1.69
55	LVDT	Geo 2	14.85	15.04	-1.28
57	LVDT	Geo 1	14.89	14.95	-0.40
59	Geo 2	LVDT	15.09	14.80	1.92

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.14 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.13)

Date of Experiment: 9.30.89 Diskette No.: 44
Type of Signal : Half Sine Source Level: 0.066 Volts
Pulse Width:050 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	15.32	15.30	0.13
9	Prox	Geo 2	15.29	14.84	2.94
13	Prox	LVDT	15.35	14.80	3.58
19	Prox	Geo 1	15.32	14.93	2.55
23	LVDT	Prox	14.89	15.25	2.36
27	Prox	Acc 1	15.29	14.62	4.38
31	Acc 2	Prox	15.22	15.20	-0.13
33	Prox	Geo 2	15.33	15.03	1.96
37	Acc 1	Prox	15.49	15.25	-1.57
53	Prox	Geo 1	15.36	15.10	1.69

Table H.15 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.13)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	15.04	0.22	4.66
2	Accelerometer 2	15.53	0.29	8.26
3	Geophone 1	15.01	0.06	0.34
4	Geophone 2	15.00	0.08	0.58
5	Proximeter	15.30	0.05	0.23
6	L.V.D.T.	14.88	0.06	0.31

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.16 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 25 mil

Date of Experiment: 9.30.89 Diskette No.: 45
Type of Signal : Half Sine Source Level: 0.11 Volts
Pulse Width: 050 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	24.44	24.43	0.04
3	Prox	Acc 2	24.88	24.55	1.33
5	LVDT	Acc 2	24.09	25.26	-4.86
7	Geo 2	Geo 1	24.36	24.31	0.21
9	Prox	Geo 2	24.94	24.25	2.77
11	LVDT	Acc 1	24.02	24.49	-1.96
13	Prox	LVDT	24.91	24.16	3.01
15	LVDT	Acc 1	24.30	24.43	-0.53
17	Acc 1	Geo 2	23.99	24.33	-1.42
19	Prox	Geo 1	24.94	24.33	2.45
21	Acc 1	Geo 1	24.36	24.39	-0.12
23	LVDT	Prox	24.31	24.74	-1.77
25	Geo 2	Acc 1	24.44	24.15	1.19
27	Prox	Acc 1	24.95	24.36	2.36
29	Acc 1	Acc 2	24.32	24.60	-1.15
31	Acc 2	Prox	24.93	24.85	0.32
33	Prox	Geo 2	24.99	24.45	2.16
35	Acc 2	Geo 2	25.09	24.46	2.51
37	Acc 1	Prox	24.29	24.82	-2.18
39	LVDT	Geo 1	24.35	24.45	-0.41
41	Acc 2	Geo 1	25.12	24.41	2.83
43	LVDT	Acc 2	24.31	24.71	-1.65
45	Geo 2	Geo 1	24.44	24.45	-0.04
47	Acc 2	Geo 2	24.70	24.30	1.62
49	Acc 1	Acc 2	24.21	25.20	-4.09
51	Acc 2	Geo 1	25.08	24.39	2.75
53	Prox	Geo 1	24.99	24.50	1.96
55	LVDT	Geo 2	24.40	24.34	0.25
57	LVDT	Geo 1	24.31	24.53	-0.90
59	Geo 2	LVDT	24.50	24.21	1.18

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.17 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.16)

Date of Experiment: 9.30.89 Diskette No.: 45
Type of Signal : Half Sine Source Level: 0.11 Volts
Pulse Width:050 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	24.88	24.55	1.33
9	Prox	Geo 2	24.94	24.25	2.77
13	Prox	LVDT	24.91	24.16	3.01
19	Prox	Geo 1	24.94	24.33	2.45
23	LVDT	Prox	24.31	24.74	1.74
27	Prox	Acc 1	24.95	24.36	2.36
31	Acc 2	Prox	24.93	24.85	-0.32
33	Prox	Geo 2	24.99	24.45	2.16
37	Acc 1	Prox	24.29	24.82	2.14
53	Prox	Geo 1	24.99	24.50	1.96

Table H.18 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.16)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	24.30	0.14	2.07
2	Accelerometer 2	24.92	0.25	6.20
3	Geophone 1	24.42	0.07	0.42
4	Geophone 2	24.39	0.08	0.60
5	Proximeter	24.90	0.08	0.57
6	L.V.D.T.	24.25	0.12	1.34

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.19 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 75 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.30.89 Diskette No.: 40
Type of Signal : Half Sine Source Level: 0.02475 Volts
Pulse Width: 075 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	4.76	4.86	-2.10
3	Prox	Acc 2	4.94	5.29	-7.08
5	LVDT	Acc 2	4.74	5.32	-12.18
7	Geo 2	Geo 1	5.01	4.87	2.87
9	Prox	Geo 2	4.86	4.90	-0.76
11	LVDT	Acc 1	4.72	5.17	-9.38
13	Prox	LVDT	4.91	4.69	4.54
15	LVDT	Acc 1	4.71	4.86	-3.10
17	Acc 1	Geo 2	4.69	4.96	-5.80
19	Prox	Geo 1	4.94	4.93	0.26
21	Acc 1	Geo 1	5.13	4.86	5.17
23	LVDT	Prox	4.80	4.96	-3.29
25	Geo 2	Acc 1	4.98	5.13	-3.03
27	Prox	Acc 1	4.91	4.95	-0.81
29	Acc 1	Acc 2	4.82	5.45	-13.07
31	Acc 2	Prox	5.25	4.89	6.91
33	Prox	Geo 2	4.94	5.02	-1.64
35	Acc 2	Geo 2	4.44	5.03	-13.22
37	Acc 1	Prox	5.52	4.91	11.12
39	LVDT	Geo 1	4.69	4.88	-4.12
41	Acc 2	Geo 1	4.57	4.88	-6.88
43	LVDT	Acc 2	4.77	4.91	-3.06
45	Geo 2	Geo 1	5.04	4.91	2.74
47	Acc 2	Geo 2	4.86	4.92	-1.11
49	Acc 1	Acc 2	4.99	4.66	6.61
51	Acc 2	Geo 1	4.94	4.86	1.46
53	Prox	Geo 1	4.97	4.87	1.91
55	LVDT	Geo 2	4.74	4.95	-4.38
57	LVDT	Geo 1	4.78	4.88	-1.99
59	Geo 2	LVDT	5.02	4.81	4.30

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.20 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.19)

Date of Experiment: 9.30.89 Diskette No.: 40
Type of Signal : Half Sine Source Level: 0.02475 Volts
Pulse Width:075 ms.

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference+ (percent)
3	Prox	Acc 2	4.94	5.29	-7.08
9	Prox	Geo 2	4.86	4.90	-0.76
13	Prox	LVDT	4.91	4.69	4.54
19	Prox	Geo 1	4.94	4.93	0.26
23	LVDT	Prox	4.80	4.96	3.19
27	Prox	Acc 1	4.91	4.95	-0.81
31	Acc 2	Prox	5.25	4.89	-7.42
33	Prox	Geo 2	4.94	5.02	-1.64
37	Acc 1	Prox	5.52	4.91	-12.51
53	Prox	Geo 1	4.97	4.87	1.91

Table H.21 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.19)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	5.00	0.23	5.42
2	Accelerometer 2	4.97	0.33	10.93
3	Geophone 1	4.88	0.02	0.04
4	Geophone 2	4.98	0.05	0.23
5	Proximeter	4.92	0.03	0.10
6	L.V.D.T.	4.75	0.04	0.17

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.22 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 75 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.30.89 Diskette No.: 41
Type of Signal : Half Sine Source Level: 0.06875 Volts
Pulse Width: 075 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	13.65	14.42	-5.64
3	Prox	Acc 2	14.74	14.65	0.61
5	LVDT	Acc 2	14.23	15.06	-5.83
7	Geo 2	Geo 1	14.44	14.43	0.07
9	Prox	Geo 2	14.78	14.27	3.45
11	LVDT	Acc 1	14.33	14.08	1.74
13	Prox	LVDT	14.85	14.22	4.24
15	LVDT	Acc 1	14.34	14.16	1.26
17	Acc 1	Geo 2	14.23	14.39	-1.12
19	Prox	Geo 1	14.77	14.41	2.44
21	Acc 1	Geo 1	14.22	14.50	-1.97
	LVDT	Prox	14.33	14.78	-3.14
	Geo 2	Acc 1	14.46	14.13	2.28
	Prox	Acc 1	14.72	13.96	5.16
[illegible]	Acc 1	Acc 2	14.57	14.86	-1.99
31	Acc 2	Prox	14.81	14.66	1.01
33	Prox	Geo 2	14.75	14.41	2.31
35	Acc 2	Geo 2	14.86	14.37	3.30
37	Acc 1	Prox	14.55	14.67	-0.82
39	LVDT	Geo 1	14.32	14.56	-1.68
41	Acc 2	Geo 1	15.18	14.54	4.22
43	LVDT	Acc 2	14.33	14.84	-3.56
45	Geo 2	Geo 1	14.39	14.61	-1.53
47	Acc 2	Geo 2	14.77	14.43	2.30
49	Acc 1	Acc 2	13.99	14.68	-4.93
51	Acc 2	Geo 1	14.83	14.60	1.55
53	Prox	Geo 1	14.74	14.64	0.68
55	LVDT	Geo 2	14.31	14.46	-1.05
57	LVDT	Geo 1	14.31	14.48	-1.19
59	Geo 2	LVDT	14.42	14.23	1.32

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.23 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.22)

Date of Experiment: 9.30.89 Diskette No.: 41
Type of Signal : Half Sine Source Level: 0.06875 Volts
Pulse Width:075 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	14.74	14.65	0.61
9	Prox	Geo 2	14.78	14.27	3.45
13	Prox	LVDT	14.85	14.22	4.24
19	Prox	Geo 1	14.77	14.41	2.44
23	LVDT	Prox	14.33	14.78	3.04
27	Prox	Acc 1	14.72	13.96	5.16
31	Acc 2	Prox	14.81	14.66	-1.02
33	Prox	Geo 2	14.75	14.41	2.31
37	Acc 1	Prox	14.55	14.67	0.82
53	Prox	Geo 1	14.74	14.64	0.68

Table H.24 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.22)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	14.15	0.26	6.65
2	Accelerometer 2	14.85	0.15	2.30
3	Geophone 1	14.52	0.08	0.63
4	Geophone 2	14.40	0.05	0.28
5	Proximeter	14.75	0.05	0.28
6	L.V.D.T.	14.30	0.05	0.21

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.25 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 75 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.30.89 Diskette No.: 42
Type of Signal : Half Sine Source Level: 0.1155 Volts
Pulse Width: 075 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	23.25	23.21	0.17
3	Prox	Acc 2	23.69	23.37	1.35
5	LVDT	Acc 2	22.96	22.49	2.05
7	Geo 2	Geo 1	23.13	23.23	-0.43
9	Prox	Geo 2	23.69	22.97	3.04
11	LVDT	Acc 1	22.92	23.46	-2.36
13	Prox	LVDT	23.68	22.96	3.04
15	LVDT	Acc 1	23.13	22.97	0.69
17	Acc 1	Geo 2	22.83	22.97	-0.61
19	Prox	Geo 1	23.72	23.23	2.07
21	Acc 1	Geo 1	23.53	23.36	0.72
23	LVDT	Prox	23.03	23.58	-2.39
25	Geo 2	Acc 1	23.13	22.59	2.33
27	Prox	Acc 1	23.72	23.49	0.97
29	Acc 1	Acc 2	22.61	23.11	-2.21
31	Acc 2	Prox	23.12	23.63	-2.21
33	Prox	Geo 2	23.76	22.90	3.62
35	Acc 2	Geo 2	23.88	23.02	3.60
37	Acc 1	Prox	22.53	23.53	-4.44
39	LVDT	Geo 1	23.12	23.37	-1.08
41	Acc 2	Geo 1	23.64	23.41	0.97
43	LVDT	Acc 2	23.29	22.75	2.32
45	Geo 2	Geo 1	23.44	23.48	-0.17
47	Acc 2	Geo 2	23.46	23.29	0.72
49	Acc 1	Acc 2	23.44	22.71	3.11
51	Acc 2	Geo 1	23.42	23.37	0.21
53	Prox	Geo 1	23.87	23.47	1.68
55	LVDT	Geo 2	23.23	23.22	0.04
57	LVDT	Geo 1	23.19	23.49	-1.29
59	Geo 2	LVDT	23.17	23.06	0.47

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.26 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.25)

Date of Experiment: 9.30.89 Diskette No.: 42
Type of Signal : Half Sine Source Level: 0.1155 Volts
Pulse Width:075 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	23.69	23.37	1.35
9	Prox	Geo 2	23.69	22.97	3.04
13	Prox	LVDT	23.68	22.96	3.04
19	Prox	Geo 1	23.72	23.23	2.07
23	LVDT	Prox	23.03	23.58	2.33
27	Prox	Acc 1	23.72	23.49	0.97
31	Acc 2	Prox	23.12	23.63	2.16
33	Prox	Geo 2	23.76	22.90	3.62
37	Acc 1	Prox	22.53	23.53	4.25
53	Prox	Geo 1	23.87	23.47	1.68

Table H.27 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.25)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	23.07	0.39	15.11
2	Accelerometer 2	23.20	0.42	17.62
3	Geophone 1	23.36	0.10	1.02
4	Geophone 2	23.12	0.16	2.47
5	Proximeter	23.69	0.09	0.80
6	L.V.D.T.	23.09	0.12	1.39

+Difference=[(Prox. defl.)-(Other Device defl.)]*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.28 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 100 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.29.89 Diskette No.: 37
Type of Signal : Half Sine Source Level: 0.02475 Volts
Pulse Width: 100 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	4.26	4.49	-5.38
3	Prox	Acc 2	4.55	4.45	2.02
5	LVDT	Acc 2	4.46	4.14	7.22
7	Geo 2	Geo 1	4.57	4.49	1.64
9	Prox	Geo 2	4.55	4.54	0.07
11	LVDT	Acc 1	4.45	4.63	-4.09
13	Prox	LVDT	4.52	4.42	2.12
15	LVDT	Acc 1	4.45	3.94	11.41
17	Acc 1	Geo 2	4.93	4.58	7.10
19	Prox	Geo 1	4.51	4.54	-0.69
21	Acc 1	Geo 1	4.82	4.45	7.79
23	LVDT	Prox	4.54	4.64	-2.18
25	Geo 2	Acc 1	4.66	4.10	11.90
27	Prox	Acc 1	4.68	4.12	11.95
29	Acc 1	Acc 2	4.34	4.53	-4.35
31	Acc 2	Prox	4.76	4.57	3.83
33	Prox	Geo 2	4.64	4.76	-2.50
35	Acc 2	Geo 2	4.95	4.65	6.04
37	Acc 1	Prox	4.34	4.59	-5.60
39	LVDT	Geo 1	4.53	4.69	-3.42
41	Acc 2	Geo 1	4.68	4.64	0.77
43	LVDT	Acc 2	4.50	4.24	5.76
45	Geo 2	Geo 1	4.78	4.59	3.99
47	Acc 2	Geo 2	4.31	4.66	-8.12
49	Acc 1	Acc 2	4.70	4.85	-3.17
51	Acc 2	Geo 1	4.79	4.61	3.61
53	Prox	Geo 1	4.65	4.49	3.36
55	LVDT	Geo 2	4.53	4.46	1.54
57	LVDT	Geo 1	4.56	4.59	-0.77
59	Geo 2	LVDT	4.78	4.55	4.95

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.29 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.28)

Date of Experiment: 9.29.89 Diskette No.: 37
Type of Signal : Half Sine Source Level: 0.02475 Volts
Pulse Width:100 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	4.55	4.45	2.02
9	Prox	Geo 2	4.55	4.54	0.07
13	Prox	LVDT	4.52	4.42	2.12
19	Prox	Geo 1	4.51	4.54	-0.69
23	LVDT	Prox	4.54	4.64	2.14
27	Prox	Acc 1	4.68	4.12	11.95
31	Acc 2	Prox	4.76	4.57	-3.98
33	Prox	Geo 2	4.64	4.76	-2.50
37	Acc 1	Prox	4.34	4.59	5.30
53	Prox	Geo 1	4.65	4.49	3.36

Table H.30 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.28)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	4.42	0.32	10.08
2	Accelerometer 2	4.57	0.26	7.00
3	Geophone 1	4.56	0.07	0.56
4	Geophone 2	4.64	0.10	1.05
5	Proximeter	4.59	0.06	0.31
6	L.V.D.T.	4.50	0.05	0.23

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.31 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 100 msec and a Nominal Deflection of 15 mil

Date of Experiment: 9.30.89 Diskette No.: 38
Type of Signal : Half Sine Source Level: 0.07425 Volts
Pulse Width: 100 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	13.83	14.22	-2.82
3	Prox	Acc 2	14.49	14.32	1.17
5	LVDT	Acc 2	14.16	13.94	1.55
7	Geo 2	Geo 1	14.52	14.26	1.79
9	Prox	Geo 2	14.52	14.17	2.41
11	LVDT	Acc 1	14.22	13.38	5.91
13	Prox	LVDT	14.55	14.13	2.89
15	LVDT	Acc 1	14.19	14.60	-2.89
17	Acc 1	Geo 2	13.83	14.11	-2.02
19	Prox	Geo 1	14.58	14.33	1.71
21	Acc 1	Geo 1	13.39	14.30	-6.80
23	LVDT	Prox	14.18	14.45	-1.90
25	Geo 2	Acc 1	14.71	14.21	3.40
27	Prox	Acc 1	14.56	14.00	3.85
29	Acc 1	Acc 2	13.85	13.49	2.60
31	Acc 2	Prox	14.83	14.53	2.02
33	Prox	Geo 2	14.58	14.14	3.02
35	Acc 2	Geo 2	14.25	14.12	0.91
37	Acc 1	Prox	14.75	14.53	1.49
39	LVDT	Geo 1	14.24	14.40	-1.12
41	Acc 2	Geo 1	14.72	14.40	2.17
43	LVDT	Acc 2	14.22	13.35	6.12
45	Geo 2	Geo 1	14.67	14.33	2.32
47	Acc 2	Geo 2	13.42	14.13	-5.29
49	Acc 1	Acc 2	13.59	14.22	-4.64
51	Acc 2	Geo 1	13.56	14.25	-5.09
53	Prox	Geo 1	14.64	14.28	2.46
55	LVDT	Geo 2	14.29	14.16	0.91
57	LVDT	Geo 1	14.29	14.25	0.28
59	Geo 2	LVDT	14.49	14.18	2.14

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.32 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.31)

Date of Experiment: 9.30.89 Diskette No.: 38
Type of Signal : Half Sine Source Level: 0.07425 Volts
Pulse Width:100 ms.

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference[+] (percent)
3	Prox	Acc 2	14.49	14.32	1.17
9	Prox	Geo 2	14.52	14.17	2.41
13	Prox	LVDT	14.55	14.13	2.89
19	Prox	Geo 1	14.58	14.33	1.71
23	LVDT	Prox	14.18	14.45	1.87
27	Prox	Acc 1	14.56	14.00	3.85
31	Acc 2	Prox	14.83	14.53	-2.06
33	Prox	Geo 2	14.58	14.14	3.02
37	Acc 1	Prox	14.75	14.53	-1.51
53	Prox	Geo 1	14.64	14.28	2.46

Table H.33 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.31)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	13.94	0.44	19.39
2	Accelerometer 2	14.01	0.51	26.36
3	Geophone 1	14.30	0.06	0.35
4	Geophone 2	14.32	0.23	5.44
5	Proximeter	14.54	0.05	0.25
6	L.V.D.T.	14.21	0.05	0.25

[+]Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.34 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 100 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.30.89 Diskette No.: 39
Type of Signal : Half Sine Source Level: 0.12375 Volts
Pulse Width: 100 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	22.73	23.24	-2.24
3	Prox	Acc 2	23.77	22.14	6.86
5	LVDT	Acc 2	23.26	20.89	10.19
7	Geo 2	Geo 1	23.58	23.33	1.06
9	Prox	Geo 2	23.88	23.25	2.64
11	LVDT	Acc 1	23.29	22.63	2.83
13	Prox	LVDT	23.93	23.20	3.05
15	LVDT	Acc 1	23.36	22.13	5.27
17	Acc 1	Geo 2	22.14	23.22	-4.88
19	Prox	Geo 1	23.99	23.42	2.38
21	Acc 1	Geo 1	22.23	23.34	-4.99
23	LVDT	Prox	23.45	23.86	-1.75
25	Geo 2	Acc 1	23.64	21.93	7.23
27	Prox	Acc 1	23.96	21.99	8.22
29	Acc 1	Acc 2	22.35	22.03	1.43
31	Acc 2	Prox	21.77	23.83	-9.46
33	Prox	Geo 2	23.96	23.41	2.30
35	Acc 2	Geo 2	22.44	23.46	-4.55
37	Acc 1	Prox	21.84	23.84	-9.16
39	LVDT	Geo 1	23.37	23.40	-0.13
41	Acc 2	Geo 1	22.99	23.65	-2.87
43	LVDT	Acc 2	23.47	23.19	1.19
45	Geo 2	Geo 1	23.74	23.48	1.10
47	Acc 2	Geo 2	21.92	23.62	-7.76
49	Acc 1	Acc 2	22.15	21.85	1.35
51	Acc 2	Geo 1	22.03	23.52	-6.76
53	Prox	Geo 1	24.03	23.52	2.12
55	LVDT	Geo 2	23.47	23.75	-1.19
57	LVDT	Geo 1	23.50	23.56	-0.26
59	Geo 2	LVDT	23.83	23.34	2.06

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.35 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.34)

Date of Experiment: 9.30.89 Diskette No.: 39
Type of Signal : Half Sine Source Level: 0.12375 Volts
Pulse Width:100 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	23.77	22.14	6.86
9	Prox	Geo 2	23.88	23.25	2.64
13	Prox	LVDT	23.93	23.20	3.05
19	Prox	Geo 1	23.99	23.42	2.38
23	LVDT	Prox	23.45	23.86	1.72
27	Prox	Acc 1	23.96	21.99	8.22
31	Acc 2	Prox	21.77	23.83	8.64
33	Prox	Geo 2	23.96	23.41	2.30
37	Acc 1	Prox	21.84	23.84	8.39
53	Prox	Geo 1	24.03	23.52	2.12

Table H.36 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.34)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	22.21	0.27	7.45
2	Accelerometer 2	22.13	0.61	37.69
3	Geophone 1	23.45	0.12	1.37
4	Geophone 2	23.55	0.20	3.95
5	Proximeter	23.91	0.08	0.60
6	L.V.D.T.	23.37	0.10	0.92

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.37 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 25 msec and a Nominal Deflection of 5 mils

Date of Experiment: 10.1.89 Diskette No.: 49
Type of Signal : Triangle Source Level: 0.035 Volts
Pulse Width: 025 ms.

File	Device Used		Deflection (mil)		Difference+
No.	Channel 1	Channel 2	Channel 1	Channel 2	(percent)
1	Acc 1	Geo 1	5.69	5.72	-0.67
3	Prox	Acc 2	5.78	5.90	-2.11
5	LVDT	Acc 2	5.61	5.55	1.00
7	Geo 2	Geo 1	5.79	5.71	1.45
9	Prox	Geo 2	5.79	5.68	1.81
11	LVDT	Acc 1	5.72	5.60	2.15
13	Prox	LVDT	5.79	5.63	2.70
15	LVDT	Acc 1	5.54	5.46	1.52
17	Acc 1	Geo 2	6.12	5.78	5.54
19	Prox	Geo 1	5.79	5.77	0.36
21	Acc 1	Geo 1	5.68	5.71	-0.40
23	LVDT	Prox	5.68	5.76	-1.41
25	Geo 2	Acc 1	5.82	5.33	8.43
27	Prox	Acc 1	5.81	5.57	4.20
29	Acc 1	Acc 2	6.02	6.05	-0.63
31	Acc 2	Prox	5.73	5.75	-0.40
33	Prox	Geo 2	5.79	5.72	1.16
35	Acc 2	Geo 2	5.80	5.72	1.24
37	Acc 1	Prox	5.89	5.75	2.46
39	LVDT	Geo 1	5.65	5.71	-1.15
41	Acc 2	Geo 1	6.06	5.70	5.99
43	LVDT	Acc 2	5.66	5.67	-0.23
45	Geo 2	Geo 1	5.81	5.72	1.43
47	Acc 2	Geo 2	5.70	5.73	-0.46
49	Acc 1	Acc 2	5.83	5.73	1.72
51	Acc 2	Geo 1	5.79	5.74	0.90
53	Prox	Geo 1	5.77	5.73	0.71
55	LVDT	Geo 2	5.66	5.79	-2.39
57	LVDT	Geo 1	5.65	5.70	-0.97
59	Geo 2	LVDT	5.79	5.70	1.69

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.38 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.37)

Date of Experiment: 10.1.89 Diskette No.: 49
Type of Signal : Triangle Source Level: 0.035 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	5.78	5.90	-2.11
9	Prox	Geo 2	5.79	5.68	1.81
13	Prox	LVDT	5.79	5.63	2.70
19	Prox	Geo 1	5.79	5.77	0.36
23	LVDT	Prox	5.68	5.76	1.39
27	Prox	Acc 1	5.81	5.57	4.20
31	Acc 2	Prox	5.73	5.75	0.40
33	Prox	Geo 2	5.79	5.72	1.16
37	Acc 1	Prox	5.89	5.75	-2.52
53	Prox	Geo 1	5.77	5.73	0.71

Table H.39 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.37)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	5.72	0.23	5.48
2	Accelerometer 2	5.80	0.16	2.43
3	Geophone 1	5.72	0.02	0.04
4	Geophone 2	5.76	0.04	0.19
5	Proximeter	5.78	0.02	0.04
6	L.V.D.T.	5.65	0.05	0.22

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.40 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 25 msec and a Nominal Deflection of 15 mils

Date of Experiment: 10.1.89 Diskette No.: 50
Type of Signal : Triangle Source Level: 0.095 Volts
Pulse Width: 025 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	15.82	15.65	1.07
3	Prox	Acc 2	16.13	16.30	-1.05
5	LVDT	Acc 2	15.61	16.13	-3.33
7	Geo 2	Geo 1	15.86	15.63	1.45
9	Prox	Geo 2	16.12	15.67	2.79
11	LVDT	Acc 1	15.66	15.44	1.40
13	Prox	LVDT	16.25	15.73	3.20
15	LVDT	Acc 1	15.71	15.81	-0.64
17	Acc 1	Geo 2	15.93	15.76	1.07
19	Prox	Geo 1	16.09	15.60	3.05
21	Acc 1	Geo 1	15.88	15.59	1.83
23	LVDT	Prox	15.67	16.03	-2.30
25	Geo 2	Acc 1	15.79	16.09	-1.90
27	Prox	Acc 1	16.16	15.49	4.15
29	Acc 1	Acc 2	16.01	15.91	0.62
31	Acc 2	Prox	16.65	16.05	3.60
33	Prox	Geo 2	16.13	15.75	2.36
35	Acc 2	Geo 2	16.26	15.70	3.44
37	Acc 1	Prox	16.35	16.06	1.77
39	LVDT	Geo 1	15.65	15.66	-0.06
41	Acc 2	Geo 1	16.07	15.70	2.30
43	LVDT	Acc 2	15.68	16.33	-4.15
45	Geo 2	Geo 1	15.88	15.65	1.45
47	Acc 2	Geo 2	15.98	15.82	1.00
49	Acc 1	Acc 2	15.70	15.80	-0.64
51	Acc 2	Geo 1	16.28	15.64	3.93
53	Prox	Geo 1	16.18	15.59	3.65
55	LVDT	Geo 2	15.72	15.73	-0.06
57	LVDT	Geo 1	15.73	15.66	0.45
59	Geo 2	LVDT	15.81	15.61	1.27

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.41 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.40)

Date of Experiment: 10.1.89 Diskette No.: 50
Type of Signal : Triangle Source Level: 0.095 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	16.13	16.30	-1.05
9	Prox	Geo 2	16.12	15.67	2.79
13	Prox	LVDT	16.25	15.73	3.20
19	Prox	Geo 1	16.09	15.60	3.05
23	LVDT	Prox	15.67	16.03	2.25
27	Prox	Acc 1	16.16	15.49	4.15
31	Acc 2	Prox	16.65	16.05	-3.74
33	Prox	Geo 2	16.13	15.75	2.36
37	Acc 1	Prox	16.35	16.06	-1.81
53	Prox	Geo 1	16.18	15.59	3.65

Table H.42 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.40)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	15.85	0.26	6.63
2	Accelerometer 2	16.17	0.23	5.45
3	Geophone 1	15.64	0.03	0.11
4	Geophone 2	15.78	0.06	0.41
5	Proximeter	16.12	0.06	0.40
6	L.V.D.T.	15.68	0.04	0.19

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.43 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 25 msec and a Nominal Deflection of 25 mils

Date of Experiment: 10.1.89 Diskette No.: 51
Type of Signal : Triangle Source Level: 0.155 Volts
Pulse Width: 025 ms.

File	Device Used		Deflection (mil)		Difference[+]
No.	Channel 1	Channel 2	Channel 1	Channel 2	(percent)
1	Acc 1	Geo 1	25.77	25.45	1.24
3	Prox	Acc 2	26.28	26.28	0.00
5	LVDT	Acc 2	25.55	26.35	-3.13
7	Geo 2	Geo 1	25.26	25.13	0.51
9	Prox	Geo 2	26.32	25.47	3.23
11	LVDT	Acc 1	25.58	25.18	1.56
13	Prox	LVDT	26.16	25.48	2.60
15	LVDT	Acc 1	25.48	25.21	1.06
17	Acc 1	Geo 2	25.43	25.22	0.83
19	Prox	Geo 1	26.16	25.43	2.79
21	Acc 1	Geo 1	25.40	25.70	-1.18
23	LVDT	Prox	25.58	26.13	-2.15
25	Geo 2	Acc 1	25.37	25.79	-1.66
27	Prox	Acc 1	26.31	25.56	2.85
29	Acc 1	Acc 2	25.94	26.50	-2.16
31	Acc 2	Prox	26.20	26.10	0.38
33	Prox	Geo 2	26.25	25.43	3.12
35	Acc 2	Geo 2	26.20	25.42	2.98
37	Acc 1	Prox	25.93	26.10	-0.66
39	LVDT	Geo 1	25.65	25.42	0.90
41	Acc 2	Geo 1	25.81	25.45	1.39
43	LVDT	Acc 2	25.57	26.13	-2.19
45	Geo 2	Geo 1	25.42	25.47	-0.20
47	Acc 2	Geo 2	26.41	25.40	3.82
49	Acc 1	Acc 2	25.57	26.40	-3.25
51	Acc 2	Geo 1	26.29	25.21	4.11
53	Prox	Geo 1	26.31	25.48	3.15
55	LVDT	Geo 2	25.52	25.39	0.51
57	LVDT	Geo 1	25.60	25.47	0.51
59	Geo 2	LVDT	25.28	25.48	-0.79

[+]Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.44 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.43)

Date of Experiment: 10.1.89 Diskette No.: 51
Type of Signal : Triangle Source Level: 0.155 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	26.28	26.28	0.00
9	Prox	Geo 2	26.32	25.47	3.23
13	Prox	LVDT	26.16	25.48	2.60
19	Prox	Geo 1	26.16	25.43	2.79
23	LVDT	Prox	25.58	26.13	2.10
27	Prox	Acc 1	26.31	25.56	2.85
31	Acc 2	Prox	26.20	26.10	-0.38
33	Prox	Geo 2	26.25	25.43	3.12
37	Acc 1	Prox	25.93	26.10	0.65
53	Prox	Geo 1	26.31	25.48	3.15

Table H.45 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.43)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	25.58	0.26	6.85
2	Accelerometer 2	26.26	0.18	3.36
3	Geophone 1	25.42	0.15	2.17
4	Geophone 2	25.37	0.08	0.62
5	Proximeter	26.21	0.09	0.74
6	L.V.D.T.	25.55	0.06	0.30

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.46 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 5 mils

Date of Experiment: 10.1.89 Diskette No.: 52
Type of Signal : Triangle Source Level: 0.028 Volts
Pulse Width: 050 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	5.89	5.55	5.77
3	Prox	Acc 2	5.64	5.87	-3.99
5	LVDT	Acc 2	5.62	5.26	6.34
7	Geo 2	Geo 1	5.66	5.56	1.63
9	Prox	Geo 2	5.60	5.58	0.39
11	LVDT	Acc 1	5.58	5.40	3.19
13	Prox	LVDT	5.60	5.41	3.48
15	LVDT	Acc 1	5.52	5.51	0.09
17	Acc 1	Geo 2	5.05	5.59	-10.88
19	Prox	Geo 1	5.63	5.57	0.92
21	Acc 1	Geo 1	5.97	5.56	6.93
23	LVDT	Prox	5.47	5.60	-2.32
25	Geo 2	Acc 1	5.66	5.43	4.06
27	Prox	Acc 1	5.64	4.97	11.82
29	Acc 1	Acc 2	5.32	5.62	-5.68
31	Acc 2	Prox	5.76	5.56	3.37
33	Prox	Geo 2	5.63	5.56	1.10
35	Acc 2	Geo 2	5.40	5.53	-2.47
37	Acc 1	Prox	5.65	5.60	0.94
39	LVDT	Geo 1	5.49	5.54	-0.82
41	Acc 2	Geo 1	5.62	5.55	1.28
43	LVDT	Acc 2	5.48	5.53	-0.95
45	Geo 2	Geo 1	5.69	5.57	2.23
47	Acc 2	Geo 2	5.48	5.62	-2.59
49	Acc 1	Acc 2	5.10	5.37	-5.41
51	Acc 2	Geo 1	5.68	5.56	2.15
53	Prox	Geo 1	5.65	5.61	0.78
55	LVDT	Geo 2	5.46	5.60	-2.68
57	LVDT	Geo 1	5.48	5.61	-2.32
59	Geo 2	LVDT	5.67	5.43	4.23

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.47 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.46)

Date of Experiment: 10.1.89 Diskette No.: 52
Type of Signal : Traingle Source Level: 0.028 Volts
Pulse Width:050 ms.

File No.	Device Used		Deflection (mil)		Difference[+] (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	5.64	5.87	-3.99
9	Prox	Geo 2	5.60	5.58	0.39
13	Prox	LVDT	5.60	5.41	3.48
19	Prox	Geo 1	5.63	5.57	0.92
23	LVDT	Prox	5.47	5.60	2.27
27	Prox	Acc 1	5.64	4.97	11.82
31	Acc 2	Prox	5.76	5.56	-3.49
33	Prox	Geo 2	5.63	5.56	1.10
37	Acc 1	Prox	5.65	5.60	-0.95
53	Prox	Geo 1	5.65	5.61	0.78

Table H.48 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.46)

Test No.	Device Used	Average Deflection (mils)	Standard Deviation (mils)	Variance (percent)
1	Accelorometer 1	5.43	0.32	10.47
2	Accelorometer 2	5.56	0.18	3.13
3	Geophone 1	5.57	0.02	0.05
4	Geophone 2	5.62	0.05	0.25
5	Proximeter	5.61	0.03	0.07
6	L.V.D.T.	5.49	0.06	0.38

[+]Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.49 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 15 mils

Date of Experiment: 10.1.89 Diskette No.: 53
Type of Signal : Triangle Source Level: 0.073 Volts
Pulse Width: 050 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	14.75	14.75	0.00
3	Prox	Acc 2	15.02	15.43	-2.73
5	LVDT	Acc 2	14.76	15.30	-3.66
7	Geo 2	Geo 1	14.86	14.75	0.74
9	Prox	Geo 2	14.99	14.71	1.87
11	LVDT	Acc 1	14.70	14.84	-0.95
13	Prox	LVDT	15.02	14.70	2.13
15	LVDT	Acc 1	14.72	14.65	0.48
17	Acc 1	Geo 2	15.06	14.88	1.20
19	Prox	Geo 1	15.07	14.85	1.46
21	Acc 1	Geo 1	15.19	14.78	2.70
23	LVDT	Prox	14.72	14.99	-1.83
25	Geo 2	Acc 1	14.95	14.50	3.01
27	Prox	Acc 1	15.08	14.73	2.32
29	Acc 1	Acc 2	14.74	15.59	-5.77
31	Acc 2	Prox	14.76	14.97	-1.42
33	Prox	Geo 2	15.09	14.86	1.52
35	Acc 2	Geo 2	15.24	14.87	2.43
37	Acc 1	Prox	14.72	15.03	-2.11
39	LVDT	Geo 1	14.73	14.82	-0.61
41	Acc 2	Geo 1	14.95	14.85	0.67
43	LVDT	Acc 2	14.79	15.60	-5.48
45	Geo 2	Geo 1	14.96	14.88	0.53
47	Acc 2	Geo 2	15.22	14.87	2.30
49	Acc 1	Acc 2	15.05	15.18	-0.86
51	Acc 2	Geo 1	15.69	14.92	4.91
53	Prox	Geo 1	15.17	14.84	2.18
55	LVDT	Geo 2	14.79	14.93	-0.95
57	LVDT	Geo 1	14.83	14.90	-0.47
59	Geo 2	LVDT	15.01	14.80	1.40

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.50 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.49)

Date of Experiment: 10.1.89 Diskette No.: 53
Type of Signal : Triangle Source Level: 0.073 Volts
Pulse Width:050 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	15.02	15.43	-2.73
9	Prox	Geo 2	14.99	14.71	1.87
13	Prox	LVDT	15.02	14.70	2.13
19	Prox	Geo 1	15.07	14.85	1.46
23	LVDT	Prox	14.72	14.99	1.80
27	Prox	Acc 1	15.08	14.73	2.32
31	Acc 2	Prox	14.76	14.97	1.40
33	Prox	Geo 2	15.09	14.86	1.52
37	Acc 1	Prox	14.72	15.03	2.06
53	Prox	Geo 1	15.17	14.84	2.18

Table H.51 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.49)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	14.82	0.20	4.08
2	Accelerometer 2	15.30	0.28	7.81
3	Geophone 1	14.83	0.06	0.32
4	Geophone 2	14.89	0.08	0.60
5	Proximeter	15.04	0.06	0.33
6	L.V.D.T.	14.75	0.04	0.19

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.52 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 25 mils

Date of Experiment: 10.1.89 Diskette No.: 54
Type of Signal : Triangle Source Level: 0.120 Volts
Pulse Width: 050 ms.

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Acc 1	Geo 1	24.15	24.00	0.62
3	Prox	Acc 2	24.57	24.89	-1.30
5	LVDT	Acc 2	24.04	24.50	-1.91
7	Geo 2	Geo 1	24.13	24.01	0.50
9	Prox	Geo 2	24.59	24.00	2.40
11	LVDT	Acc 1	24.00	24.22	-0.92
13	Prox	LVDT	24.57	23.86	2.89
15	LVDT	Acc 1	24.00	24.25	-1.04
17	Acc 1	Geo 2	23.84	23.96	-0.50
19	Prox	Geo 1	24.57	24.04	2.16
21	Acc 1	Geo 1	24.42	24.04	1.56
23	LVDT	Prox	24.04	24.49	-1.87
25	Geo 2	Acc 1	24.19	24.13	0.25
27	Prox	Acc 1	24.65	24.03	2.52
29	Acc 1	Acc 2	24.26	24.59	-1.36
31	Acc 2	Prox	24.45	24.50	-0.20
33	Prox	Geo 2	24.67	24.17	2.03
35	Acc 2	Geo 2	24.73	23.99	2.99
37	Acc 1	Prox	24.26	24.50	-0.99
39	LVDT	Geo 1	24.12	24.14	-0.08
41	Acc 2	Geo 1	24.50	24.12	1.55
43	LVDT	Acc 2	24.12	24.16	-0.17
45	Geo 2	Geo 1	24.21	24.11	0.41
47	Acc 2	Geo 2	24.71	24.07	2.59
49	Acc 1	Acc 2	24.20	24.58	-1.57
51	Acc 2	Geo 1	24.58	24.14	1.79
53	Prox	Geo 1	24.68	24.12	2.27
55	LVDT	Geo 2	24.05	24.14	-0.37
57	LVDT	Geo 1	24.13	24.06	0.29
59	Geo 2	LVDT	24.17	23.98	0.79

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.53 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.52)

Date of Experiment: 10.1.89 Diskette No.: 54
Type of Signal : Triangle Source Level: 0.120 Volts
Pulse Width:050 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	24.57	24.89	-1.30
9	Prox	Geo 2	24.59	24.00	2.40
13	Prox	LVDT	24.57	23.86	2.89
19	Prox	Geo 1	24.57	24.04	2.16
23	LVDT	Prox	24.04	24.49	1.84
27	Prox	Acc 1	24.65	24.03	2.52
31	Acc 2	Prox	24.45	24.50	0.20
33	Prox	Geo 2	24.67	24.17	2.03
37	Acc 1	Prox	24.26	24.50	0.98
53	Prox	Geo 1	24.68	24.12	2.27

Table H.54 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.52)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	24.18	0.15	2.19
2	Accelerometer 2	24.57	0.18	3.40
3	Geophone 1	24.08	0.05	0.26
4	Geophone 2	24.10	0.09	0.75
5	Proximeter	24.58	0.07	0.44
6	L.V.D.T.	24.03	0.08	0.60

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.55 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 100 msec and a Nominal Deflection of 15 mils

Date of Experiment: 10.1.89 Diskette No.: 56
Type of Signal : Triangle Source Level: 0.085 Volts
Pulse Width: 100 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	12.18	14.20	-16.58
3	Prox	Acc 2	14.35	12.80	10.80
5	LVDT	Acc 2	14.26	12.85	9.89
7	Geo 2	Geo 1	14.47	14.26	1.45
9	Prox	Geo 2	14.39	14.01	2.64
11	LVDT	Acc 1	14.22	12.77	10.20
13	Prox	LVDT	14.38	14.13	1.74
15	LVDT	Acc 1	14.24	13.13	7.79
17	Acc 1	Geo 2	13.54	14.19	-4.80
19	Prox	Geo 1	14.39	14.14	1.74
21	Acc 1	Geo 1	13.77	14.20	-3.12
23	LVDT	Prox	14.21	14.37	-1.13
25	Geo 2	Acc 1	14.86	13.70	7.81
27	Prox	Acc 1	14.48	12.94	10.64
29	Acc 1	Acc 2	14.55	13.34	8.32
31	Acc 2	Prox	14.07	14.39	-2.27
33	Prox	Geo 2	14.48	14.14	2.35
35	Acc 2	Geo 2	13.60	14.08	-3.53
37	Acc 1	Prox	11.71	14.38	-22.80
39	LVDT	Geo 1	14.19	14.25	-0.42
41	Acc 2	Geo 1	13.21	14.09	-6.66
43	LVDT	Acc 2	14.19	14.02	1.20
45	Geo 2	Geo 1	14.25	14.20	0.35
47	Acc 2	Geo 2	14.51	14.35	1.10
49	Acc 1	Acc 2	13.83	13.10	5.28
51	Acc 2	Geo 1	13.56	14.17	-4.50
53	Prox	Geo 1	14.48	14.14	2.35
55	LVDT	Geo 2	14.24	14.35	-0.77
57	LVDT	Geo 1	14.23	14.21	0.14
59	Geo 2	LVDT	14.40	14.18	1.53

+Difference={Channel 1–Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.56 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.55)

Date of Experiment: 10.1.89 Diskette No.: 56
Type of Signal : Triangle Source Level: 0.085 Volts
Pulse Width:100 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	14.35	12.80	10.80
9	Prox	Geo 2	14.39	14.01	2.64
13	Prox	LVDT	14.38	14.13	1.74
19	Prox	Geo 1	14.39	14.14	1.74
23	LVDT	Prox	14.21	14.37	1.11
27	Prox	Acc 1	14.48	12.94	10.64
31	Acc 2	Prox	14.07	14.39	2.22
33	Prox	Geo 2	14.48	14.14	2.35
37	Acc 1	Prox	11.71	14.38	18.57
53	Prox	Geo 1	14.48	14.14	2.35

Table H.57 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.55)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	13.21	0.80	64.26
2	Accelerometer 2	13.51	0.53	28.11
3	Geophone 1	14.19	0.05	0.24
4	Geophone 2	14.31	0.23	5.29
5	Proximeter	14.41	0.05	0.23
6	L.V.D.T.	14.21	0.04	0.13

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.58 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 100 msec and a Nominal Deflection of 25 mils

Date of Experiment: 10.1.89 Diskette No.: 57
Type of Signal : Triangle Source Level: 0.14 Volts
Pulse Width: 100 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	21.58	23.71	-9.87
3	Prox	Acc 2	24.11	22.60	6.26
5	LVDT	Acc 2	23.85	21.86	8.34
7	Geo 2	Geo 1	24.14	23.70	1.82
9	Prox	Geo 2	24.10	23.98	0.50
11	LVDT	Acc 1	23.81	23.00	3.40
13	Prox	LVDT	24.12	23.65	1.95
15	LVDT	Acc 1	23.81	20.22	15.08
17	Acc 1	Geo 2	20.59	23.84	-15.78
19	Prox	Geo 1	24.14	23.24	3.73
21	Acc 1	Geo 1	20.82	23.51	-12.92
23	LVDT	Prox	23.78	24.01	-0.97
25	Geo 2	Acc 1	24.20	22.03	8.97
27	Prox	Acc 1	24.15	22.00	8.90
29	Acc 1	Acc 2	22.27	22.10	0.76
31	Acc 2	Prox	21.94	24.02	-9.48
33	Prox	Geo 2	24.18	23.66	2.15
35	Acc 2	Geo 2	23.15	23.75	-2.59
37	Acc 1	Prox	21.34	24.05	-12.70
39	LVDT	Geo 1	23.87	23.51	1.51
41	Acc 2	Geo 1	21.96	23.67	-7.79
43	LVDT	Acc 2	23.79	21.71	8.74
45	Geo 2	Geo 1	24.17	23.54	2.61
47	Acc 2	Geo 2	21.27	23.49	-10.44
49	Acc 1	Acc 2	23.30	21.46	7.90
51	Acc 2	Geo 1	22.29	23.47	-5.29
53	Prox	Geo 1	24.16	23.74	1.74
55	LVDT	Geo 2	23.86	24.00	-0.59
57	LVDT	Geo 1	23.83	23.54	1.22
59	Geo 2	LVDT	24.26	23.70	2.31

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.59 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.58)

Date of Experiment: 10.1.89 Diskette No.: 57
Type of Signal : Triangle Source Level: 0.14 Volts
Pulse Width:100 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	24.11	22.60	6.26
9	Prox	Geo 2	24.10	23.98	0.50
13	Prox	LVDT	24.12	23.65	1.95
19	Prox	Geo 1	24.14	23.24	3.73
23	LVDT	Prox	23.78	24.01	0.96
27	Prox	Acc 1	24.15	22.00	8.90
31	Acc 2	Prox	21.94	24.02	8.66
33	Prox	Geo 2	24.18	23.66	2.15
37	Acc 1	Prox	21.34	24.05	11.27
53	Prox	Geo 1	24.16	23.74	1.74

Table H.60 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.58)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	21.72	0.95	91.12
2	Accelerometer 2	22.03	0.52	26.98
3	Geophone 1	23.56	0.14	2.03
4	Geophone 2	23.95	0.24	5.94
5	Proximeter	24.10	0.06	0.31
6	L.V.D.T.	23.80	0.07	0.45

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.61 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 25 msec and a Nominal Deflection of 5 mils

Date of Experiment: 10.1.89 Diskette No.: 64
Type of Signal : Square Source Level: 0.0165 Volts
Pulse Width: 025 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	5.48	5.53	-0.86
3	Prox	Acc 2	5.58	5.58	-0.09
5	LVDT	Acc 2	5.52	5.82	-5.46
7	Geo 2	Geo 1	5.73	5.54	3.40
9	Prox	Geo 2	5.59	5.58	0.20
11	LVDT	Acc 1	5.41	5.63	-4.22
13	Prox	LVDT	5.61	5.49	2.18
15	LVDT	Acc 1	5.49	5.40	1.64
17	Acc 1	Geo 2	5.71	5.54	2.86
19	Prox	Geo 1	5.58	5.47	1.99
21	Acc 1	Geo 1	5.55	5.48	1.23
23	LVDT	Prox	5.51	5.55	-0.78
25	Geo 2	Acc 1	5.51	5.59	-1.53
27	Prox	Acc 1	5.59	5.33	4.72
29	Acc 1	Acc 2	5.69	5.32	6.42
31	Acc 2	Prox	6.01	5.55	7.63
33	Prox	Geo 2	5.57	5.60	-0.59
35	Acc 2	Geo 2	6.00	5.58	7.06
37	Acc 1	Prox	5.50	5.54	-0.64
39	LVDT	Geo 1	5.53	5.45	1.39
41	Acc 2	Geo 1	5.19	5.51	-6.19
43	LVDT	Acc 2	5.51	5.44	1.22
45	Geo 2	Geo 1	5.61	5.51	1.91
47	Acc 2	Geo 2	5.59	5.49	1.74
49	Acc 1	Acc 2	5.90	5.64	4.43
51	Acc 2	Geo 1	6.00	5.49	8.41
53	Prox	Geo 1	5.60	5.60	0.00
55	LVDT	Geo 2	5.49	5.57	-1.53
57	LVDT	Geo 1	5.42	5.50	-1.55
59	Geo 2	LVDT	5.57	5.46	2.06

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.62 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.61)

Date of Experiment: 10.1.89 Diskette No.: 64
Type of Signal : Square Source Level: 0.0165 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	5.58	5.58	-0.09
9	Prox	Geo 2	5.59	5.58	0.20
13	Prox	LVDT	5.61	5.49	2.18
19	Prox	Geo 1	5.58	5.47	1.99
23	LVDT	Prox	5.51	5.55	0.77
27	Prox	Acc 1	5.59	5.33	4.72
31	Acc 2	Prox	6.01	5.55	-8.26
33	Prox	Geo 2	5.57	5.60	-0.59
37	Acc 1	Prox	5.50	5.54	0.63
53	Prox	Geo 1	5.60	5.60	0.00

Table H.63 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.61)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	5.58	0.16	2.45
2	Accelerometer 2	5.66	0.28	7.71
3	Geophone 1	5.51	0.04	0.15
4	Geophone 2	5.58	0.06	0.40
5	Proximeter	5.57	0.02	0.05
6	L.V.D.T.	5.48	0.04	0.15

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.64 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 25 msec and a Nominal Deflection of 15 mil

Date of Experiment: 10.02.89 Diskette No.: 65
Type of Signal : Square Source Level: 0.033 Volts
Pulse Width: 025 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	14.94	14.68	1.74
3	Prox	Acc 2	14.97	14.96	0.07
5	LVDT	Acc 2	14.67	14.95	-1.91
7	Geo 2	Geo 1	14.86	14.59	1.82
9	Prox	Geo 2	15.01	14.74	1.80
11	LVDT	Acc 1	14.80	14.77	0.20
13	Prox	LVDT	15.02	14.63	2.60
15	LVDT	Acc 1	14.76	14.64	0.81
17	Acc 1	Geo 2	15.00	14.63	2.47
19	Prox	Geo 1	15.02	14.69	2.20
21	Acc 1	Geo 1	14.50	14.59	-0.62
23	LVDT	Prox	14.78	14.95	-1.15
25	Geo 2	Acc 1	14.88	14.85	0.20
27	Prox	Acc 1	15.07	14.45	4.11
29	Acc 1	Acc 2	14.53	14.93	-2.75
31	Acc 2	Prox	14.81	14.93	-0.81
33	Prox	Geo 2	15.08	14.65	2.85
35	Acc 2	Geo 2	15.19	14.63	3.69
37	Acc 1	Prox	14.81	14.99	-1.22
39	LVDT	Geo 1	14.81	14.71	0.68
41	Acc 2	Geo 1	15.15	14.80	2.31
43	LVDT	Acc 2	14.81	14.86	-0.34
45	Geo 2	Geo 1	14.84	14.67	1.15
47	Acc 2	Geo 2	15.50	14.74	4.90
49	Acc 1	Acc 2	14.92	15.03	-0.74
51	Acc 2	Geo 1	14.83	14.70	0.88
53	Prox	Geo 1	15.05	14.62	2.86
55	LVDT	Geo 2	14.73	14.77	-0.27
57	LVDT	Geo 1	14.79	14.69	0.68
59	Geo 2	LVDT	14.94	14.67	1.81

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.65 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.64)

Date of Experiment: 10.02.89 Diskette No.: 65
Type of Signal : Square Source Level: 0.033 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	14.97	14.96	0.07
9	Prox	Geo 2	15.01	14.74	1.80
13	Prox	LVDT	15.02	14.63	2.60
19	Prox	Geo 1	15.02	14.69	2.20
23	LVDT	Prox	14.78	14.95	1.14
27	Prox	Acc 1	15.07	14.45	4.11
31	Acc 2	Prox	14.81	14.93	0.80
33	Prox	Geo 2	15.08	14.65	2.85
37	Acc 1	Prox	14.81	14.99	1.20
53	Prox	Geo 1	15.05	14.62	2.86

Table H.66 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.64)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	14.74	0.19	3.54
2	Accelerometer 2	15.02	0.20	3.99
3	Geophone 1	14.67	0.06	0.35
4	Geophone 2	14.77	0.10	1.09
5	Proximeter	15.01	0.05	0.22
6	L.V.D.T.	14.75	0.06	0.40

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.67 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 25 msec and a Nominal Deflection of 25 mils

Date of Experiment: 10.02.89 Diskette No.: 66
Type of Signal : Square Source Level: 0.049 Volts
Pulse Width: 025 ms.

File No.	Device Used		Deflection (mil)		Difference[+] (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	23.92	24.19	-1.13
3	Prox	Acc 2	24.72	24.46	1.05
5	LVDT	Acc 2	24.12	24.92	-3.32
7	Geo 2	Geo 1	24.26	24.13	0.54
9	Prox	Geo 2	24.76	24.05	2.87
11	LVDT	Acc 1	24.30	23.92	1.56
13	Prox	LVDT	24.76	24.08	2.75
15	LVDT	Acc 1	24.29	23.90	1.61
17	Acc 1	Geo 2	24.20	24.06	0.58
19	Prox	Geo 1	24.76	24.12	2.58
21	Acc 1	Geo 1	24.27	24.15	0.49
23	LVDT	Prox	24.29	24.64	-1.44
25	Geo 2	Acc 1	24.18	23.54	2.65
27	Prox	Acc 1	24.76	24.29	1.90
29	Acc 1	Acc 2	24.62	24.85	-0.93
31	Acc 2	Prox	24.61	24.59	0.08
33	Prox	Geo 2	24.76	24.14	2.50
35	Acc 2	Geo 2	24.48	24.19	1.18
37	Acc 1	Prox	24.21	24.67	-1.90
39	LVDT	Geo 1	24.35	24.25	0.41
41	Acc 2	Geo 1	24.64	24.20	1.79
43	LVDT	Acc 2	24.27	24.18	0.37
45	Geo 2	Geo 1	24.33	24.22	0.45
47	Acc 2	Geo 2	24.81	24.11	2.82
49	Acc 1	Acc 2	24.30	24.49	-0.78
51	Acc 2	Geo 1	24.60	24.21	1.59
53	Prox	Geo 1	24.83	24.25	2.34
55	LVDT	Geo 2	24.38	24.11	1.11
57	LVDT	Geo 1	24.36	24.29	0.29
59	Geo 2	LVDT	24.39	24.21	0.74

[+]Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.68 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.67)

Date of Experiment: 10.02.89 Diskette No.: 66
Type of Signal : Square Source Level: 0.049 Volts
Pulse Width:025 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	24.72	24.46	1.05
9	Prox	Geo 2	24.76	24.05	2.87
13	Prox	LVDT	24.76	24.08	2.75
19	Prox	Geo 1	24.76	24.12	2.58
23	LVDT	Prox	24.29	24.64	1.42
27	Prox	Acc 1	24.76	24.29	1.90
31	Acc 2	Prox	24.61	24.59	-0.08
33	Prox	Geo 2	24.76	24.14	2.50
37	Acc 1	Prox	24.21	24.67	1.86
53	Prox	Geo 1	24.83	24.25	2.34

Table H.69 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.67)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	24.12	0.29	8.13
2	Accelerometer 2	24.60	0.21	4.33
3	Geophone 1	24.20	0.05	0.27
4	Geophone 2	24.18	0.11	1.16
5	Proximeter	24.73	0.07	0.46
6	L.V.D.T.	24.27	0.10	0.90

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.70 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 5 mils

Date of Experiment: 10.1.89 Diskette No.: 61
Type of Signal : Square Source Level: 0.0165 Volts
Pulse Width: 050 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	5.07	5.49	-8.29
3	Prox	Acc 2	5.24	4.80	8.38
5	LVDT	Acc 2	5.09	5.62	-10.44
7	Geo 2	Geo 1	5.44	5.37	1.36
9	Prox	Geo 2	5.25	5.12	2.51
11	LVDT	Acc 1	5.17	4.99	3.43
13	Prox	LVDT	5.28	5.20	1.53
15	LVDT	Acc 1	5.17	4.06	21.33
17	Acc 1	Geo 2	4.94	5.32	-7.84
19	Prox	Geo 1	5.26	5.24	0.32
21	Acc 1	Geo 1	4.66	5.33	-14.32
23	LVDT	Prox	5.20	5.28	-1.56
25	Geo 2	Acc 1	5.34	4.65	12.83
27	Prox	Acc 1	5.30	5.46	-3.00
29	Acc 1	Acc 2	4.80	5.48	-14.17
31	Acc 2	Prox	6.15	5.26	14.41
33	Prox	Geo 2	5.27	5.32	-1.02
35	Acc 2	Geo 2	5.40	5.22	3.28
37	Acc 1	Prox	5.01	5.26	-4.95
39	LVDT	Geo 1	5.21	5.33	-2.40
41	Acc 2	Geo 1	5.65	5.37	4.92
43	LVDT	Acc 2	5.20	5.28	-1.64
45	Geo 2	Geo 1	5.47	5.36	2.01
47	Acc 2	Geo 2	5.47	5.31	2.89
49	Acc 1	Acc 2	4.75	5.91	-24.34
51	Acc 2	Geo 1	5.54	5.24	5.43
53	Prox	Geo 1	5.27	5.33	-1.08
55	LVDT	Geo 2	5.20	5.29	-1.75
57	LVDT	Geo 1	5.24	5.43	-3.71
59	Geo 2	LVDT	5.33	5.23	1.90

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.71 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.70)

Date of Experiment: 10.1.89 Diskette No.: 61
Type of Signal : Square Source Level: 0.0165 Volts
Pulse Width:050 ms.

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
3	Prox	Acc 2	5.24	4.80	8.38
9	Prox	Geo 2	5.25	5.12	2.51
13	Prox	LVDT	5.28	5.20	1.53
19	Prox	Geo 1	5.26	5.24	0.32
23	LVDT	Prox	5.20	5.28	1.53
27	Prox	Acc 1	5.30	5.46	-3.00
31	Acc 2	Prox	6.15	5.26	-16.84
33	Prox	Geo 2	5.27	5.32	-1.02
37	Acc 1	Prox	5.01	5.26	4.71
53	Prox	Geo 1	5.27	5.33	-1.08

Table H.72 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.70)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	4.84	0.34	11.78
2	Accelerometer 2	5.53	0.34	11.59
3	Geophone 1	5.35	0.07	0.51
4	Geophone 2	5.32	0.09	0.88
5	Proximeter	5.27	0.02	0.03
6	L.V.D.T.	5.19	0.04	0.16

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.73 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 15 mils

Date of Experiment: 10.1.89 Diskette No.: 62
Type of Signal : Square Source Level: 0.04675 Volts
Pulse Width: 050 ms.

File	Device Used		Deflection (mil)		Difference+
No.	Channel 1	Channel 2	Channel 1	Channel 2	(percent)
1	Acc 1	Geo 1	16.47	16.16	1.88
3	Prox	Acc 2	16.57	16.48	0.54
5	LVDT	Acc 2	16.28	15.81	2.89
7	Geo 2	Geo 1	16.41	16.19	1.34
9	Prox	Geo 2	16.63	16.51	0.72
11	LVDT	Acc 1	16.30	15.97	2.02
13	Prox	LVDT	16.61	16.21	2.41
15	LVDT	Acc 1	16.27	16.05	1.35
17	Acc 1	Geo 2	16.28	16.30	-0.12
19	Prox	Geo 1	16.59	16.39	1.21
21	Acc 1	Geo 1	15.25	16.25	-6.56
23	LVDT	Prox	16.37	16.57	-1.22
25	Geo 2	Acc 1	16.39	15.63	4.64
27	Prox	Acc 1	16.63	16.20	2.59
29	Acc 1	Acc 2	16.33	15.81	3.18
31	Acc 2	Prox	16.55	16.52	0.18
33	Prox	Geo 2	16.65	16.43	1.32
35	Acc 2	Geo 2	16.87	16.34	3.14
37	Acc 1	Prox	16.15	16.59	-2.72
39	LVDT	Geo 1	16.38	16.22	0.98
41	Acc 2	Geo 1	16.41	16.34	0.43
43	LVDT	Acc 2	16.33	16.68	-2.14
45	Geo 2	Geo 1	16.66	16.31	2.10
47	Acc 2	Geo 2	16.19	16.32	-0.80
49	Acc 1	Acc 2	15.78	16.25	-2.98
51	Acc 2	Geo 1	16.99	16.23	4.47
53	Prox	Geo 1	16.67	16.23	2.64
55	LVDT	Geo 2	16.32	16.28	0.25
57	LVDT	Geo 1	16.37	16.20	1.04
59	Geo 2	LVDT	16.65	16.20	2.70

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.74 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.73)

Date of Experiment: 10.1.89 Diskette No.: 62
Type of Signal : Square Source Level: 0.04675 Volts
Pulse Width:050 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	16.57	16.48	0.54
9	Prox	Geo 2	16.63	16.51	0.72
13	Prox	LVDT	16.61	16.21	2.41
19	Prox	Geo 1	16.59	16.39	1.21
23	LVDT	Prox	16.37	16.57	1.21
27	Prox	Acc 1	16.63	16.20	2.59
31	Acc 2	Prox	16.55	16.52	-0.18
33	Prox	Geo 2	16.65	16.43	1.32
37	Acc 1	Prox	16.15	16.59	2.65
53	Prox	Geo 1	16.67	16.23	2.64

Table H.75 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.73)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	16.01	0.35	12.21
2	Accelerometer 2	16.40	0.38	14.39
3	Geophone 1	16.25	0.07	0.47
4	Geophone 2	16.43	0.13	1.69
5	Proximeter	16.60	0.04	0.18
6	L.V.D.T.	16.30	0.06	0.37

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.76 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 50 msec and a Nominal Deflection of 25 mil

Date of Experiment: 10.1.89 Diskette No.: 63
Type of Signal : Square Source Level: 0.066 Volts
Pulse Width: 050 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	23.78	24.35	-2.40
3	Prox	Acc 2	24.97	24.31	2.64
5	LVDT	Acc 2	24.46	24.08	1.55
7	Geo 2	Geo 1	24.80	24.38	1.69
9	Prox	Geo 2	24.95	24.51	1.76
11	LVDT	Acc 1	24.50	23.22	5.22
13	Prox	LVDT	24.98	24.31	2.68
15	LVDT	Acc 1	24.46	24.33	0.53
17	Acc 1	Geo 2	23.98	24.58	-2.50
19	Prox	Geo 1	25.00	24.40	2.40
21	Acc 1	Geo 1	23.63	24.46	-3.51
23	LVDT	Prox	24.56	24.86	-1.22
25	Geo 2	Acc 1	24.47	24.01	1.88
27	Prox	Acc 1	25.00	23.92	4.32
29	Acc 1	Acc 2	24.17	24.54	-1.53
31	Acc 2	Prox	24.53	24.89	-1.47
33	Prox	Geo 2	25.06	24.41	2.59
35	Acc 2	Geo 2	24.48	24.52	-0.16
37	Acc 1	Prox	24.10	24.93	-3.44
39	LVDT	Geo 1	24.54	24.44	0.41
41	Acc 2	Geo 1	24.63	24.50	0.53
43	LVDT	Acc 2	24.46	24.52	-0.25
45	Geo 2	Geo 1	24.60	24.42	0.73
47	Acc 2	Geo 2	24.07	24.36	-1.20
49	Acc 1	Acc 2	24.70	24.30	1.62
51	Acc 2	Geo 1	25.12	24.49	2.51
53	Prox	Geo 1	25.04	24.50	2.16
55	LVDT	Geo 2	24.51	24.56	-0.20
57	LVDT	Geo 1	24.55	24.32	0.94
59	Geo 2	LVDT	24.87	24.37	2.01

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.77 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.76)

Date of Experiment: 10.1.89 Diskette No.: 63
Type of Signal : Square Source Level: 0.066 Volts
Pulse Width:050 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	24.97	24.31	2.64
9	Prox	Geo 2	24.95	24.51	1.76
13	Prox	LVDT	24.98	24.31	2.68
19	Prox	Geo 1	25.00	24.40	2.40
23	LVDT	Prox	24.56	24.86	1.21
27	Prox	Acc 1	25.00	23.92	4.32
31	Acc 2	Prox	24.53	24.89	1.45
33	Prox	Geo 2	25.06	24.41	2.59
37	Acc 1	Prox	24.10	24.93	3.33
53	Prox	Geo 1	25.04	24.50	2.16

Table H.78 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.76)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	23.98	0.38	14.36
2	Accelerometer 2	24.46	0.29	8.24
3	Geophone 1	24.43	0.06	0.36
4	Geophone 2	24.57	0.15	2.30
5	Proximeter	24.97	0.06	0.35
6	L.V.D.T.	24.47	0.08	0.58

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.79 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 100 msec and a Nominal Deflection of 5 mils

Date of Experiment: 10.1.89 Diskette No.: 58
Type of Signal : Square Source Level: 0.01375 Volts
Pulse Width: 100 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	3.56	4.28	-20.19
3	Prox	Acc 2	4.34	4.54	-4.42
5	LVDT	Acc 2	4.20	4.74	-12.75
7	Geo 2	Geo 1	4.50	4.08	9.38
9	Prox	Geo 2	4.34	4.12	4.98
11	LVDT	Acc 1	4.21	5.80	-37.69
13	Prox	LVDT	4.35	4.20	3.38
15	LVDT	Acc 1	4.24	3.77	11.22
17	Acc 1	Geo 2	2.75	4.40	-60.34
19	Prox	Geo 1	4.32	4.29	0.76
21	Acc 1	Geo 1	5.48	4.23	22.92
23	LVDT	Prox	4.21	4.28	-1.64
25	Geo 2	Acc 1	4.30	3.03	29.57
27	Prox	Acc 1	4.32	3.24	25.07
29	Acc 1	Acc 2	5.35	6.77	-26.49
31	Acc 2	Prox	5.07	4.30	15.30
33	Prox	Geo 2	4.34	4.24	2.28
35	Acc 2	Geo 2	3.39	4.20	-24.06
37	Acc 1	Prox	5.29	4.32	18.35
39	LVDT	Geo 1	4.28	4.39	-2.59
41	Acc 2	Geo 1	4.72	4.07	13.61
43	LVDT	Acc 2	4.25	4.55	-7.03
45	Geo 2	Geo 1	4.23	4.20	0.83
47	Acc 2	Geo 2	4.47	4.23	5.35
49	Acc 1	Acc 2	4.35	6.21	-42.80
51	Acc 2	Geo 1	4.27	4.28	-0.19
53	Prox	Geo 1	4.33	4.11	5.15
55	LVDT	Geo 2	4.35	4.56	-4.66
57	LVDT	Geo 1	4.30	4.39	-2.05
59	Geo 2	LVDT	4.28	4.31	-0.82

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.80 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.79)

Date of Experiment: 10.1.89 Diskette No.: 58
Type of Signal : Square Source Level: 0.01375 Volts
Pulse Width:100 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
3	Prox	Acc 2	4.34	4.54	-4.42
9	Prox	Geo 2	4.34	4.12	4.98
13	Prox	LVDT	4.35	4.20	3.38
19	Prox	Geo 1	4.32	4.29	0.76
23	LVDT	Prox	4.21	4.28	1.61
27	Prox	Acc 1	4.32	3.24	25.07
31	Acc 2	Prox	5.07	4.30	-18.07
33	Prox	Geo 2	4.34	4.24	2.28
37	Acc 1	Prox	5.29	4.32	-22.48
53	Prox	Geo 1	4.33	4.11	5.15

Table H.81 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.79)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	4.26	1.08	117.09
2	Accelerometer 2	4.87	0.92	84.09
3	Geophone 1	4.23	0.11	1.26
4	Geophone 2	4.31	0.13	1.70
5	Proximeter	4.32	0.02	0.04
6	L.V.D.T.	4.26	0.05	0.25

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.82 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 100 msec and a Nominal Deflection of 15 mils

Date of Experiment: 10.1.89 Diskette No.: 59
Type of Signal : Square Source Level: 0.0385 Volts
Pulse Width: 100 ms.

File No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	13.92	14.70	-5.60
3	Prox	Acc 2	15.06	13.42	10.89
5	LVDT	Acc 2	14.92	14.88	0.27
7	Geo 2	Geo 1	15.50	14.99	3.29
9	Prox	Geo 2	15.09	14.70	2.58
11	LVDT	Acc 1	14.81	15.11	-2.03
13	Prox	LVDT	15.12	14.78	2.25
15	LVDT	Acc 1	14.81	14.94	-0.88
17	Acc 1	Geo 2	15.64	14.71	5.95
19	Prox	Geo 1	15.09	14.72	2.45
21	Acc 1	Geo 1	15.03	14.78	1.66
23	LVDT	Prox	14.75	14.99	-1.63
25	Geo 2	Acc 1	15.03	15.54	-3.39
27	Prox	Acc 1	15.05	14.66	2.59
29	Acc 1	Acc 2	15.24	16.04	-5.25
31	Acc 2	Prox	13.41	15.00	-11.86
33	Prox	Geo 2	15.06	14.65	2.72
35	Acc 2	Geo 2	15.39	14.56	5.39
37	Acc 1	Prox	15.13	15.01	0.79
39	LVDT	Geo 1	14.91	14.85	0.40
41	Acc 2	Geo 1	15.06	14.78	1.86
43	LVDT	Acc 2	14.84	15.12	-1.89
45	Geo 2	Geo 1	15.25	14.70	3.61
47	Acc 2	Geo 2	16.48	14.95	9.28
49	Acc 1	Acc 2	12.06	14.88	-23.38
51	Acc 2	Geo 1	14.27	14.96	-4.84
53	Prox	Geo 1	15.14	14.99	0.99
55	LVDT	Geo 2	14.85	14.70	1.01
57	LVDT	Geo 1	15.00	14.68	2.13
59	Geo 2	LVDT	15.54	14.84	4.50

+Difference={Channel 1–Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.83 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.82)

Date of Experiment: 10.1.89 Diskette No.: 59
Type of Signal : Square Source Level: 0.0385 Volts
Pulse Width:100 ms.

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference+ (percent)
3	Prox	Acc 2	15.06	13.42	10.89
9	Prox	Geo 2	15.09	14.70	2.58
13	Prox	LVDT	15.12	14.78	2.25
19	Prox	Geo 1	15.09	14.72	2.45
23	LVDT	Prox	14.75	14.99	1.60
27	Prox	Acc 1	15.05	14.66	2.59
31	Acc 2	Prox	13.41	15.00	10.60
33	Prox	Geo 2	15.06	14.65	2.72
37	Acc 1	Prox	15.13	15.01	-0.80
53	Prox	Geo 1	15.14	14.99	0.99

Table H.84 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.82)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	14.73	1.00	99.73
2	Accelerometer 2	14.90	0.94	89.18
3	Geophone 1	14.82	0.12	1.40
4	Geophone 2	14.96	0.34	11.71
5	Proximeter	15.06	0.05	0.23
6	L.V.D.T.	14.85	0.07	0.49

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.:18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.85 Testing Sequence Used in Deflection Measurements for an Impulse Motion with a Pulse Width of 100 msec and a Nominal Deflection of 25 mils

Date of Experiment: 10.1.89 Diskette No.: 60
Type of Signal : Square Source Level: 0.05775 Volts
Pulse Width: 100 ms.

File No.	Device Used		Deflection (mil)		Difference+ (percent)
	Channel 1	Channel 2	Channel 1	Channel 2	
1	Acc 1	Geo 1	22.64	24.64	-8.83
3	Prox	Acc 2	24.83	24.16	2.70
5	LVDT	Acc 2	24.52	23.79	2.98
7	Geo 2	Geo 1	25.13	24.58	2.19
9	Prox	Geo 2	24.87	24.87	0.00
11	LVDT	Acc 1	24.52	23.55	3.96
13	Prox	LVDT	24.88	24.35	2.13
15	LVDT	Acc 1	24.53	22.02	10.23
17	Acc 1	Geo 2	22.70	24.36	-7.31
19	Prox	Geo 1	24.87	24.42	1.81
21	Acc 1	Geo 1	22.65	24.21	-6.89
23	LVDT	Prox	24.53	24.78	-1.02
25	Geo 2	Acc 1	25.38	22.65	10.76
27	Prox	Acc 1	24.92	23.32	6.42
29	Acc 1	Acc 2	24.12	23.07	4.35
31	Acc 2	Prox	25.44	24.76	2.67
33	Prox	Geo 2	24.97	24.84	0.52
35	Acc 2	Geo 2	25.90	24.63	4.90
37	Acc 1	Prox	22.54	24.82	-10.12
39	LVDT	Geo 1	22.54	24.73	-9.72
41	Acc 2	Geo 1	24.62	24.37	1.02
43	LVDT	Acc 2	24.54	24.34	0.81
45	Geo 2	Geo 1	24.90	24.29	2.45
47	Acc 2	Geo 2	22.88	24.50	-7.08
49	Acc 1	Acc 2	24.41	22.55	7.62
51	Acc 2	Geo 1	24.67	24.50	0.69
53	Prox	Geo 1	24.99	24.47	2.08
55	LVDT	Geo 2	24.66	24.79	-0.53
57	LVDT	Geo 1	24.63	24.43	0.81
59	Geo 2	LVDT	25.32	24.56	3.00

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No.: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No.: 1 & 2 ; LVDT Serial No.: 4745

Table H.86 Comparison of Deflections from Proximeter and Other Sensors (for Data Reflected in Table H.85)

Date of Experiment: 10.1.89 Diskette No.: 60
Type of Signal : Square Source Level: 0.05775 Volts
Pulse Width:100 ms.

File No.	Device Used Channel 1	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference+ (percent)
3	Prox	Acc 2	24.83	24.16	2.70
9	Prox	Geo 2	24.87	24.87	0.00
13	Prox	LVDT	24.88	24.35	2.13
19	Prox	Geo 1	24.87	24.42	1.81
23	LVDT	Prox	24.53	24.78	1.01
27	Prox	Acc 1	24.92	23.32	6.42
31	Acc 2	Prox	25.44	24.76	-2.75
33	Prox	Geo 2	24.97	24.84	0.52
37	Acc 1	Prox	22.54	24.82	9.19
53	Prox	Geo 1	24.99	24.47	2.08

Table H.87 Evaluation of Variation in Deflections Measured by Each Sensor (for Data Reflected in Table H.85)

Test No.	Device Used	Average Deflection (mil)	Standard Deviation (mil)	Variance (percent)
1	Accelerometer 1	23.06	0.72	52.48
2	Accelerometer 2	24.14	1.04	107.22
3	Geophone 1	24.46	0.15	2.23
4	Geophone 2	24.87	0.32	9.93
5	Proximeter	24.87	0.07	0.51
6	L.V.D.T.	24.34	0.60	36.52

+Difference={(Prox. defl.)-(Other Device defl.)}*100/(Prox. defl.)

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1 & 2 ; LVDT Serial No.: 4745

Table H.88 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 12.5 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.9.89 Diskette No.: LAS10

Type of Signal : Half Sine Source Level: 0.05225 Volts

Pulse Width:12.5 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	5.42	5.37	0.96
2	Laser	Prox.	5.34	5.31	0.65
3	Laser	Acc 2	5.34	4.62	13.59
4	Laser	LVDT	5.45	5.28	3.14
5	Laser	Geo 2	5.41	5.40	0.17
6	Laser	Acc 1	5.32	5.78	-8.71

* Average = 5.39 mil
Standard Deviation = 0.05 mil
Variance = 0.22 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.89 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 12.5 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.9.89 Diskette No.: LAS10

Type of Signal : Half Sine Source Level: 0.15125 Volts

Pulse Width:12.5 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.50	15.15	2.26
2	Laser	Prox.	15.55	15.42	0.84
3	Laser	Acc 2	15.55	16.15	-3.86
4	Laser	LVDT	15.48	15.42	0.39
5	Laser	Geo 2	15.57	15.37	1.28
6	Laser	Acc 1	15.59	15.57	0.13

* Average = 15.52 mil
Standard Deviation = 0.03 mil
Variance = 0.09 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.90 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 12.5 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.9.89 Diskette No.: LAS10

Type of Signal : Half Sine Source Level: 0.2475 Volts

Pulse Width:12.5 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	25.12	24.78	1.35
2	Laser	Prox.	25.03	25.20	-0.68
3	Laser	Acc 2	25.08	26.06	-3.91
4	Laser	LVDT	24.93	25.15	-0.88
5	Laser	Geo 2	24.99	24.75	0.96
6	Laser	Acc 1	24.95	25.23	-1.12

* Average = 25.04 mil
Standard Deviation = 0.07 mil
Variance = 0.51 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.91 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 025 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.9.89 Diskette No.: LAS09

Type of Signal : Half Sine Source Level: 0.03025 Volts

Pulse Width:025 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.25	5.15	1.88
2	Laser	Prox.	5.27	5.09	3.42
3	Laser	Acc 2	5.34	5.88	-10.07
4	Laser	LVDT	5.24	5.18	1.09
5	Laser	Geo 2	5.28	5.33	-0.99
6	Laser	Acc 1	5.33	5.28	0.96

* Average = 5.28 mil
Standard Deviation = 0.04 mil
Variance = 0.17 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.92 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 025 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.9.89 Diskette No.: LAS09

Type of Signal : Half Sine Source Level: 0.088 Volts

Pulse Width:025 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.49	15.06	2.78
2	Laser	Prox.	15.44	15.33	0.71
3	Laser	Acc 2	15.43	14.96	3.05
4	Laser	LVDT	15.51	15.37	0.90
5	Laser	Geo 2	15.52	15.37	0.97
6	Laser	Acc 1	15.44	15.56	-0.78

* Average = 15.47 mil
Standard Deviation = 0.03 mil
Variance = 0.11 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.93 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 025 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.9.89 Diskette No.: LAS09

Type of Signal : Half Sine Source Level: 0.1485 Volts

Pulse Width:025 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	25.24	25.36	-0.48
2	Laser	Prox.	25.37	25.70	-1.30
3	Laser	Acc 2	25.66	26.27	-2.38
4	Laser	LVDT	25.92	25.65	1.04
5	Laser	Geo 2	25.72	25.15	2.22
6	Laser	Acc 1	25.68	25.71	-0.12

* Average = 25.55 mil
Standard Deviation = 0.26 mil
Variance = 6.94 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.94 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.9.89 Diskette No.: LAS08

Type of Signal : Half Sine Source Level: 0.022 Volts

Pulse Width:050 ms.

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	5.17	5.16	0.25
2	Laser	Prox.	5.15	4.93	4.25
3	Laser	Acc 2	5.15	5.12	0.62
4	Laser	LVDT	5.19	4.99	3.74
5	Laser	Geo 2	5.15	5.18	-0.70
6	Laser	Acc 1	5.16	4.76	7.77

* Average = 5.16 mil
Standard Deviation = 0.02 mil
Variance = 0.03 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.95 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.9.89 Diskette No.: LAS08

Type of Signal : Half Sine Source Level: 0.066 Volts

Pulse Width:050 ms.

Test No.	Device Used Channel 1*	Channel 2	Deflection (mil) Channel 1	Channel 2	Difference (percent)+
1	Laser	Geo 1	16.10	15.95	0.93
2	Laser	Prox.	15.90	15.82	0.50
3	Laser	Acc 2	16.03	16.92	-5.55
4	Laser	LVDT	16.07	16.07	0.00
5	Laser	Geo 2	16.08	16.11	-0.19
6	Laser	Acc 1	16.01	15.83	1.12

* Average = 16.03 mil
Standard Deviation = 0.08 mil
Variance = 0.58 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.96 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.9.89 Diskette No.: LAS08

Type of Signal : Half Sine Source Level: 0.11 Volts

Pulse Width:050 ms.

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	26.18	25.96	0.84
2	Laser	Prox.	25.93	25.84	0.35
3	Laser	Acc 2	25.83	26.18	-1.36
4	Laser	LVDT	25.93	25.88	0.19
5	Laser	Geo 2	25.95	26.02	-0.27
6	Laser	Acc 1	26.04	25.74	1.15

* Average = 25.97 mil
Standard Deviation = 0.13 mil
Variance = 1.67 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.97 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.9.89 Diskette No.: LAS07

Type of Signal : Half Sine Source Level: 0.02475 Volts

Pulse Width:075 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	5.62	5.71	-1.62
2	Laser	Prox.	5.47	5.41	1.08
3	Laser	Acc 2	5.74	5.23	8.95
4	Laser	LVDT	5.56	5.45	1.85
5	Laser	Geo 2	5.62	5.67	-0.93
6	Laser	Acc 1	5.64	5.64	0.07

* Average = 5.60 mil
Standard Deviation = 0.10 mil
Variance = 0.98 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.98 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.9.89 Diskette No.: LAS07

Type of Signal : Half Sine Source Level: 0.06875 Volts

Pulse Width:075 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.81	15.61	1.27
2	Laser	Prox.	15.73	15.94	-1.34
3	Laser	Acc 2	15.69	15.55	0.89
4	Laser	LVDT	15.78	15.71	0.44
5	Laser	Geo 2	15.78	15.63	0.95
6	Laser	Acc 1	15.56	15.33	1.48

* Average = 15.75 mil
Standard Deviation = 0.05 mil
Variance = 0.21 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.99 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.9.89 Diskette No.: LAS07

Type of Signal : Half Sine Source Level: 0.1155 Volts

Pulse Width:075 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	25.75	25.90	-0.58
2	Laser	Prox.	25.74	25.73	0.04
3	Laser	Acc 2	25.92	25.70	0.85
4	Laser	LVDT	25.79	25.58	0.81
5	Laser	Geo 2	26.14	25.96	0.69
6	Laser	Acc 1	25.75	25.15	2.33

* Average = 25.80 mil
Standard Deviation = 0.07 mil
Variance = 0.51 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.100 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.9.89 Diskette No.: LASE06

Type of Signal : Half Sine Source Level: 0.02475 Volts

Pulse Width:100 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.10	4.88	4.24
2	Laser	Prox.	5.10	5.06	0.79
3	Laser	Acc 2	5.10	4.25	16.51
4	Laser	LVDT	5.07	5.05	0.45
5	Laser	Geo 2	5.07	4.92	3.02
6	Laser	Acc 1	5.10	4.72	7.42

* Average = 5.09 mil
Standard Deviation = 0.01 mil
Variance = 0.02 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.101 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.8.89 Diskette No.: LASE06

Type of Signal : Half Sine Source Level: 0.07425 Volts

Pulse Width:100 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.00	14.55	3.00
2	Laser	Prox.	15.20	15.18	0.13
3	Laser	Acc 2	15.20	15.05	0.99
4	Laser	LVDT	15.20	15.18	0.13
5	Laser	Geo 2	15.20	14.95	1.64
6	Laser	Acc 1	15.22	14.83	2.56

* Average = 15.15 mil
Standard Deviation = 0.09 mil
Variance = 0.75 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.102 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.9.89 Diskette No.: LASE06

Type of Signal : Half Sine Source Level: 0.12375 Volts

Pulse Width:100 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	26.04	25.78	1.00
2	Laser	Prox.	26.04	26.04	0.00
3	Laser	Acc 2	26.34	23.71	9.98
4	Laser	LVDT	26.22	25.91	1.18
5	Laser	Geo 2	26.25	25.59	2.51
6	Laser	Acc 1	26.43	24.01	9.16

* Average = 26.16 mil
Standard Deviation = 0.13 mil
Variance = 1.62 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.103 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 113 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.9.89 Diskette No.: LAS11

Type of Signal : Half Sine Source Level: 0.0275 Volts

Pulse Width:112.5 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.68	5.67	0.16
2	Laser	Prox.	5.60	5.47	2.30
3	Laser	Acc 2	5.58	6.19	-10.97
4	Laser	LVDT	5.60	5.59	0.07
5	Laser	Geo 2	5.66	5.58	1.36
6	Laser	Acc 1	5.82	6.07	-4.42

* Average = 5.61 mil
Standard Deviation = 0.04 mil
Variance = 0.16 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.104 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 113 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.9.89 Diskette No.: LAS11

Type of Signal : Half Sine Source Level: 0.07425 Volts

Pulse Width:112.5 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.13	14.81	2.12
2	Laser	Prox.	15.09	14.89	1.33
3	Laser	Acc 2	15.17	15.03	0.92
4	Laser	LVDT	15.18	15.09	0.59
5	Laser	Geo 2	15.09	15.15	-0.40
6	Laser	Acc 1	15.14	15.13	0.07

* Average = 15.14 mil
Standard Deviation = 0.04 mil
Variance = 0.13 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.105 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 113 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.10.89 Diskette No.: LAS11

Type of Signal : Half Sine Source Level: 0.12375 Volts

Pulse Width:112.5 ms.

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	25.74	25.73	0.04
2	Laser	Prox.	25.87	25.63	0.93
3	Laser	Acc 2	25.84	24.04	6.97
4	Laser	LVDT	25.87	25.83	0.15
5	Laser	Geo 2	25.87	25.80	0.27
6	Laser	Acc 1	25.87	24.19	6.49

* Average = 25.83 mil
Standard Deviation = 0.05 mil
Variance = 0.28 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.106 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 125 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.10.89 Diskette No.: LAS12

Type of Signal : Half Sine Source Level: 0.02475 Volts

Pulse Width:125 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	5.07	5.09	-0.41
2	Laser	Prox.	5.27	5.18	1.58
3	Laser	Acc 2	5.17	5.65	-9.20
4	Laser	LVDT	5.16	5.20	-0.83
5	Laser	Geo 2	5.16	5.15	0.12
6	Laser	Acc 1	5.12	5.05	1.46

* Average = 5.17 mil
Standard Deviation = 0.07 mil
Variance = 0.49 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.107 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 125 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.10.89 Diskette No.: LAS12

Type of Signal : Half Sine Source Level: 0.07425 Volts

Pulse Width:125 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.17	14.82	2.31
2	Laser	Prox.	15.12	14.88	1.59
3	Laser	Acc 2	15.16	13.93	8.11
4	Laser	LVDT	15.22	15.08	0.92
5	Laser	Geo 2	15.17	15.01	1.05
6	Laser	Acc 1	15.17	13.74	9.43

* Average = 15.17 mil
Standard Deviation = 0.04 mil
Variance = 0.13 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.108 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 125 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.10.89 Diskette No.: LAS12

Type of Signal : Half Sine Source Level: 0.12375 Volts

Pulse Width:125 ms.

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	26.07	25.76	1.19
2	Laser	Prox.	26.27	25.85	0.35
3	Laser	Acc 2	26.20	22.24	14.43
4	Laser	LVDT	26.46	26.20	0.98
5	Laser	Geo 2	26.25	25.93	1.22
6	Laser	Acc 1	26.10	22.79	12.68

* Average = 26.23 mil
Standard Deviation = 0.13 mil
Variance = 1.64 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.109 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 150 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.10.89 Diskette No.: LAS13

Type of Signal : Half Sine Source Level: 0.0275 Volts

Pulse Width:150 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.17	5.18	-0.12
2	Laser	Prox.	5.19	5.20	-0.12
3	Laser	Acc 2	5.30	5.70	-7.57
4	Laser	LVDT	5.24	5.30	-1.18
5	Laser	Geo 2	5.25	5.14	2.00
6	Laser	Acc 1	5.27	4.91	6.78

* Average = 5.23 mil
Standard Deviation = 0.05 mil
Variance = 0.23 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.110 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 150 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.10.89 Diskette No.: LAS13

Type of Signal : Half Sine Source Level: 0.07425 Volts

Pulse Width:150 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.06	14.63	2.86
2	Laser	Prox.	15.14	14.77	0.54
3	Laser	Acc 2	15.01	13.57	7.69
4	Laser	LVDT	15.20	14.96	1.58
5	Laser	Geo 2	15.12	14.76	2.38
6	Laser	Acc 1	15.20	12.40	14.72

* Average = 15.12 mil
Standard Deviation = 0.01 mil
Variance = 0.48 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.111 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 150 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.10.89 Diskette No.: LAS13

Type of Signal : Half Sine Source Level: 0.11825 Volts

Pulse Width:150 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	25.96	25.55	1.58
2	Laser	Prox.	26.12	25.66	1.76
3	Laser	Acc 2	26.09	25.33	2.91
4	Laser	LVDT	25.96	25.96	0.00
5	Laser	Geo 2	25.86	25.76	0.39
6	Laser	Acc 1	26.17	20.23	22.70

* Average = 26.03 mil
Standard Deviation = 0.07 mil
Variance = 0.54 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.112 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 175 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.12.89 Diskette No.: LAS21

Type of Signal : Half Sine Source Level: 0.0275 Volts

Pulse Width:175 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.12	5.02	2.01
2	Laser	Prox.	5.20	5.09	2.12
3	Laser	Acc 2	5.28	3.58	32.21
4	Laser	LVDT	5.15	5.24	-1.71
5	Laser	Geo 2	5.13	4.97	3.17
6	Laser	Acc 1	5.24	5.53	-5.52

* Average = 5.19 mil
Standard Deviation = 0.06 mil
Variance = 0.36 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.113 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 175 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.12.89 Diskette No.: LAS21

Type of Signal : Half Sine Source Level: 0.07425 Volts

Pulse Width:175 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.10	14.64	3.05
2	Laser	Prox.	15.19	14.68	3.36
3	Laser	Acc 2	15.01	13.19	12.13
4	Laser	LVDT	15.09	15.09	0.00
5	Laser	Geo 2	14.93	14.49	2.95
6	Laser	Acc 1	15.02	15.17	-1.00

* Average = 15.10 mil
Standard Deviation = 0.06 mil
Variance = 0.41 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.114 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 175 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.12.89 Diskette No.: LAS21

Type of Signal : Half Sine Source Level: 0.11275 Volts

Pulse Width:175 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	26.30	25.14	3.01
2	Laser	Prox.	26.26	25.57	1.88
3	Laser	Acc 2	26.12	21.07	19.33
4	Laser	LVDT	26.34	26.28	0.23
5	Laser	Geo 2	26.25	25.71	2.06
6	Laser	Acc 1	26.21	20.00	23.69

* Average = 26.25 mil
Standard Deviation = 0.01 mil
Variance = 0.49 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.115 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 025 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.12.89 Diskette No.: LAS22

Type of Signal : Triangle Source Level: 0.045 Volts

Pulse Width:025 ms.

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	5.79	5.89	-1.64
2	Laser	Prox.	5.76	5.71	0.95
3	Laser	Acc 2	5.79	5.61	3.16
4	Laser	LVDT	5.84	5.87	-0.39
5	Laser	Geo 2	5.75	5.96	-3.69
6	Laser	Acc 1	5.82	5.86	-0.77

* Average = 5.80 mil
Standard Deviation = 0.03 mil
Variance = 0.08 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.116 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 025 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.12.89 Diskette No.: LAS22

Type of Signal : Triangle Source Level: 0.095 Volts

Pulse Width:025 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	16.14	16.03	0.68
2	Laser	Prox.	16.08	15.73	2.18
3	Laser	Acc 2	16.05	16.60	-3.43
4	Laser	LVDT	16.02	16.22	-1.25
5	Laser	Geo 2	16.12	16.07	0.31
6	Laser	Acc 1	16.08	15.85	1.43

* Average = 16.07 mil
Standard Deviation = 0.04 mil
Variance = 0.20 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.117 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 025 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.12.89 Diskette No.: LAS22

Type of Signal : Triangle Source Level: 0.155 Volts

Pulse Width:025 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	26.21	25.95	0.12
2	Laser	Prox.	26.33	25.57	2.89
3	Laser	Acc 2	26.38	26.78	-1.52
4	Laser	LVDT	26.47	26.23	0.91
5	Laser	Geo 2	26.21	25.88	1.26
6	Laser	Acc 1	26.29	26.39	-0.38

* Average = 26.32 mil
Standard Deviation = 0.09 mil
Variance = 0.85 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.118 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.13.89 Diskette No.: LAS23

Type of Signal : Triangle Source Level: 0.028 Volts

Pulse Width:050 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.88	5.81	1.16
2	Laser	Prox.	5.92	5.82	1.71
3	Laser	Acc 2	5.96	5.98	-0.32
4	Laser	LVDT	5.99	5.98	0.17
5	Laser	Geo 2	6.11	6.11	0.02
6	Laser	Acc 1	6.01	5.92	1.60

* Average = 5.94 mil
Standard Deviation = 0.04 mil
Variance = 0.16 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.119 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.13.89 Diskette No.: LAS23

Type of Signal : Triangle Source Level: 0.073 Volts

Pulse Width:050 ms.

Test No.	Device Used Channel 1*	Channel 2	Deflection (mil) Channel 1	Channel 2	Difference (percent)+
1	Laser	Geo 1	16.24	15.63	3.76
2	Laser	Prox.	16.11	15.64	2.92
3	Laser	Acc 2	16.28	16.60	-1.97
4	Laser	LVDT	16.12	15.77	2.17
5	Laser	Geo 2	16.23	15.72	3.14
6	Laser	Acc 1	16.15	15.25	5.57

* Average = 16.19 mil
Standard Deviation = 0.07 mil
Variance = 0.55 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.120 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.13.89 Diskette No.: LAS23

Type of Signal : Triangle Source Level: 0.12 Volts

Pulse Width:050 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	25.40	25.36	0.16
2	Laser	Prox.	25.51	25.47	0.16
3	Laser	Acc 2	25.69	26.53	-3.27
4	Laser	LVDT	25.45	25.45	0.00
5	Laser	Geo 2	25.41	25.24	0.67
6	Laser	Acc 1	25.59	24.48	4.34

* Average = 25.51 mil
Standard Deviation = 0.11 mil
Variance = 1.20 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.121 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.13.89 Diskette No.: LAS24

Type of Signal : Triangle Source Level: 0.028 Volts

Pulse Width:075 ms.

Test No.	Device Used		Deflection (mil)		Difference
	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.43	5.47	-0.64
2	Laser	Prox.	5.43	5.40	0.61
3	Laser	Acc 2	5.51	5.14	6.76
4	Laser	LVDT	5.63	5.55	1.49
5	Laser	Geo 2	5.53	5.58	-0.94
6	Laser	Acc 1	5.55	6.12	-10.31

* Average = 5.50 mil
Standard Deviation = 0.08 mil
Variance = 0.65 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.122 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.13.89 Diskette No.: LAS24

Type of Signal : Triangle Source Level: 0.078 Volts

Pulse Width:075 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.83	15.40	2.72
2	Laser	Prox.	15.82	15.40	2.65
3	Laser	Acc 2	15.75	16.02	-1.71
4	Laser	LVDT	15.79	15.61	1.14
5	Laser	Geo 2	15.84	15.48	2.27
6	Laser	Acc 1	15.80	14.52	8.10

* Average = 15.80 mil
Standard Deviation = 0.03 mil
Variance = 0.10 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.123 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.13.89 Diskette No.: LAS24

Type of Signal : Triangle Source Level: 0.135 Volts

Pulse Width:075 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	25.10	24.83	1.08
2	Laser	Prox.	25.05	25.01	0.16
3	Laser	Acc 2	25.05	23.59	5.83
4	Laser	LVDT	25.27	25.18	0.36
5	Laser	Geo 2	25.38	25.16	0.87
6	Laser	Acc 1	25.16	23.35	7.19

* Average = 25.12 mil
Standard Deviation = 0.09 mil
Variance = 0.82 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.124 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.13.89 Diskette No.: LAS25

Type of Signal : Triangle Source Level: 0.030 Volts

Pulse Width:100 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.43	5.43	0.17
2	Laser	Prox.	5.44	5.39	0.92
3	Laser	Acc 2	5.43	5.30	2.54
4	Laser	LVDT	5.46	5.28	3.24
5	Laser	Geo 2	5.46	5.25	3.78
6	Laser	Acc 1	5.47	5.19	5.01

* Average = 5.44 mil
Standard Deviation = 0.01 mil
Variance = 0.01 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.125 Comparison of Deflection from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.13.89 Diskette No.: LAS25

Type of Signal : Triangle Source Level: 0.085 Volts

Pulse Width:100 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.50	15.00	3.23
2	Laser	Prox.	15.74	15.52	1.40
3	Laser	Acc 2	15.85	14.03	11.48
4	Laser	LVDT	15.69	15.56	0.83
5	Laser	Geo 2	15.68	15.37	1.98
6	Laser	Acc 1	15.68	14.00	10.71

* Average = 15.70 mil
Standard Deviation = 0.13 mil
Variance = 1.60 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.126 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.13.89 Diskette No.: LAS25

Type of Signal : Triangle Source Level: 0.140 Volts

Pulse Width:100 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	26.00	25.68	1.23
2	Laser	Prox.	26.07	25.73	1.30
3	Laser	Acc 2	26.19	23.86	8.90
4	Laser	LVDT	26.18	26.01	0.65
5	Laser	Geo 2	26.18	26.18	0.00
6	Laser	Acc 1	26.12	23.65	9.46

* Average = 26.11 mil
Standard Deviation = 0.08 mil
Variance = 0.63 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.127 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 025 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.12.89 Diskette No.: LAS20

Type of Signal : Square Source Level: 0.0165 Volts

Pulse Width:025 ms.

Test No.	Device Used Channel 1*	Channel 2	Deflection (mil) Channel 1	Channel 2	Difference (percent)+
1	Laser	Geo 1	5.31	5.38	-1.28
2	Laser	Prox.	5.18	5.20	-0.42
3	Laser	Acc 2	5.21	5.28	-1.30
4	Laser	LVDT	5.34	5.34	0.04
5	Laser	Geo 2	5.21	5.38	-3.26
6	Laser	Acc 1	5.24	5.28	-0.72

* Average = 5.26 mil
Standard Deviation = 0.07 mil
Variance = 0.46 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.128 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 250 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.12.89 Diskette No.: LAS20

Type of Signal : Square Source Level: 0.033 Volts

Pulse Width:025 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.73	15.65	0.51
2	Laser	Prox.	15.57	15.40	1.09
3	Laser	Acc 2	15.69	16.47	-4.97
4	Laser	LVDT	15.69	15.88	-1.21
5	Laser	Geo 2	15.74	15.67	0.44
6	Laser	Acc 1	15.60	15.35	1.60

* Average = 15.67 mil
Standard Deviation = 0.06 mil
Variance = 0.36 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.129 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 025 msec and a Nominal Deflection of 25 mil

Date of Experiment: 9.12.89 Diskette No.: LAS20

Type of Signal : Square Source Level: 0.049 Volts

Pulse Width:025 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	25.63	25.35	1.09
2	Laser	Prox.	25.56	25.04	0.24
3	Laser	Acc 2	25.56	25.42	-0.24
4	Laser	LVDT	25.59	25.60	-0.04
5	Laser	Geo 2	25.56	25.38	0.70
6	Laser	Acc 1	25.33	25.88	-2.58

* Average = 25.52 mil
Standard Deviation = 0.13 mil
Variance = 1.76 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.130 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.11.89 Diskette No.: LAS19

Type of Signal : Square Source Level: 0.0165 Volts

Pulse Width:050 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	5.38	5.44	-1.13
2	Laser	Prox.	5.34	5.25	1.70
3	Laser	Acc 2	5.34	5.86	-9.64
4	Laser	LVDT	5.48	5.44	0.58
5	Laser	Geo 2	5.34	5.51	-3.09
6	Laser	Acc 1	5.41	6.02	-11.20

* Average = 5.38 mil
Standard Deviation = 0.05 mil
Variance = 0.29 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.131 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.11.89 Diskette No.: LAS19

Type of Signal : Square Source Level: 0.04675 Volts

Pulse Width:050 ms.

Test No.	Device Used		Deflection (mil)		Difference
	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	16.46	16.31	0.12
2	Laser	Prox.	16.49	16.20	1.16
3	Laser	Acc 2	16.66	17.31	-2.73
4	Laser	LVDT	16.75	16.61	0.84
5	Laser	Geo 2	16.66	16.32	2.04
6	Laser	Acc 1	16.72	16.94	-1.32

* Average = 16.62 mil
Standard Deviation = 0.11 mil
Variance = 1.21 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.132 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 050 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.11.89 Diskette No.: LAS19

Type of Signal : Square Source Level: 0.066 Volts

Pulse Width:050 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	25.07	24.71	1.44
2	Laser	Prox.	24.97	24.38	2.36
3	Laser	Acc 2	25.03	24.74	1.16
4	Laser	LVDT	24.97	25.02	-0.20
5	Laser	Geo 2	25.03	24.76	1.08
6	Laser	Acc 1	25.17	24.52	2.58

* Average = 25.01 mil
Standard Deviation = 0.04 mil
Variance = 0.18 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.133 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 5 mil

Date of Experiment: 9.11.89 Diskette No.: LAS18

Type of Signal : Square Source Level: 0.0165 Volts

Pulse Width:075 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.74	5.82	-1.36
2	Laser	Prox.	5.61	5.74	-2.30
3	Laser	Acc 2	5.61	5.72	-2.00
4	Laser	LVDT	5.71	5.82	-1.93
5	Laser	Geo 2	5.81	5.87	-1.12
6	Laser	Acc 1	5.81	6.74	-16.07

* Average = 5.66 mil
Standard Deviation = 0.06 mil
Variance = 0.35 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.134 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.11.89 Diskette No.: LAS18

Type of Signal : Square Source Level: 0.04125 Volts

Pulse Width:075 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.17	14.69	0.34
2	Laser	Prox.	15.17	14.85	2.11
3	Laser	Acc 2	15.14	16.25	-7.33
4	Laser	LVDT	15.27	15.17	0.65
5	Laser	Geo 2	15.20	14.90	1.97
6	Laser	Acc 1	15.11	14.47	4.24

* Average = 15.10 mil
Standard Deviation = 0.05 mil
Variance = 0.25 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.135 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 075 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.11.89 Diskette No.: LAS18

Type of Signal : Square Source Level: 0.0605 Volts

Pulse Width:075 ms.

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	25.49	25.28	0.82
2	Laser	Prox.	25.53	25.33	0.78
3	Laser	Acc 2	25.54	24.83	2.78
4	Laser	LVDT	25.80	25.84	-0.16
5	Laser	Geo 2	25.87	25.64	0.89
6	Laser	Acc 1	25.87	23.60	8.77

* Average = 25.59 mil
Standard Deviation = 0.12 mil
Variance = 1.51 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.136 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.10.89 Diskette No.: LAS14

Type of Signal : Square Source Level: 0.01375 Volts

Pulse Width:100 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	5.32	5.24	1.56
2	Laser	Prox.	5.31	5.16	2.77
3	Laser	Acc 2	5.21	4.35	16.55
4	Laser	LVDT	5.27	5.20	1.25
5	Laser	Geo 2	5.24	5.16	1.58
6	Laser	Acc 1	5.31	5.52	-4.13

* Average = 5.28 mil
Standard Deviation = 0.04 mil
Variance = 0.17 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.137 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.10.89 Diskette No.: LAS14

Type of Signal : Square Source Level: 0.0385 Volts

Pulse Width:100 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	15.36	14.98	2.47
2	Laser	Prox.	15.44	15.33	0.71
3	Laser	Acc 2	15.39	16.24	-5.52
4	Laser	LVDT	15.57	15.45	0.77
5	Laser	Geo 2	15.57	15.38	1.22
6	Laser	Acc 1	15.57	16.52	-6.10

* Average = 15.44 mil
Standard Deviation = 0.08 mil
Variance = 0.65 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.138 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 100 msec and a Nominal Deflection of 25 mil

Date of Experiment: 9.10.89 Diskette No.: LAS14

Type of Signal : Square Source Level: 0.05775 Volts

Pulse Width:100 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	25.73	25.68	0.19
2	Laser	Prox.	25.70	25.56	0.54
3	Laser	Acc 2	25.73	25.37	1.40
4	Laser	LVDT	25.75	25.80	-0.19
5	Laser	Geo 2	25.65	25.58	0.27
6	Laser	Acc 1	25.73	23.24	9.68

* Average = 25.73 mil
Standard Deviation = 0.02 mil
Variance = 0.03 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.139 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 125 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.10.89 Diskette No.: LAS15

Type of Signal : Square Source Level: 0.01375 Volts

Pulse Width:125 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	5.42	5.40	0.46
2	Laser	Prox.	5.42	5.34	1.62
3	Laser	Acc 2	5.42	4.36	19.58
4	Laser	LVDT	5.44	5.46	-0.35
5	Laser	Geo 2	5.27	5.15	2.15
6	Laser	Acc 1	5.28	6.54	-23.97

* Average = 5.43 mil
Standard Deviation = 0.01 mil
Variance = 0.00 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelorometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.140 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 125 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.10.89 Diskette No.: LAS15

Type of Signal : Square Source Level: 0.03575 Volts

Pulse Width:125 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	14.72	14.34	2.58
2	Laser	Prox.	14.97	14.84	0.87
3	Laser	Acc 2	14.81	15.34	-3.58
4	Laser	LVDT	14.93	15.00	-0.47
5	Laser	Geo 2	14.93	14.76	1.14
6	Laser	Acc 1	14.75	13.38	9.29

* Average = 14.86 mil
Standard Deviation = 0.10 mil
Variance = 0.98 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.141 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 125 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.10.89 Diskette No.: LAS15

Type of Signal : Square Source Level: 0.05225 Volts

Pulse Width:125 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	25.96	25.70	1.00
2	Laser	Prox.	25.96	25.48	1.85
3	Laser	Acc 2	25.95	24.49	5.63
4	Laser	LVDT	25.84	25.82	0.08
5	Laser	Geo 2	26.04	25.99	0.19
6	Laser	Acc 1	25.97	21.71	16.40

* Average = 25.93 mil
Standard Deviation = 0.05 mil
Variance = 0.26 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.142 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 150 msec and a Nominal Deflection of 5 mil

Date of Experiment: 9.10.89 Diskette No.: LAS16

Type of Signal : Square Source Level: 0.0165 Volts

Pulse Width:150 ms.

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	6.03	5.96	1.13
2	Laser	Prox.	6.01	6.13	-1.96
3	Laser	Acc 2	6.15	6.21	-1.03
4	Laser	LVDT	6.25	6.34	-1.46
5	Laser	Geo 2	6.12	6.26	-2.32
6	Laser	Acc 1	6.07	5.00	17.52

* Average = 6.11 mil
Standard Deviation = 0.10 mil
Variance = 0.91 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.143 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 150 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.11.89 Diskette No.: LAS16

Type of Signal : Square Source Level: 0.03575 Volts

Pulse Width:150 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	15.49	15.22	1.74
2	Laser	Prox.	15.85	15.53	2.02
3	Laser	Acc 2	15.62	16.16	-3.46
4	Laser	LVDT	15.72	15.77	-0.32
5	Laser	Geo 2	15.71	15.84	-0.83
6	Laser	Acc 1	15.94	15.67	1.69

* Average = 15.67 mil
Standard Deviation = 0.13 mil
Variance = 1.75 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.144 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 150 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.11.89 Diskette No.: LAS16

Type of Signal : Square Source Level: 0.0495 Volts

Pulse Width:150 ms.

Test No.	Device Used Channel 1*	Device Used Channel 2	Deflection (mil) Channel 1	Deflection (mil) Channel 2	Difference (percent)+
1	Laser	Geo 1	24.83	24.14	2.78
2	Laser	Prox.	24.92	24.40	2.09
3	Laser	Acc 2	24.86	21.51	13.48
4	Laser	LVDT	24.87	24.77	0.40
5	Laser	Geo 2	25.08	25.03	0.20
6	Laser	Acc 1	24.93	24.98	-0.20

* Average = 24.87 mil
Standard Deviation = 0.03 mil
Variance = 0.10 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.145 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 175 msec and a Nominal Deflection of 5 mils

Date of Experiment: 9.11.89 Diskette No.: LAS17

Type of Signal : Square Source Level: 0.01375 Volts

Pulse Width:175 ms.

Test No.	Device Used		Deflection (mil)		Difference (percent)+
	Channel 1*	Channel 2	Channel 1	Channel 2	
1	Laser	Geo 1	5.22	5.15	1.25
2	Laser	Prox.	5.35	5.26	1.63
3	Laser	Acc 2	5.31	4.52	14.90
4	Laser	LVDT	5.31	5.47	-2.98
5	Laser	Geo 2	5.53	5.70	-3.15
6	Laser	Acc 1	5.58	6.02	-7.87

* Average = 5.30 mil
Standard Deviation = 0.05 mil
Variance = 0.25 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.146 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 175 msec and a Nominal Deflection of 15 mils

Date of Experiment: 9.11.89 Diskette No.: LAS17

Type of Signal : Square Source Level: 0.03575 Volts

Pulse Width:175 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	16.20	15.73	2.90
2	Laser	Prox.	16.23	16.22	0.06
3	Laser	Acc 2	16.21	17.00	-4.87
4	Laser	LVDT	16.16	16.49	-2.04
5	Laser	Geo 2	16.26	16.38	-0.74
6	Laser	Acc 1	16.16	15.53	3.90

* Average = 16.20 mil
Standard Deviation = 0.03 mil
Variance = 0.07 percent

+Difference={Channel 1-Channel 2}*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

Table H.147 Comparison of Deflections from Laser and Other Sensors for a Pulse Width of 175 msec and a Nominal Deflection of 25 mils

Date of Experiment: 9.11.89 Diskette No.: LAS17

Type of Signal : Square Source Level: 0.0495 Volts

Pulse-Width:175 ms.

Test	Device Used		Deflection (mil)		Difference
No.	Channel 1*	Channel 2	Channel 1	Channel 2	(percent)+
1	Laser	Geo 1	24.74	24.07	2.71
2	Laser	Prox.	24.92	24.23	2.77
3	Laser	Acc 2	24.80	22.11	10.85
4	Laser	LVDT	24.91	24.64	1.08
5	Laser	Geo 2	24.99	24.55	1.76
6	Laser	Acc 1	24.99	25.35	-1.44

* Average = 24.84 mil
Standard Deviation = 0.08 mil
Variance = 0.57 percent

+Difference=(Channel 1-Channel 2)*100/Channel 1

Accelerometer Serial No's: 23641 & 42 ; Prox. Serial No.: 18745
Geophone No's: 1&2; LVDT Serial No.: 4745; Laser Serial No. 2201

APPENDIX I

EVALUATION OF ACCURACY OF EACH SENSOR

FOR HALF-SINE WAVE MOTION

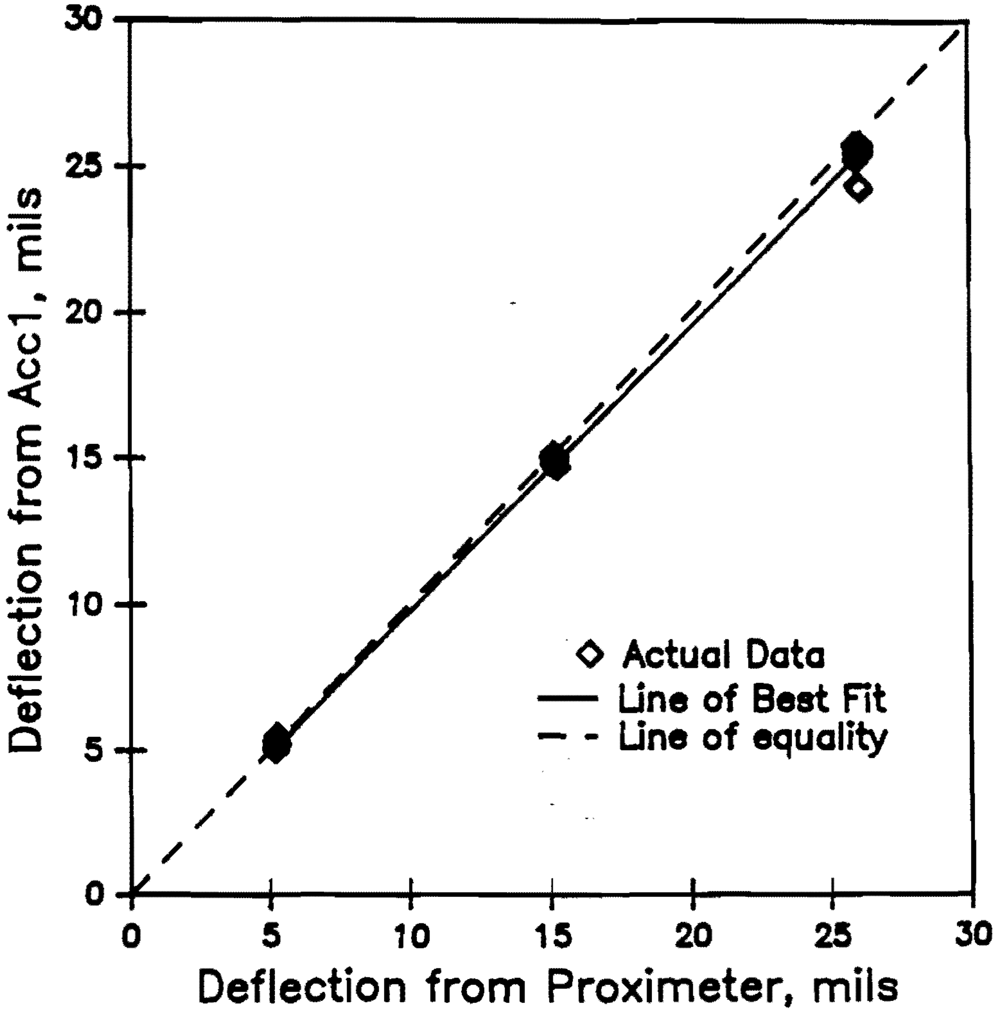


Figure I.1 Evaluation of Accuracy of Accelerometer 1 for Half-Sine Wave at Pulse Width of 25 msec. (Slope of Line is 1.03)

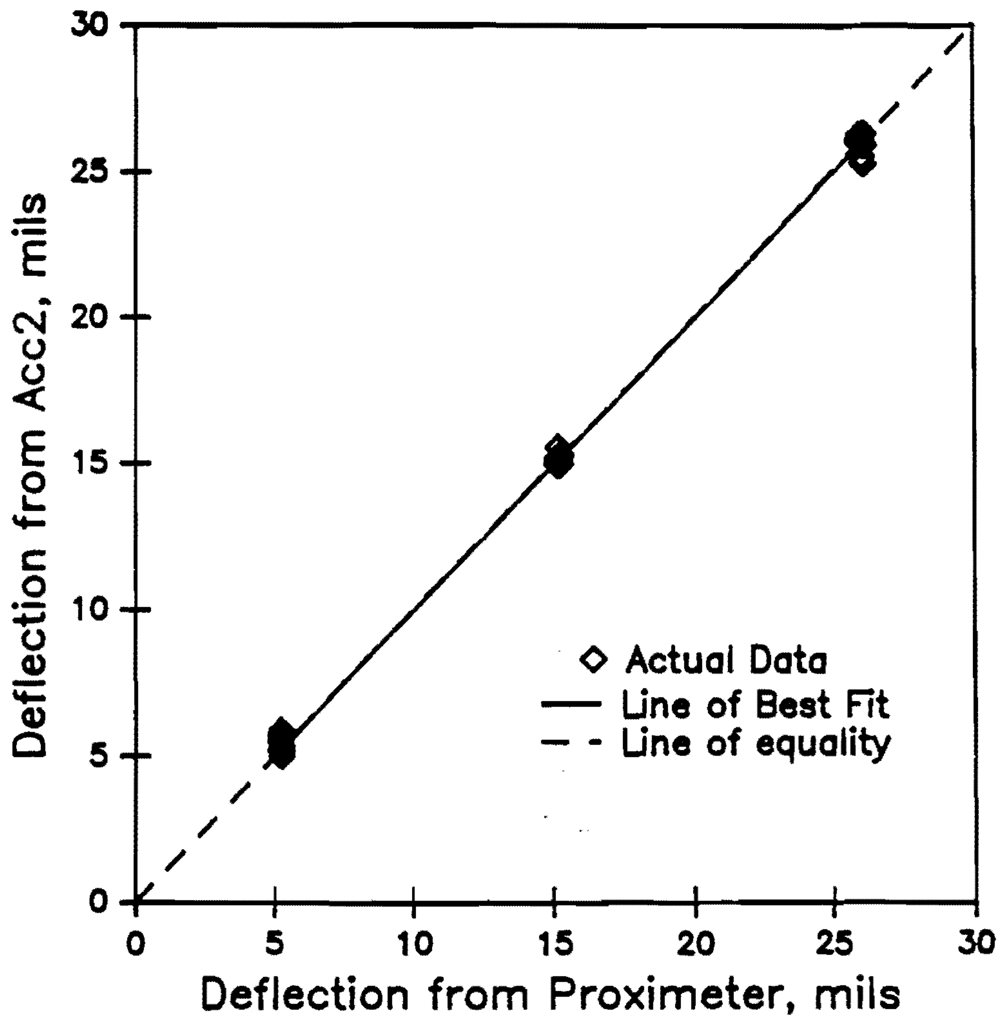


Figure I.2 Evaluation of Accuracy of Accelerometer 2 for Half-Sine Wave at Pulse Width of 25 msec. (Slope of Line is 1.00)

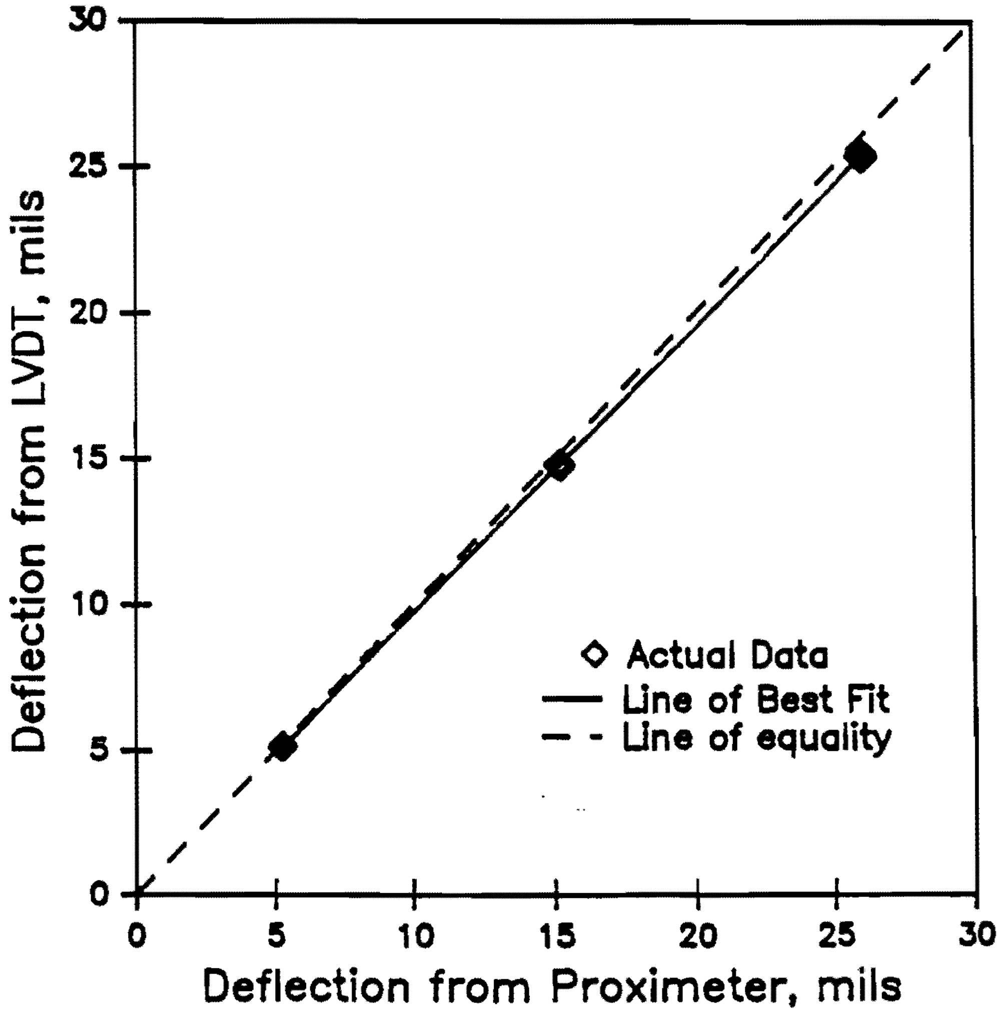


Figure I.3 Evaluation of Accuracy of LVDT for Half-Sine Wave at Pulse Width of 25 msec. (Slope of Line is 1.02)

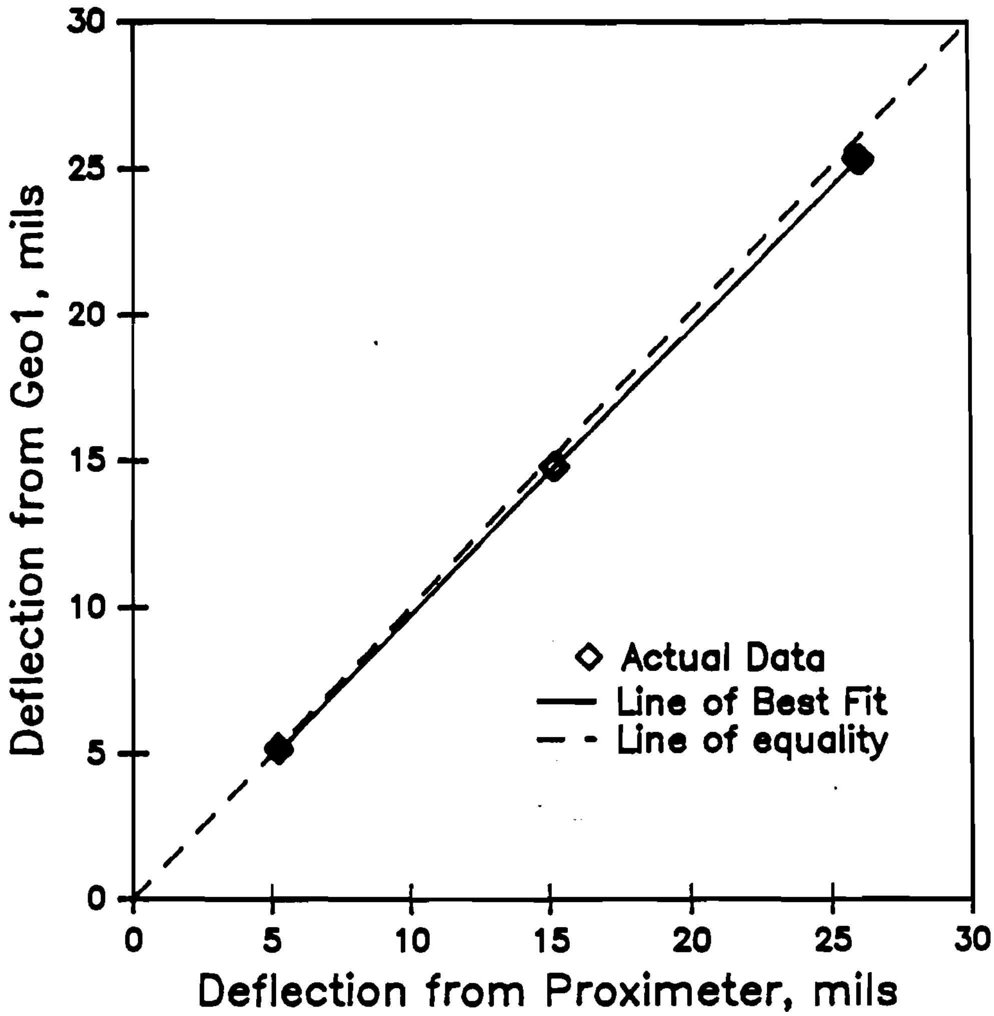


Figure I.4 Evaluation of Accuracy of Geophone 1 for Half-Sine Wave at Pulse Width of 25 msec. (Slope of Line is 1.01)

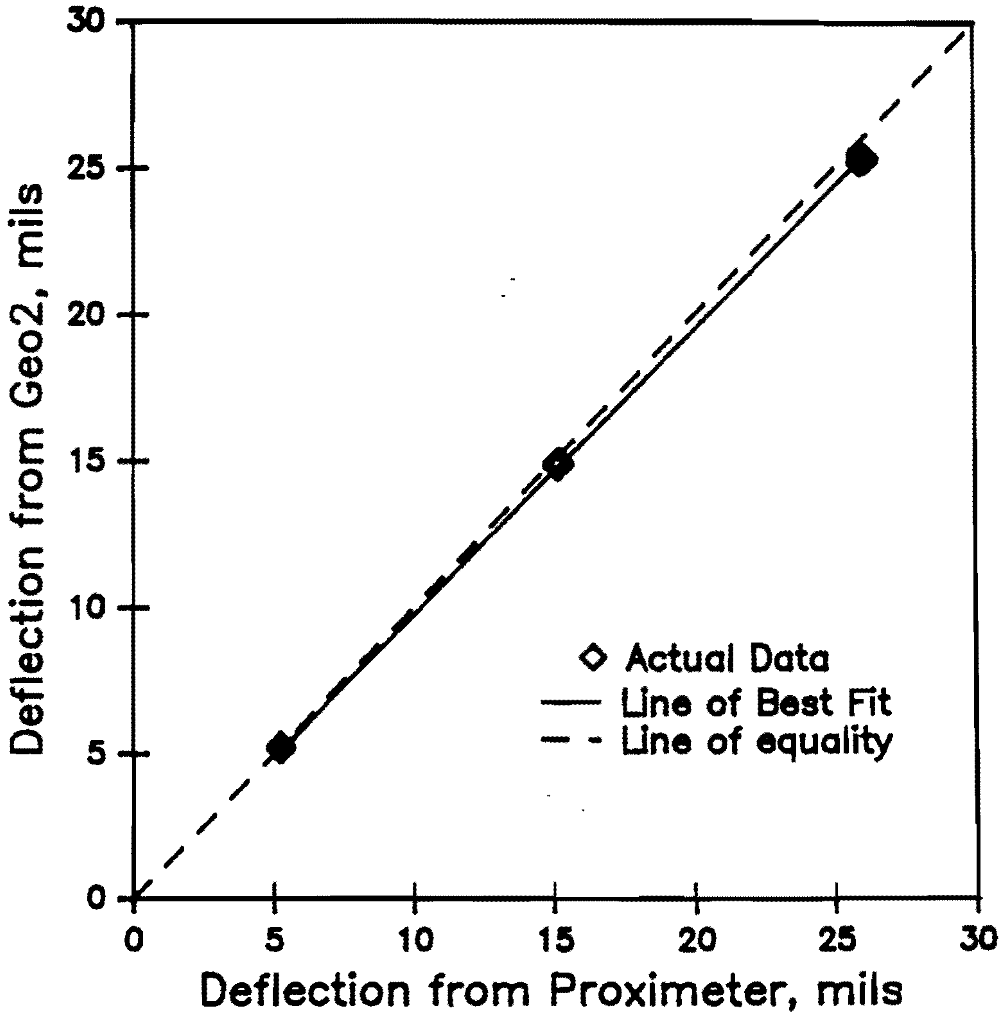


Figure I.5 Evaluation of Accuracy of Geophone 2 for Half-Sine Wave at Pulse Width of 25 msec. (Slope of Line is 1.00)

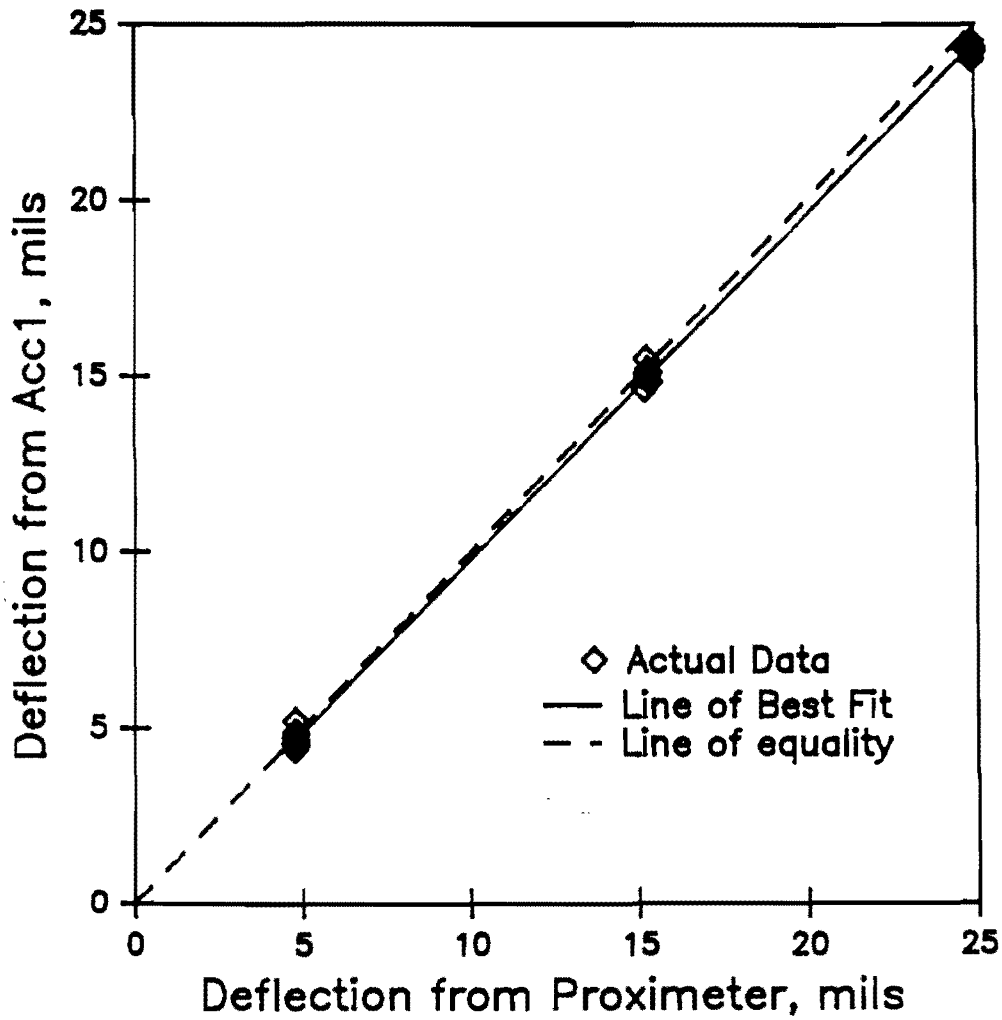


Figure I.6 Evaluation of Accuracy of Accelerometer 1 for Half-Sine Wave at Pulse Width of 50 msec. (Slope of Line is 1.03)

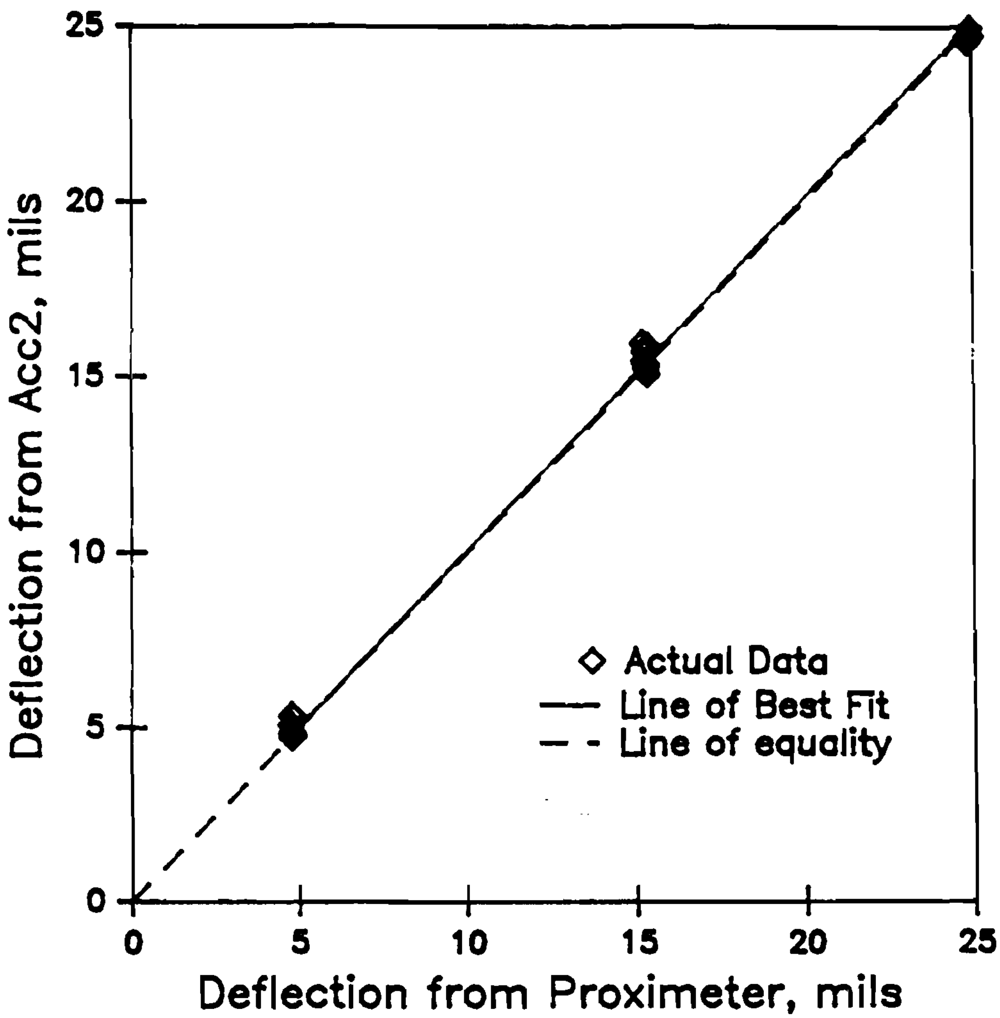


Figure I.7 Evaluation of Accuracy of Accelerometer 2 for Half-Sine Wave at Pulse Width of 50 msec. (Slope of Line is 1.00)

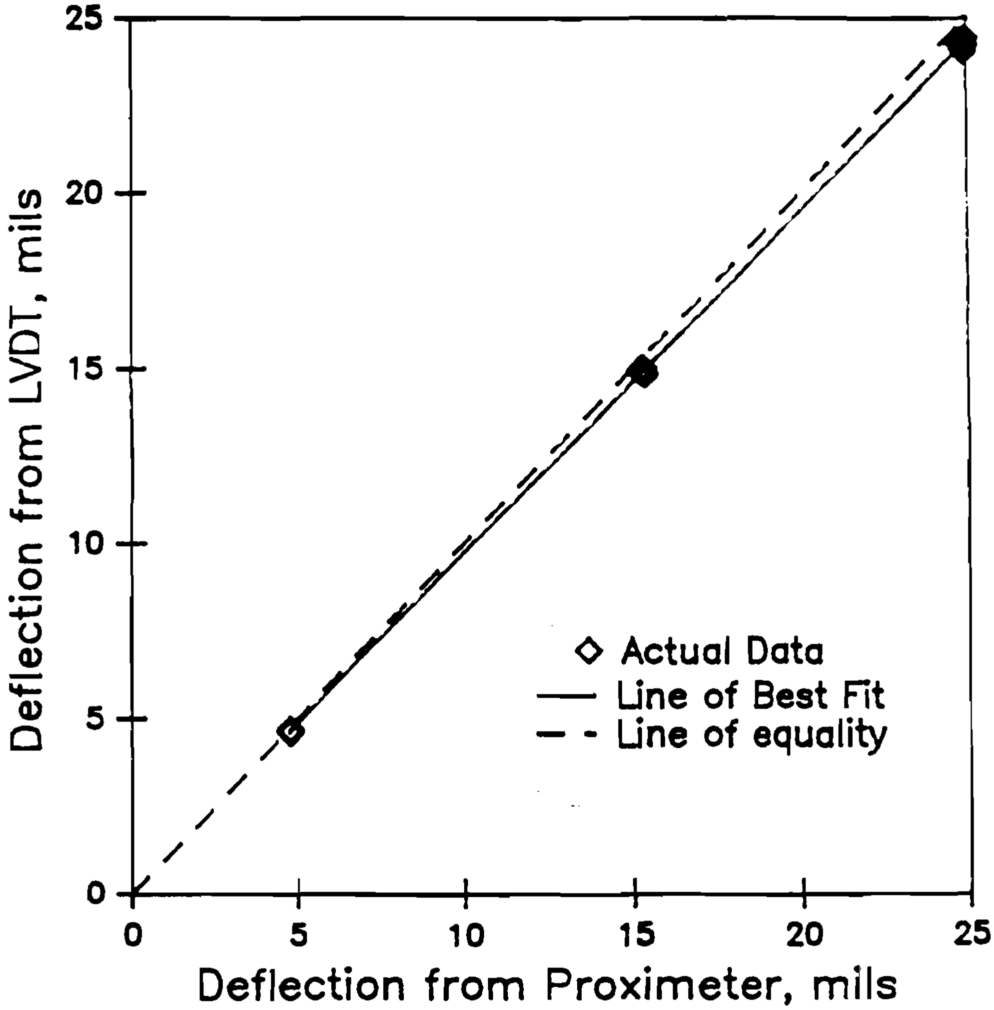


Figure I.8 Evaluation of Accuracy of LVDT for Half-Sine Wave at Pulse Width of 50 msec. (Slope of Line is 1.02)

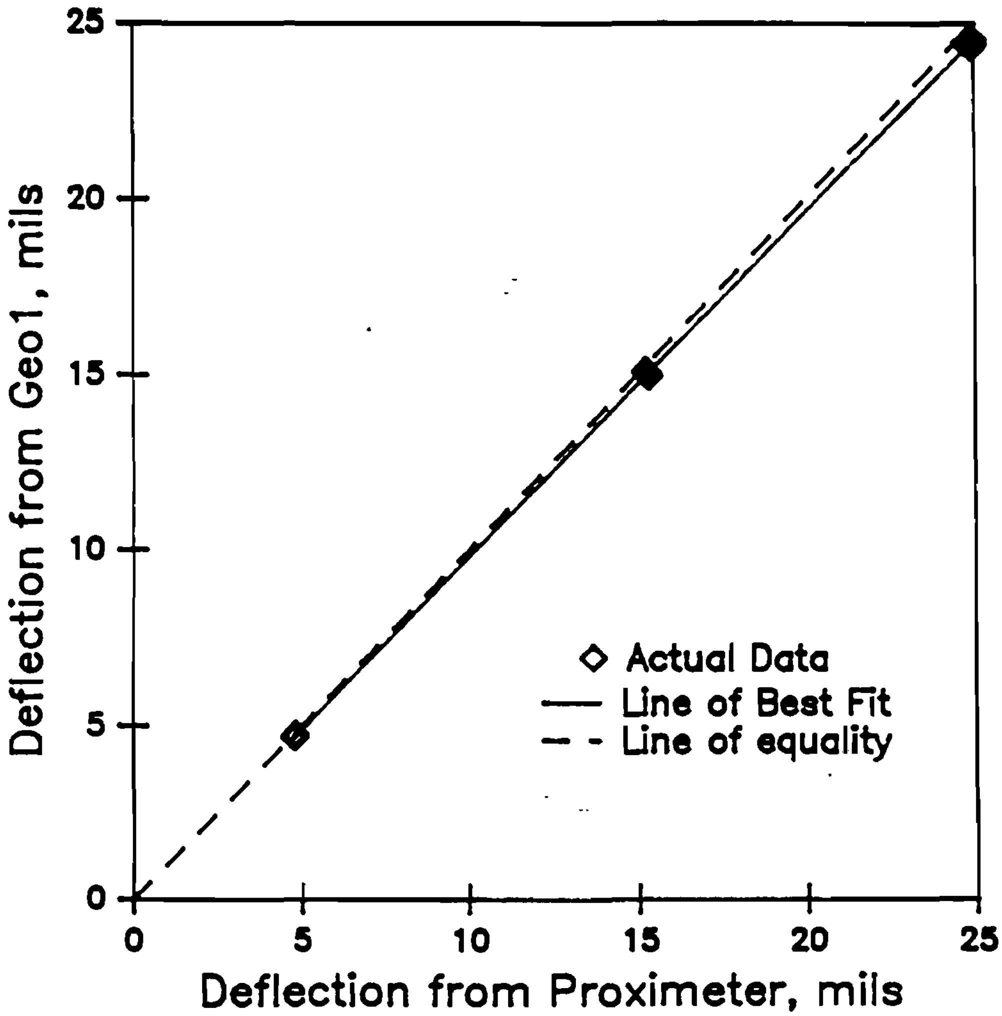


Figure I.9 Evaluation of Accuracy of Geophone 1 for Half-Sine Wave at Pulse Width of 50 msec. (Slope of Line is 1.01)

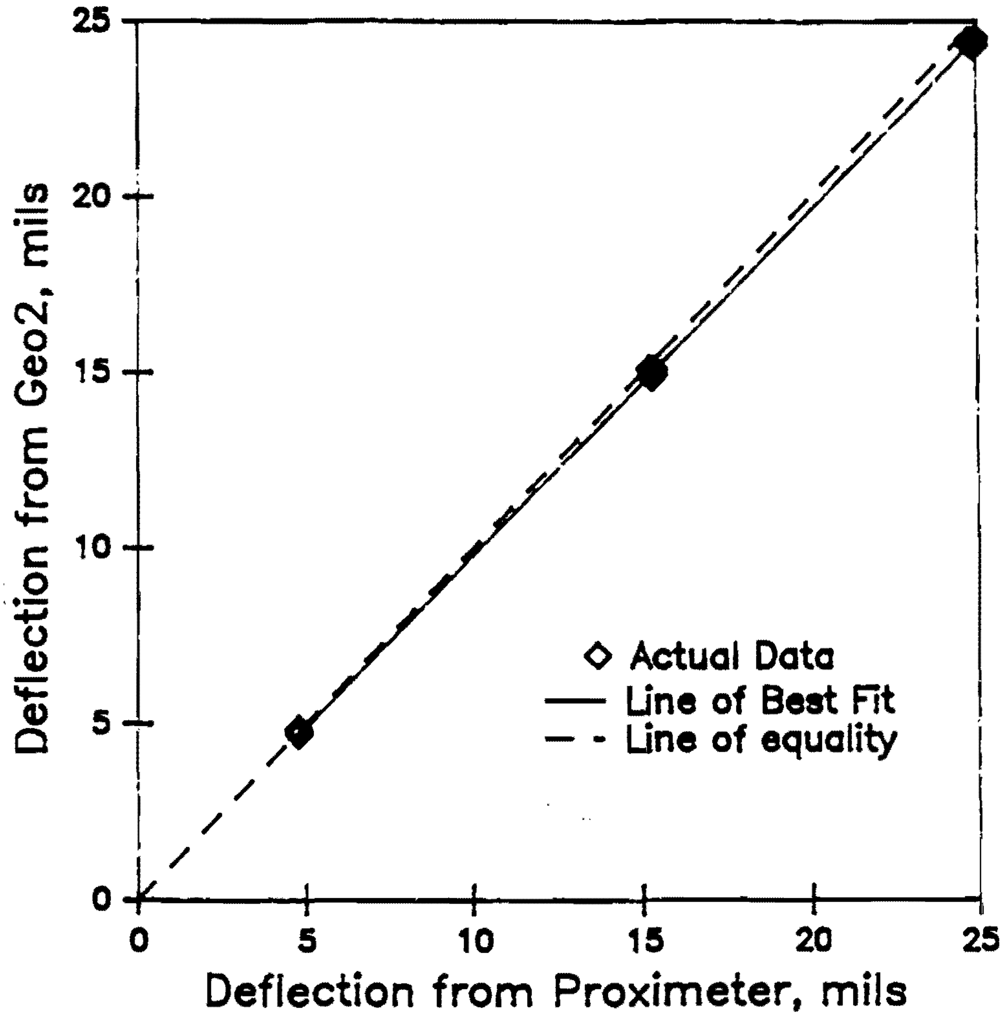


Figure I.10 Evaluation of Accuracy of Geophone 2 for Half-Sine Wave at Pulse Width of 50 msec. (Slope of Line is 1.01)

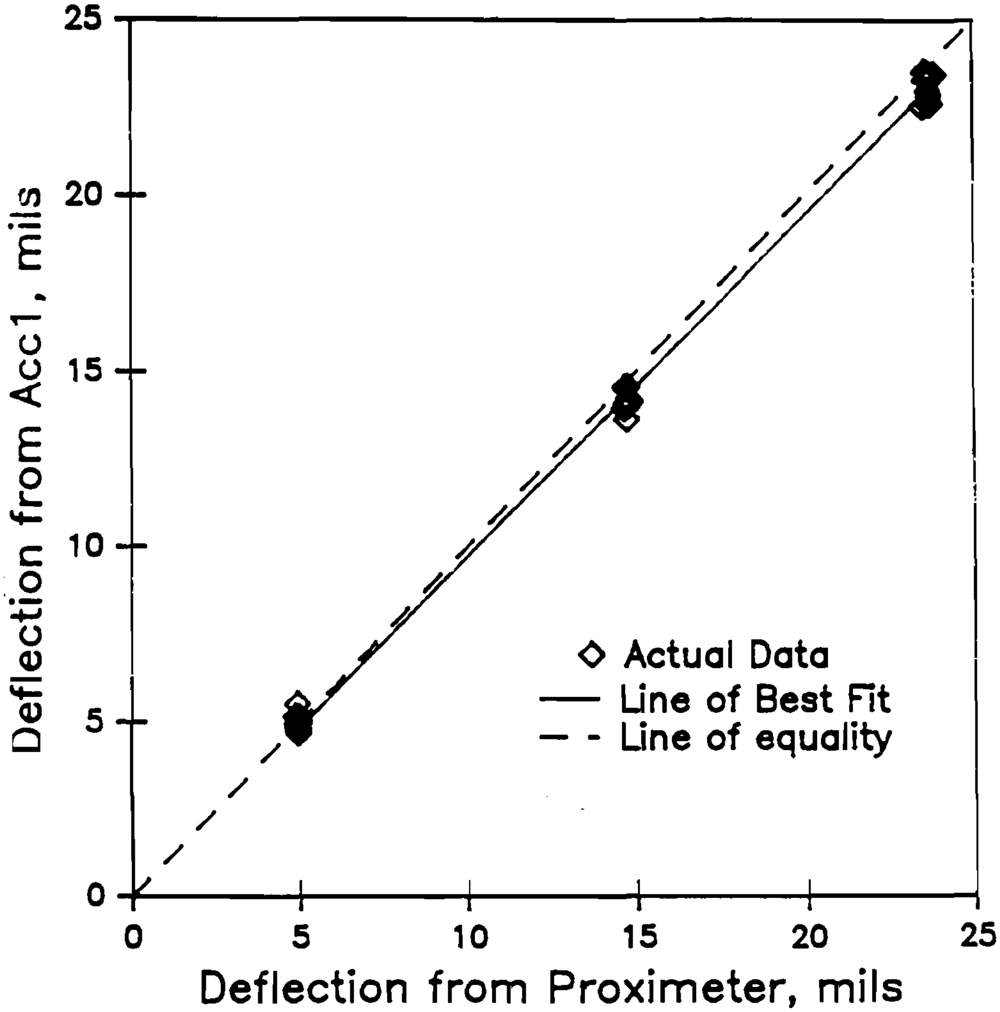


Figure I.11 Evaluation of Accuracy of Accelerometer 1 for Half-Sine Wave at Pulse Width of 75 msec. (Slope of Line is 1.02)

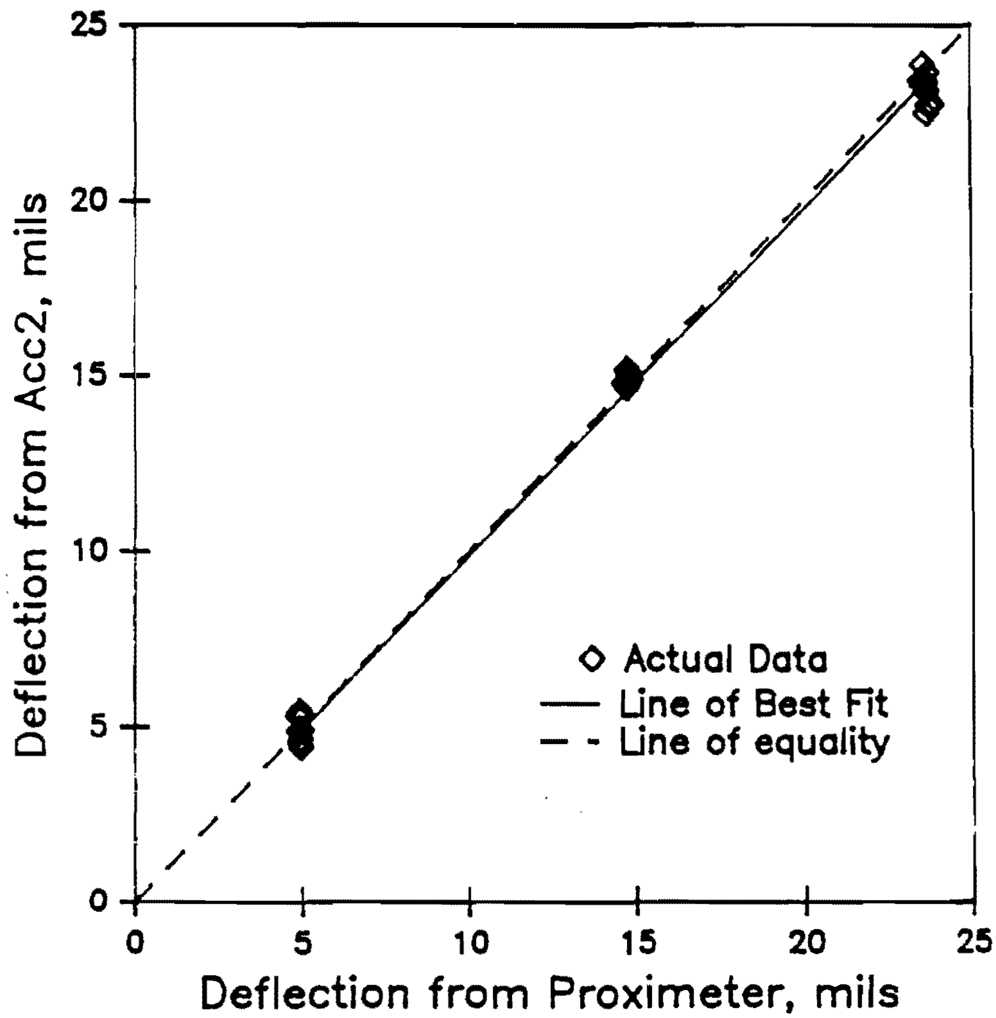


Figure I.12 Evaluation of Accuracy of Accelerometer 2 for Half-Sine Wave at Pulse Width of 75 msec. (Slope of Line is 0.99)

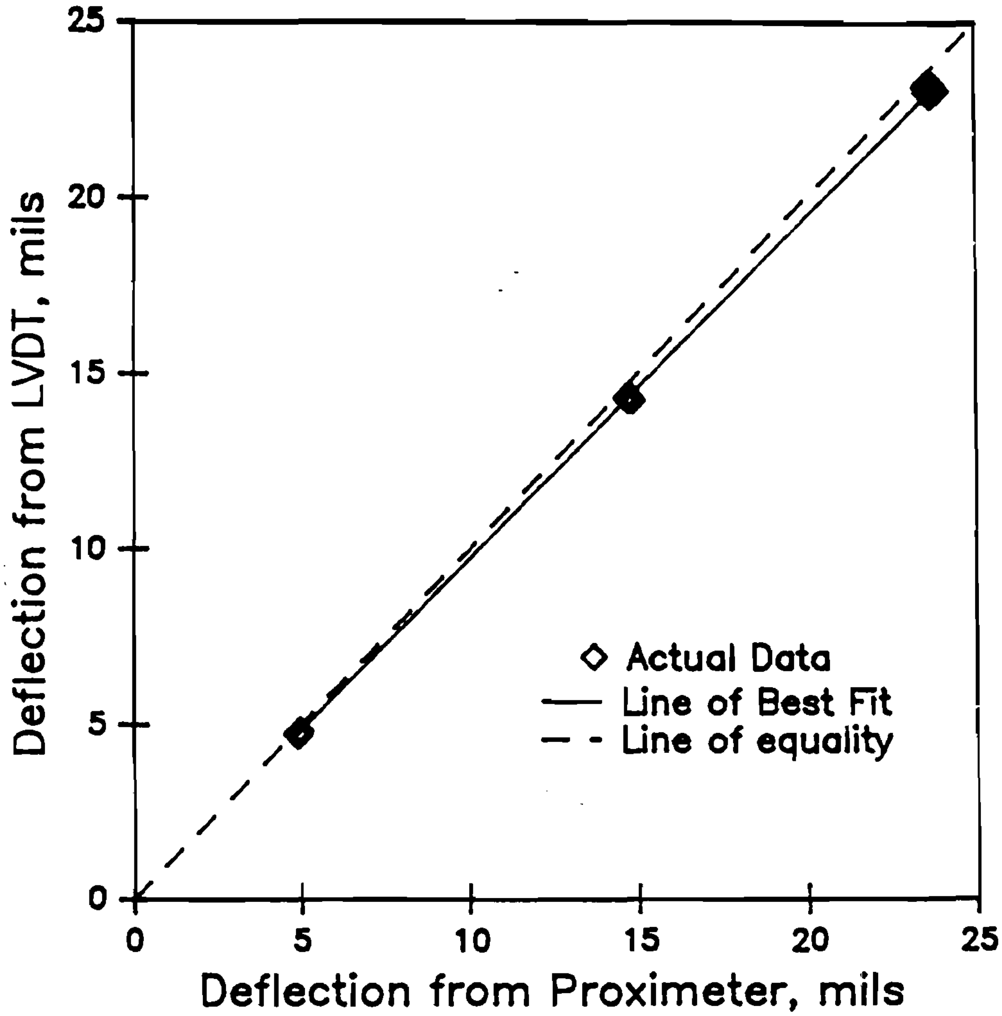


Figure I.13 Evaluation of Accuracy of LVDT for Half-Sine Wave at Pulse Width of 75 msec. (Slope of Line is 1.02)

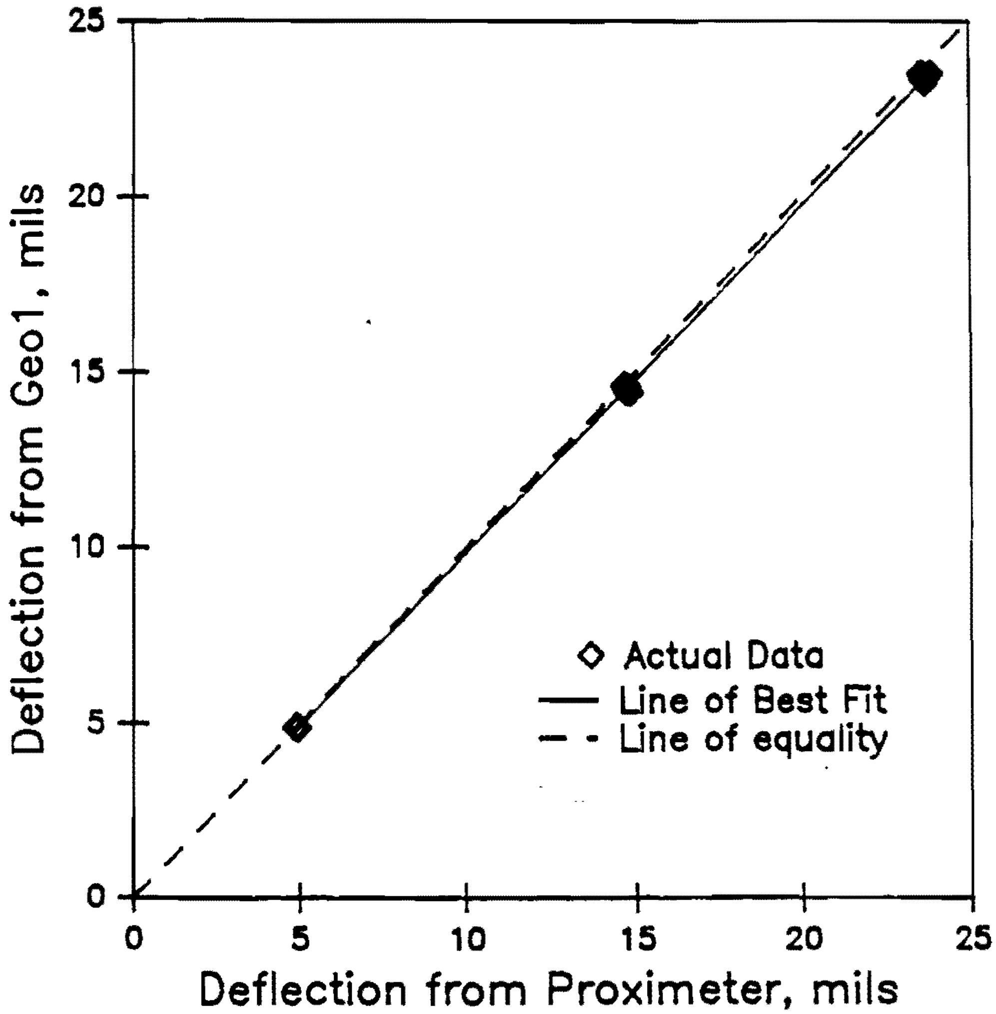


Figure I.14 Evaluation of Accuracy of Geophone 1 for Half-Sine Wave at Pulse Width of 75 msec. (Slope of Line is 1.01)

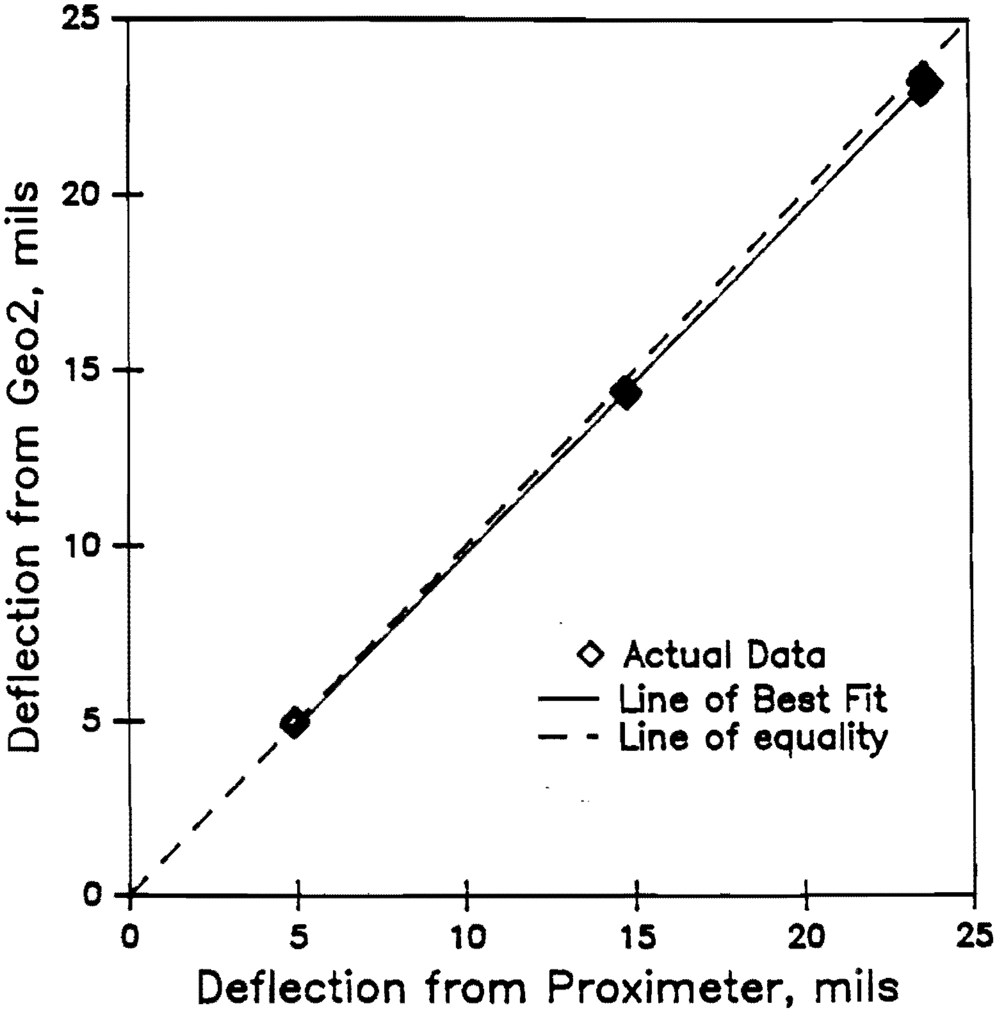


Figure I.15 Evaluation of Accuracy of Geophone 2 for Half-Sine Wave at Pulse Width of 75 msec. (Slope of Line is 1.00)

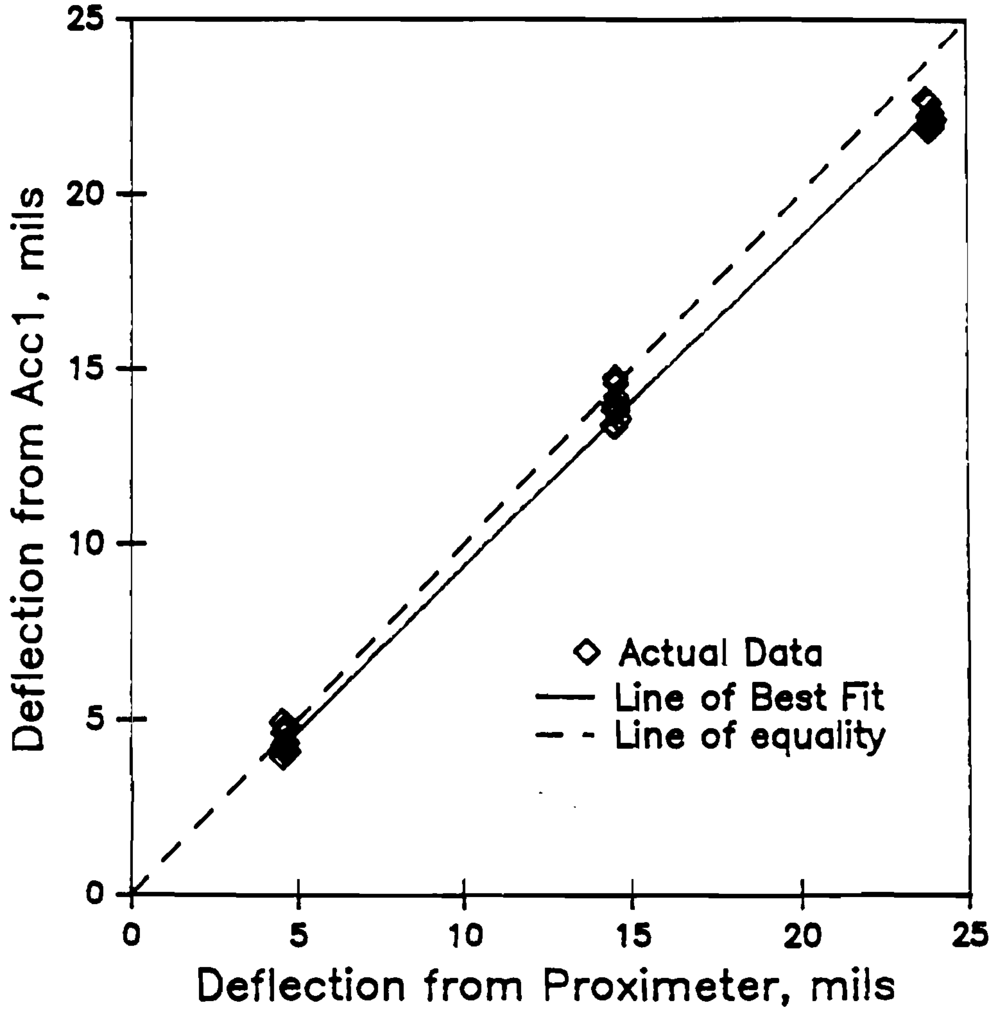


Figure I.16 Evaluation of Accuracy of Accelerometer 1 for Half-Sine Wave at Pulse Width of 100 msec. (Slope of Line is 1.02)

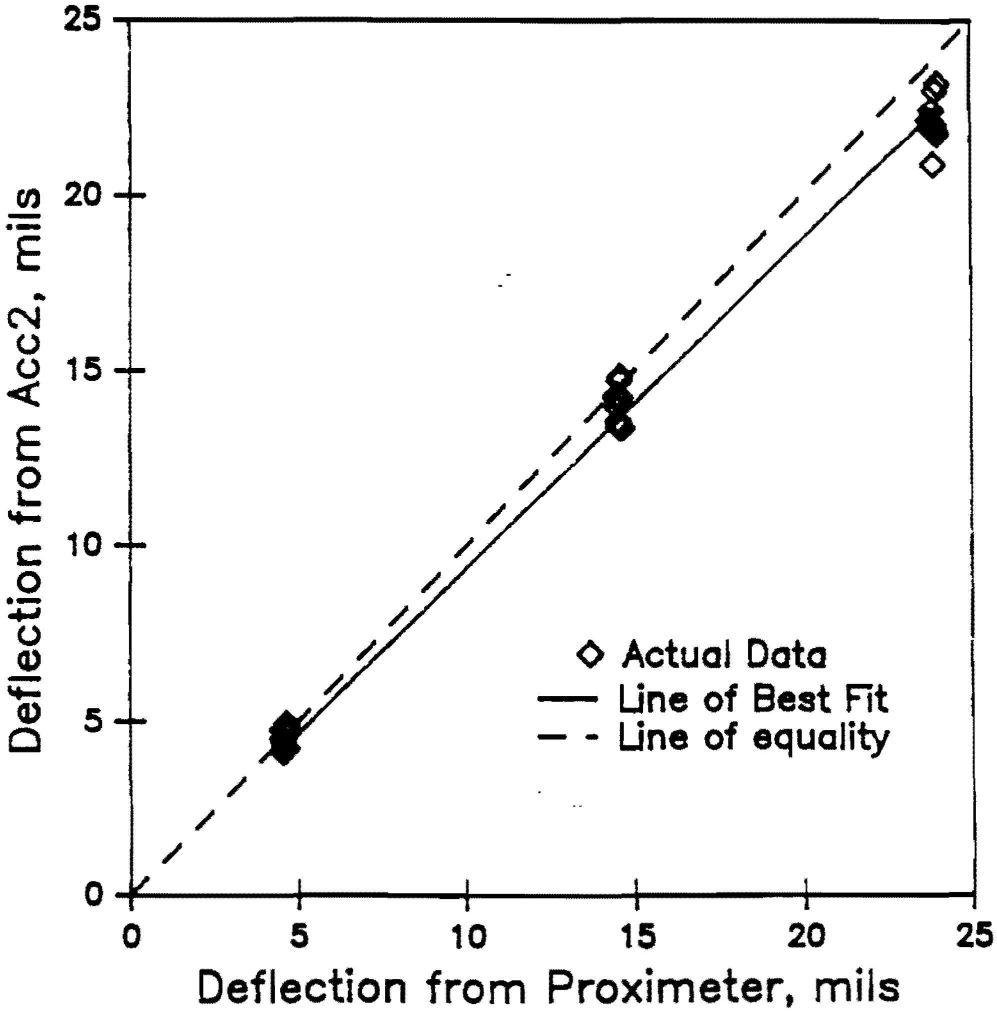


Figure I.17 Evaluation of Accuracy of Accelerometer 2 for Half-Sine Wave at Pulse Width of 100 msec. (Slope of Line is 0.99)

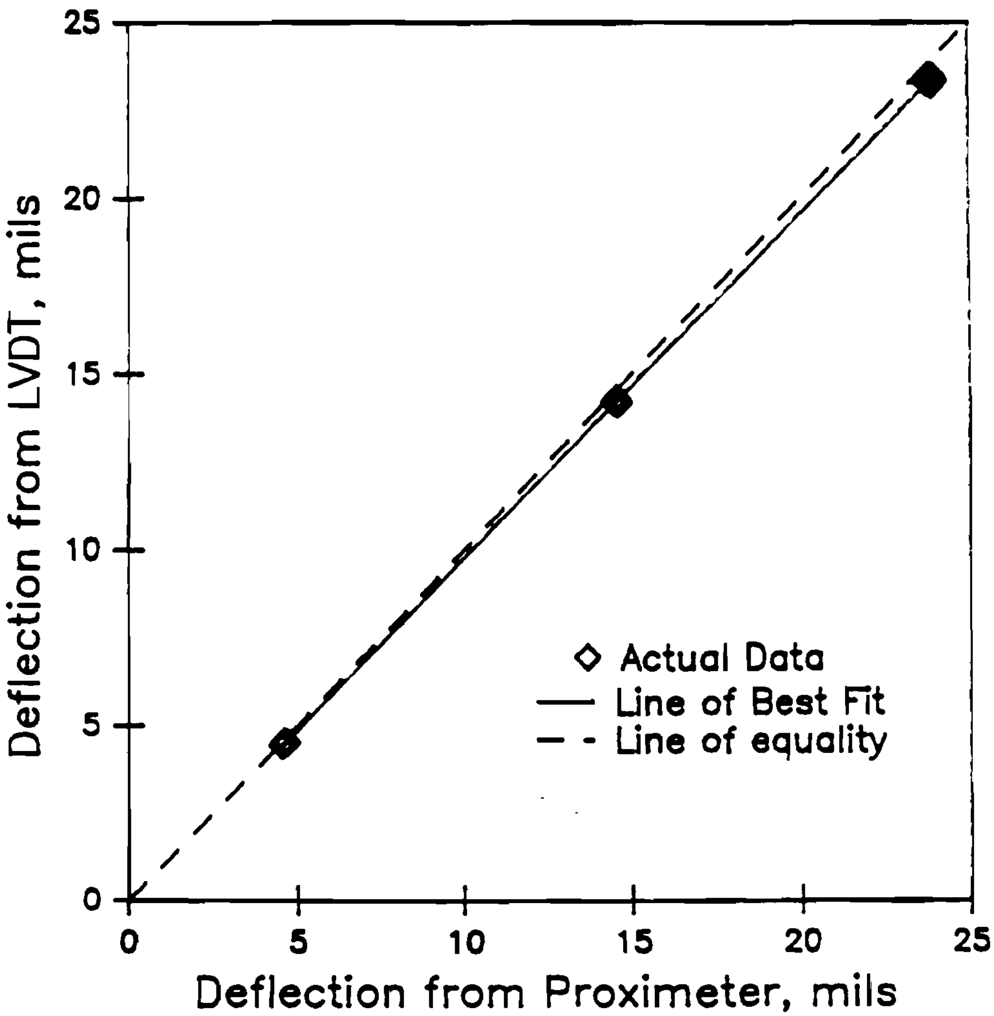


Figure I.18 Evaluation of Accuracy of LVDT for Half-Sine Wave at Pulse Width of 100 msec. (Slope of Line is 1.02)

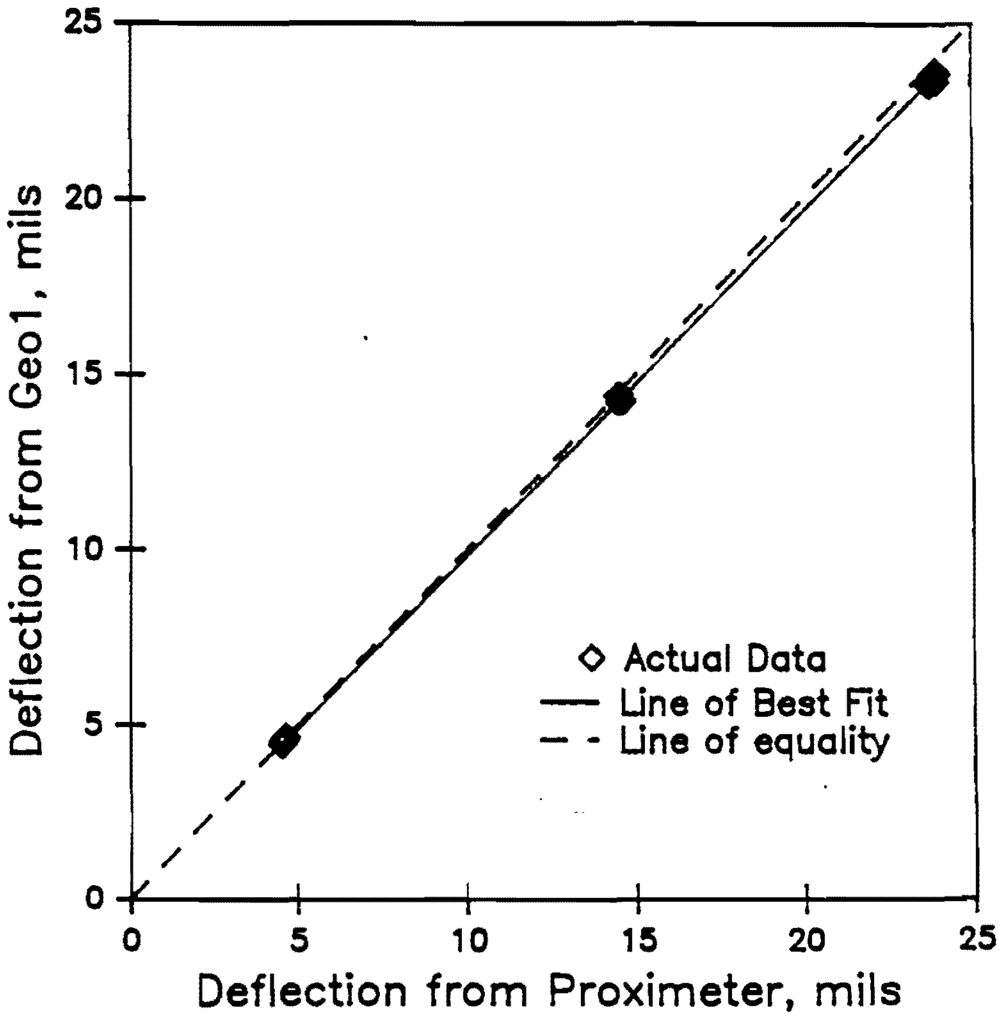


Figure I.19 Evaluation of Accuracy of Geophone 1 for Half-Sine Wave at Pulse Width of 100 msec. (Slope of Line is 1.01)

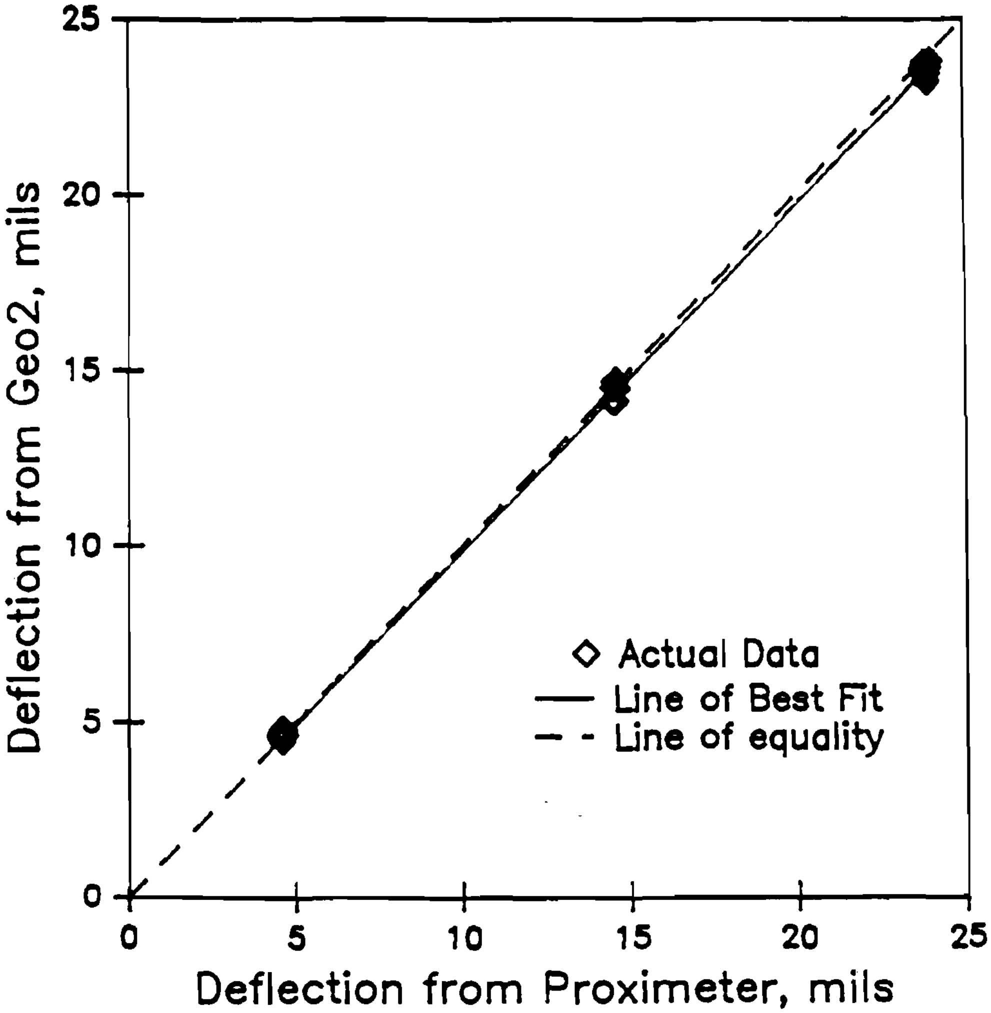
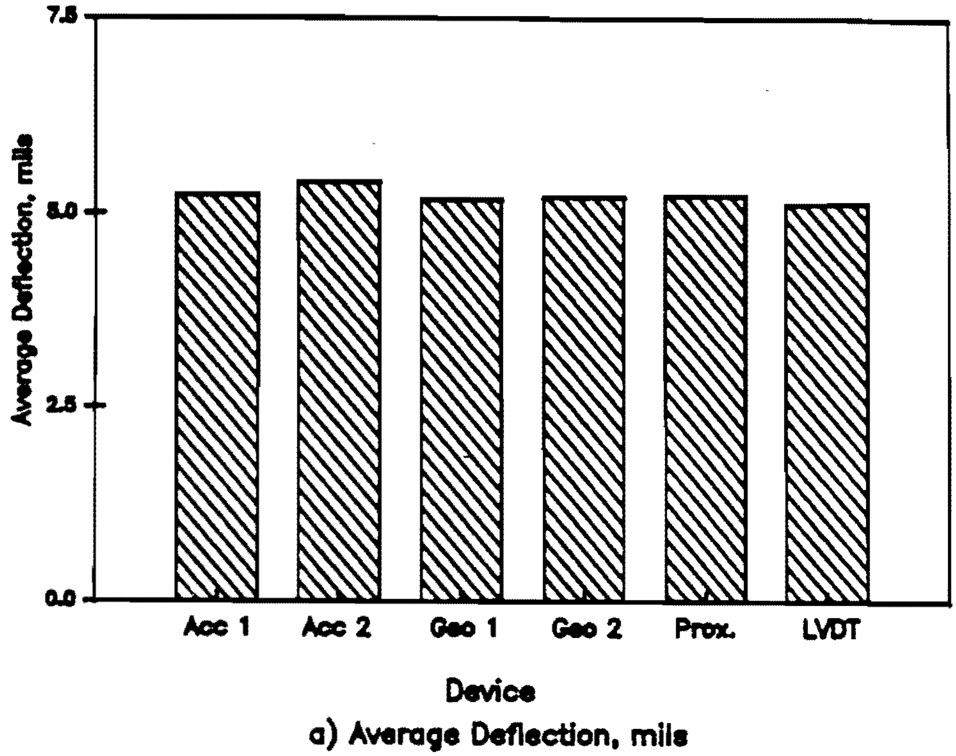


Figure I.20 Evaluation of Accuracy of Geophone 2 for Half-Sine Wave at Pulse Width of 100 msec. (Slope of Line is 1.00)

APPENDIX J

EVALUATION OF PRECISION OF EACH SENSOR

FOR HALF-SINE WAVE MOTION



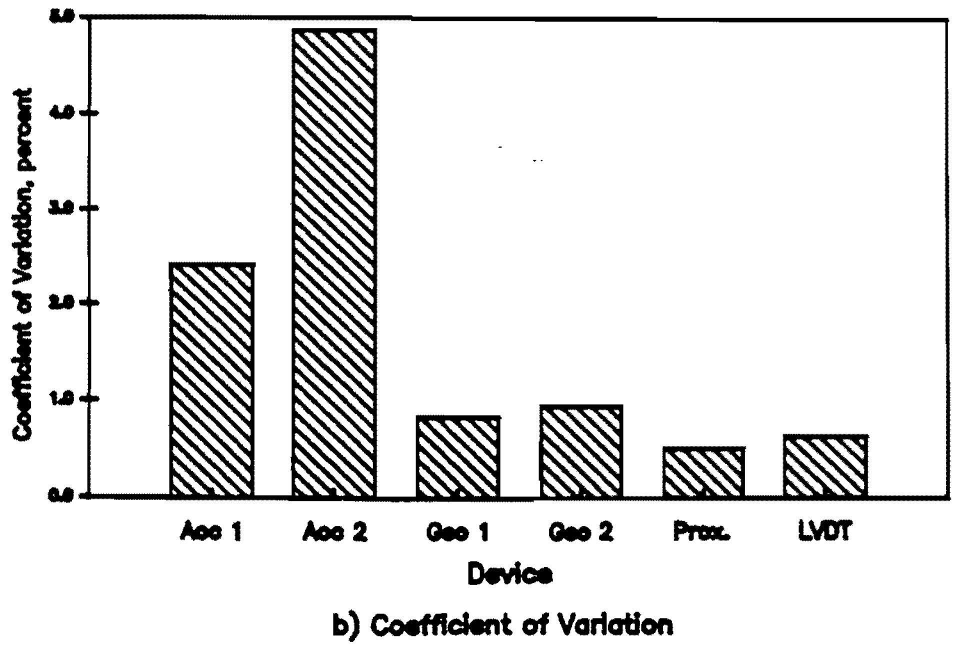
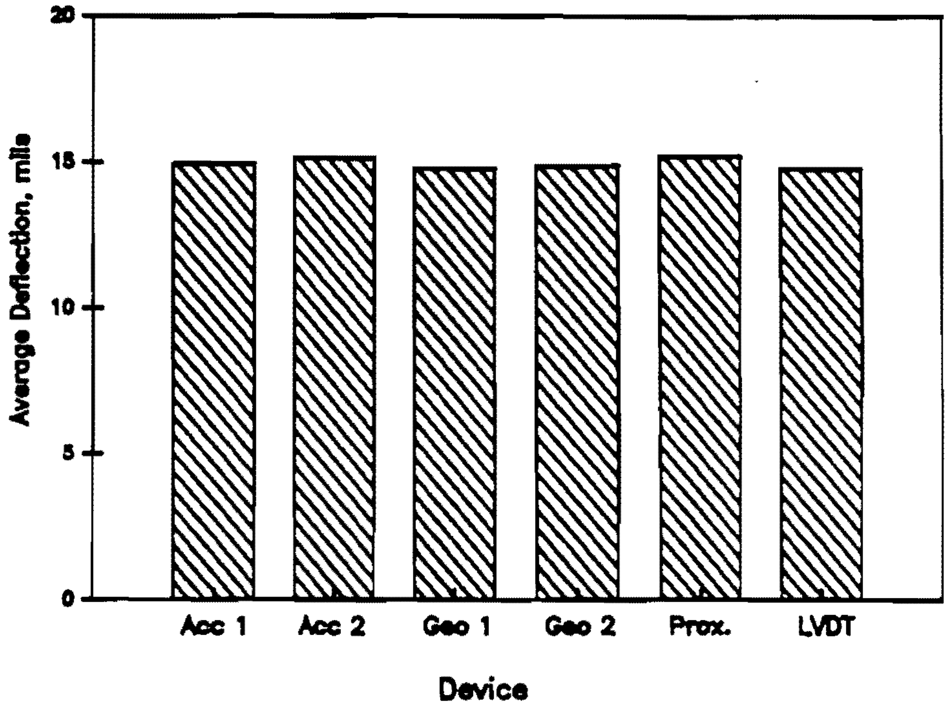
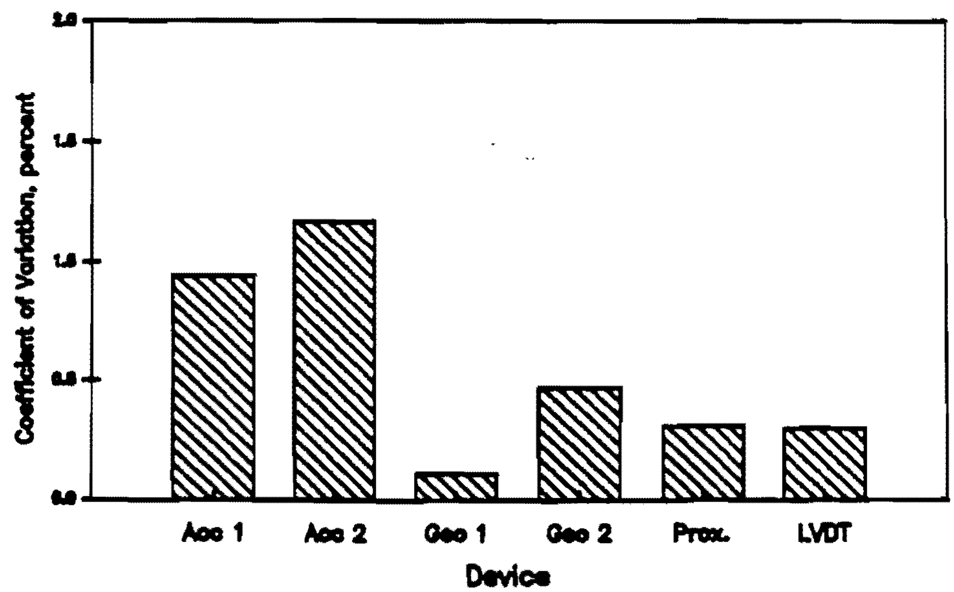


Figure J.1 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 25 msec. and a Nominal Deflection of 5.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure J.2 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 25 msec. and a Nominal Deflection of 15.0 mils (without Laser)

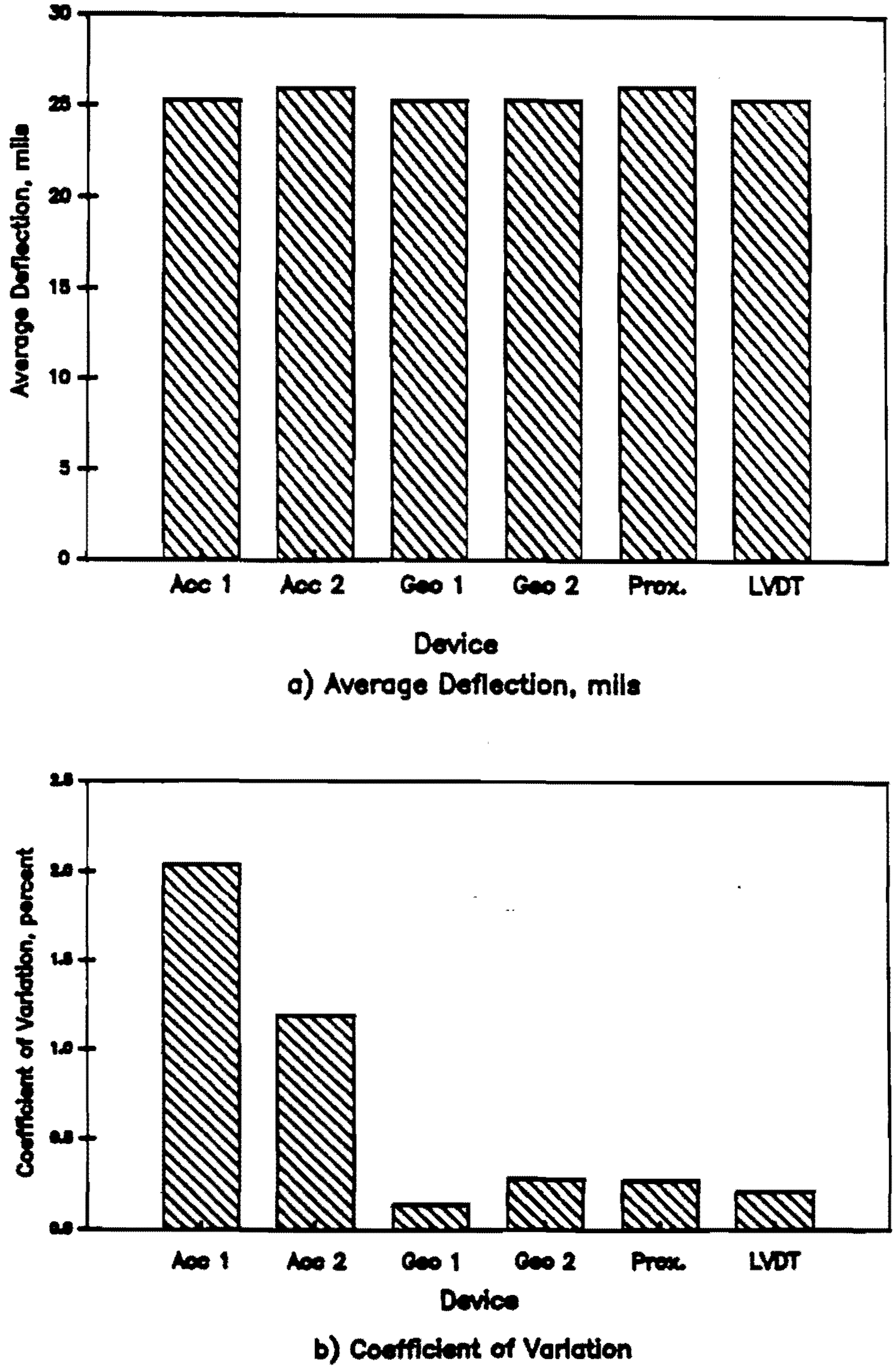
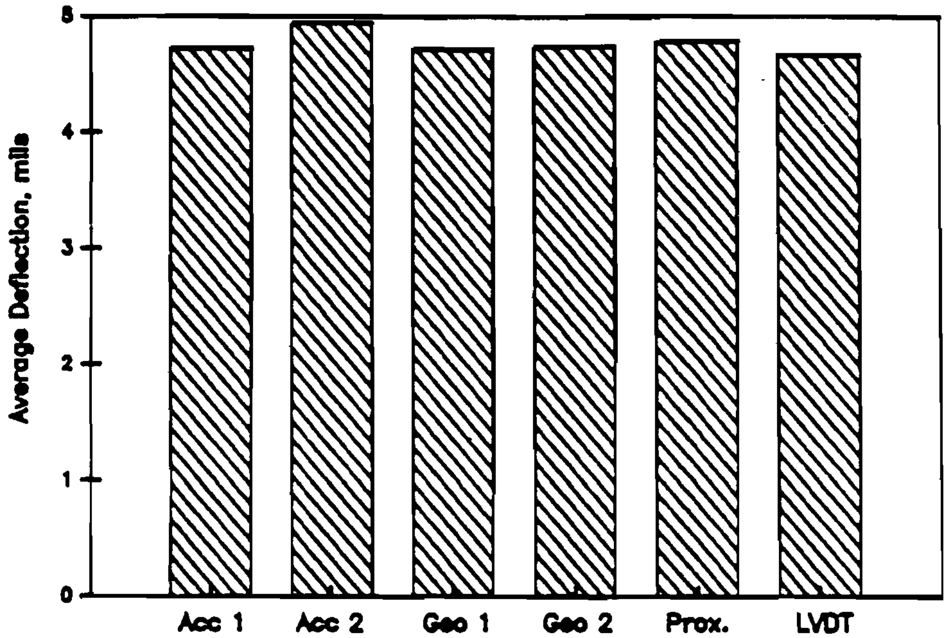
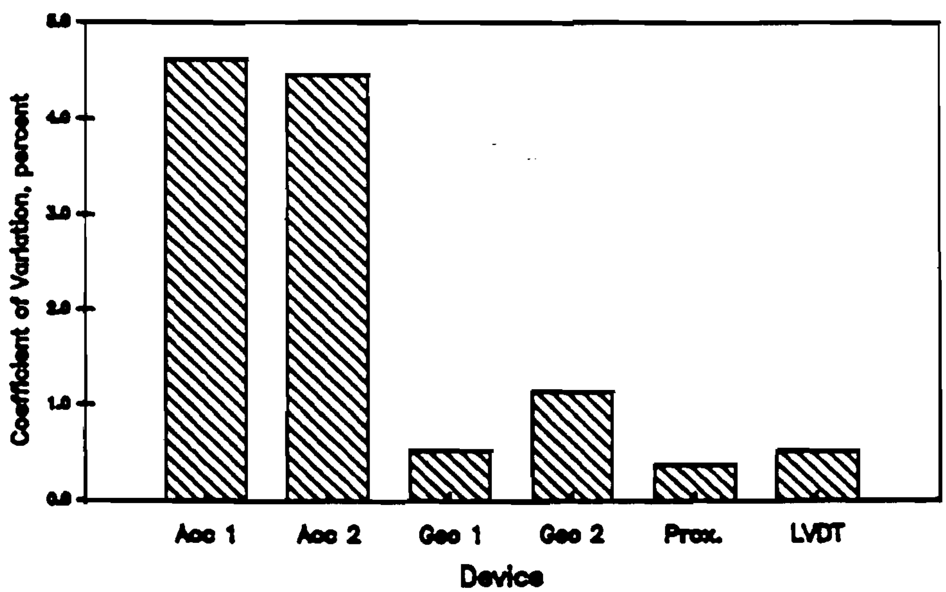


Figure J.3 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 25 msec. and a Nominal Deflection of 25.0 mils (without Laser)

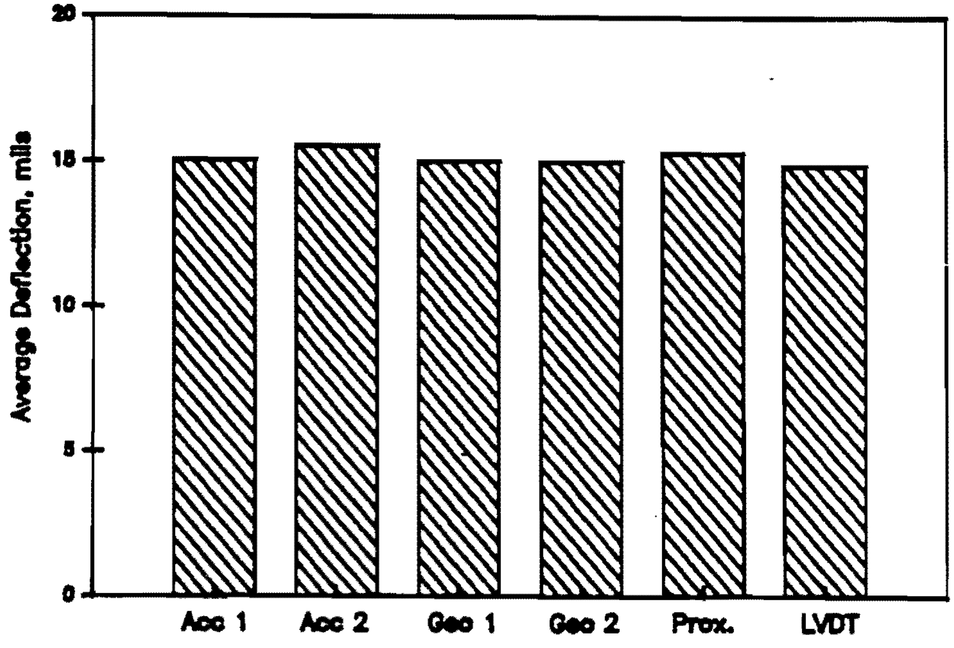


a) Average Deflection, mils

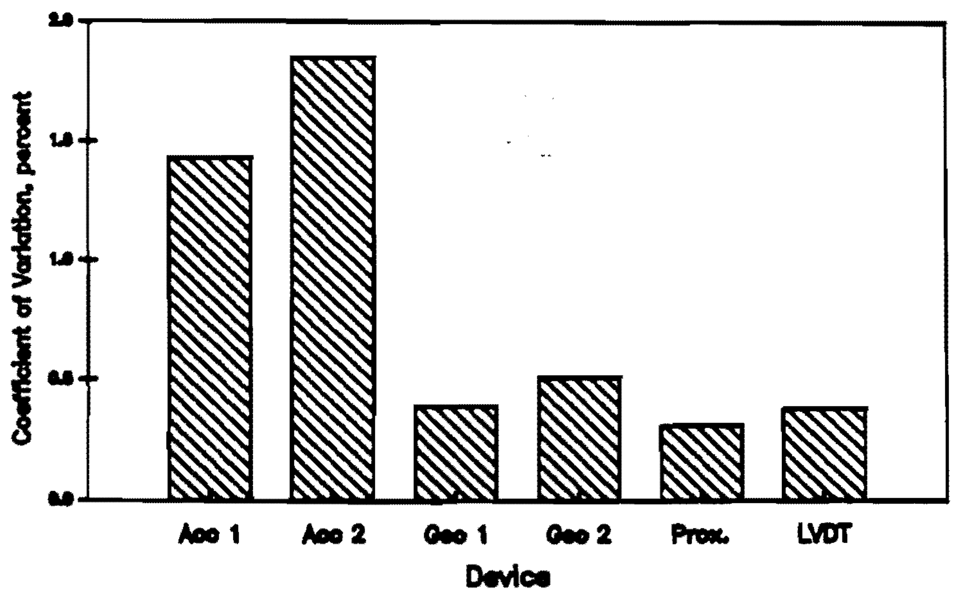


b) Coefficient of Variation

Figure J.4 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 50 msec. and a Nominal Deflection of 5.0 mils (without Laser)

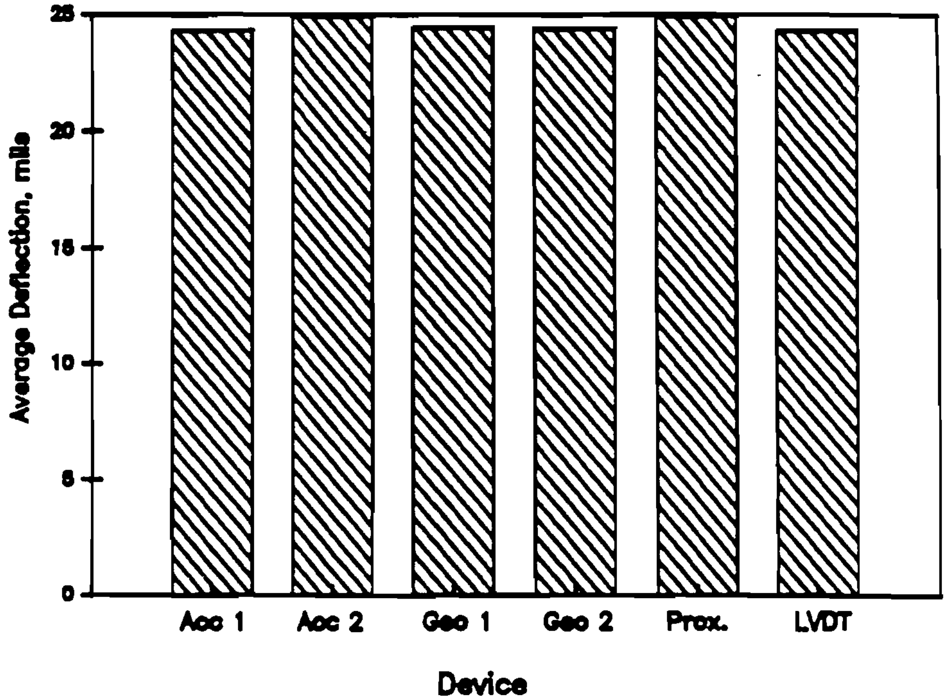


a) Average Deflection, mils

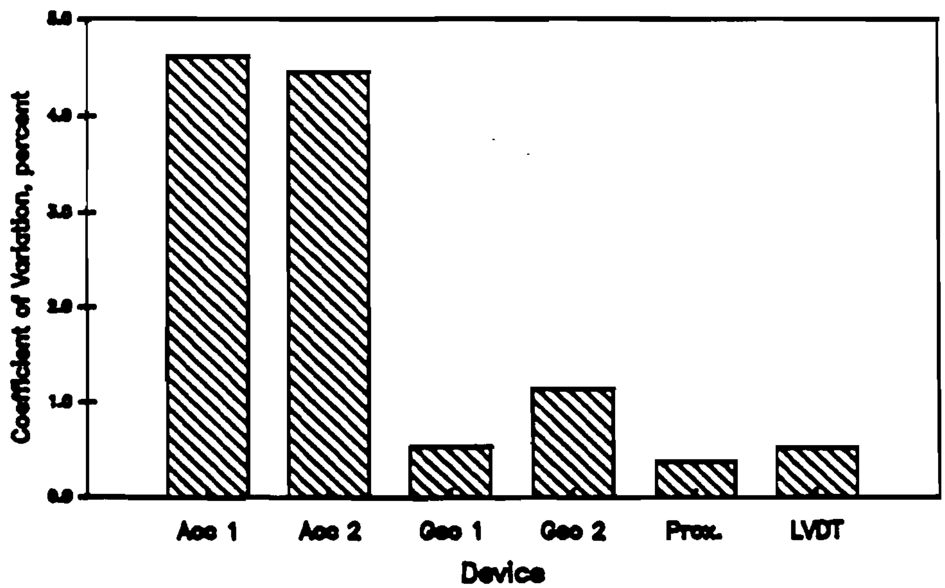


b) Coefficient of Variation

Figure J.5 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 50 msec. and a Nominal Deflection of 15.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure J.6 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 50 msec. and a Nominal Deflection of 25.0 mils (without Laser)

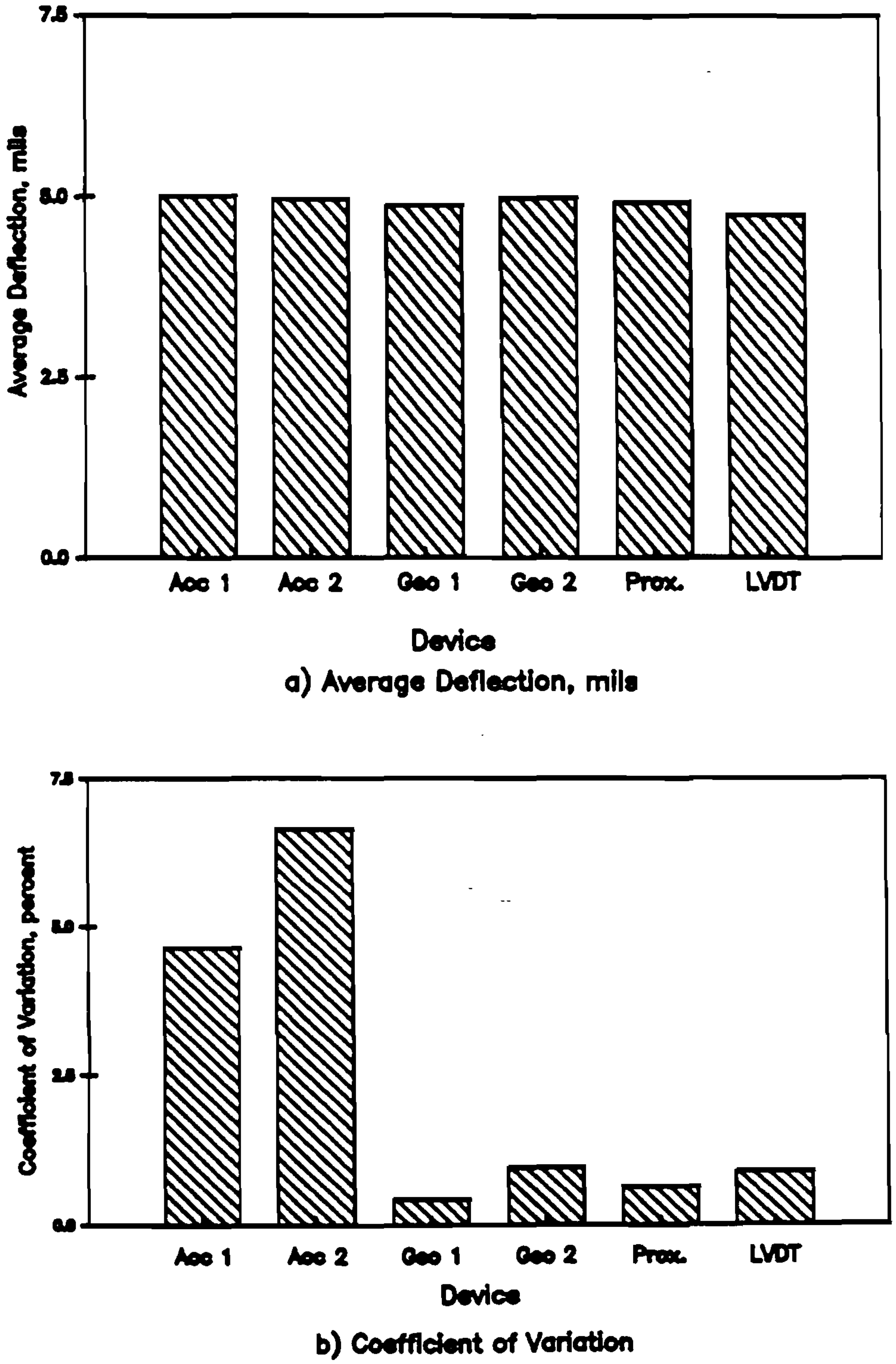
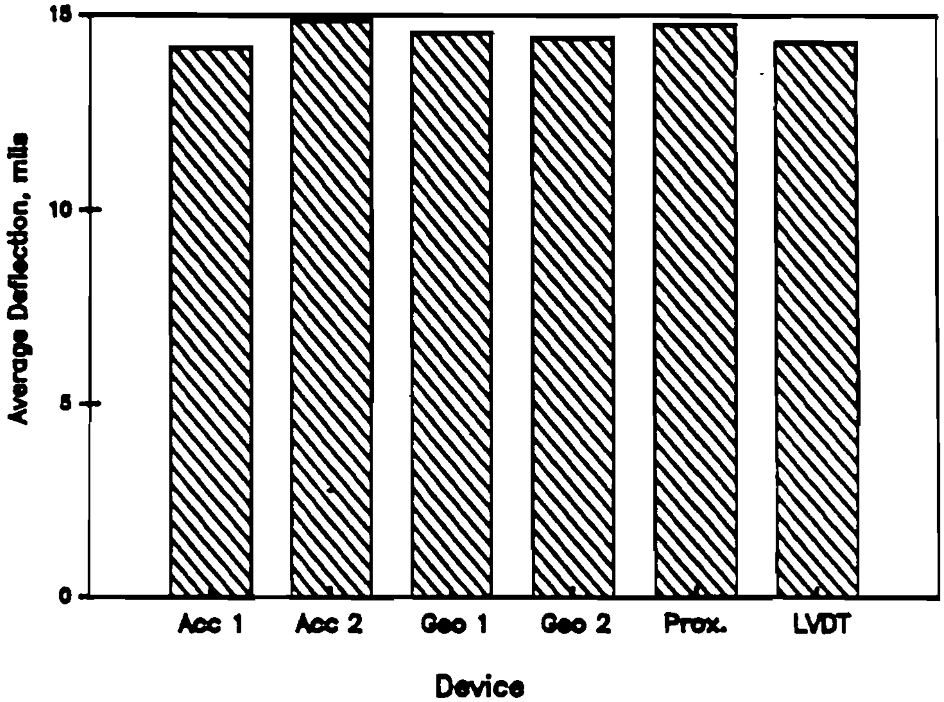
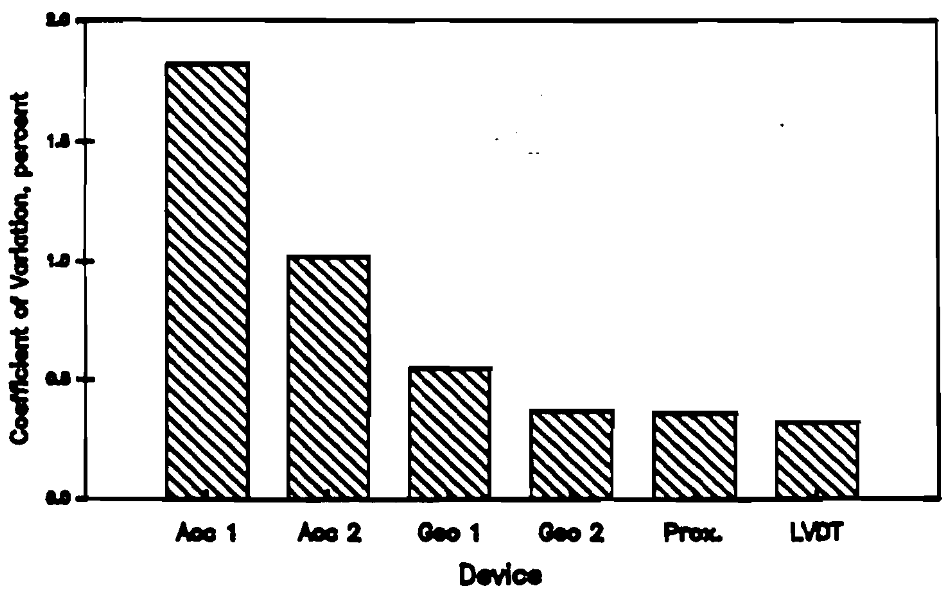


Figure J.7 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 75 msec. and a Nominal Deflection of 5.0 mils (without Laser)

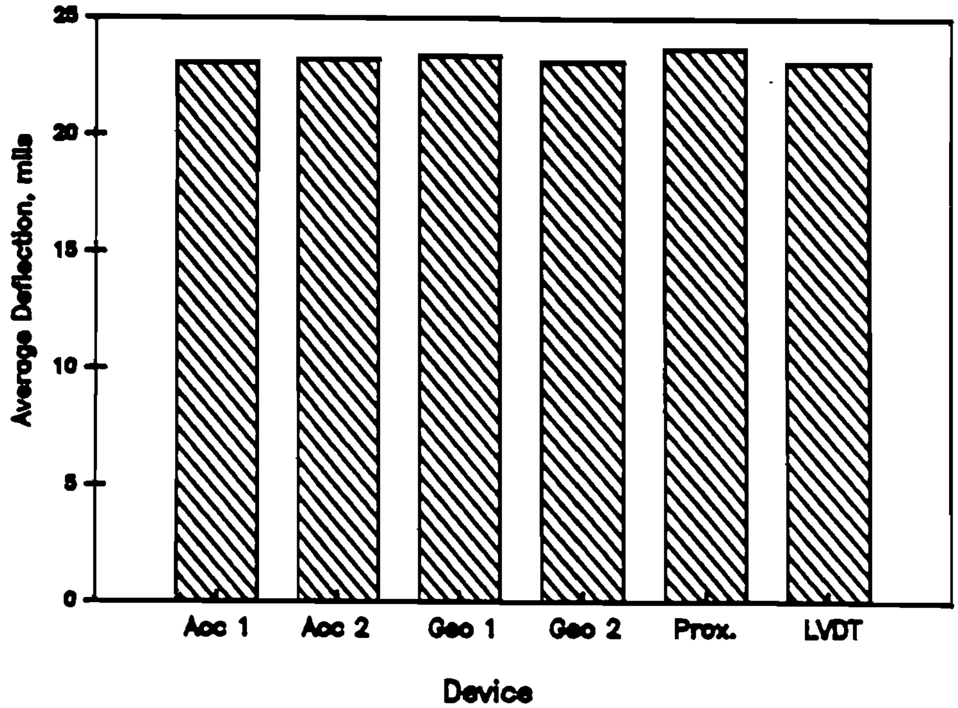


a) Average Deflection, mils

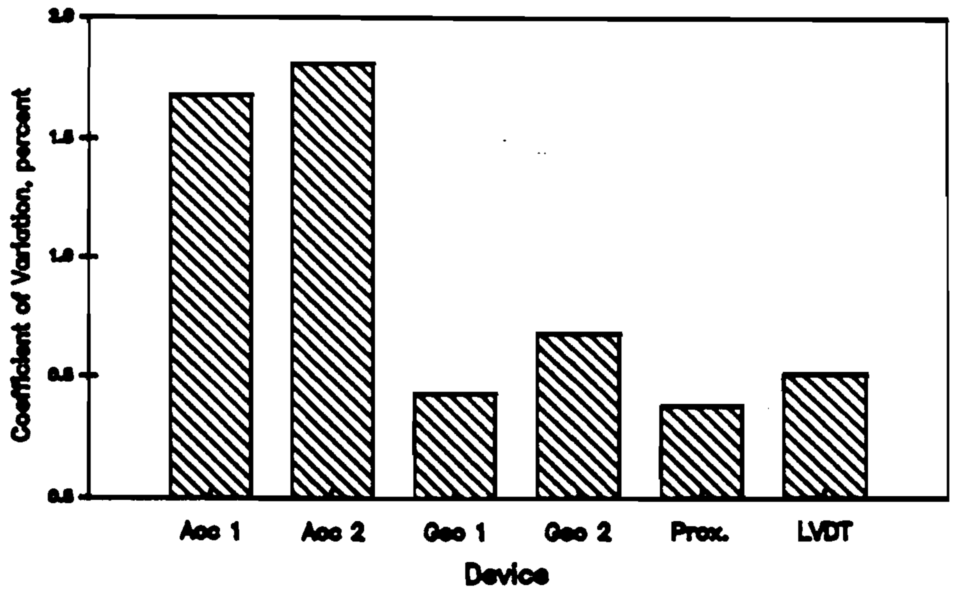


b) Coefficient of Variation

Figure J.8 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 75 msec. and a Nominal Deflection of 15.0 mils (without Laser)

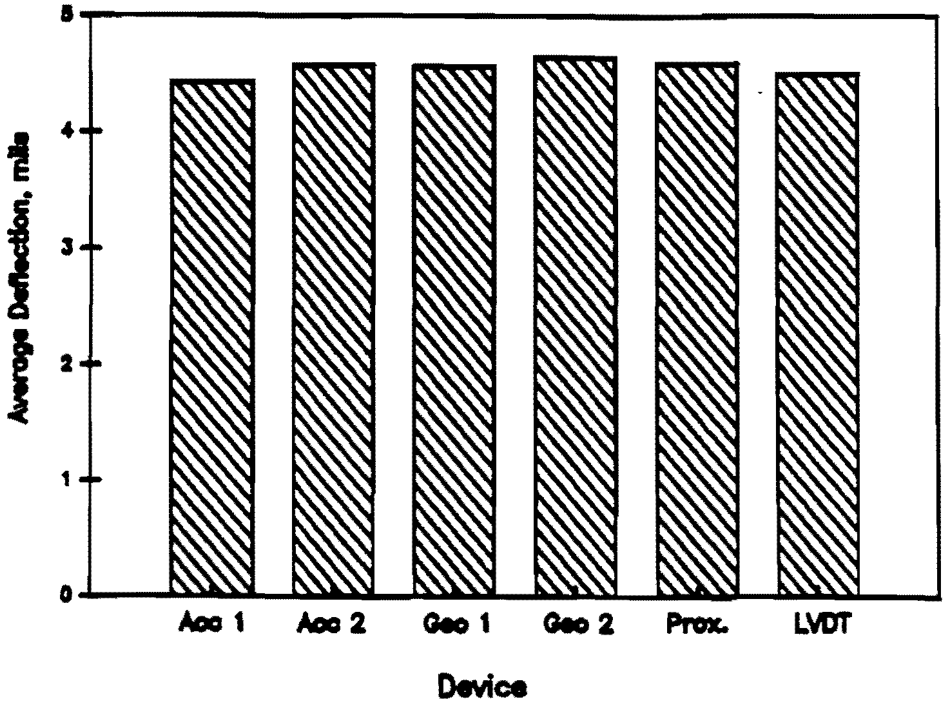


a) Average Deflection, mils

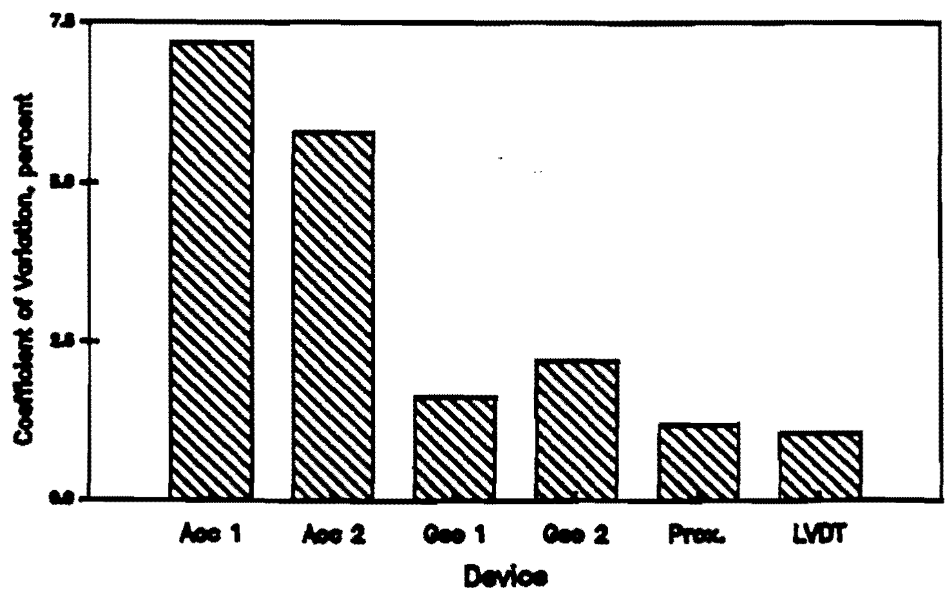


b) Coefficient of Variation

Figure J.9 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 75 msec. and a Nominal Deflection of 25.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure J.10 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 100 msec. and a Nominal Deflection of 5.0 mils (without Laser)

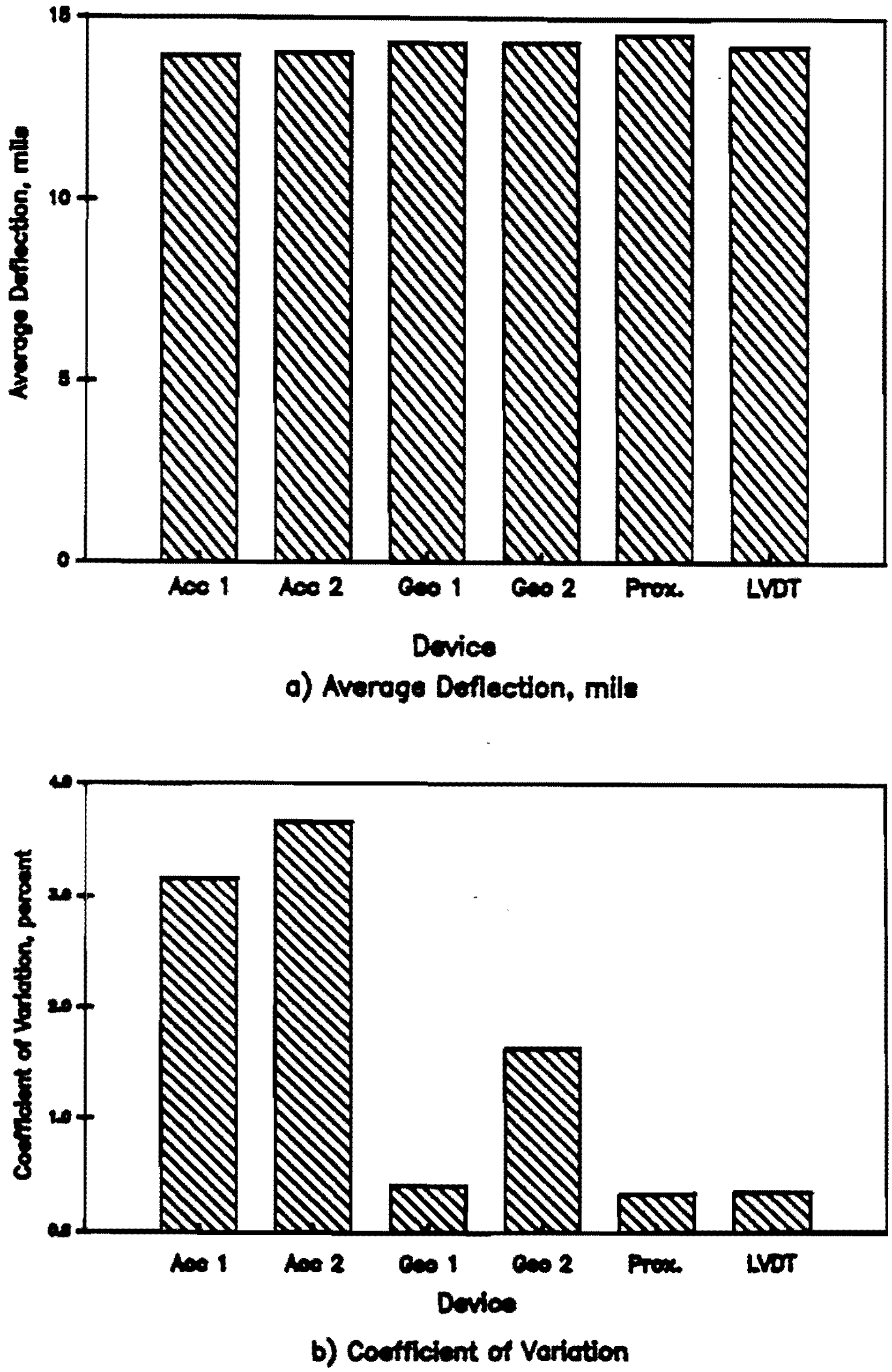


Figure J.11 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 100 msec. and a Nominal Deflection of 15.0 mils (without Laser)

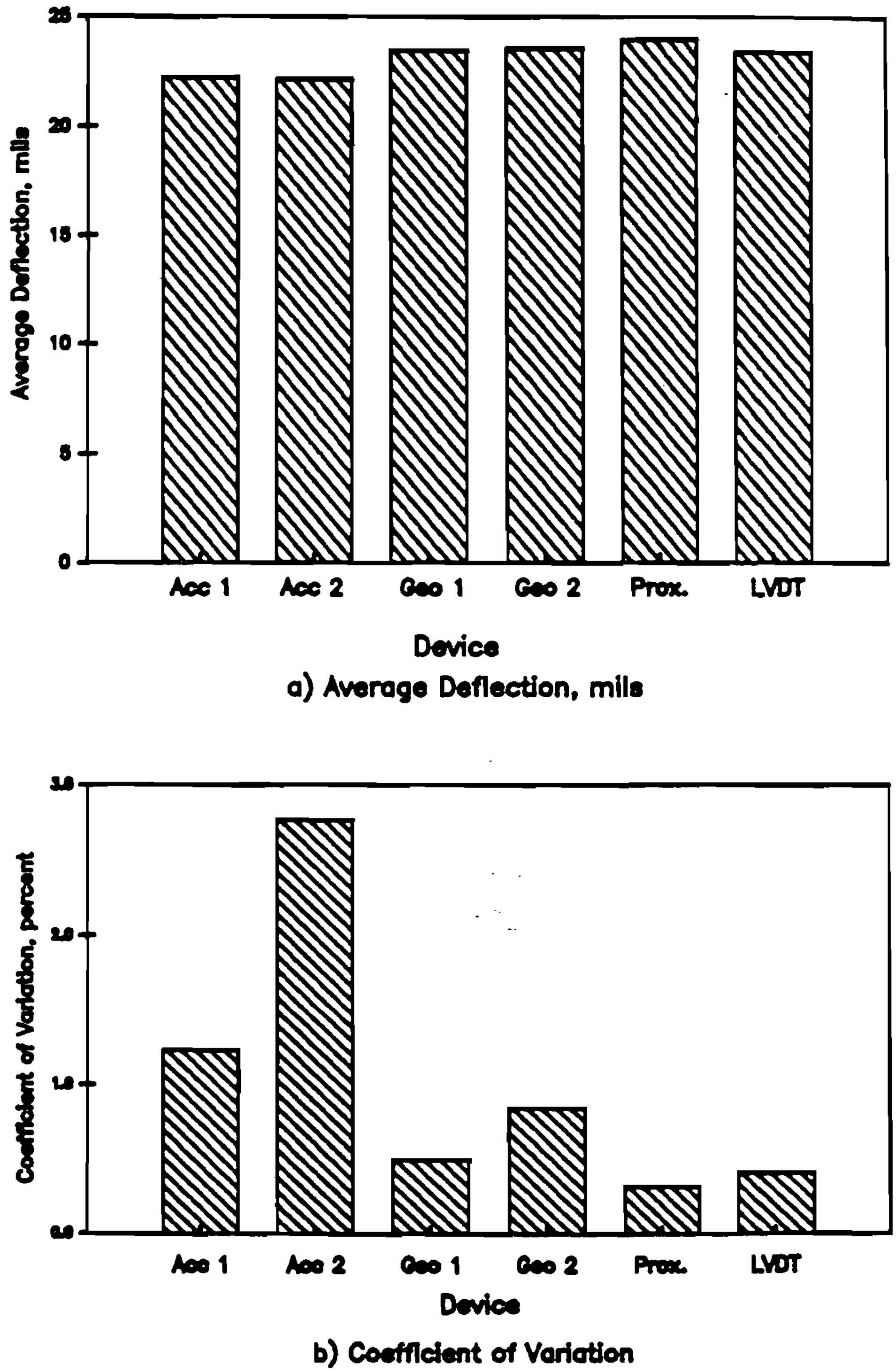


Figure J.12 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 100 msec. and a Nominal Deflection of 25.0 mils (without Laser)

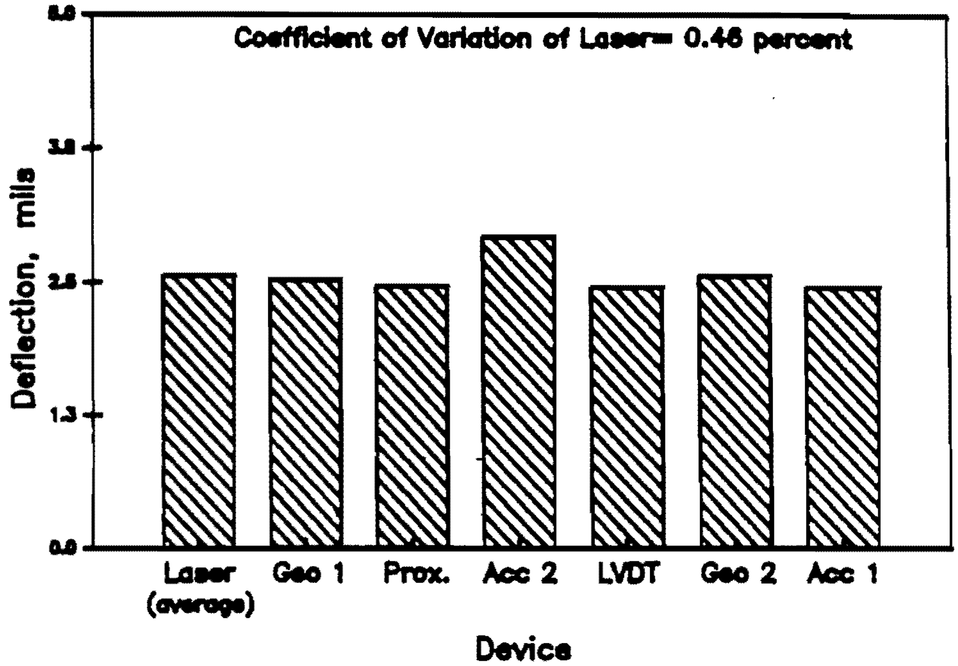


Figure J.13 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 100 msec. and a Nominal Deflection of 5.0 mils (with Laser)

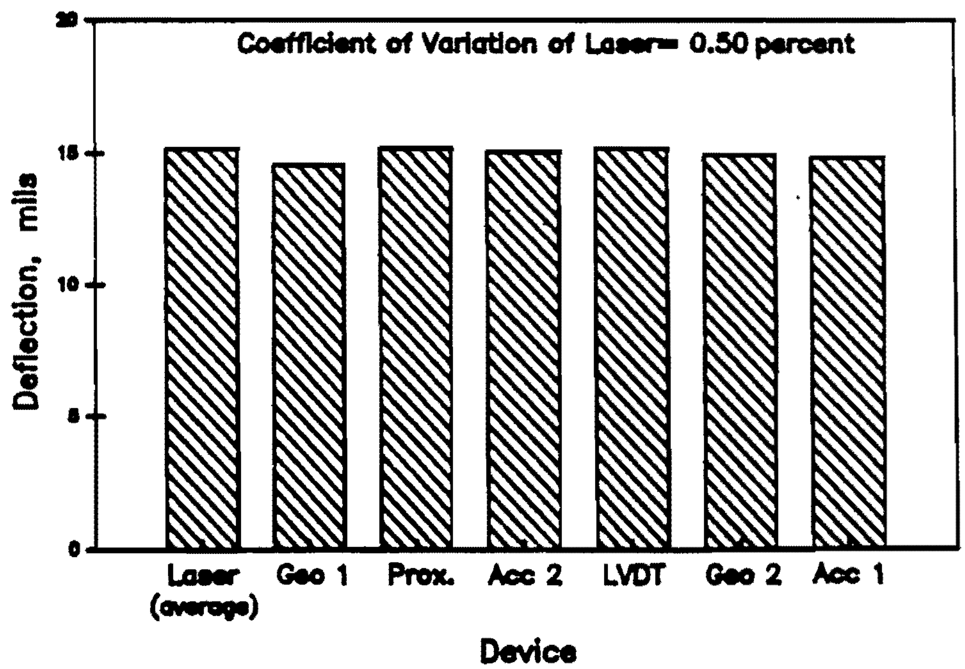


Figure J.14 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 100 msec. and a Nominal Deflection of 15.0 mils (with Laser)

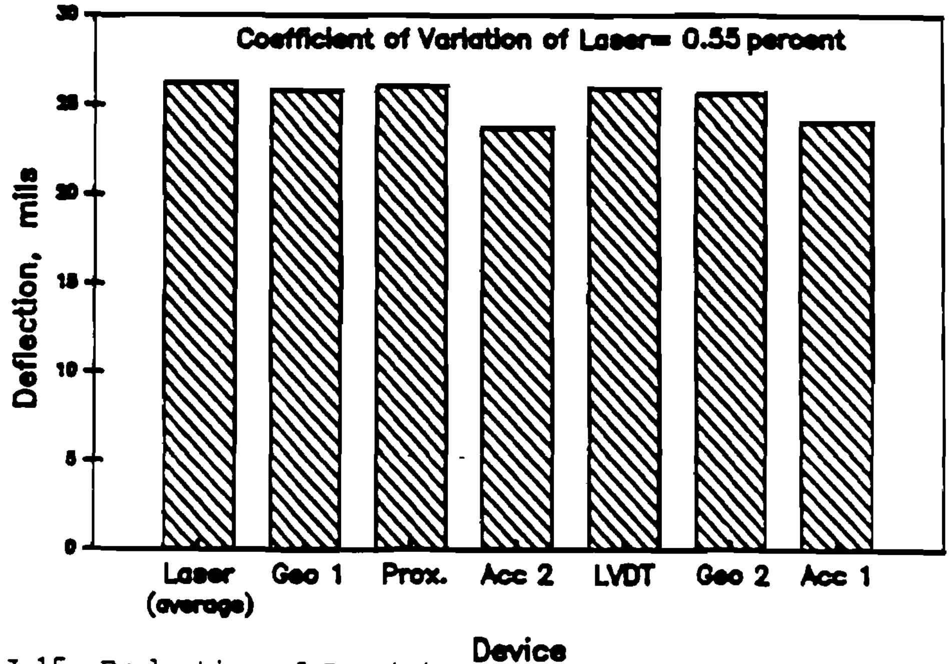


Figure J.15 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 100 msec. and a Nominal Deflection of 25.0 mils (with Laser)

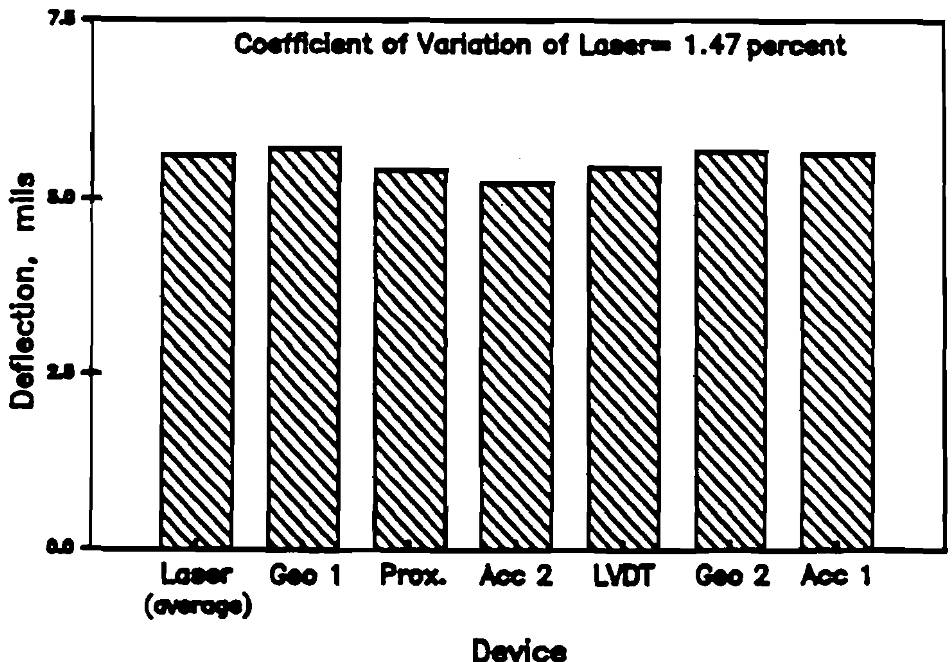


Figure J.16 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 75 msec. and a Nominal Deflection of 5.0 mils (with Laser)

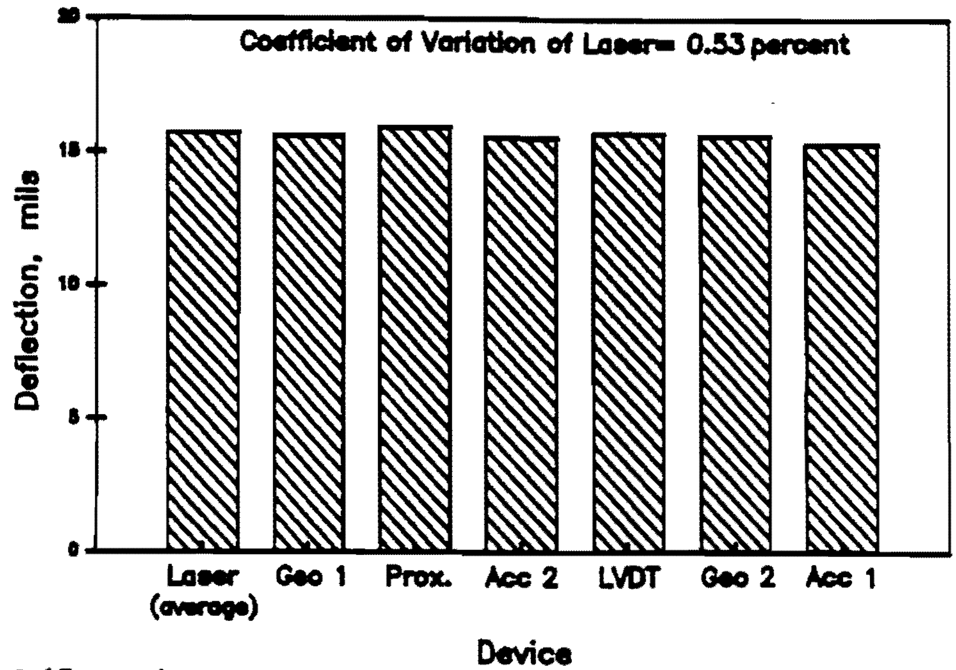


Figure J.17 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 75 msec. and a Nominal Deflection of 15.0 mils (with Laser)

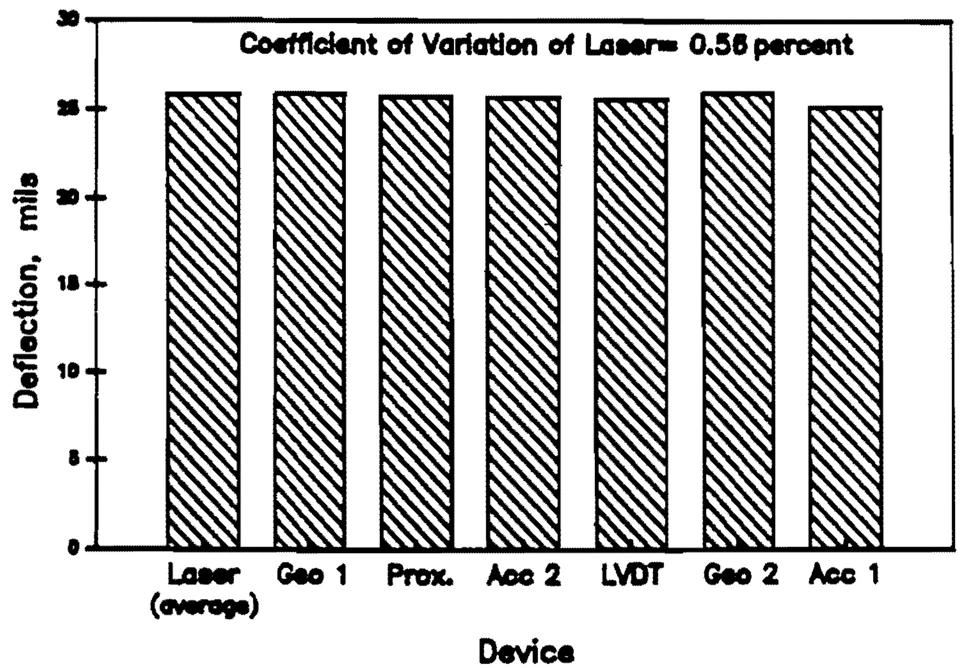


Figure J.18 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 75 msec. and a Nominal Deflection of 25.0 mils (with Laser)

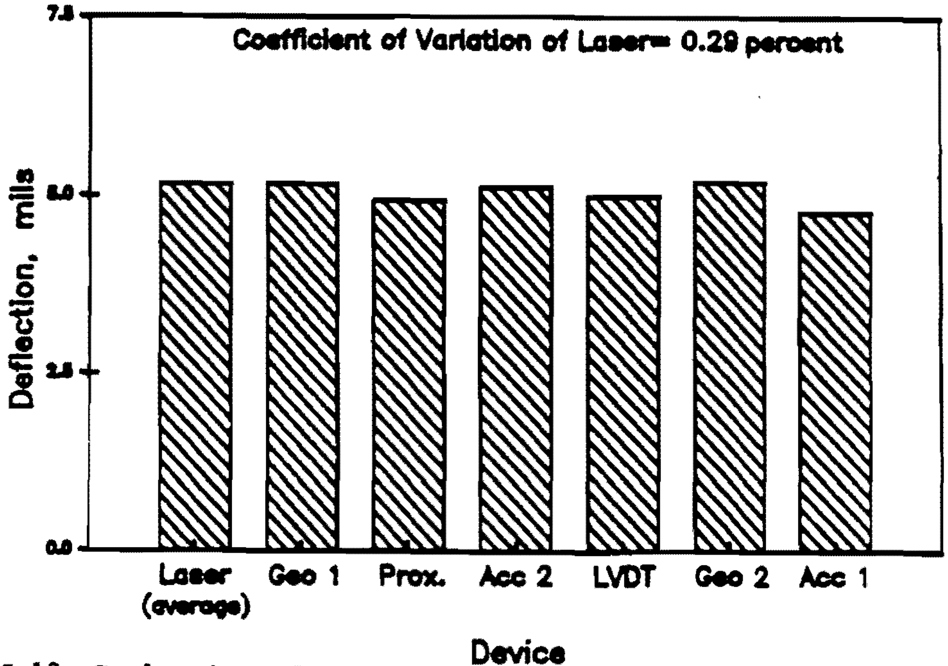


Figure J.19 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 50 msec. and a Nominal Deflection of 5.0 mils (with Laser)

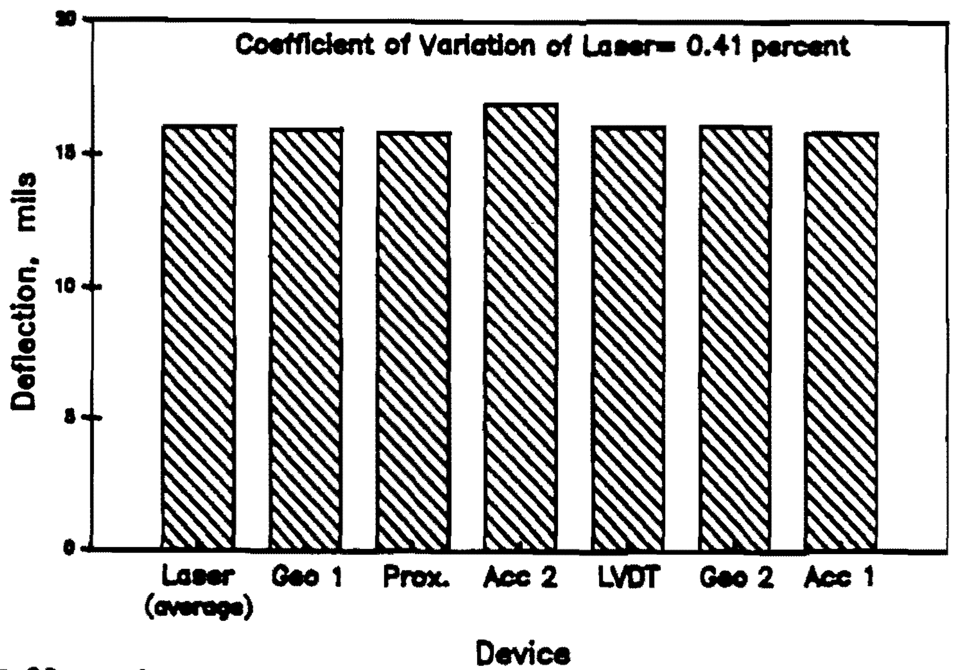


Figure J.20 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 50 msec. and a Nominal Deflection of 15.0 mils (with Laser)

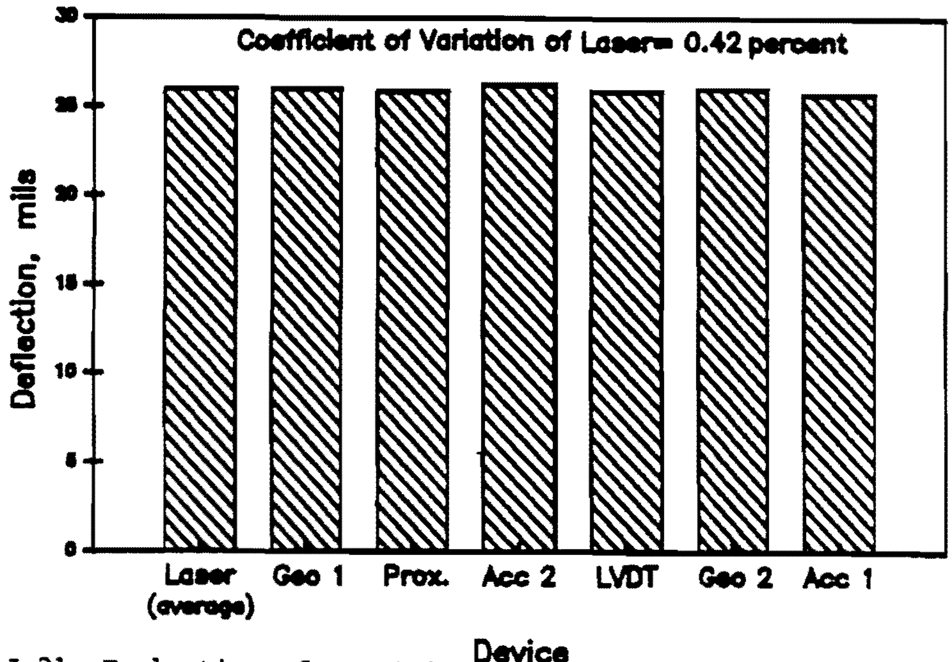


Figure J.21 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 50 msec. and a Nominal Deflection of 25.0 mils (with Laser)

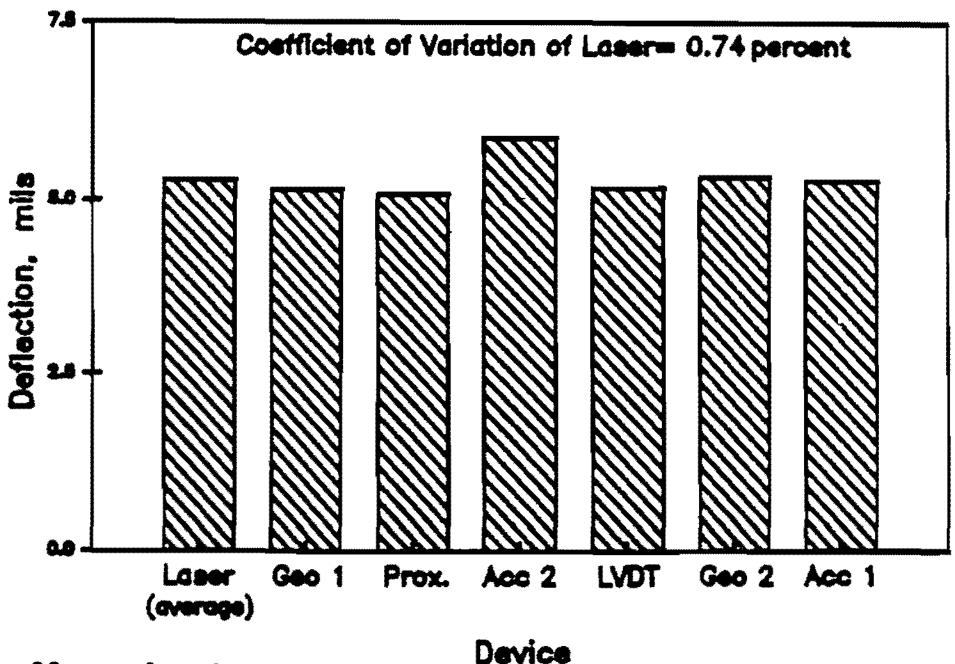


Figure J.22 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 25 msec. and a Nominal Deflection of 5.0 mils (with Laser)

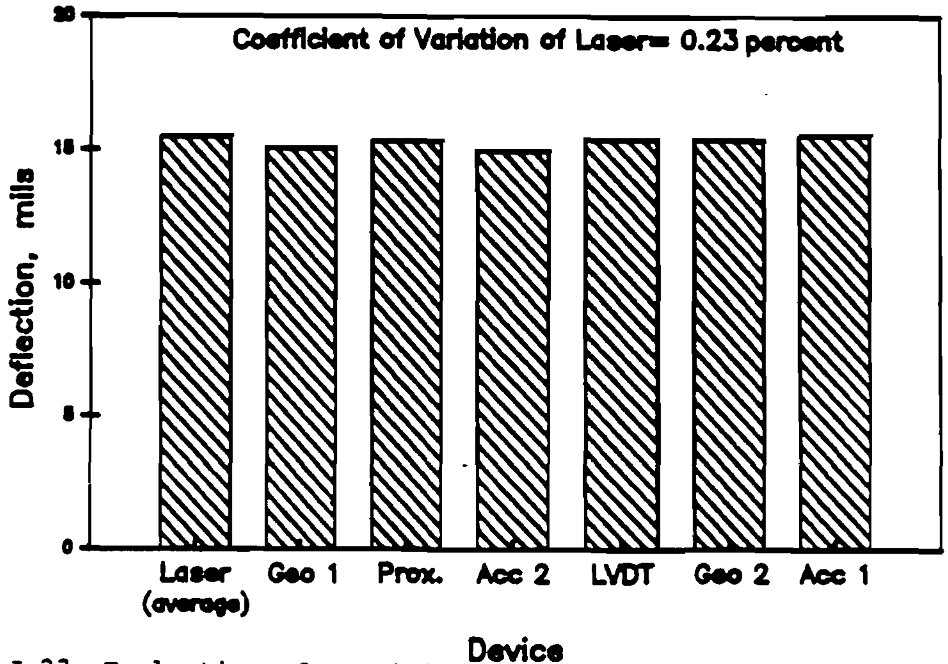


Figure J.23 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 25 msec. and a Nominal Deflection of 15.0 mils (with Laser)

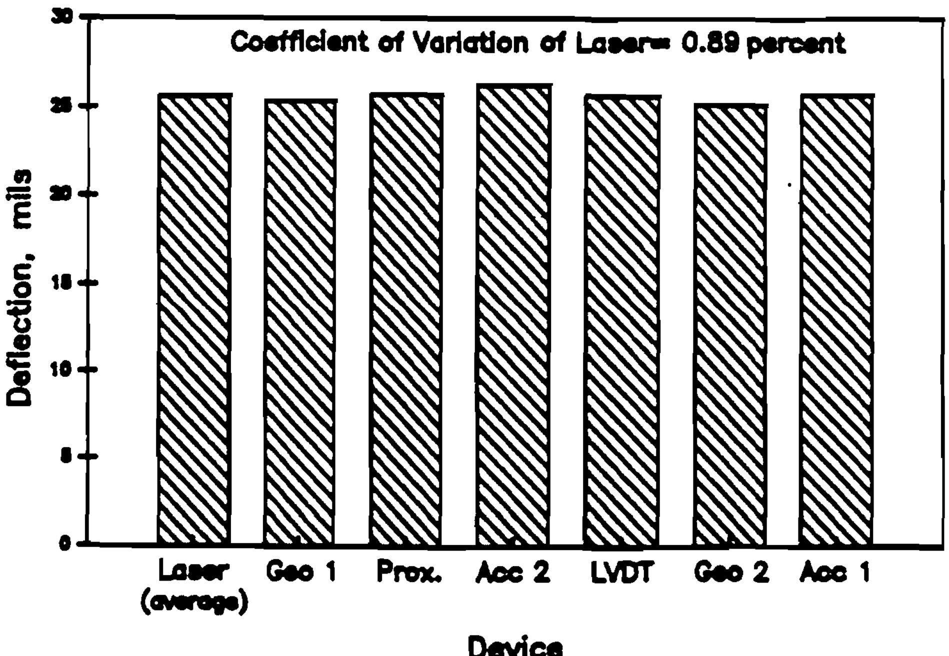


Figure J.24 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 25 msec. and a Nominal Deflection of 25.0 mils (with Laser)

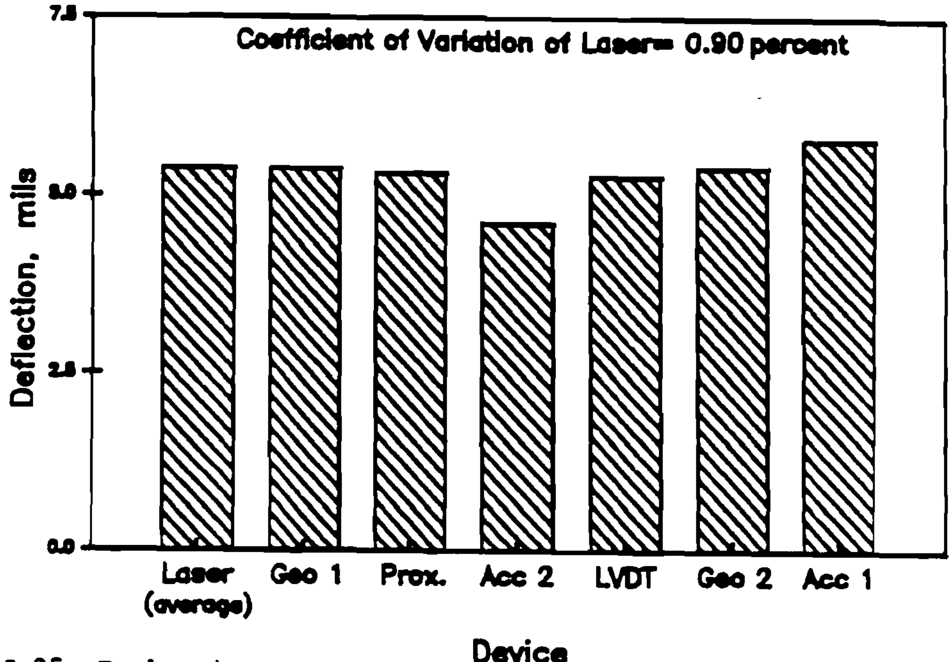


Figure J.25 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 12.5 msec. and a Nominal Deflection of 5.0 mils (with Laser)

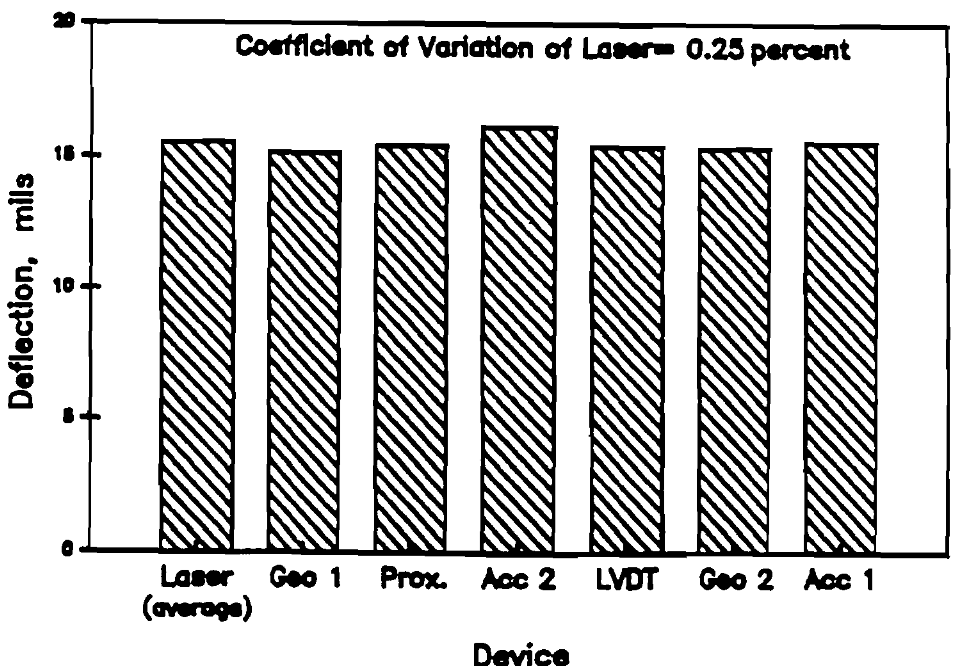


Figure J.26 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 12.5 msec. and a Nominal Deflection of 15.0 mils (with Laser)

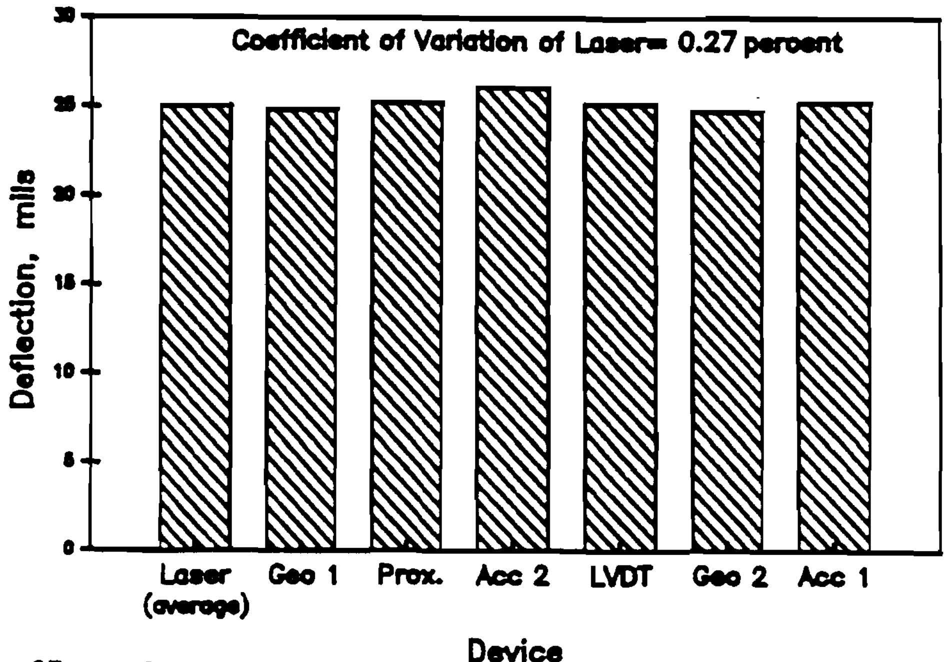


Figure J.27 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 12.5 msec. and a Nominal Deflection of 25.0 mils (with Laser)

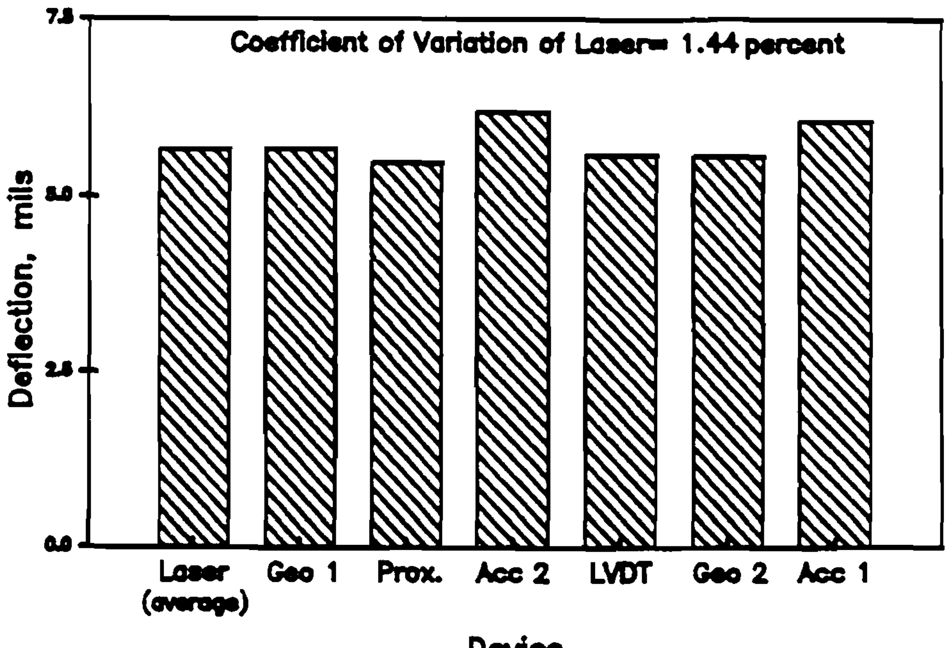


Figure J.28 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 112.5 msec. and a Nominal Deflection of 5.0 mils (with Laser)

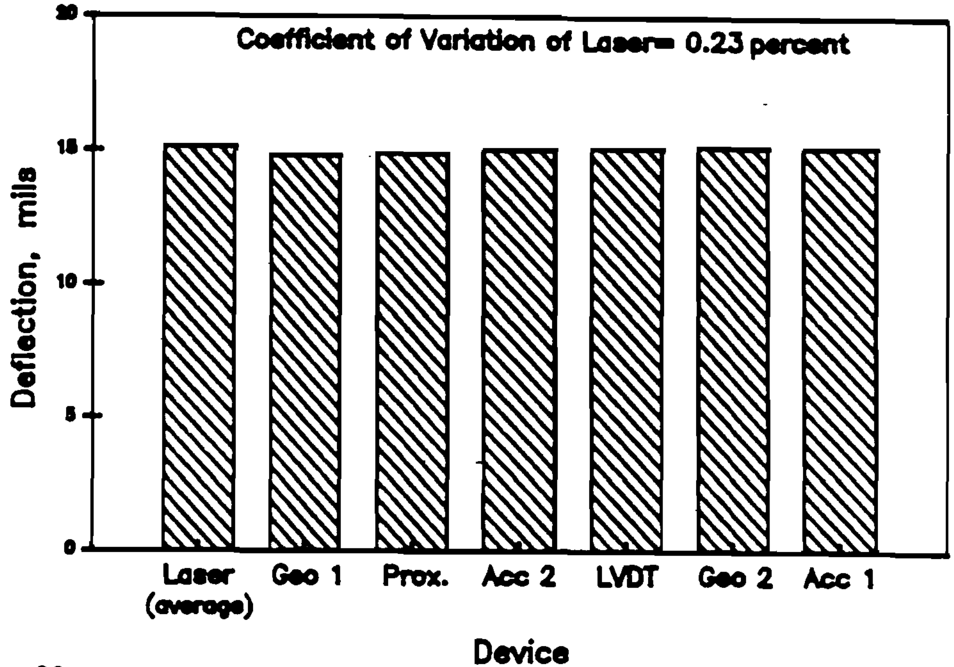


Figure J.29 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 112.5 msec. and a Nominal Deflection of 15.0 mils (with Laser)

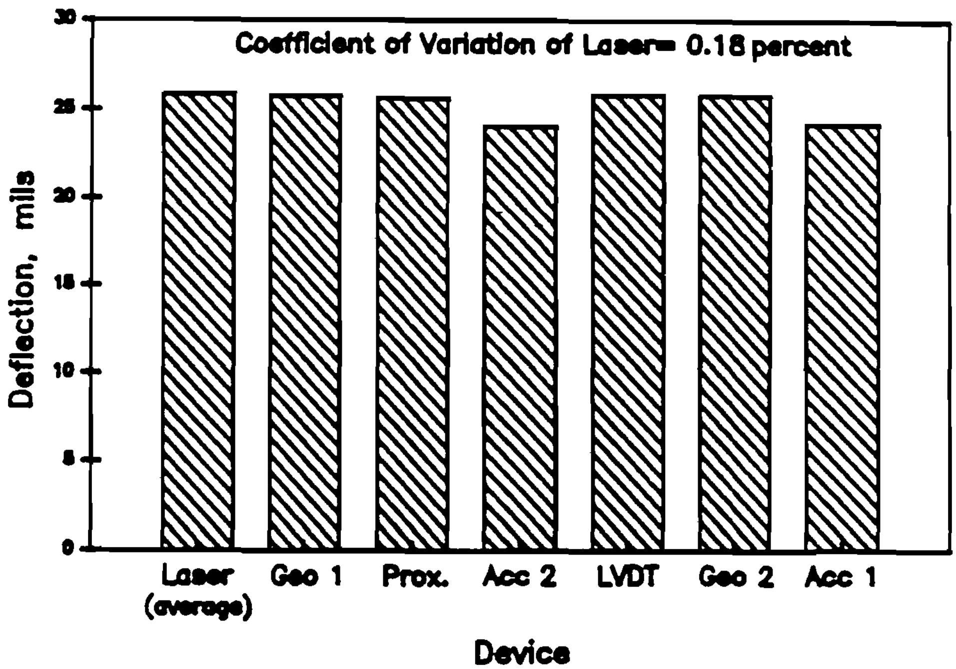


Figure J.30 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 112.5 msec. and a Nominal Deflection of 25.0 mils (with Laser)

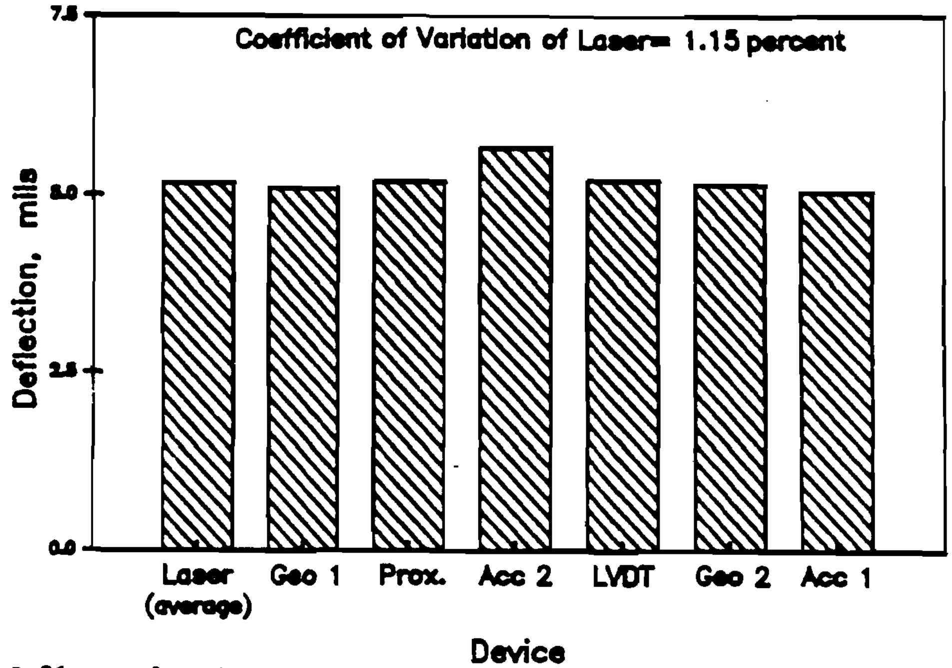


Figure J.31 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 125 msec. and a Nominal Deflection of 5.0 mils (with Laser)

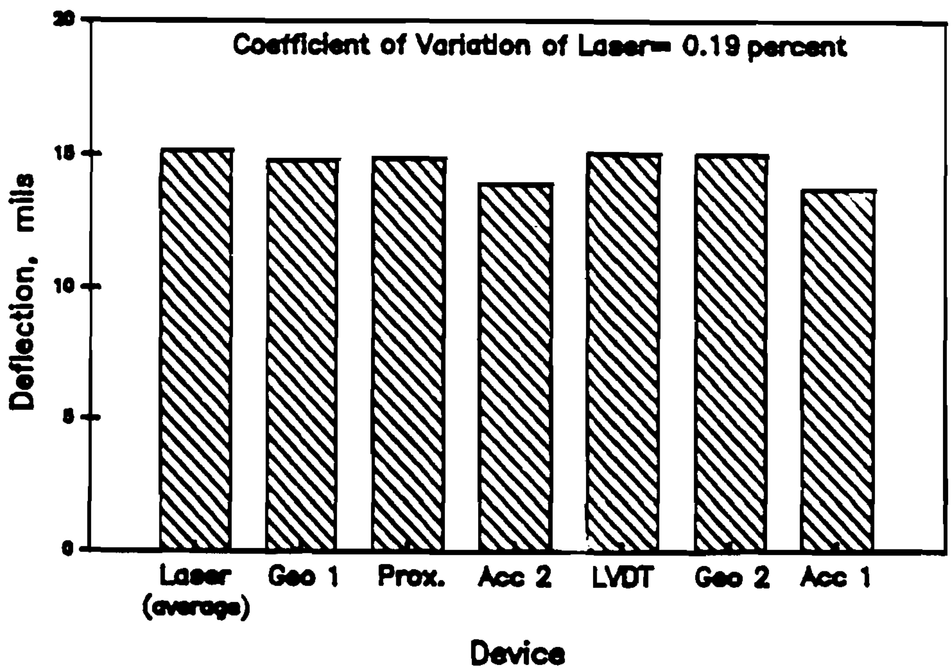


Figure J.32 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 125 msec. and a Nominal Deflection of 15.0 mils (with Laser)

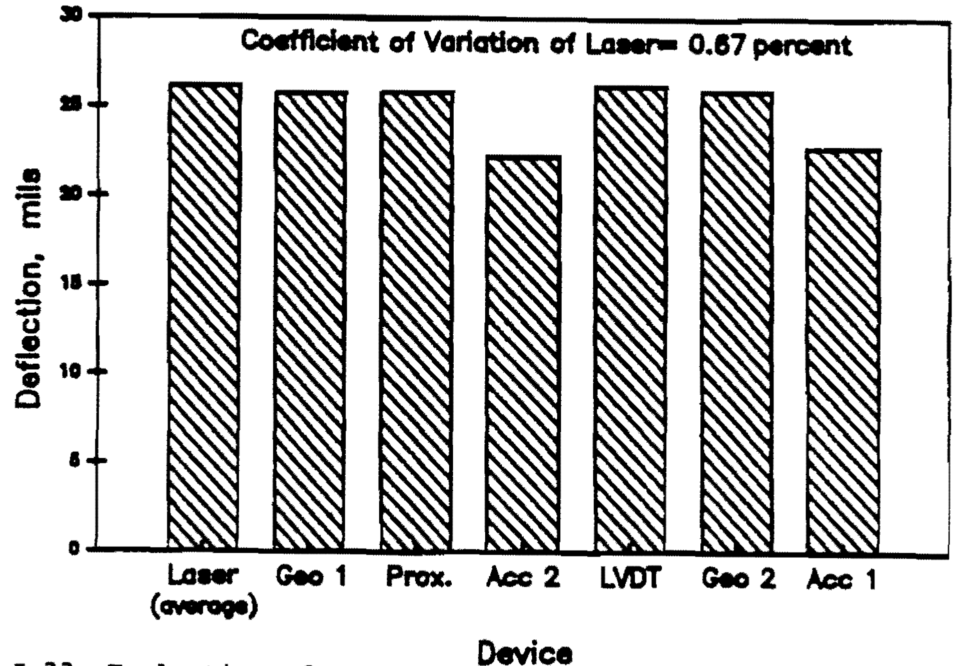


Figure J.33 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 125 msec. and a Nominal Deflection of 25.0 mils (with Laser)

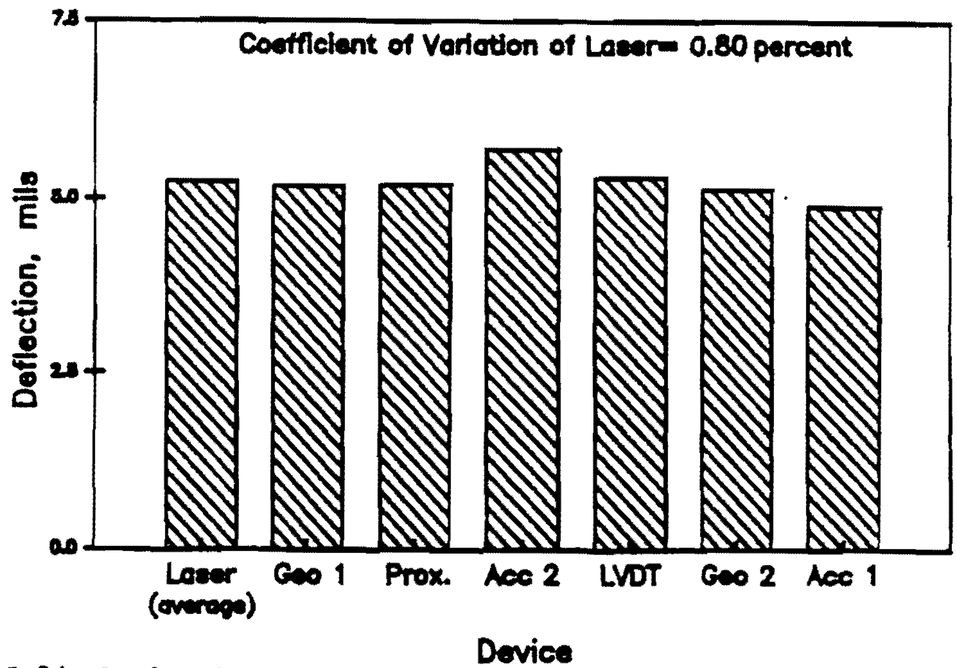


Figure J.34 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 150 msec. and a Nominal Deflection of 5.0 mils (with Laser)

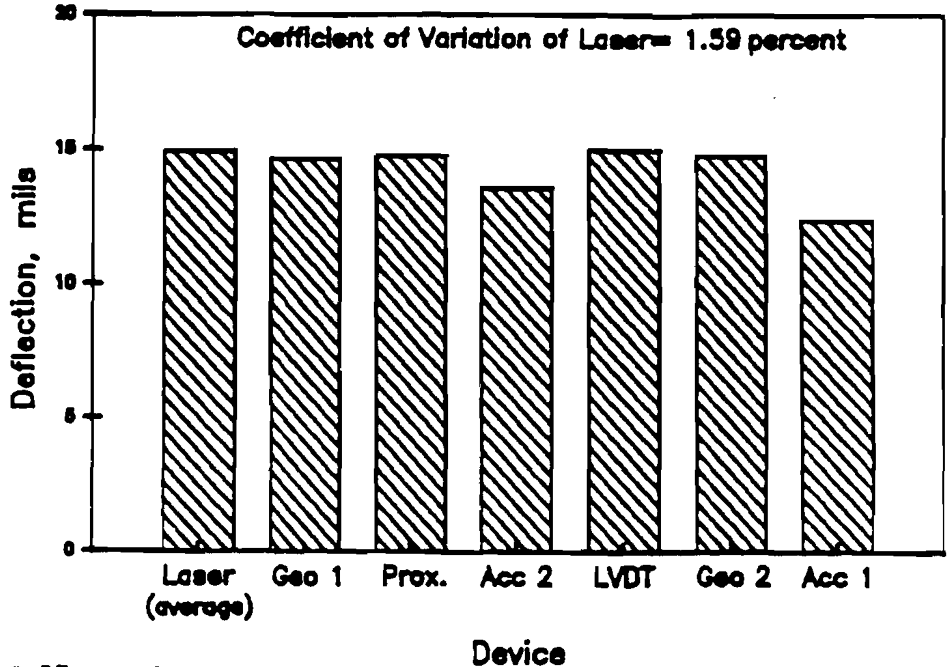


Figure J.35 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 150 msec. and a Nominal Deflection of 15.0 mils (with Laser)

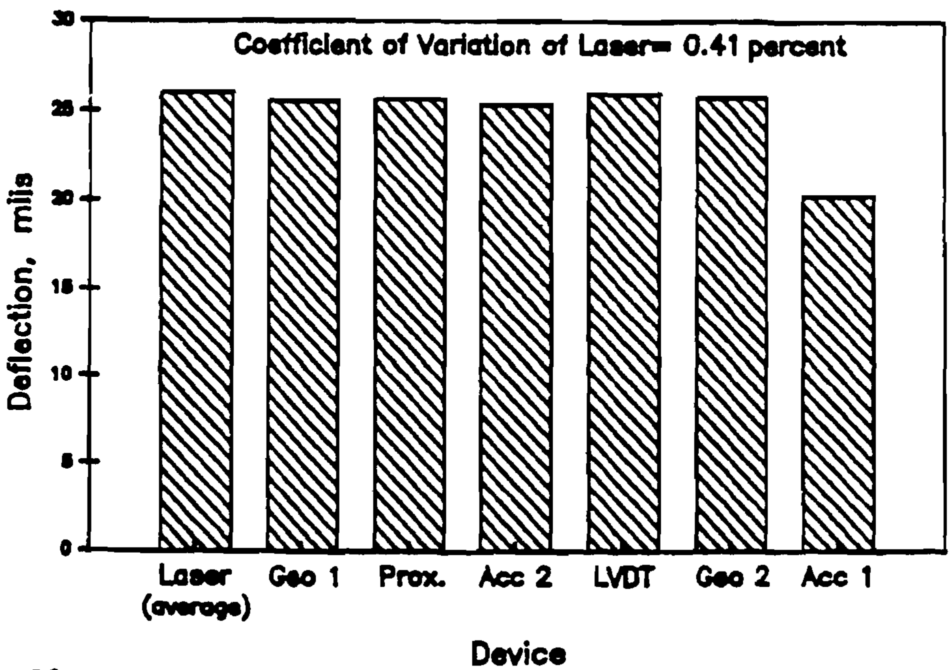


Figure J.36 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 150 msec. and a Nominal Deflection of 25.0 mils (with Laser)

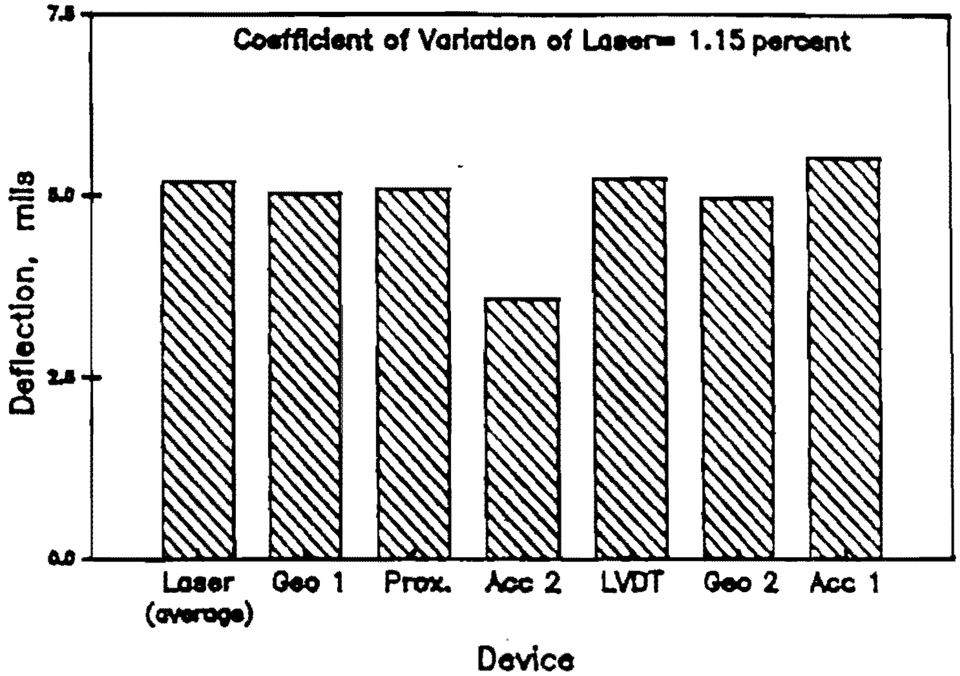


Figure J.37 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 175 msec. and a Nominal Deflection of 5.0 mils (with Laser)

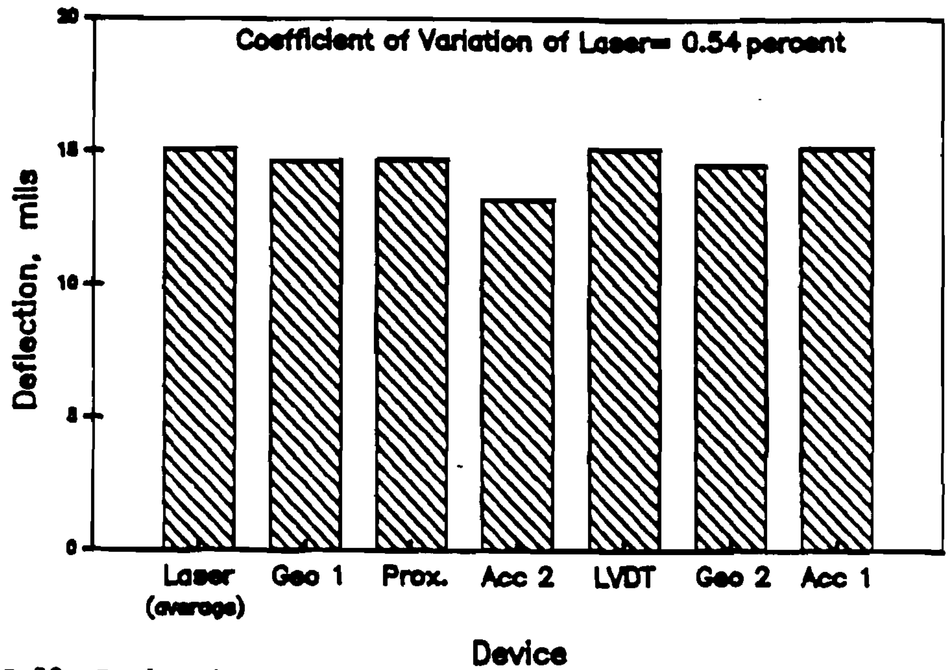


Figure J.38 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 175 msec. and a Nominal Deflection of 15.0 mils (with Laser)

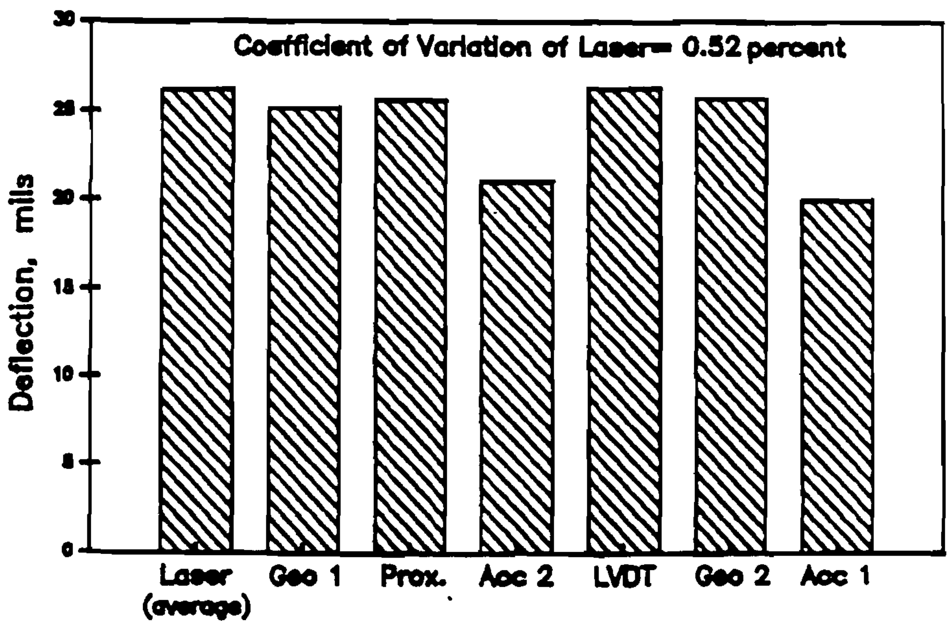


Figure J.39 Evaluation of Precision of All Sensors for Impulse Motion for Half-Sine Wave at Pulse Width of 175 msec. and a Nominal Deflection of 25.0 mils (with Laser)

APPENDIX K

EVALUATION OF ACCURACY OF EACH SENSOR

FOR SQUARE WAVE MOTION

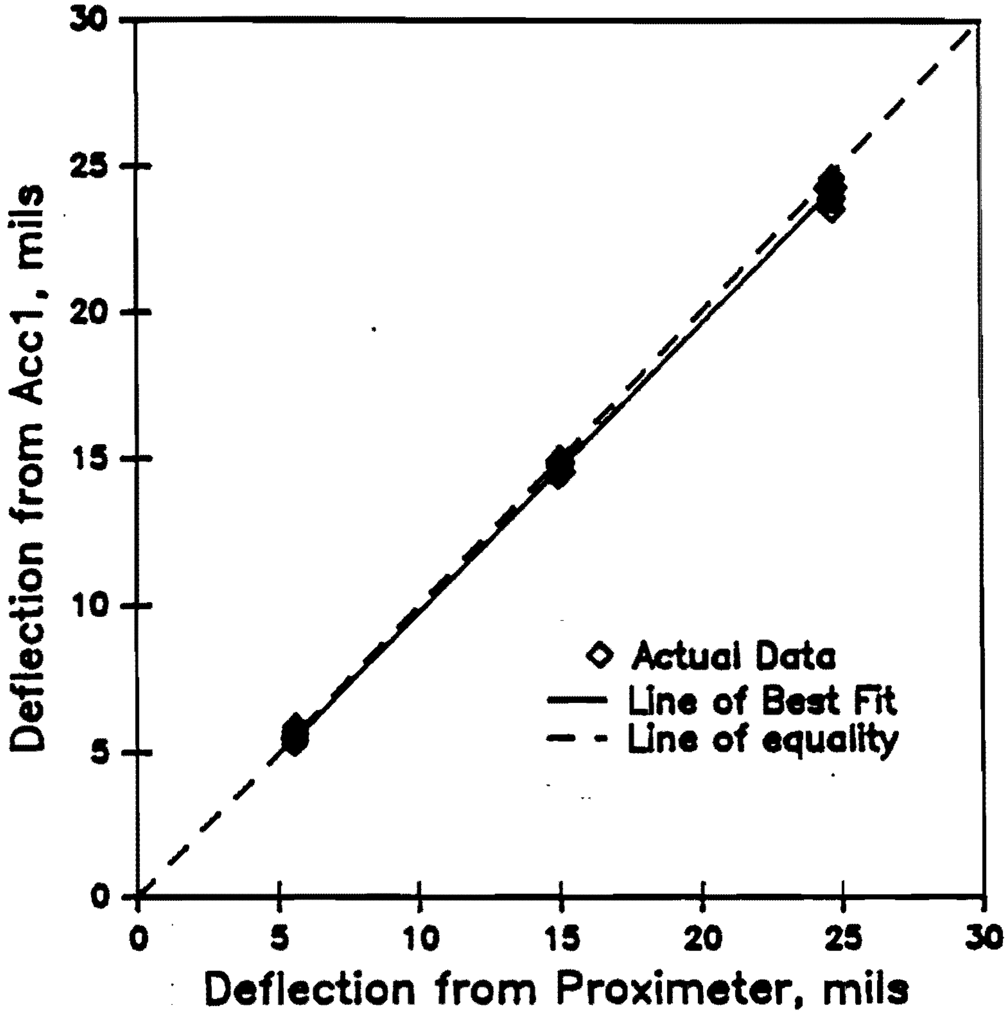


Figure K.1 Evaluation of Accuracy of Accelerometer 1 for Square Wave at Pulse Width of 25 msec. (Slope of Line is 1.03)

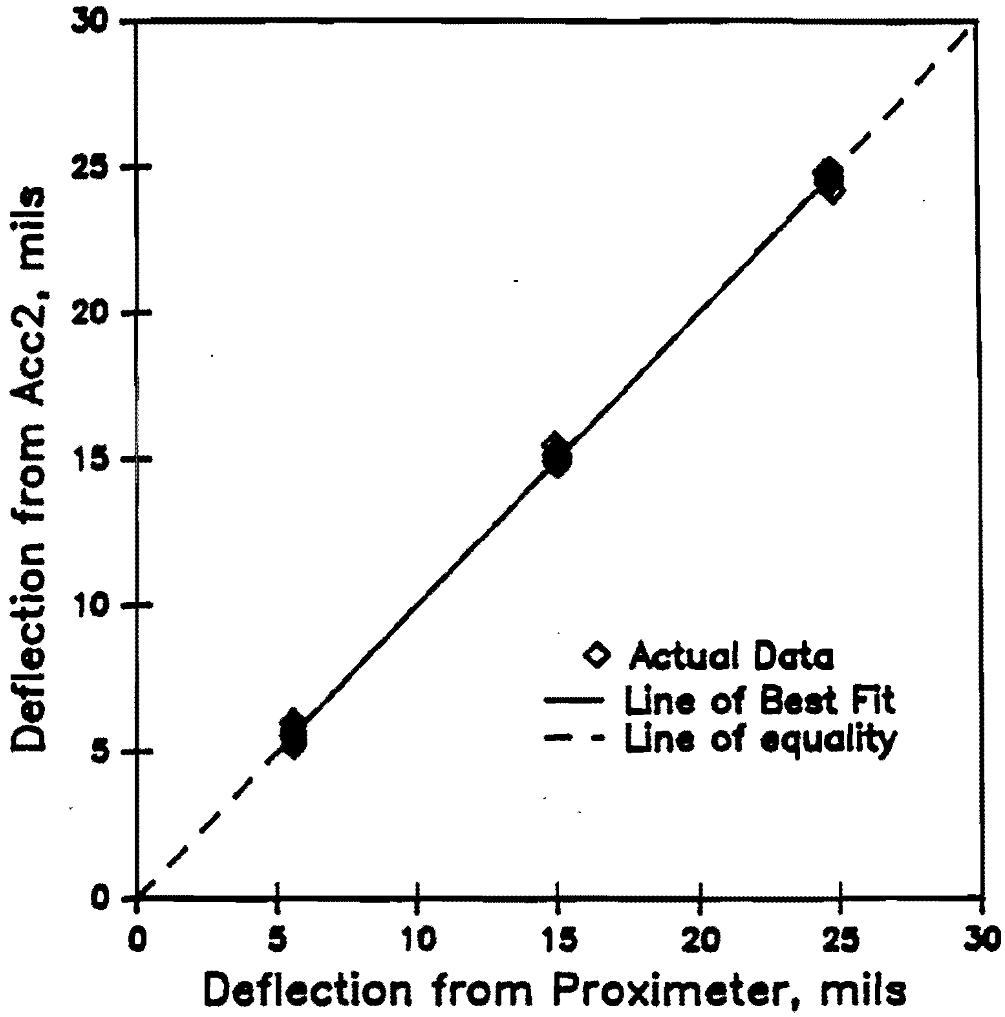


Figure K.2 Evaluation of Accuracy of Accelerometer 2 for Square Wave at Pulse Width of 25 msec. (Slope of Line is 1.00)

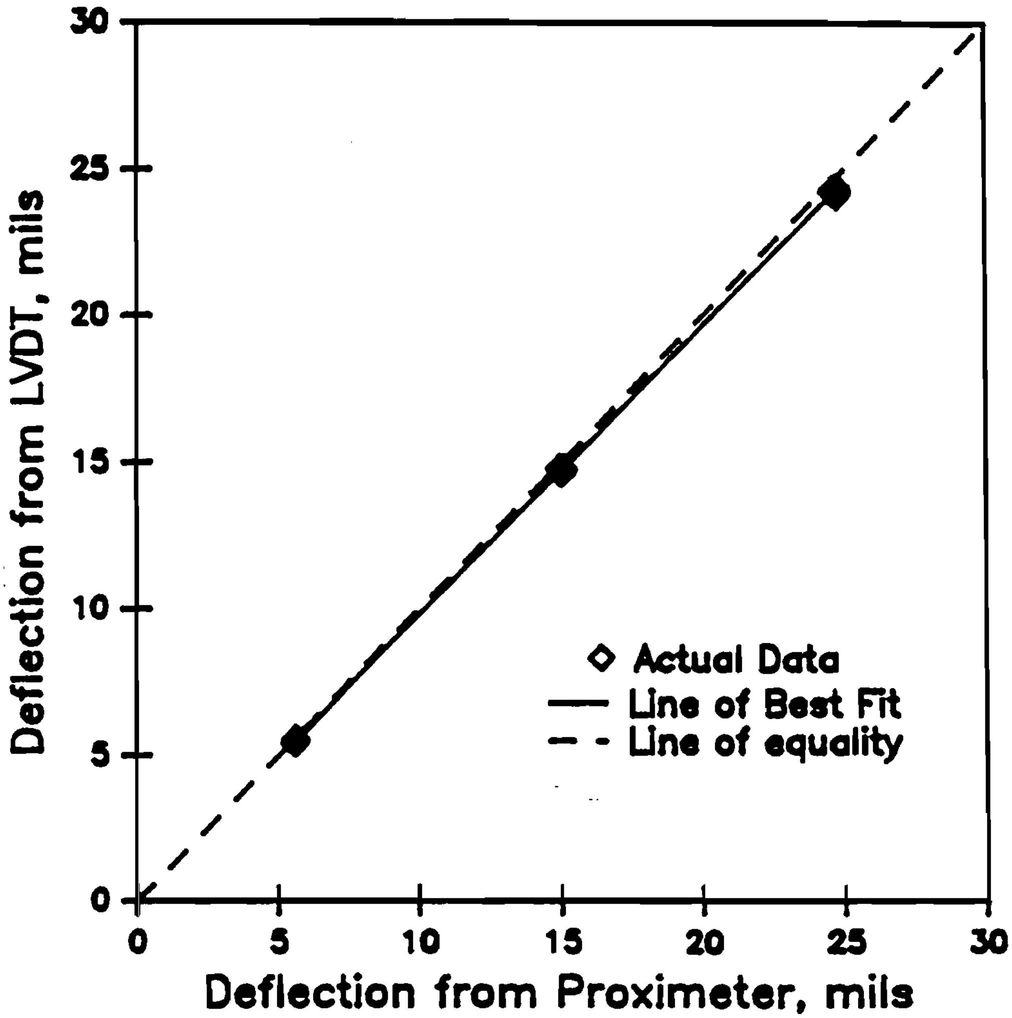


Figure K.3 Evaluation of Accuracy of LVDT for Square Wave at Pulse Width of 25 msec. (Slope of Line is 1.02)

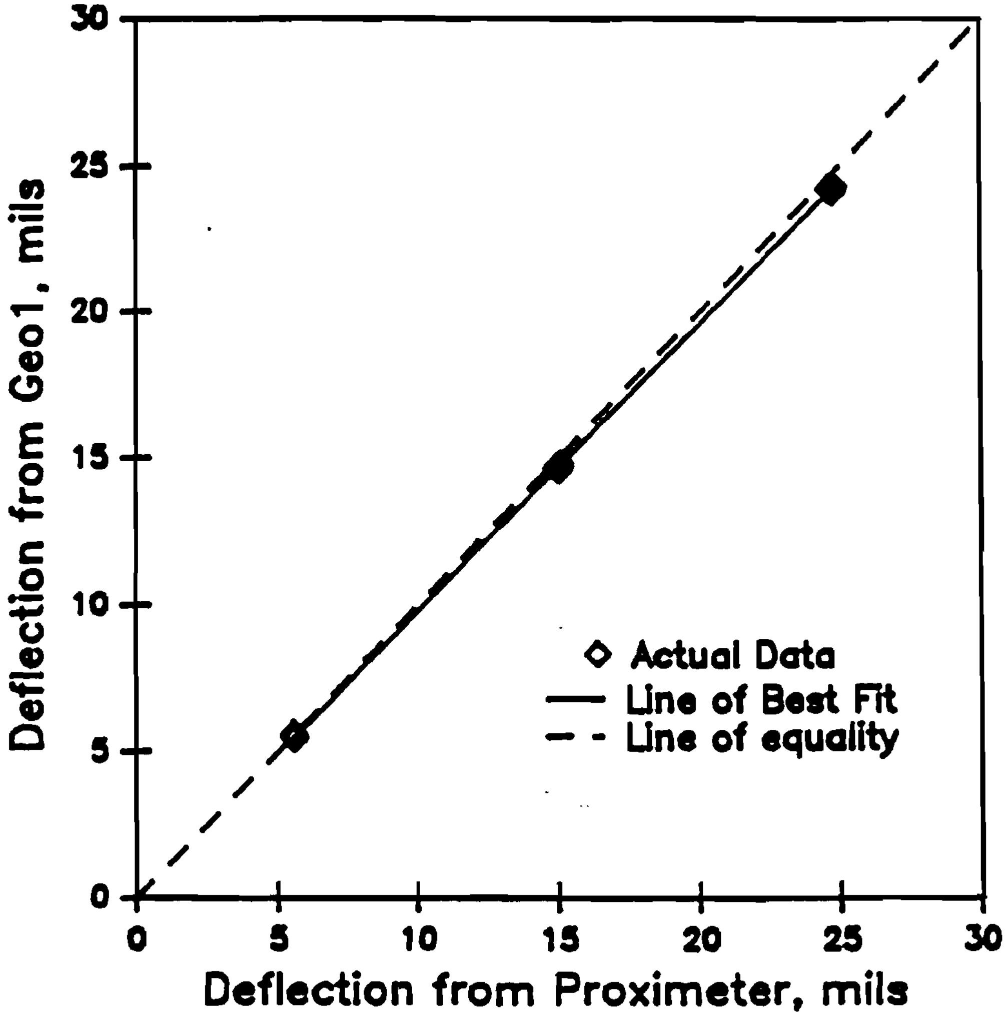


Figure K.4 Evaluation of Accuracy of Geophone 1 for Square Wave at Pulse Width of 25 msec. (Slope of Line is 1.02)

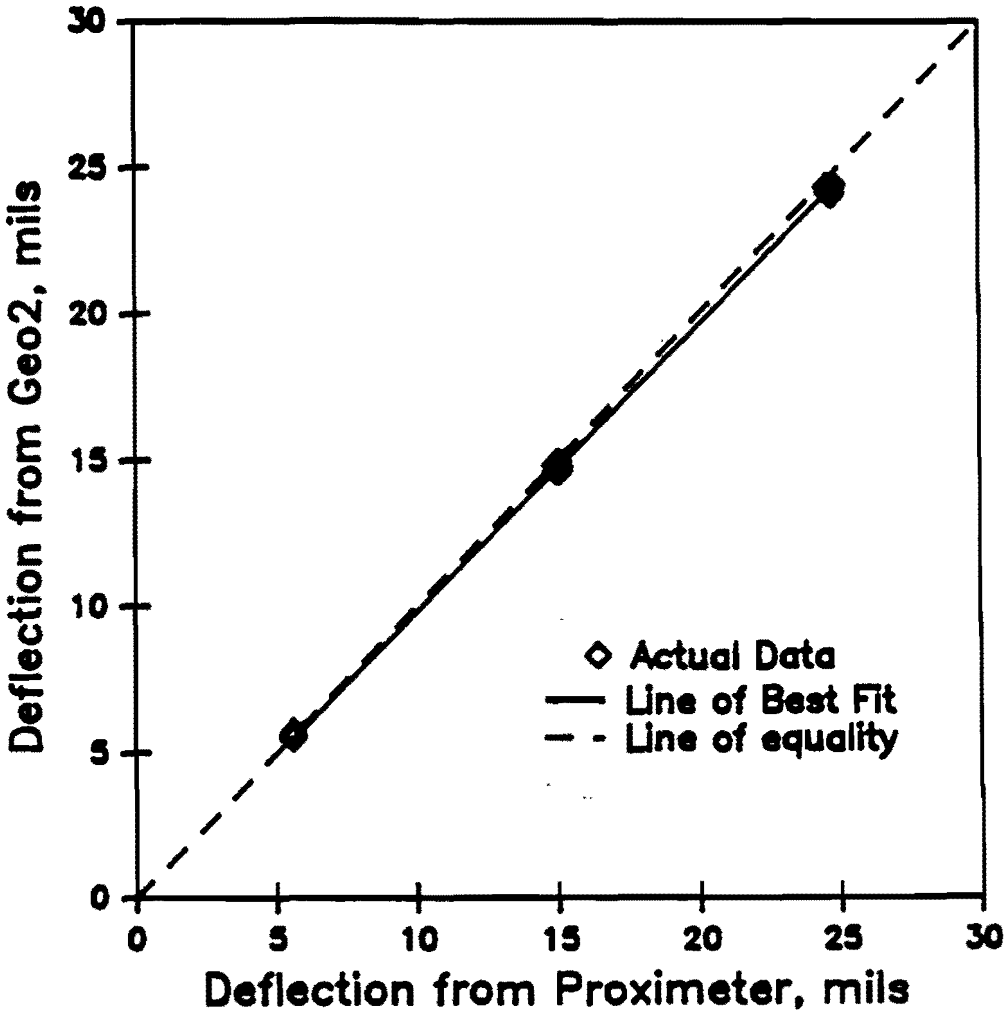


Figure K.5 Evaluation of Accuracy of Geophone 2 for Square Wave at Pulse Width of 25 msec. (Slope of Line is 1.01)

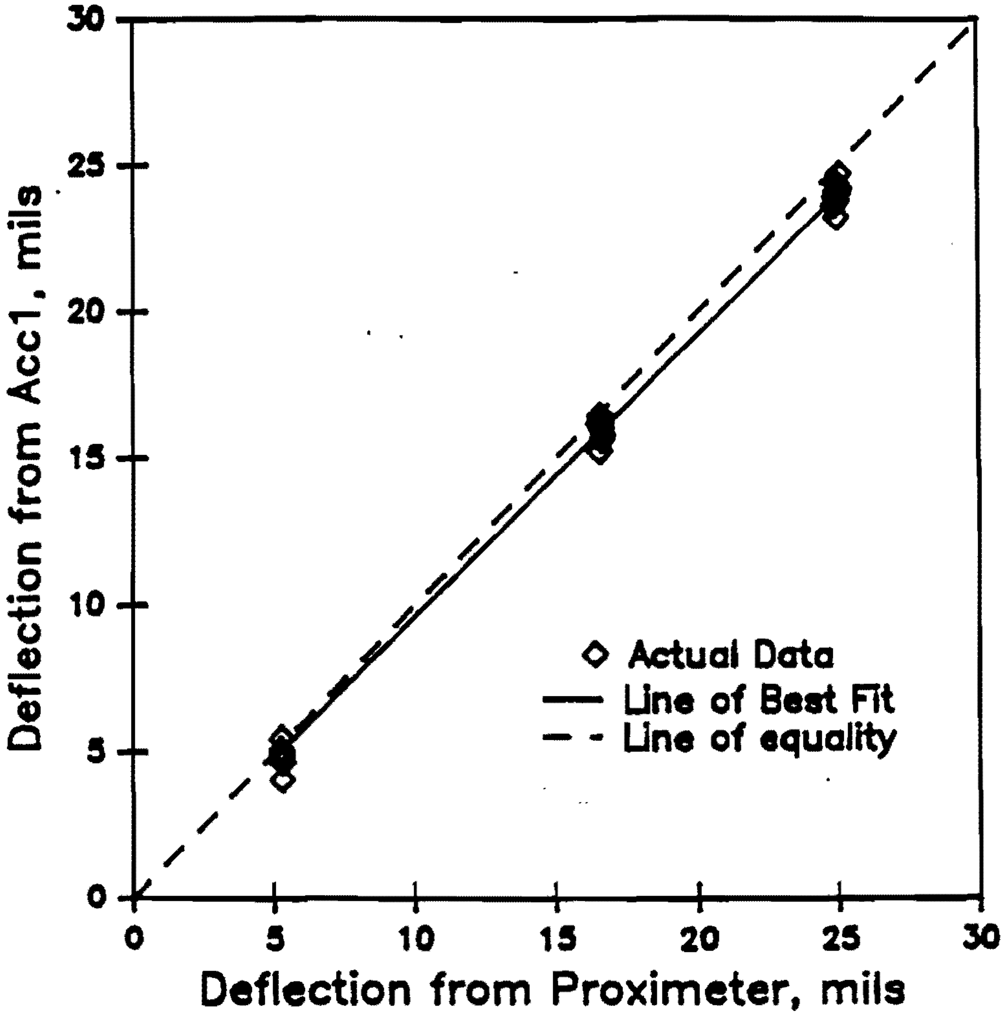


Figure K.6 Evaluation of Accuracy of Accelerometer 1 for Square Wave at Pulse Width of 50 msec. (Slope of Line is 1.03)

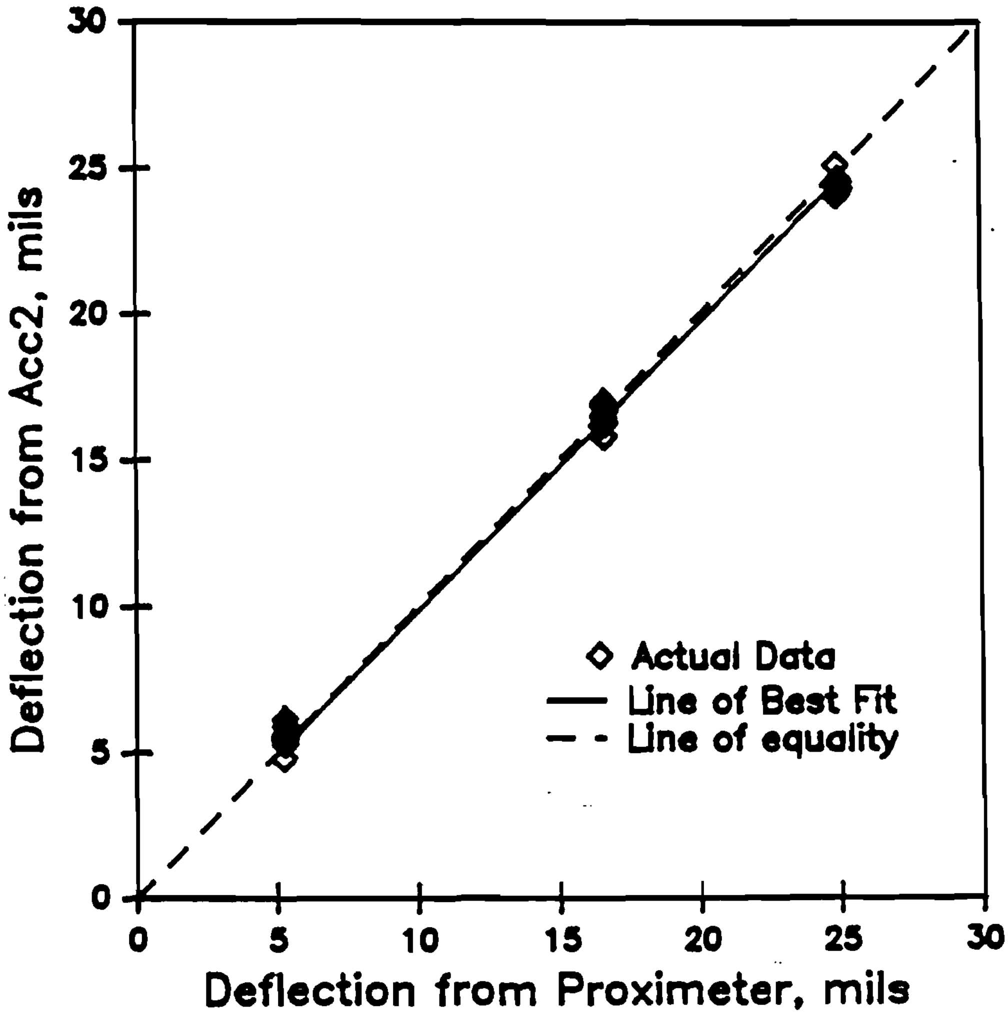


Figure K.7 Evaluation of Accuracy of Accelerometer 2 for Square Wave at Pulse Width of 50 msec. (Slope of Line is 0.99)

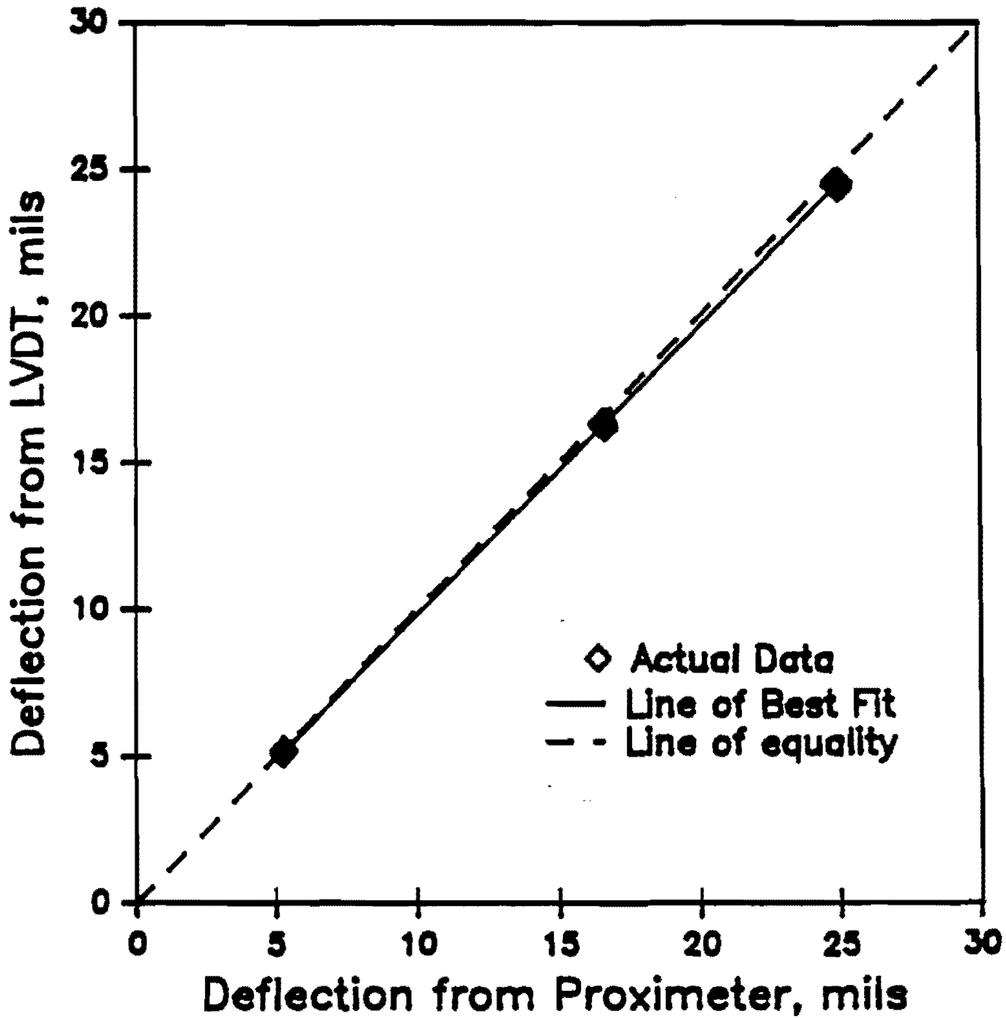


Figure K.8 Evaluation of Accuracy of LVDT for Square Wave at Pulse Width of 50 msec. (Slope of Line is 1.02)

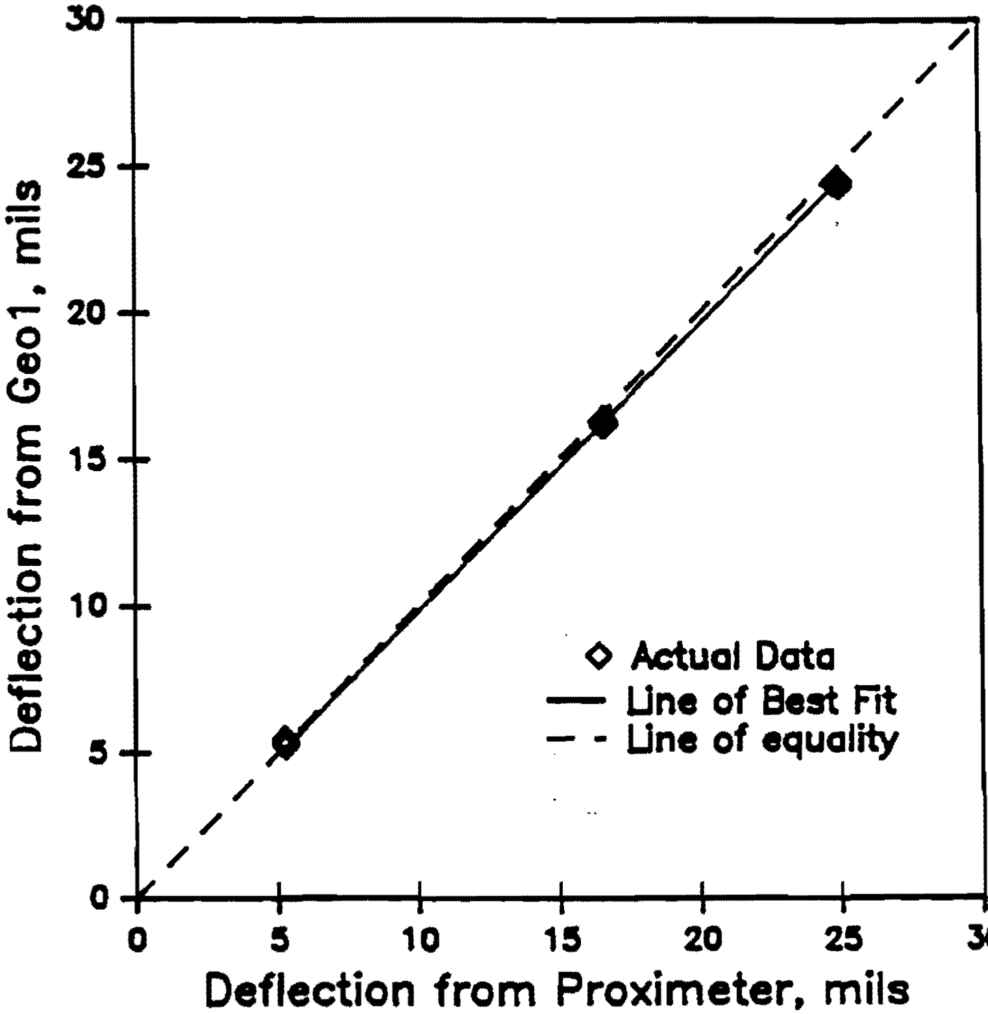


Figure K.9 Evaluation of Accuracy of Geophone 1 for Square Wave at Pulse Width of 50 msec. (Slope of Line is 1.01)

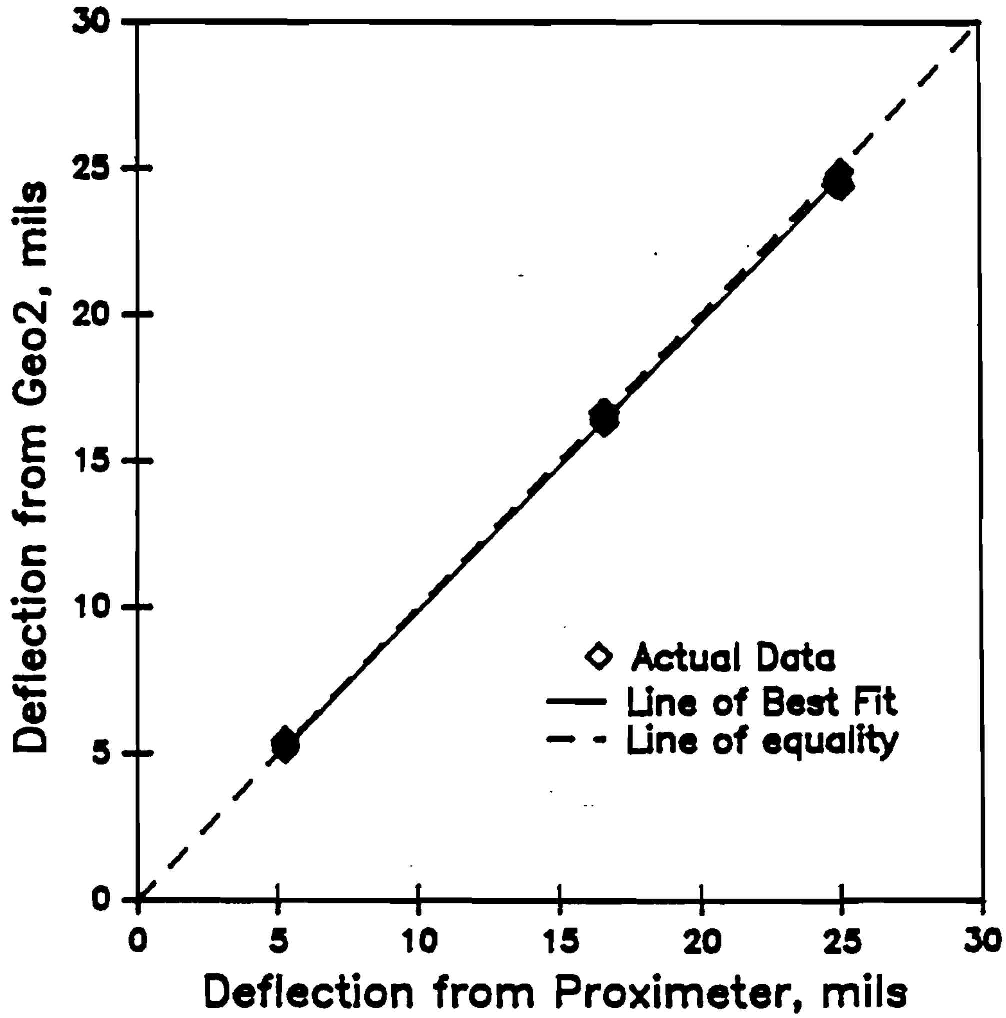


Figure K.10 Evaluation of Accuracy of Geophone 2 for Square Wave at Pulse Width of 50 msec. (Slope of Line is 1.00)

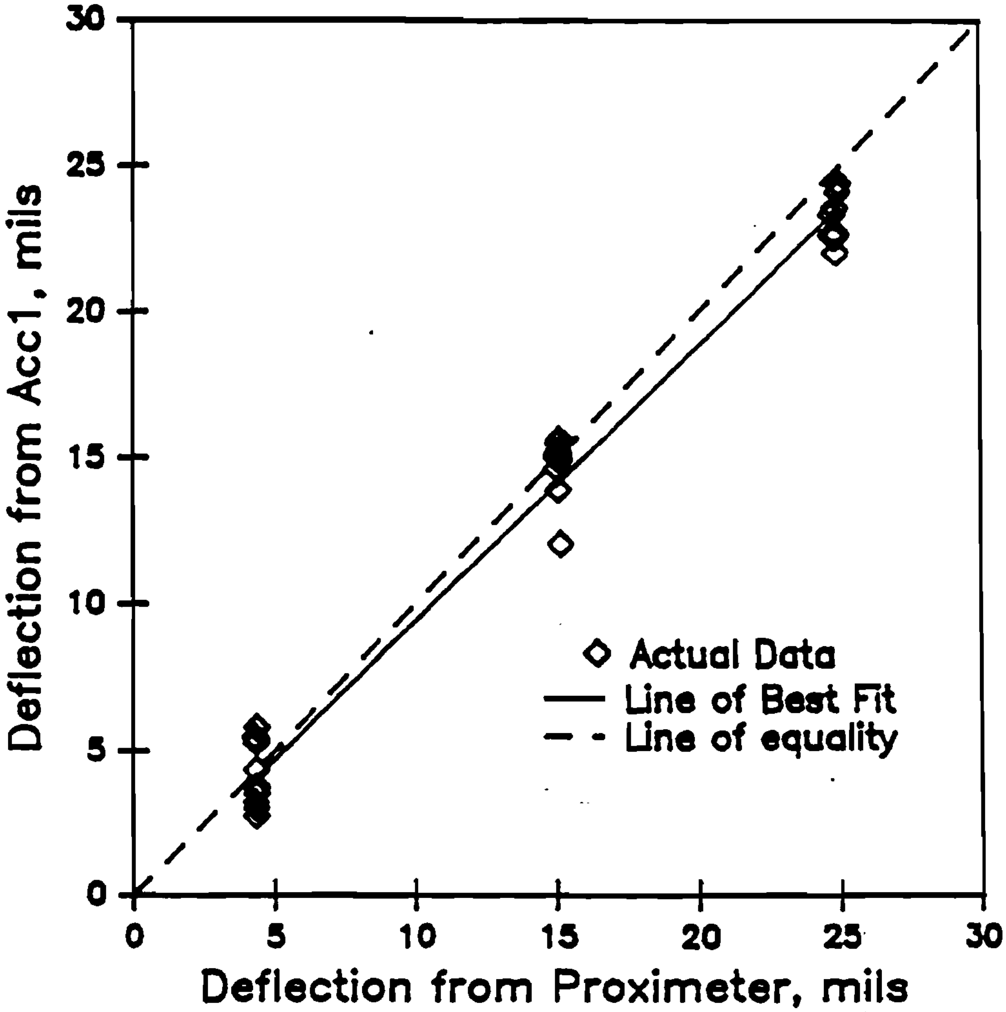


Figure K.11 Evaluation of Accuracy of Accelerometer 1 for Square Wave at Pulse Width of 100 msec. (Slope of Line is 1.02)

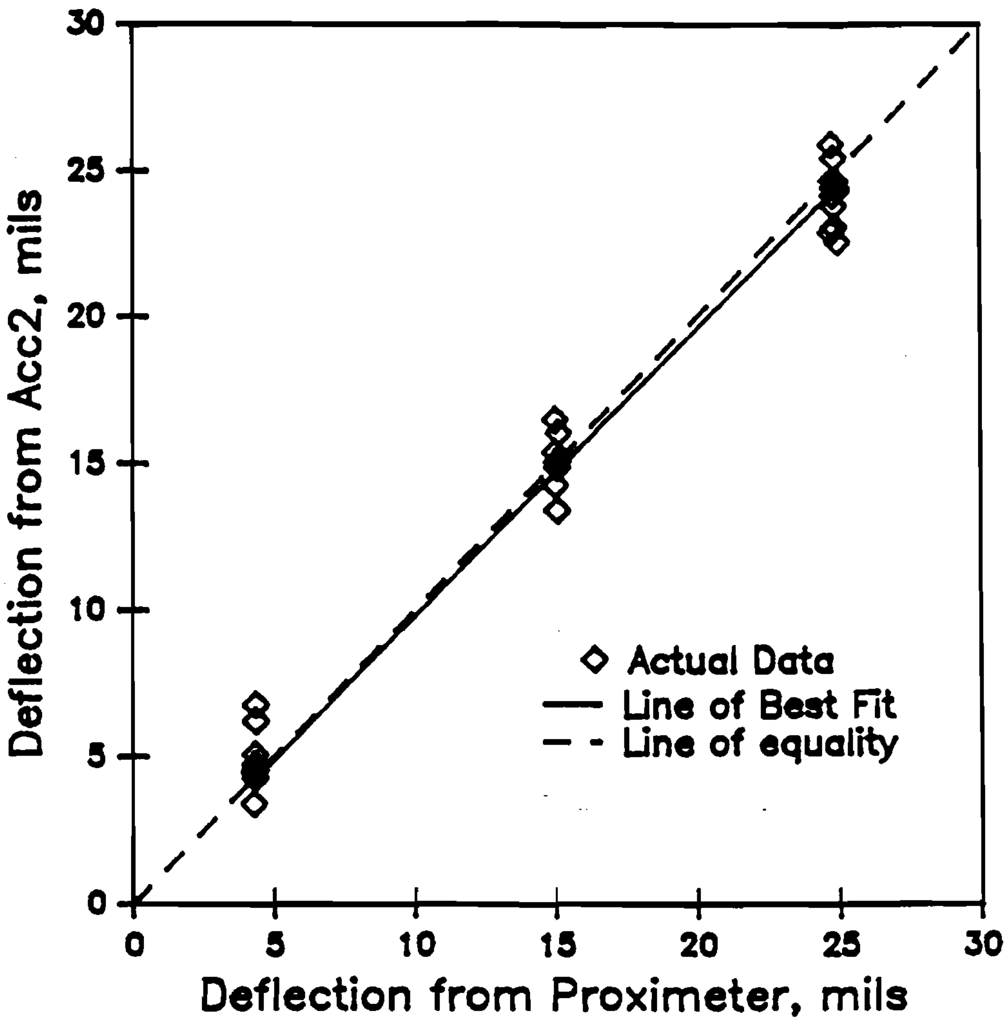


Figure K.12 Evaluation of Accuracy of Accelerometer 2 for Square Wave at Pulse Width of 100 msec. (Slope of Line is 0.99)

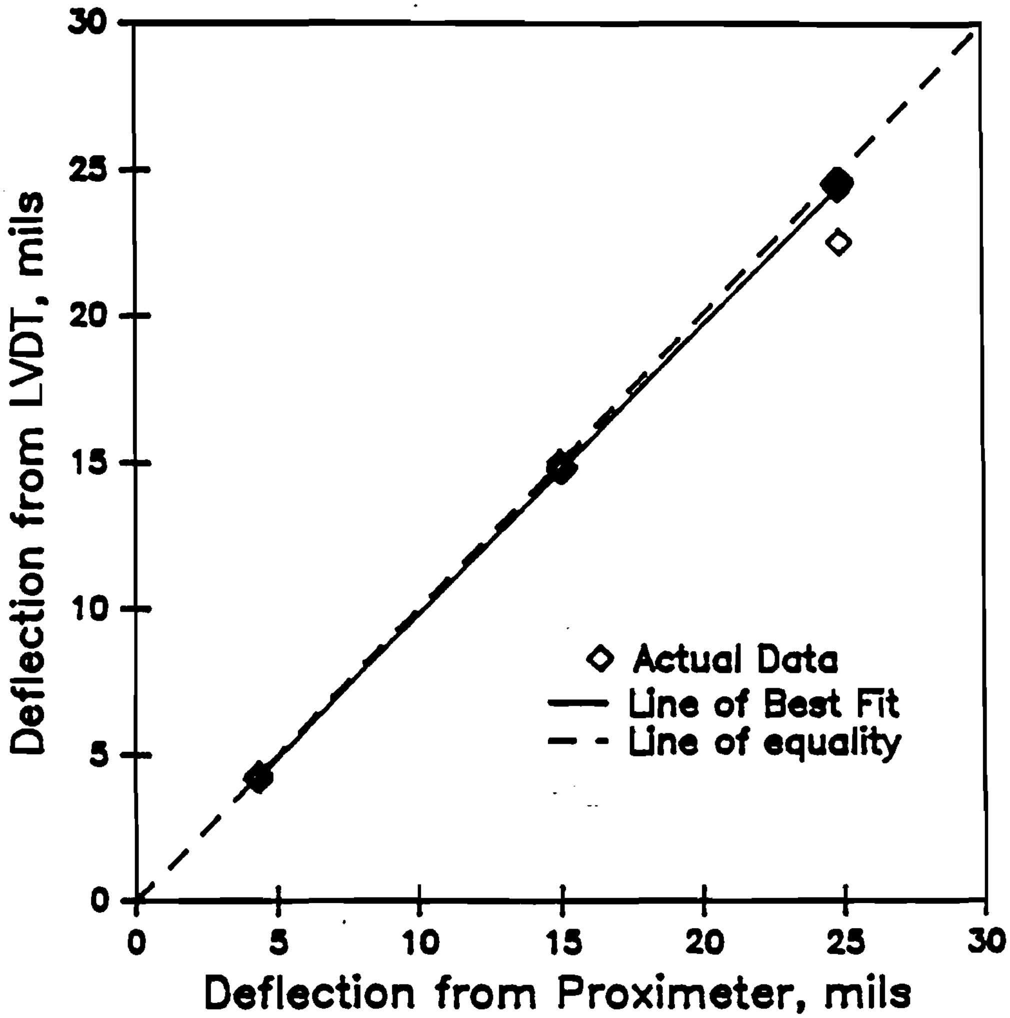


Figure K.13 Evaluation of Accuracy of LVDT for Square Wave at Pulse Width of 100 msec. (Slope of Line is 1.02)

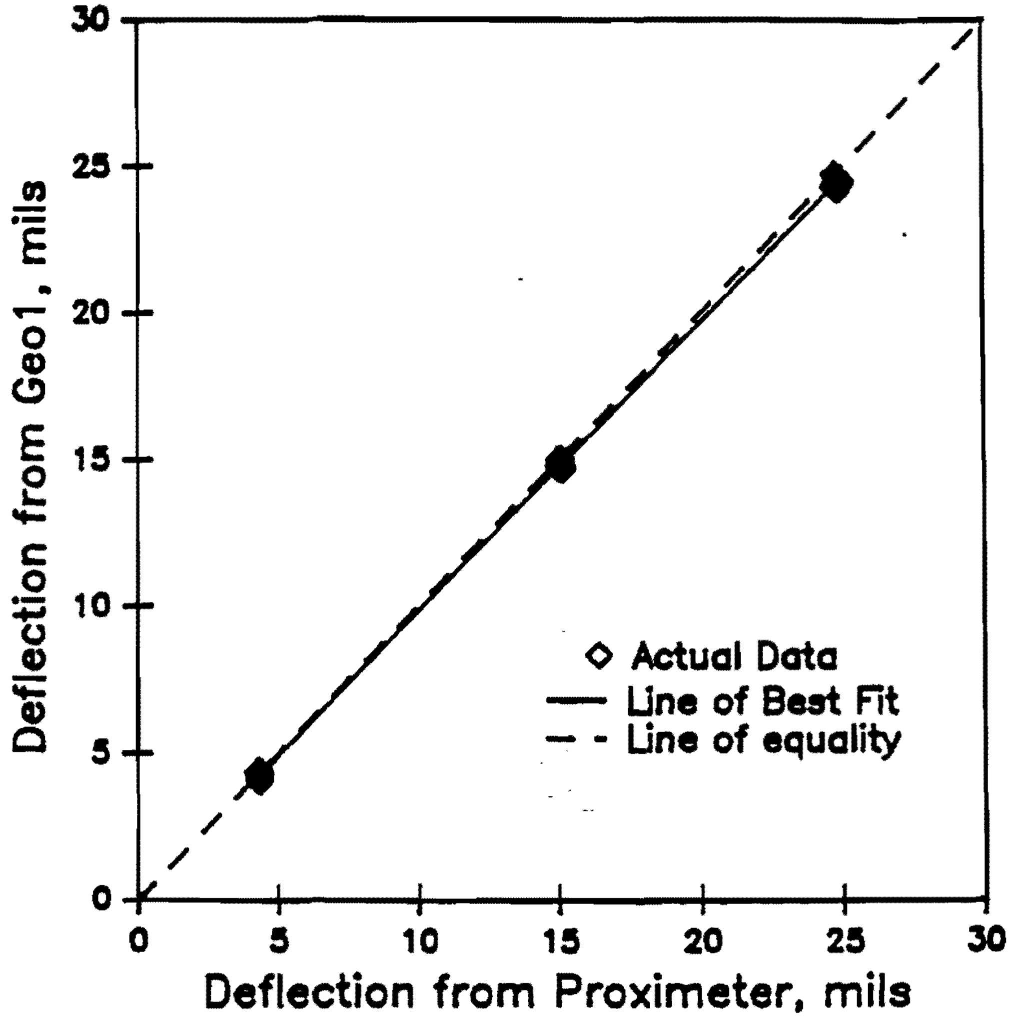


Figure K.14 Evaluation of Accuracy of Geophone 1 for Square Wave at Pulse Width of 100 msec. (Slope of Line is 1.01)

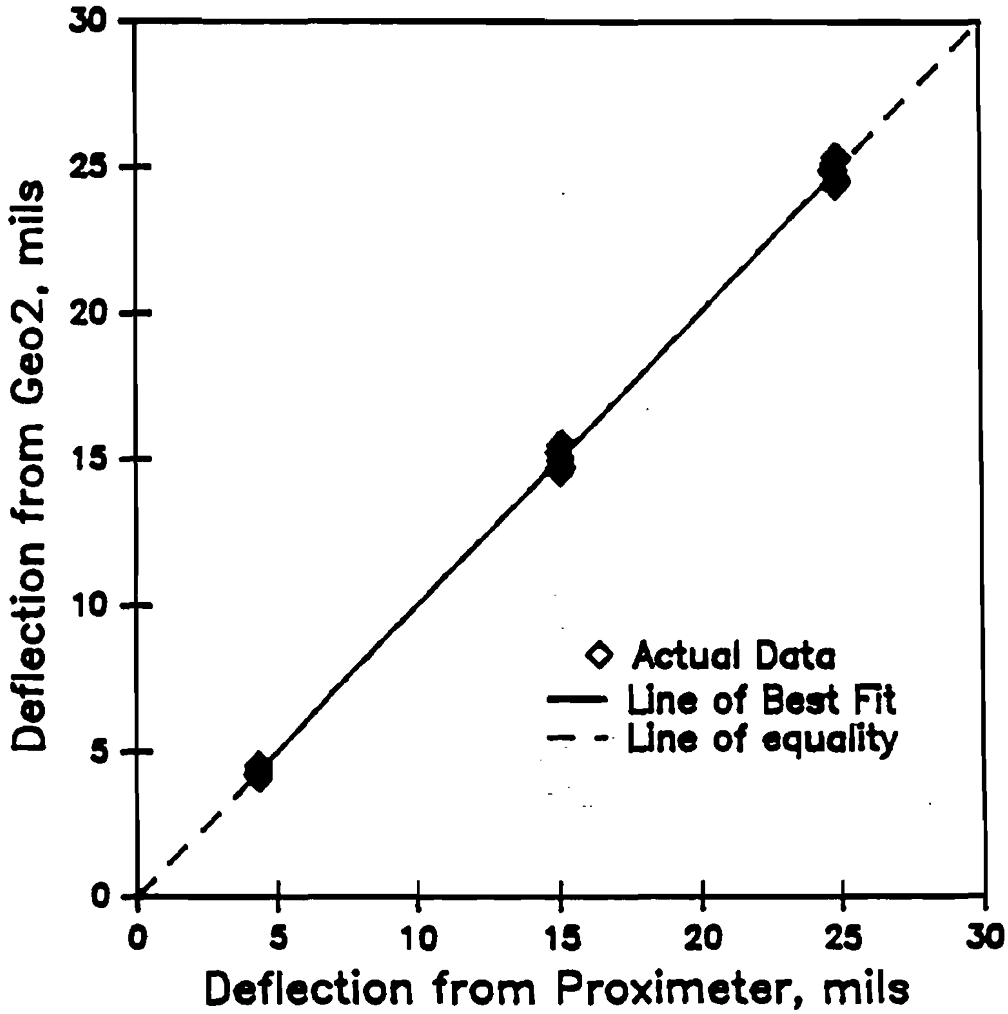
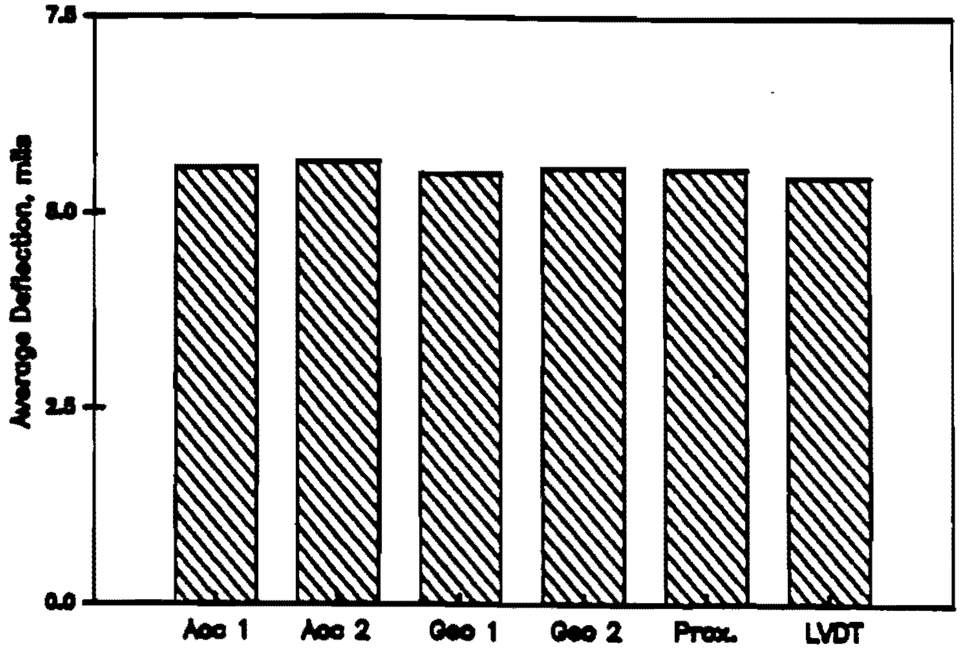


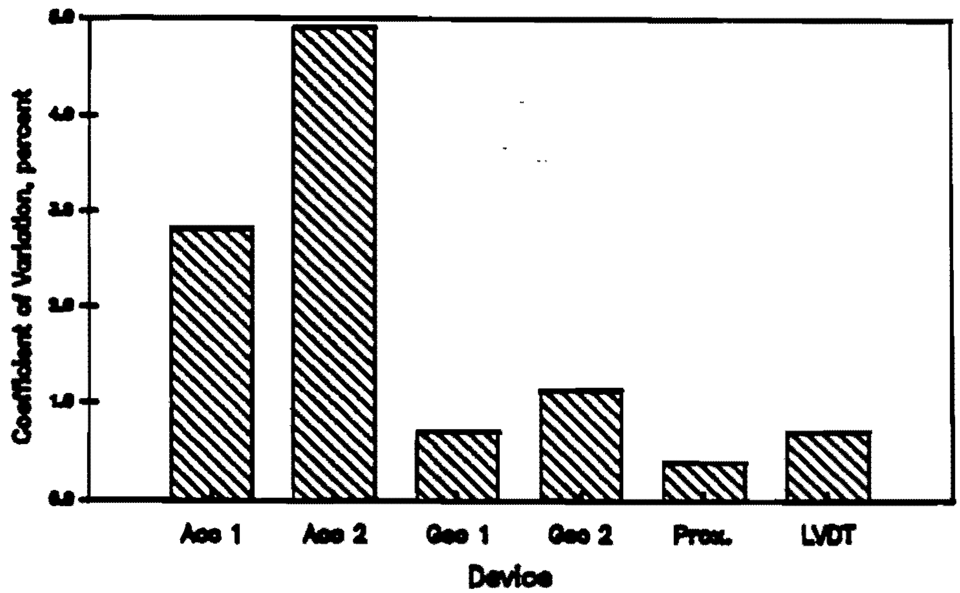
Figure K.15 Evaluation of Accuracy of Geophone 2 for Square Wave at Pulse Width of 100 msec. (Slope of Line is 1.00)

APPENDIX L

EVALUATION OF PRECISION OF EACH SENSOR FOR SQUARE WAVE MOTION



a) Average Deflection, mils



b) Coefficient of Variation

Figure L.1 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 25 msec. and a Nominal Deflection of 5.0 mils (without Laser)

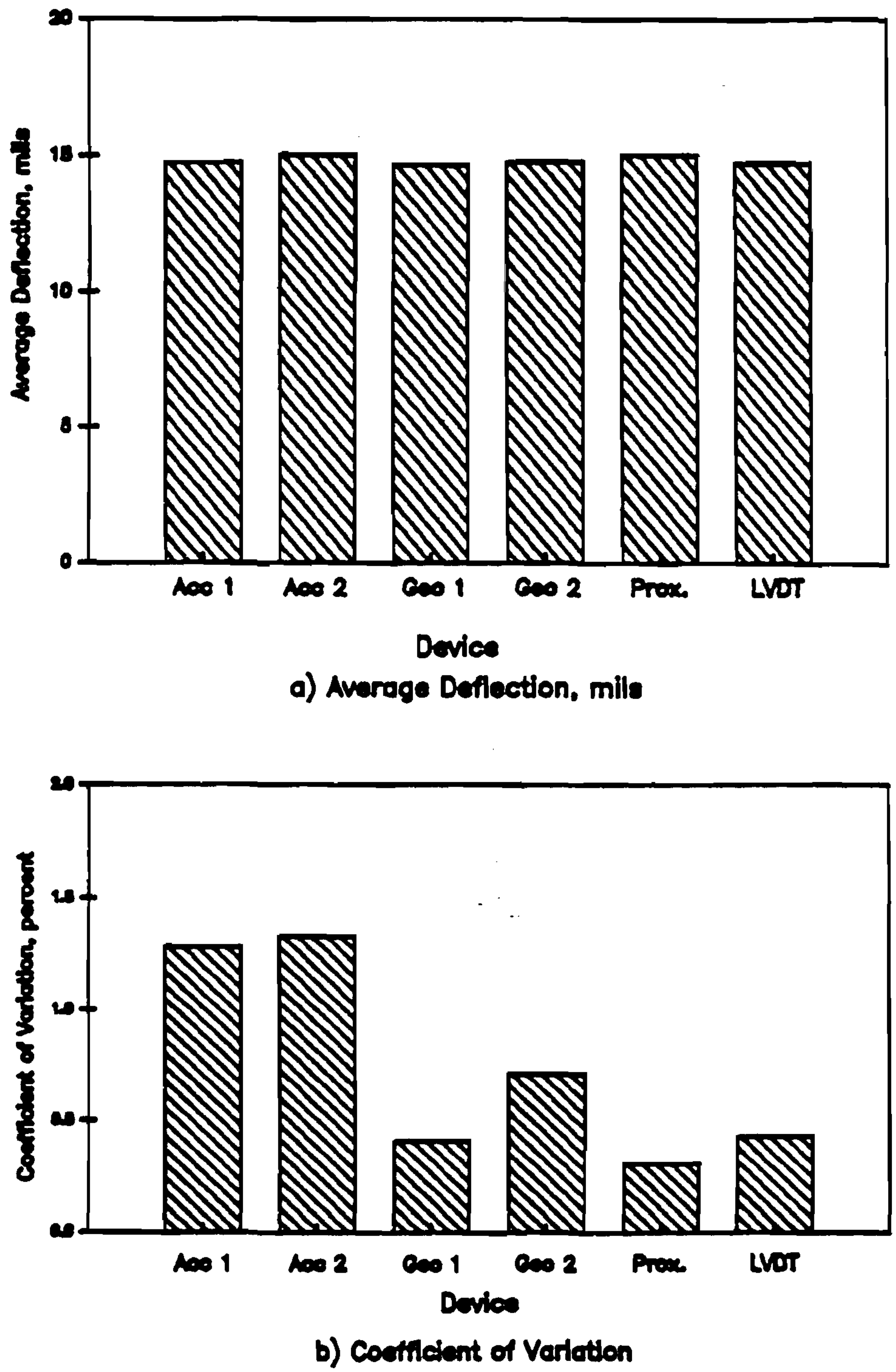
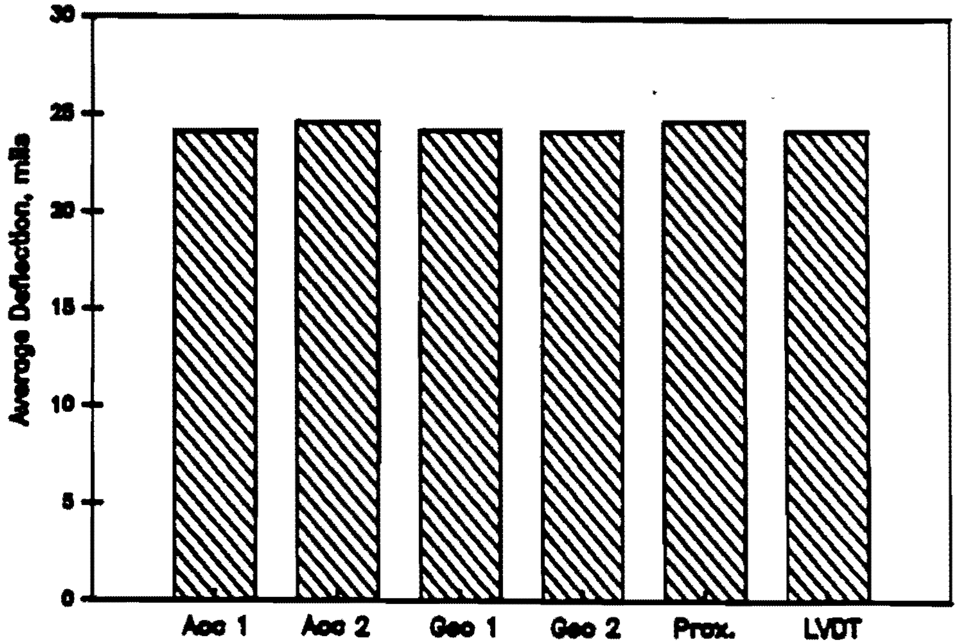
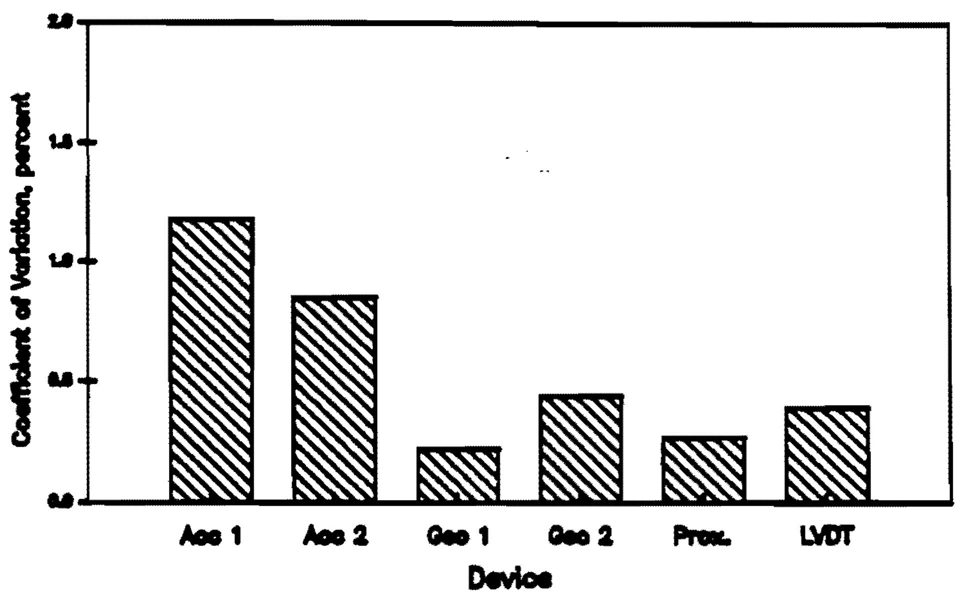


Figure L.2 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 25 msec. and a Nominal Deflection of 15.0 mils (without Laser)

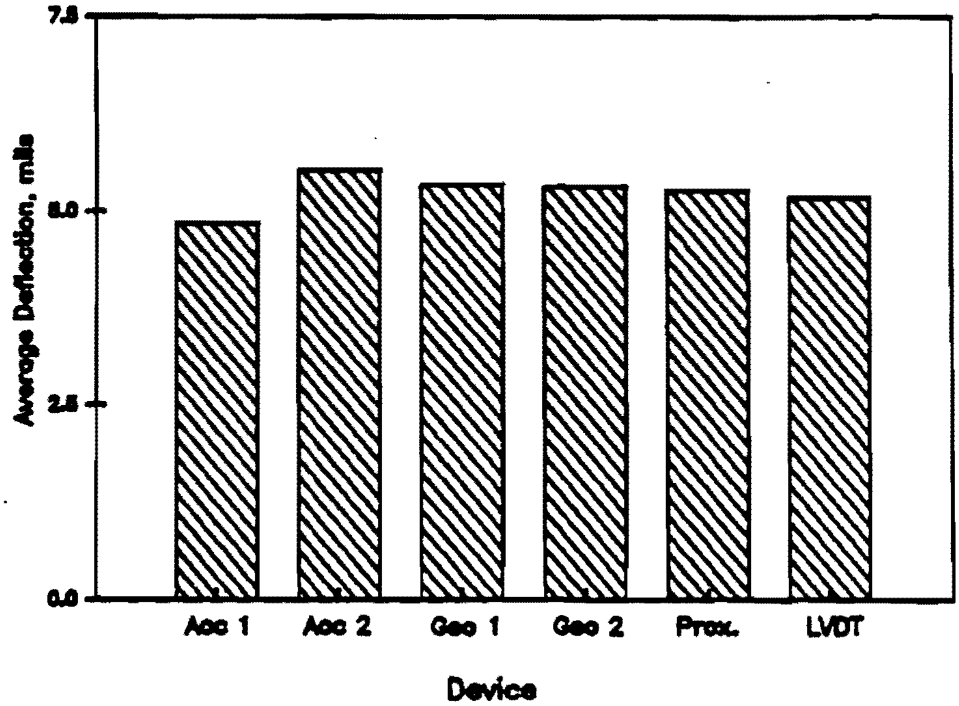


a) Average Deflection, mils

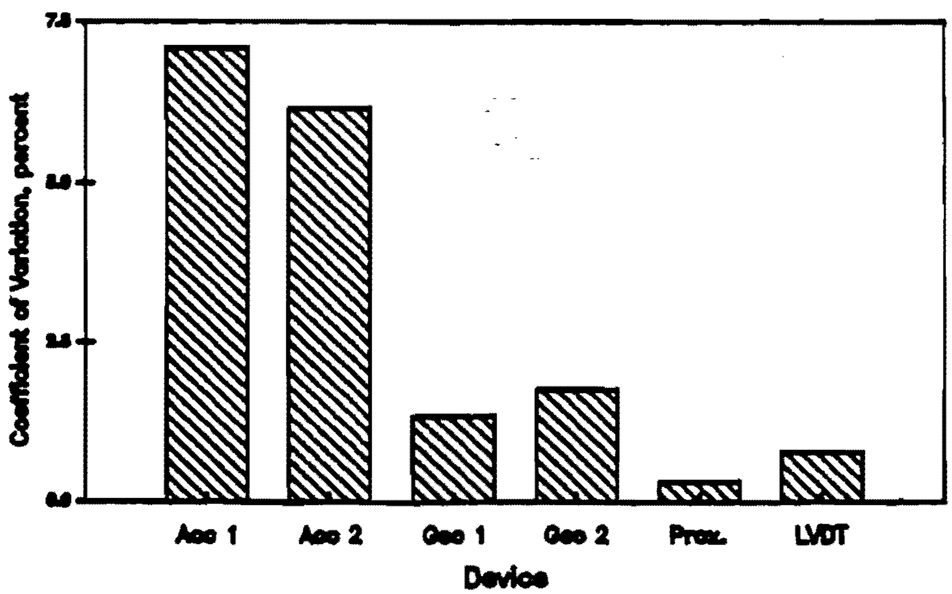


b) Coefficient of Variation

Figure L.3 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 25 msec. and a Nominal Deflection of 25.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure L.4 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 50 msec. and a Nominal Deflection of 5.0 mils (without Laser)

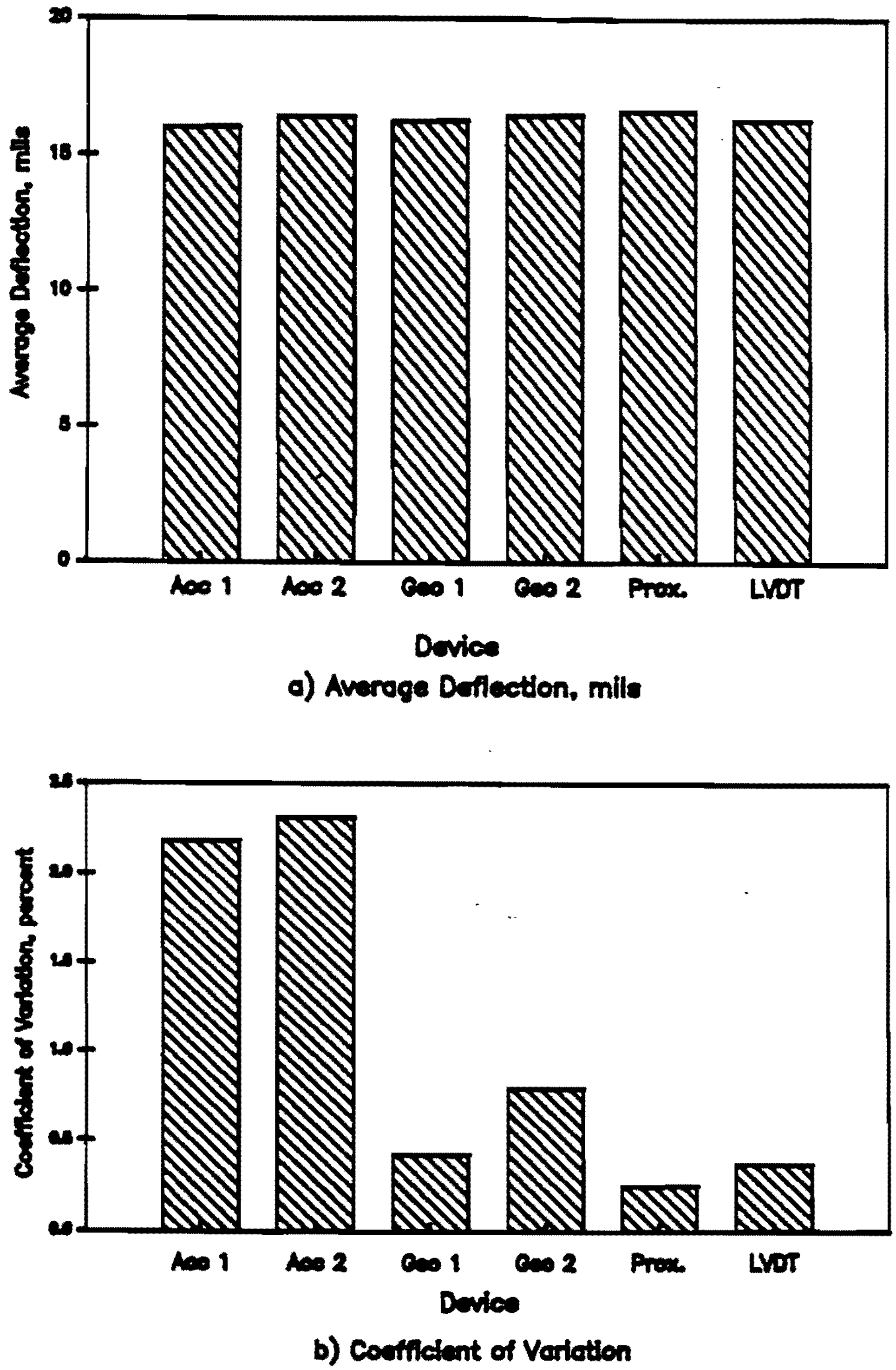
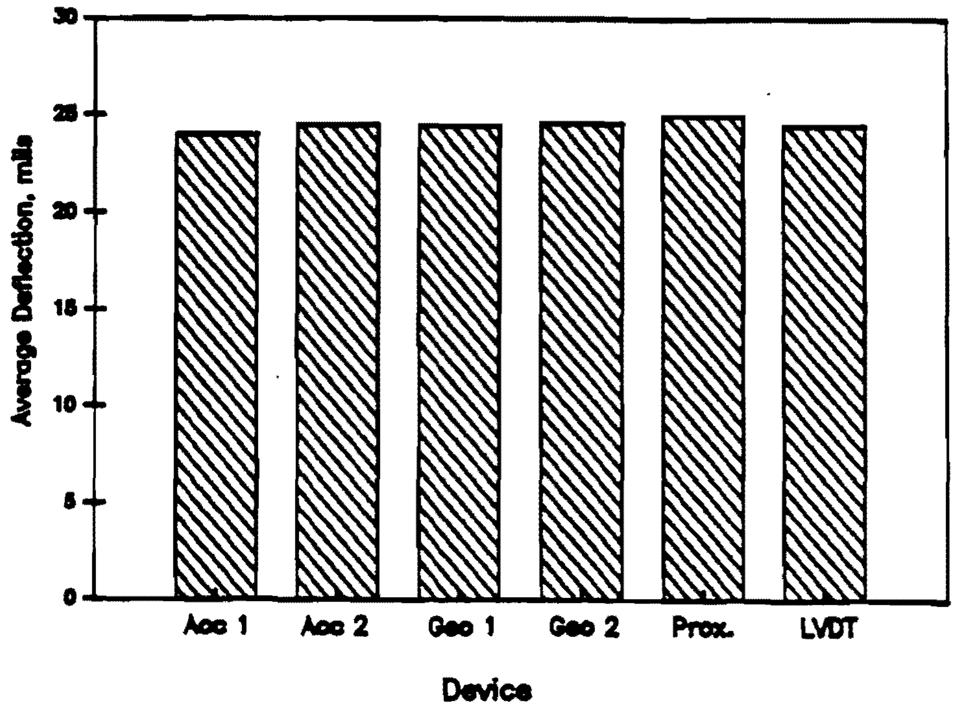


Figure L.5 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 50 msec. and a Nominal Deflection of 15.0 mils (without Laser)



a) Average Deflection, mils

Figure L.6 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 50 msec. and a Nominal Deflection of 25.0 mils (without Laser)

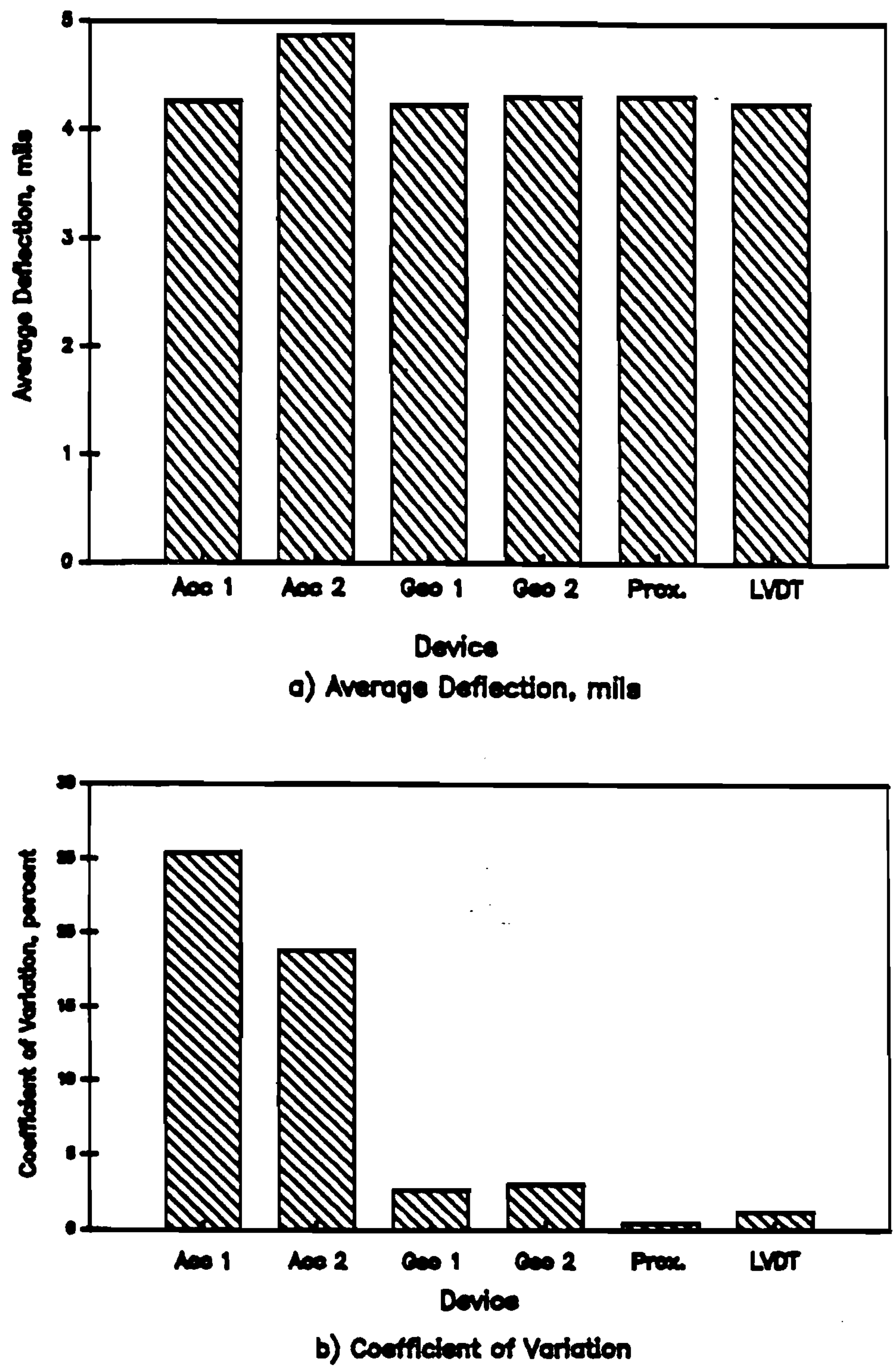
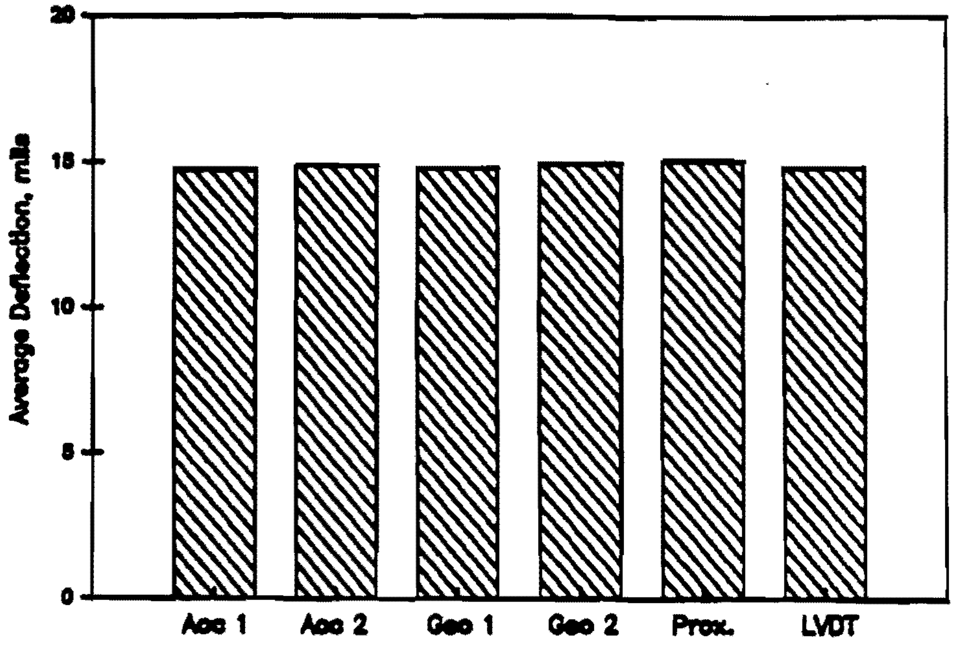
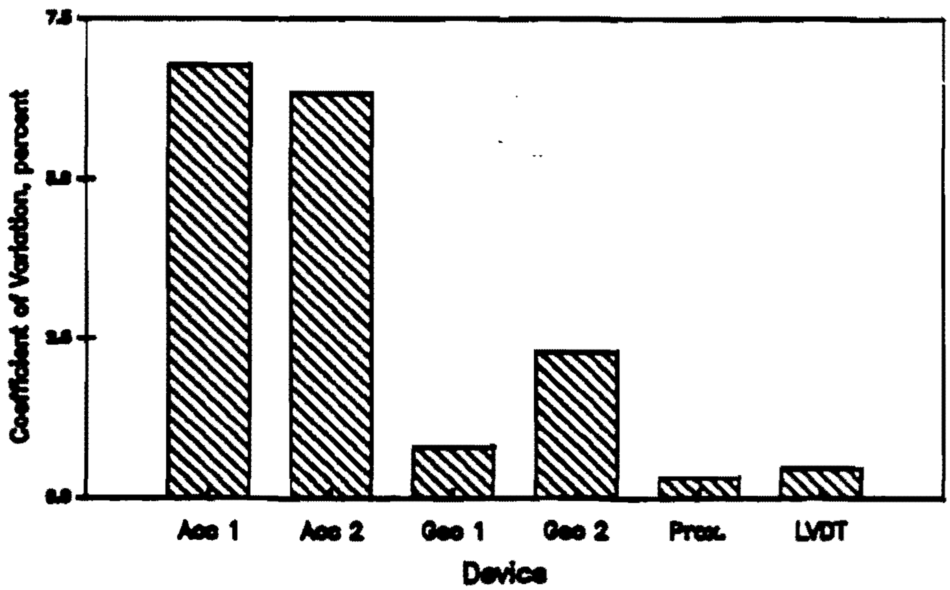


Figure L.7 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 100 msec. and a Nominal Deflection of 5.0 mils (without Laser)

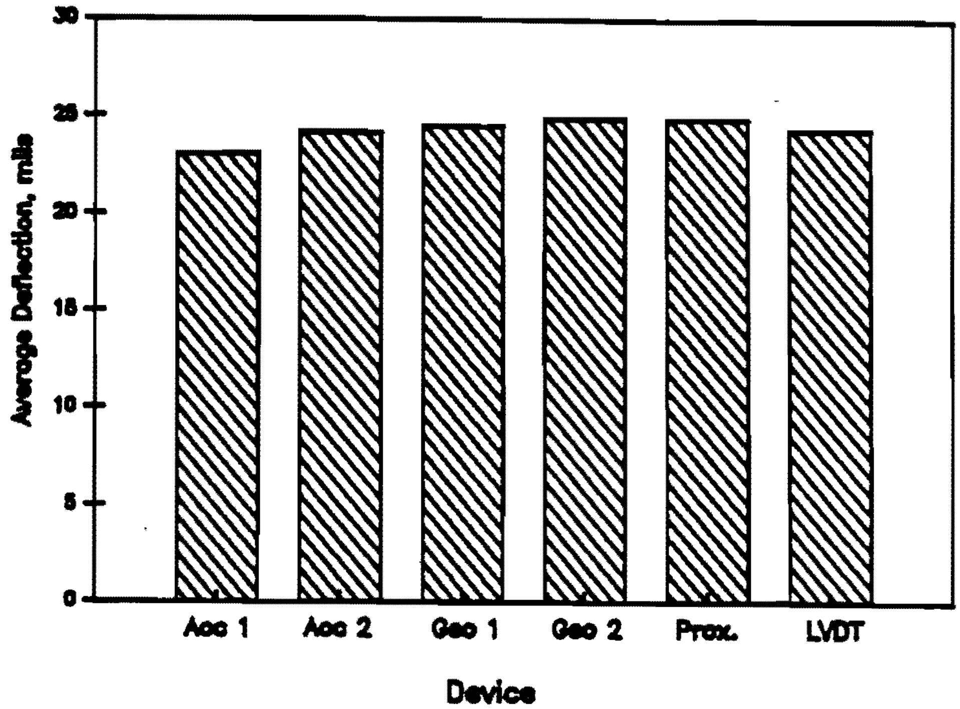


a) Average Deflection, mils

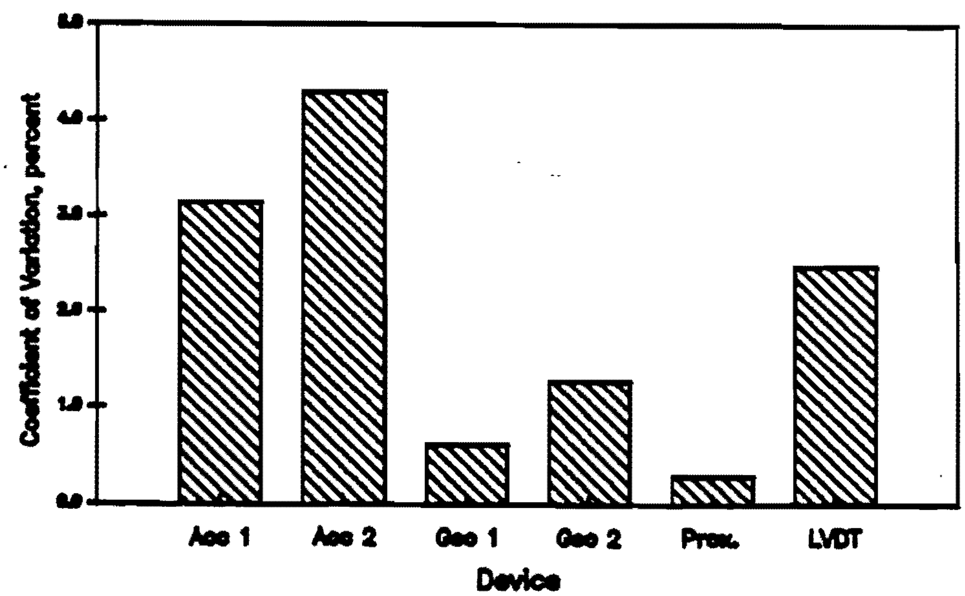


b) Coefficient of Variation

Figure L.8 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 100 msec. and a Nominal Deflection of 15.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure L.9 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 100 msec. and a Nominal Deflection of 25.0 mils (without Laser)

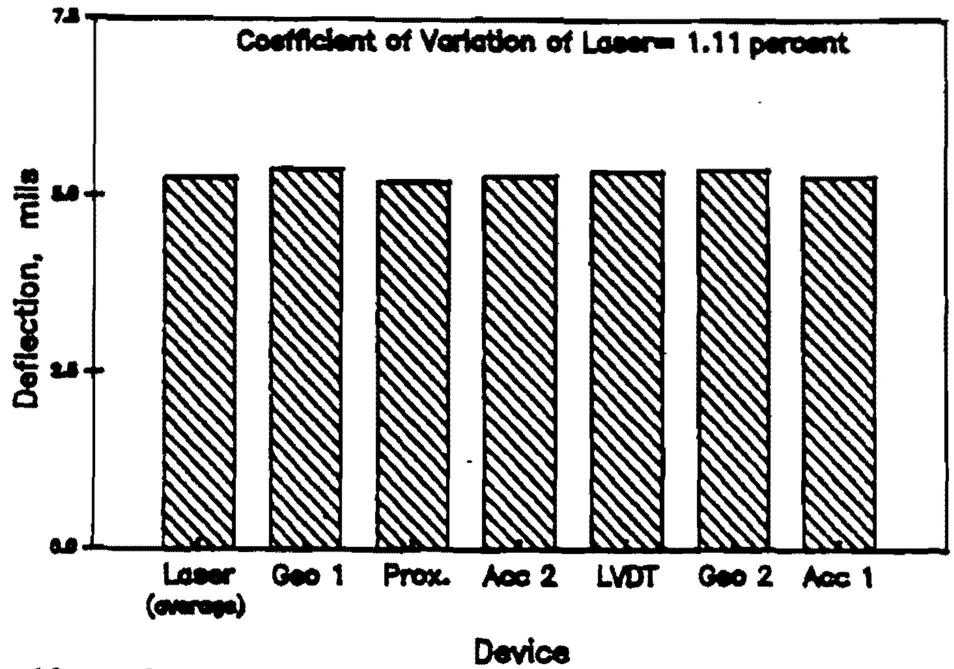


Figure L.10 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 25.0 msec. and a Nominal Deflection of 5.0 mils (with Laser)

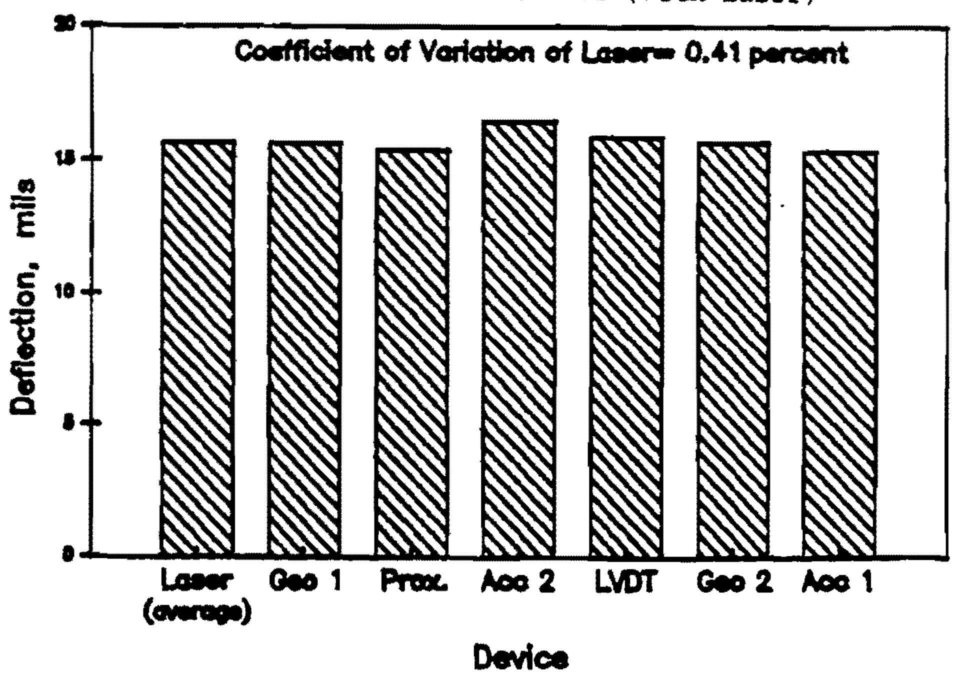


Figure L.11 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 25.0 msec. and a Nominal Deflection of 15.0 mils (with Laser)

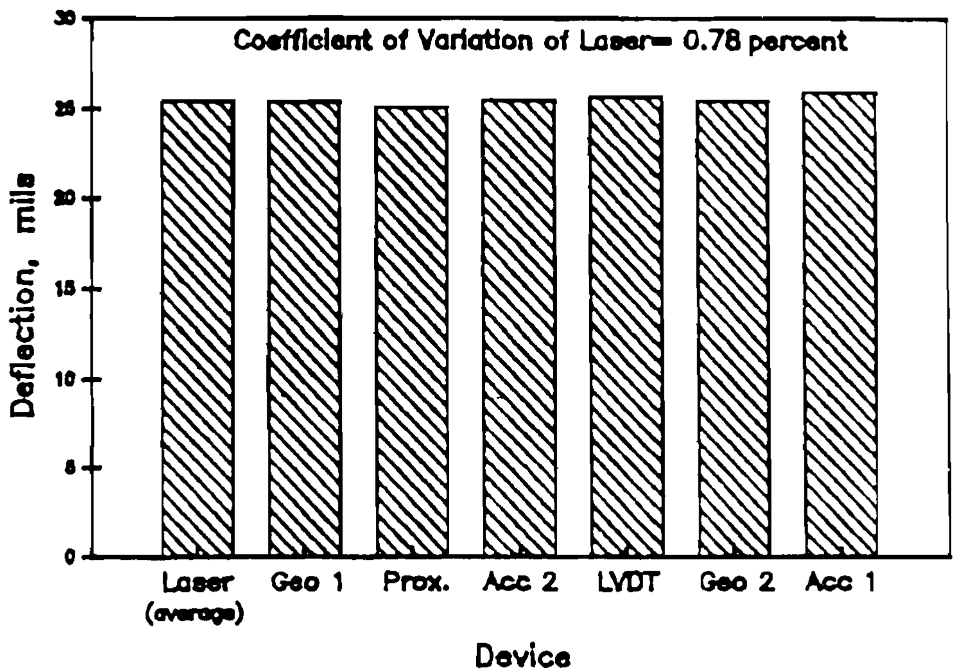


Figure L.12 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 25.0 msec. and a Nominal Deflection of 25.0 mils (with Laser)

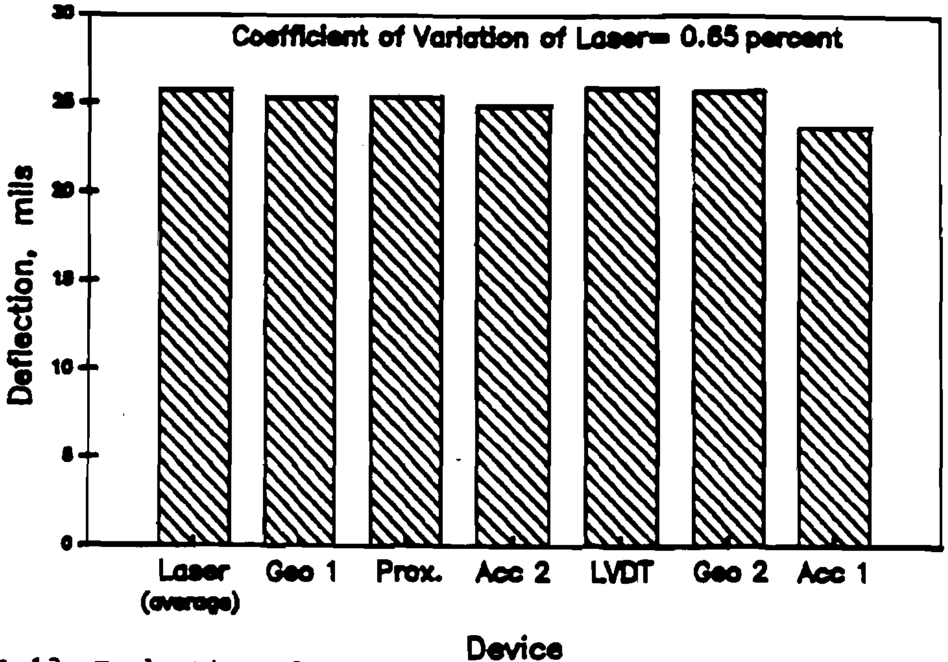


Figure L.13 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 75 msec. and a Nominal Deflection of 25.0 mils (with Laser)

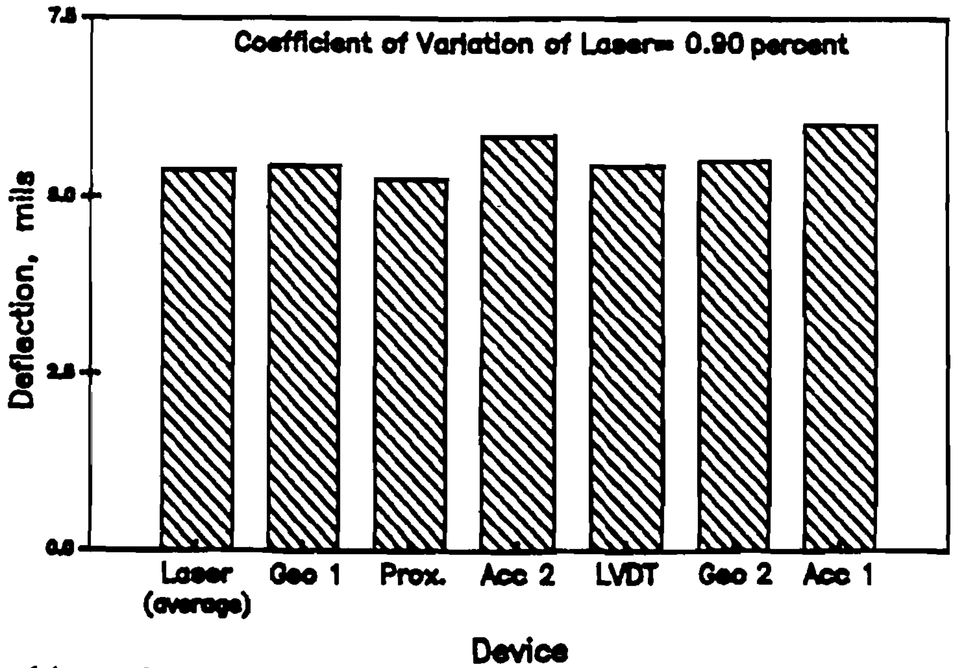


Figure L.14 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 50.0 msec. and a Nominal Deflection of 5.0 mils (with Laser)

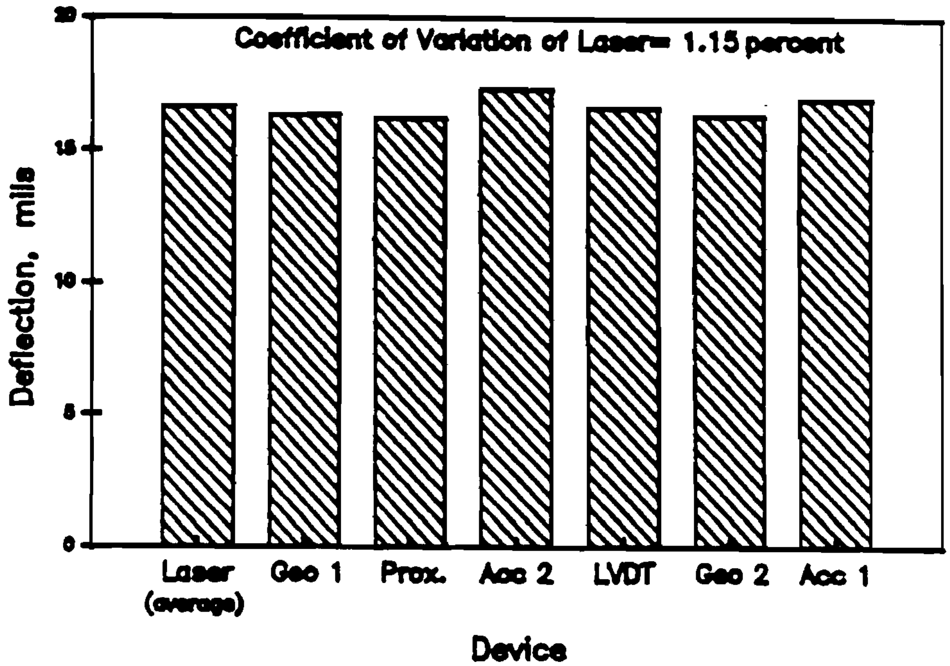


Figure L.15 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 50.0 msec. and a Nominal Deflection of 15.0 mils (with Laser)

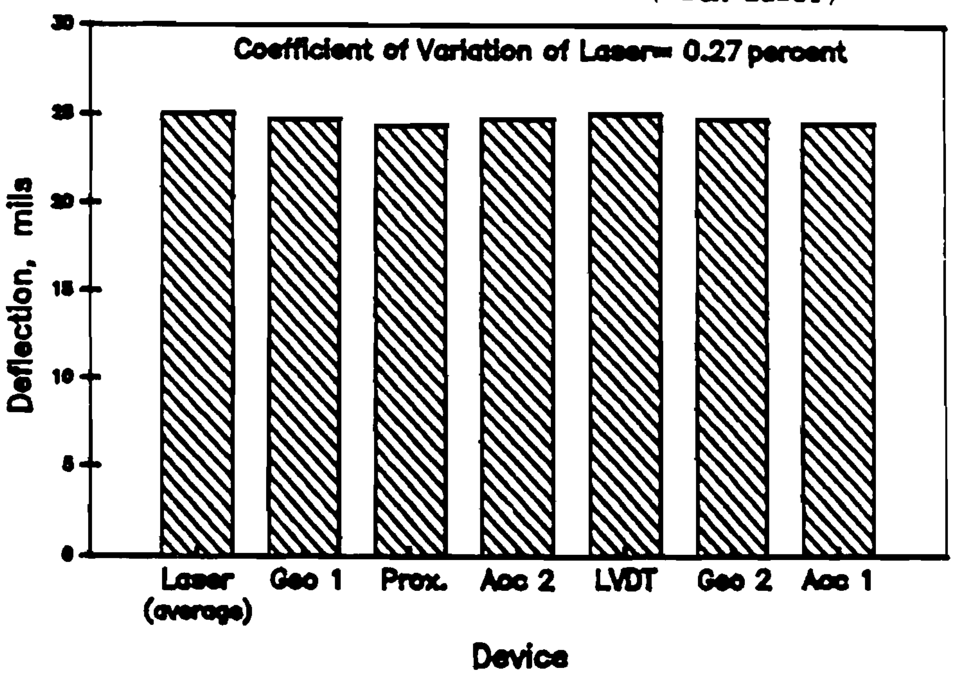


Figure L.16 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 50.0 msec. and a Nominal Deflection of 25.0 mils (with Laser)

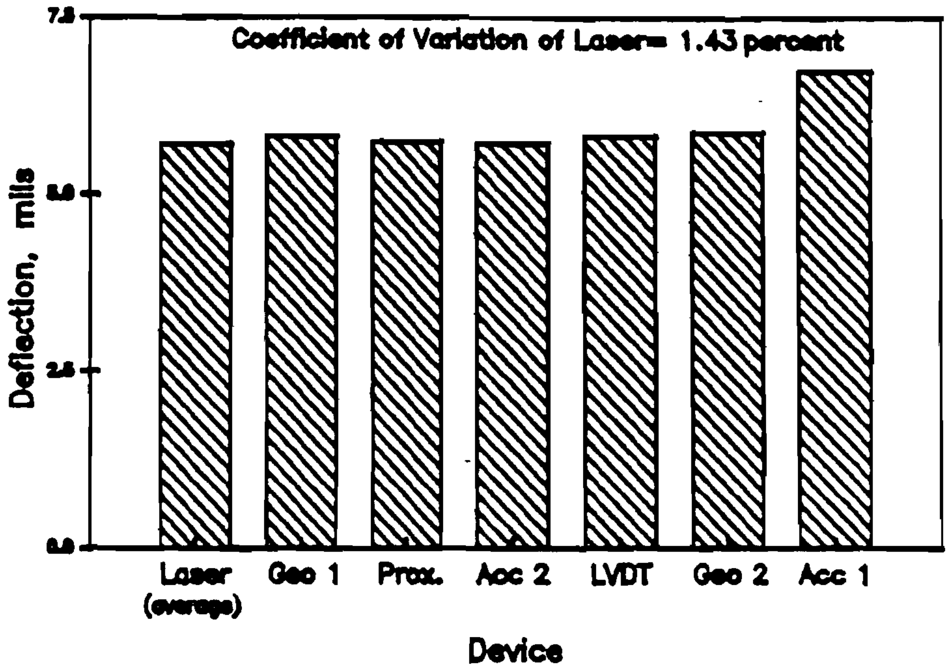


Figure L.17 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 75.0 msec. and a Nominal Deflection of 5.0 mils (with Laser)

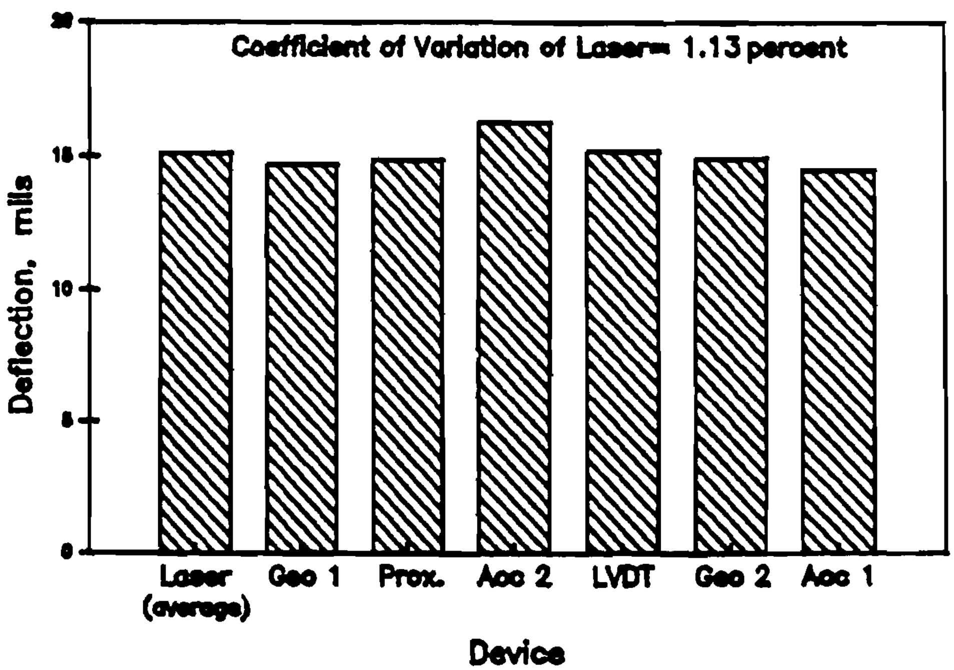


Figure L.18 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 75 msec. and a Nominal Deflection of 15.0 mils (with Laser)

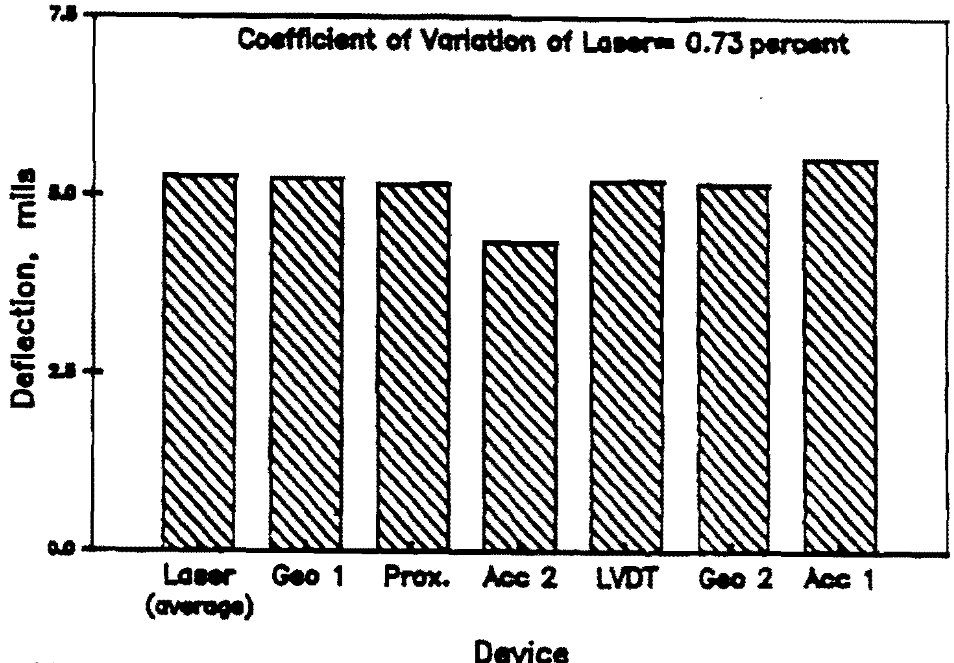


Figure L.19 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 100 msec. and a Nominal Deflection of 5.0 mils (with Laser)

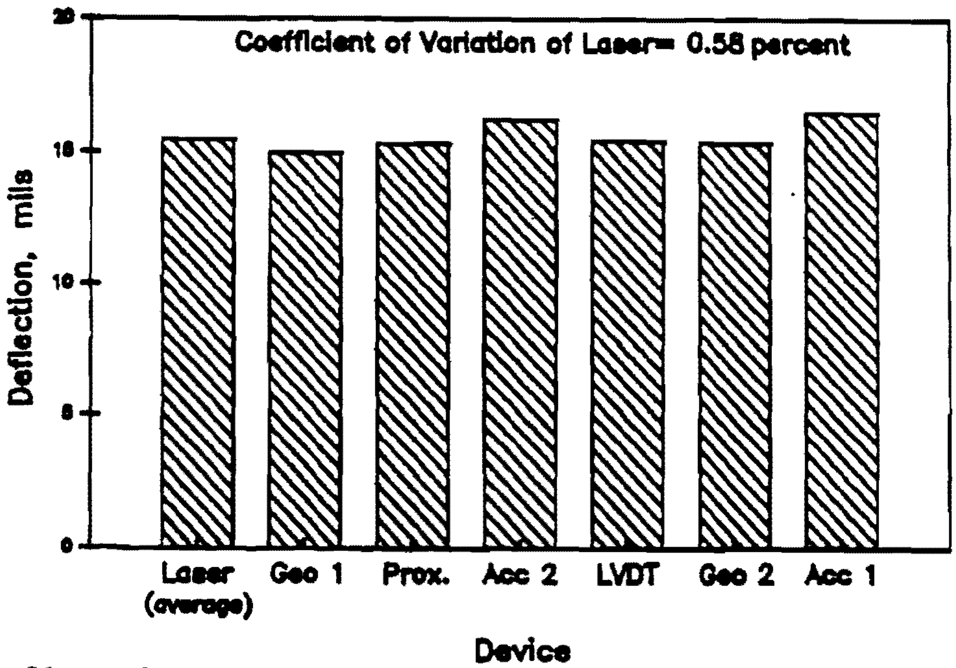


Figure L.20 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 100 msec. and a Nominal Deflection of 15.0 mils (with Laser)

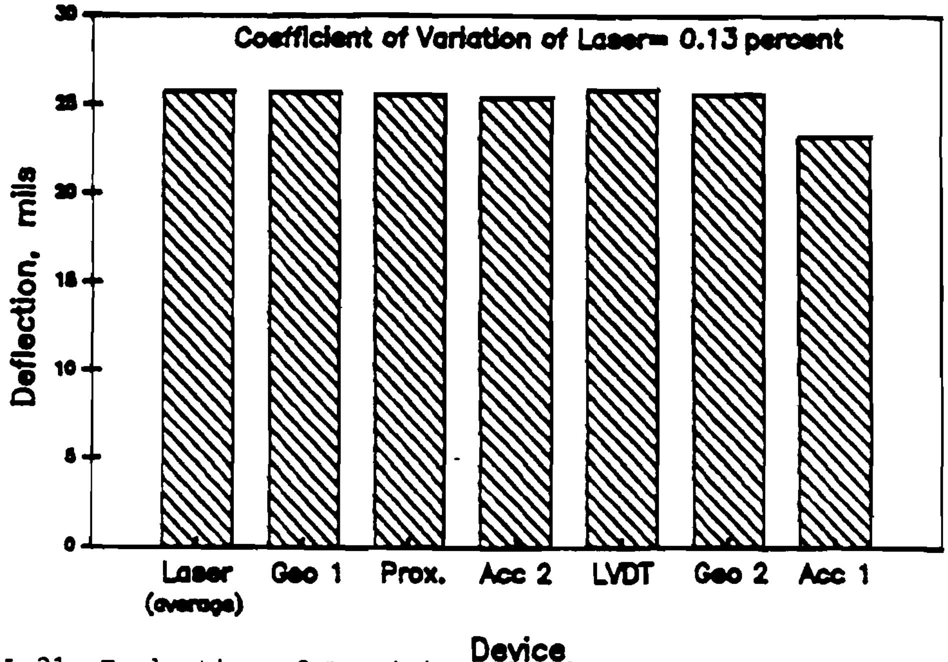


Figure L.21 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 100 msec. and a Nominal Deflection of 25.0 mils (with Laser)

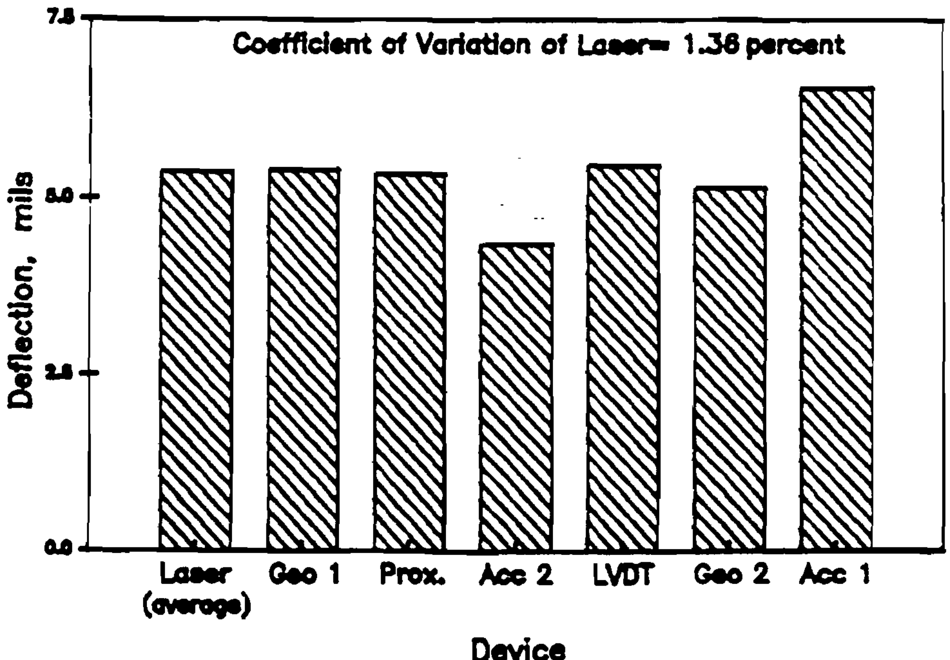


Figure L.22 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 125 msec. and a Nominal Deflection of 5.0 mils (with Laser)

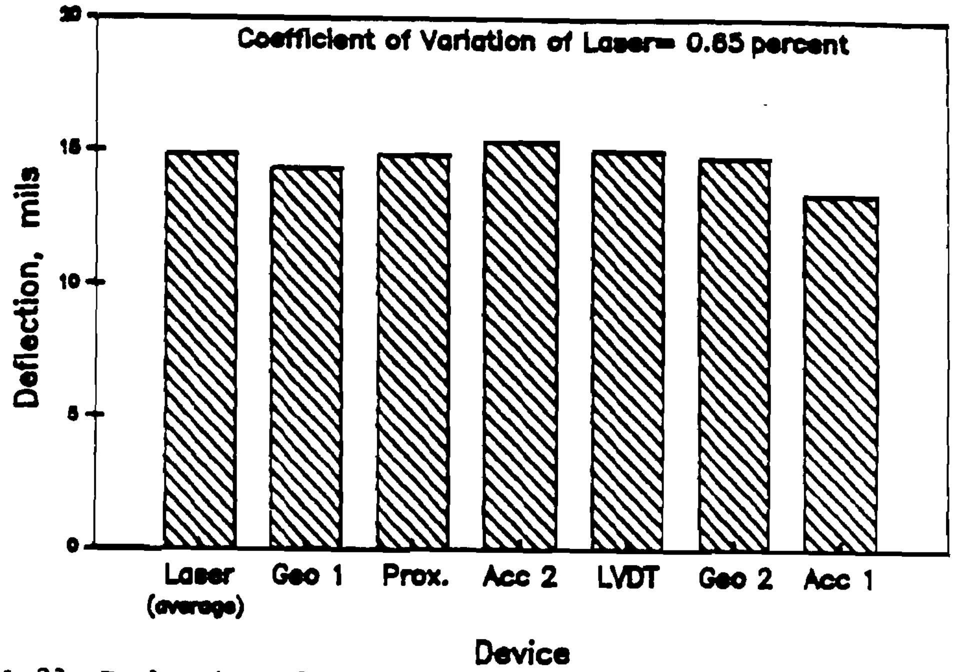


Figure L.23 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 125 msec. and a Nominal Deflection of 15.0 mils (with Laser)

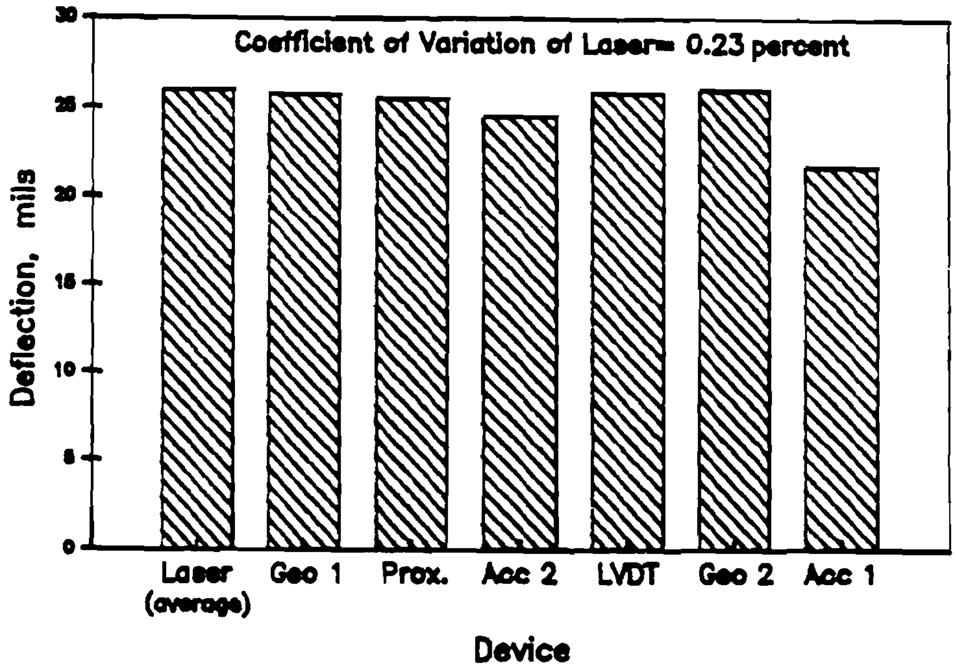


Figure L.24 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 125 msec. and a Nominal Deflection of 25.0 mils (with Laser)

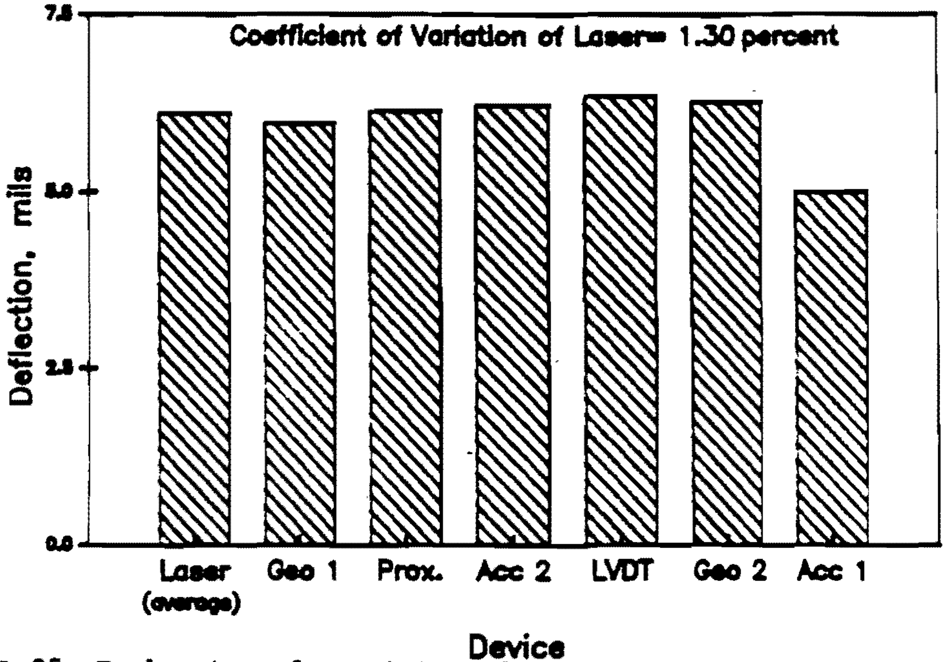


Figure L.25 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 150 msec. and a Nominal Deflection of 5.0 mils (with Laser)

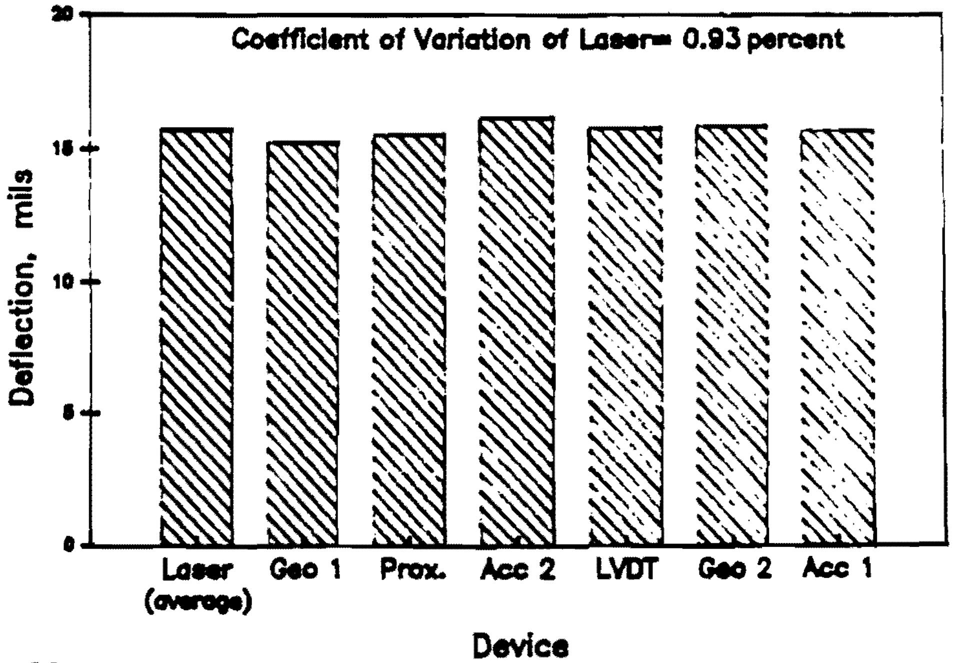


Figure L.26 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 150 msec. and a Nominal Deflection of 15.0 mils (with Laser)

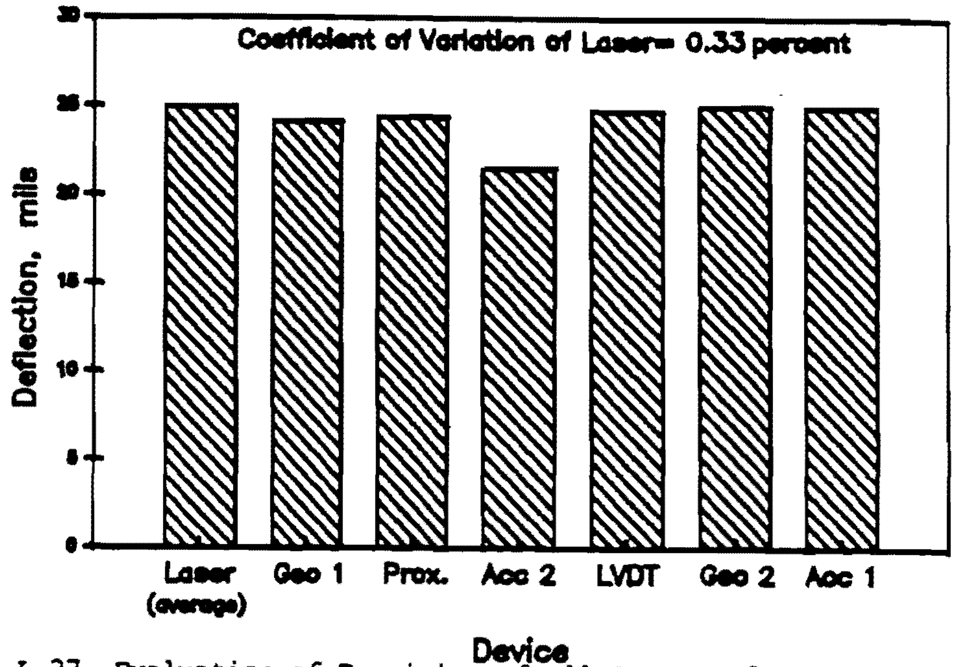


Figure L.27 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 150 msec. and a Nominal Deflection of 25.0 mils (with Laser)

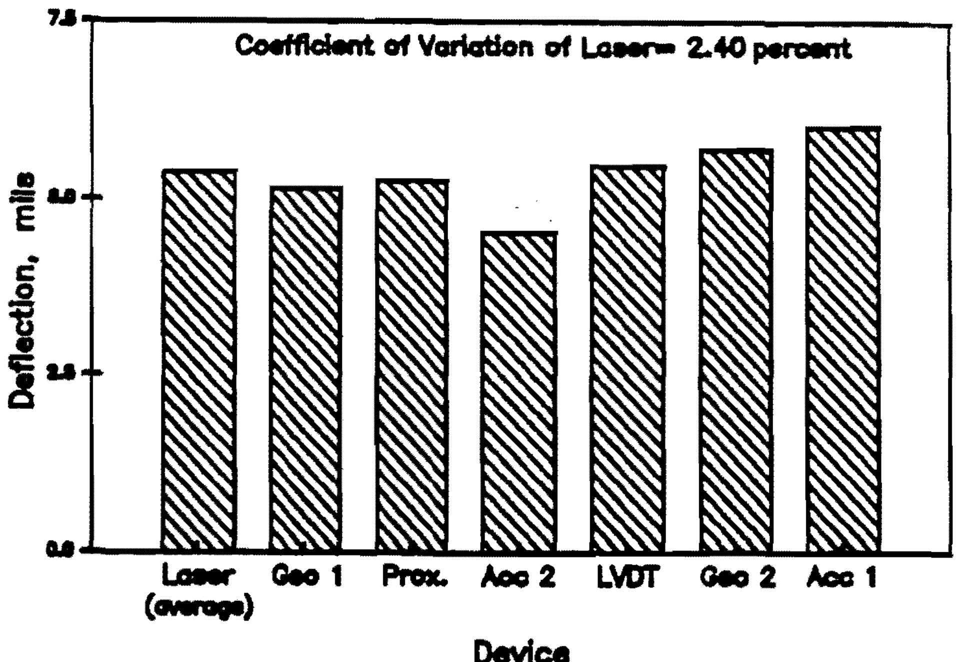


Figure L.28 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 175 msec. and a Nominal Deflection of 5.0 mils (with Laser)

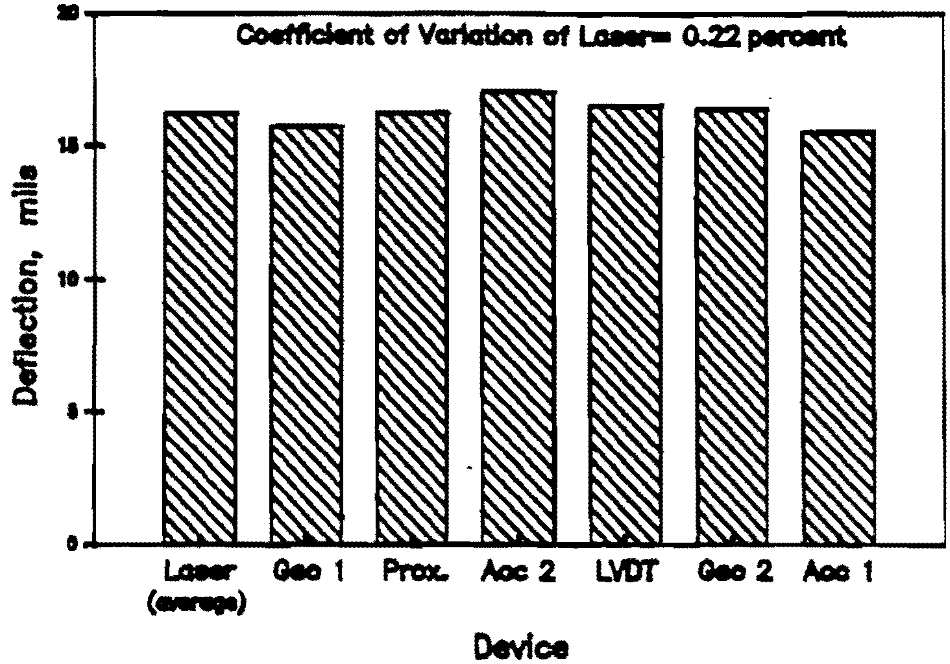


Figure L.29 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 175 msec. and a Nominal Deflection of 15.0 mils (with Laser)

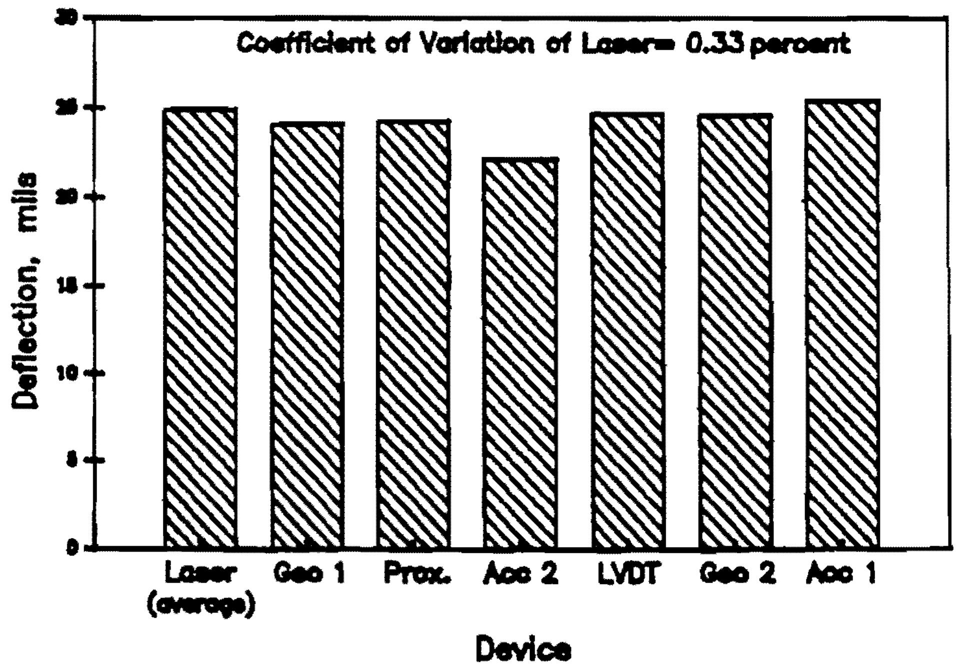


Figure L.30 Evaluation of Precision of All Sensors for Impulse Motion for Square Wave at Pulse Width of 175 msec. and a Nominal Deflection of 25.0 mils (with Laser)

APPENDIX M

EVALUATION OF ACCURACY OF EACH SENSOR FOR TRIANGULAR WAVE MOTION

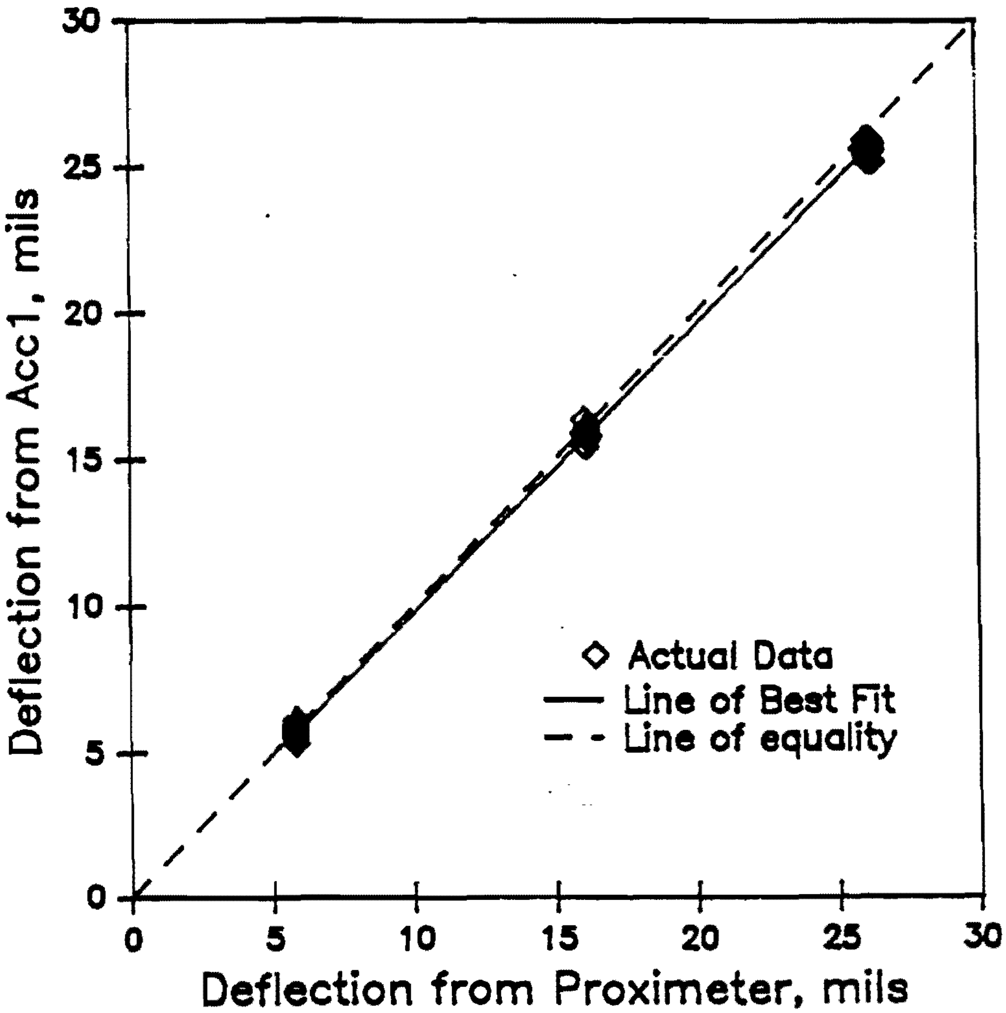


Figure M.1 Evaluation of Accuracy of Accelerometer 1 for Triangular Wave at Pulse Width of 25 msec. (Slope of Line is 1.03)

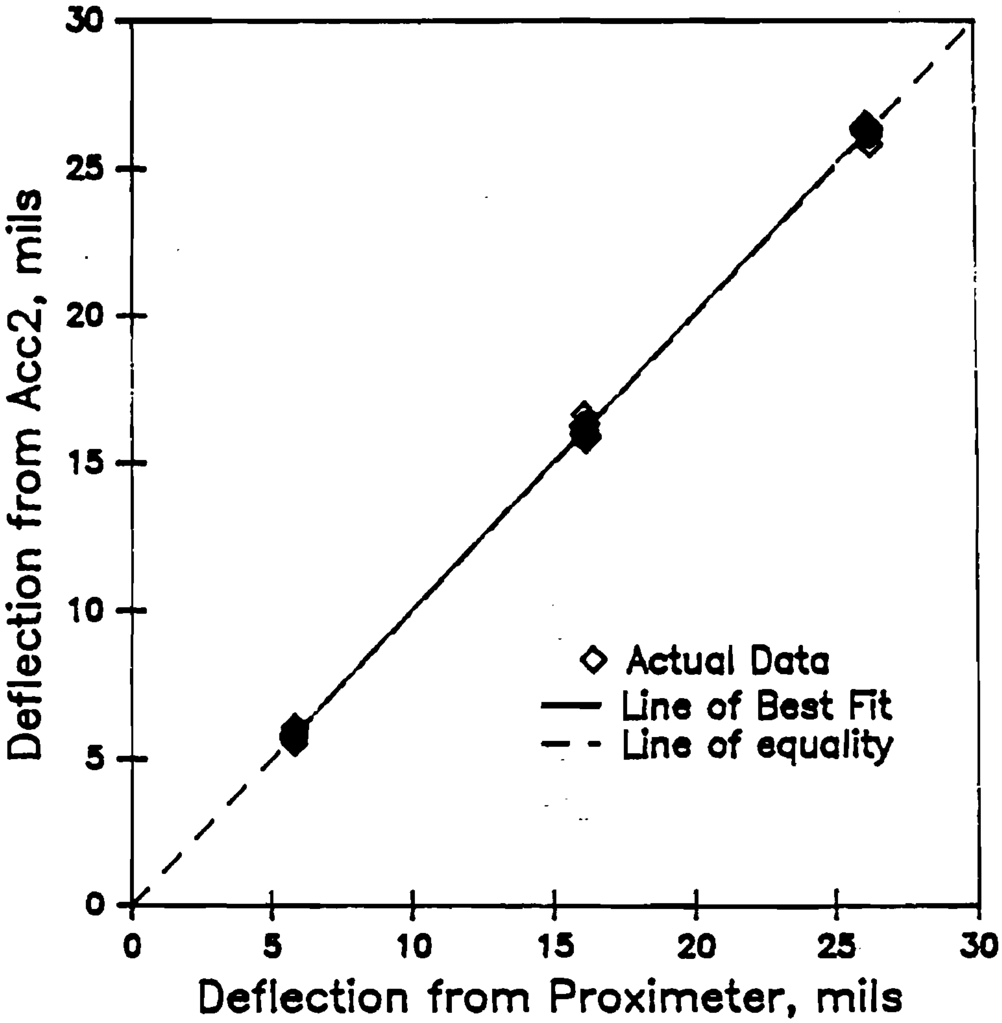


Figure M.2 Evaluation of Accuracy of Accelerometer 2 for Triangular Wave at Pulse Width of 25 msec. (Slope of Line is 1.02)

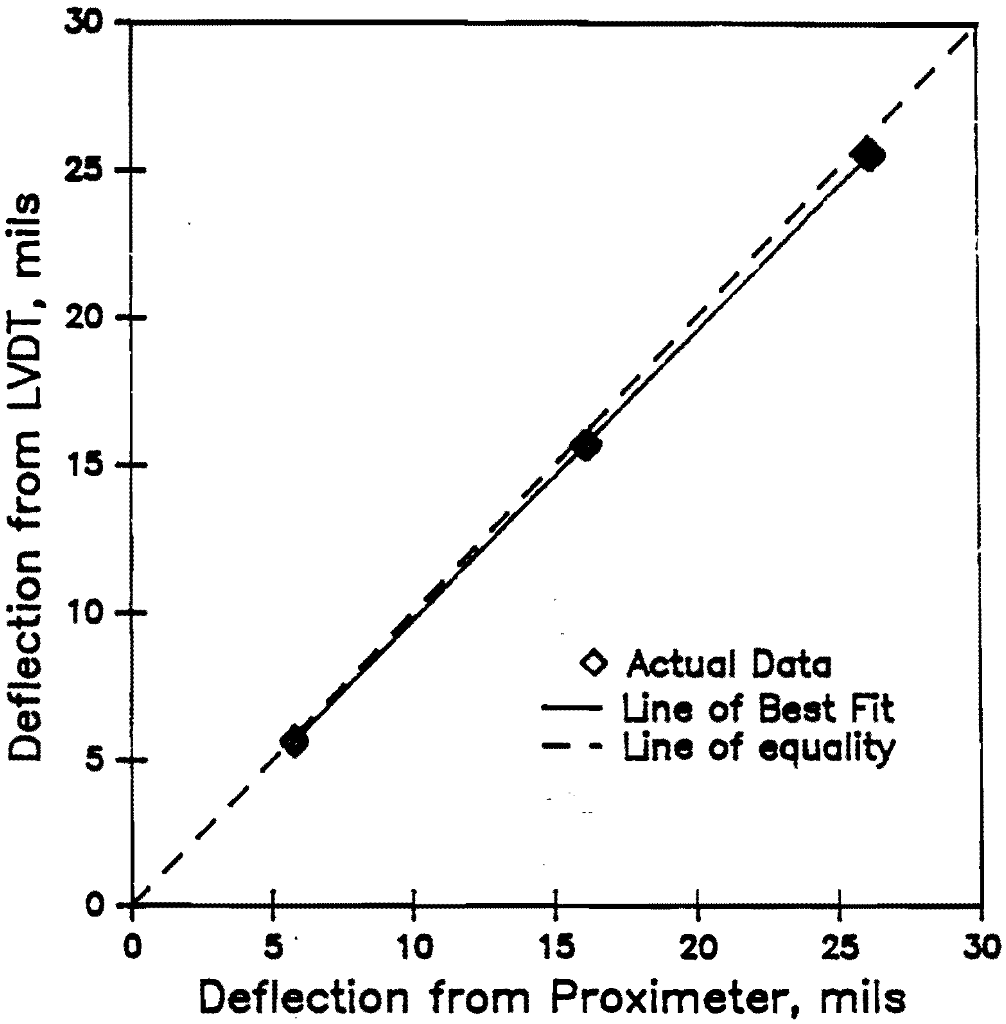


Figure M.3 Evaluation of Accuracy of LVDT for Triangular Wave at Pulse Width of 25 msec. (Slope of Line is 1.02)

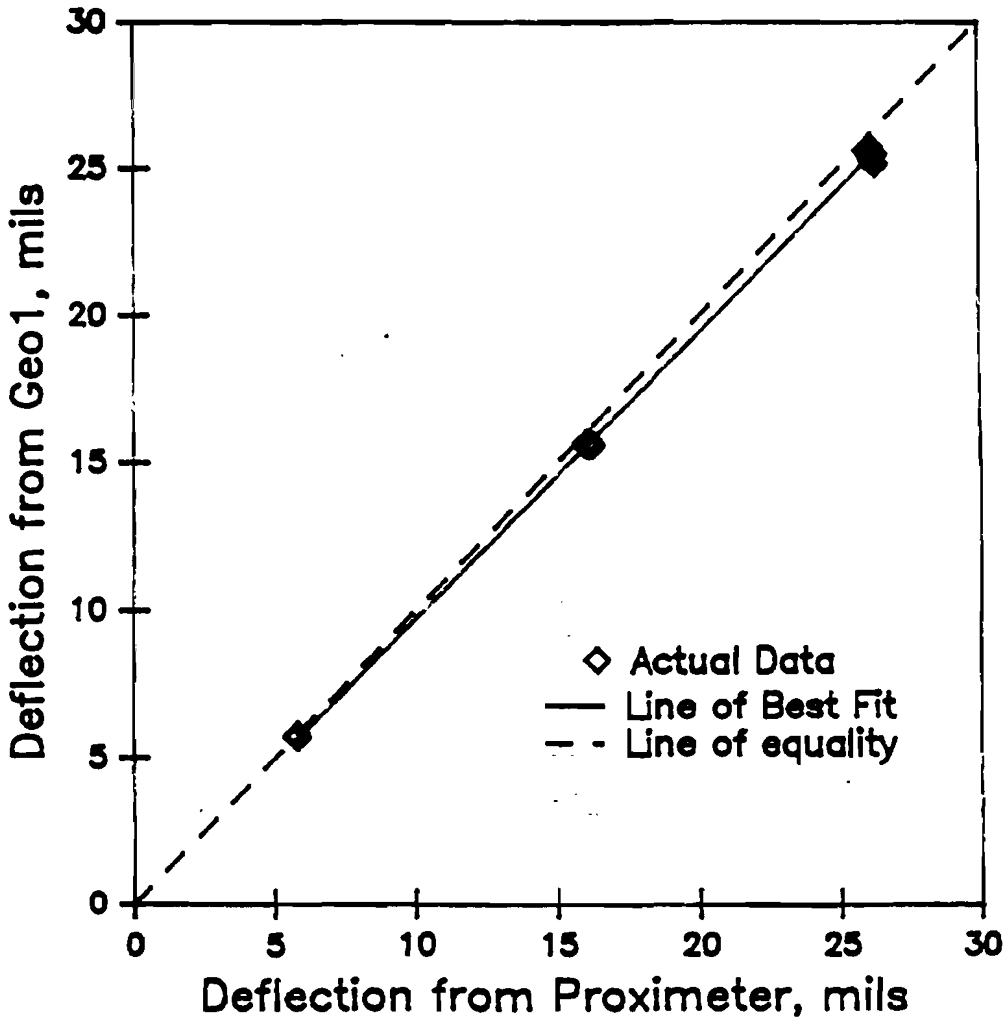


Figure M.4 Evaluation of Accuracy of Geophone 1 for Triangular Wave at Pulse Width of 25 msec. (Slope of Line is 1.01)

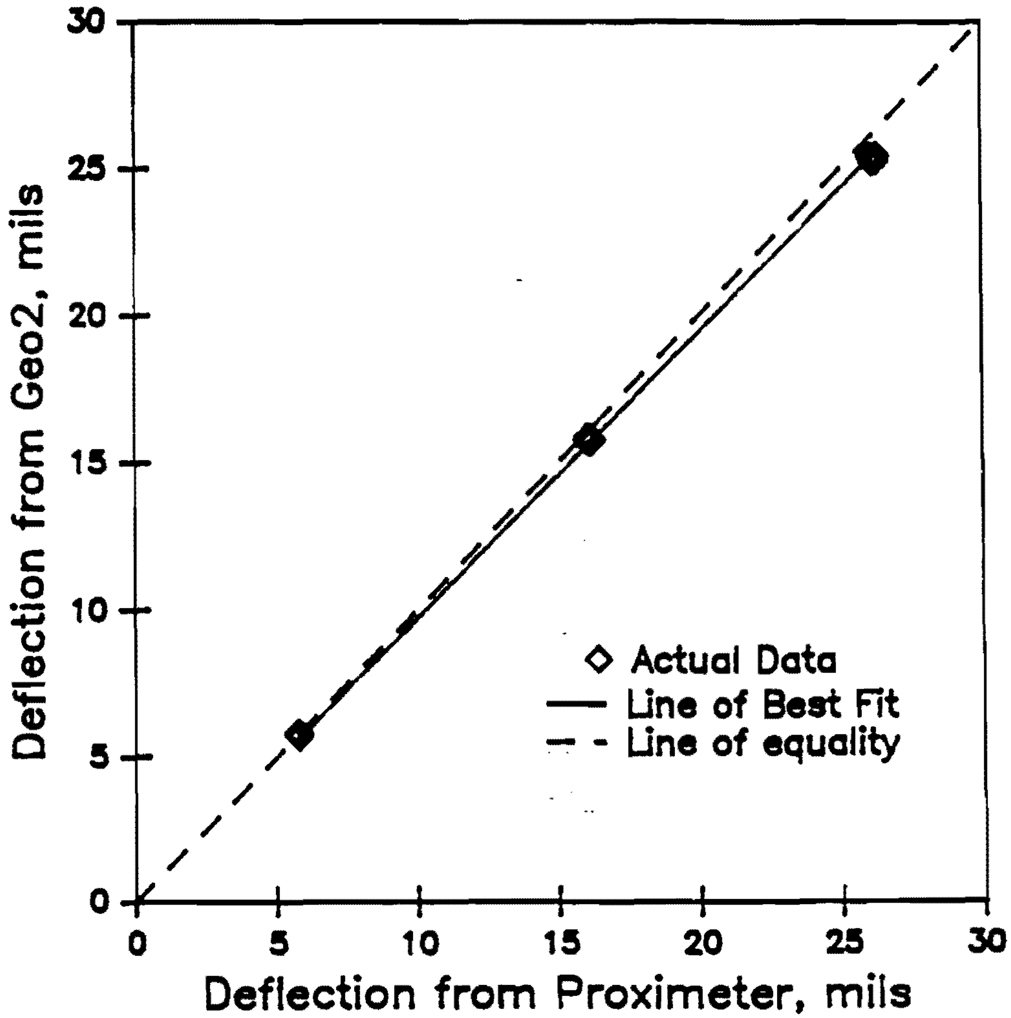


Figure M.5 Evaluation of Accuracy of Geophone 2 for Triangular Wave at Pulse Width of 25 msec. (Slope of Line is 1.00)

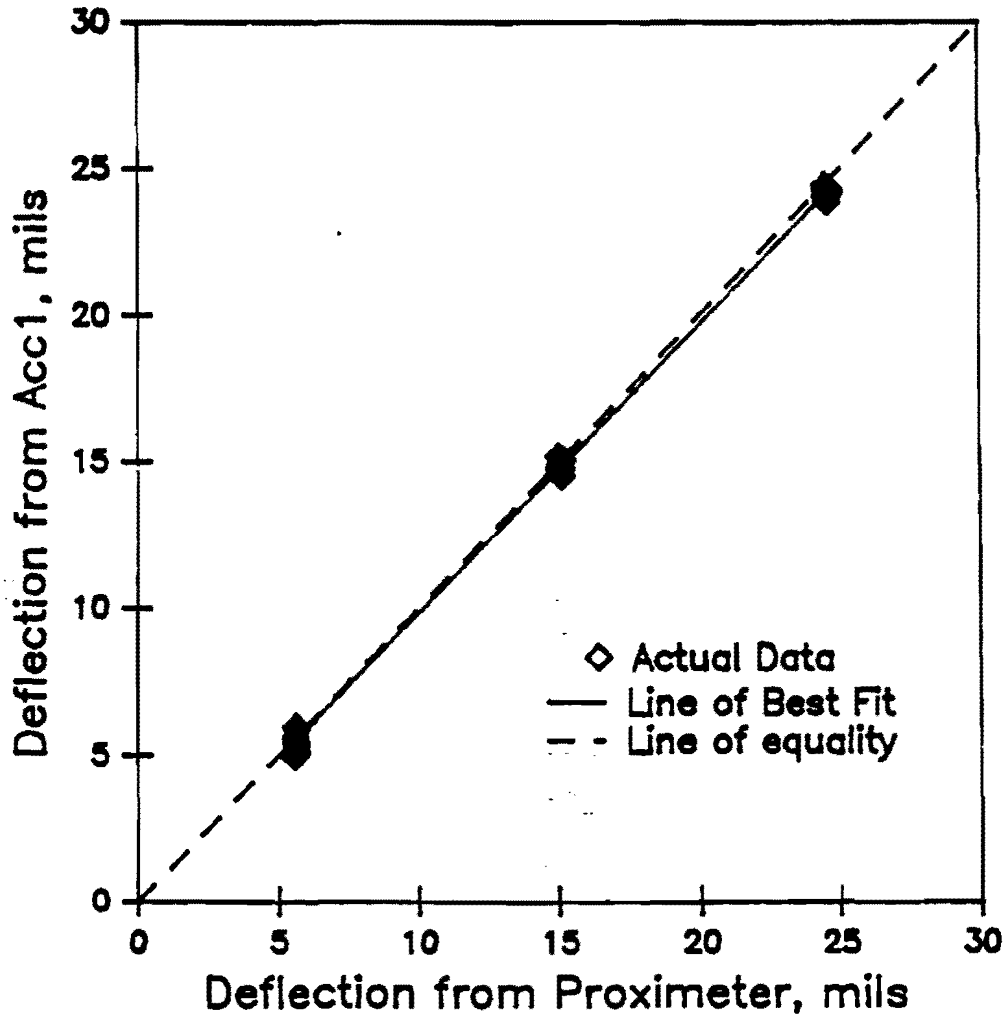


Figure M.6 Evaluation of Accuracy of Accelerometer 1 for Triangular Wave at Pulse Width of 50 msec. (Slope of Line is 1.02)

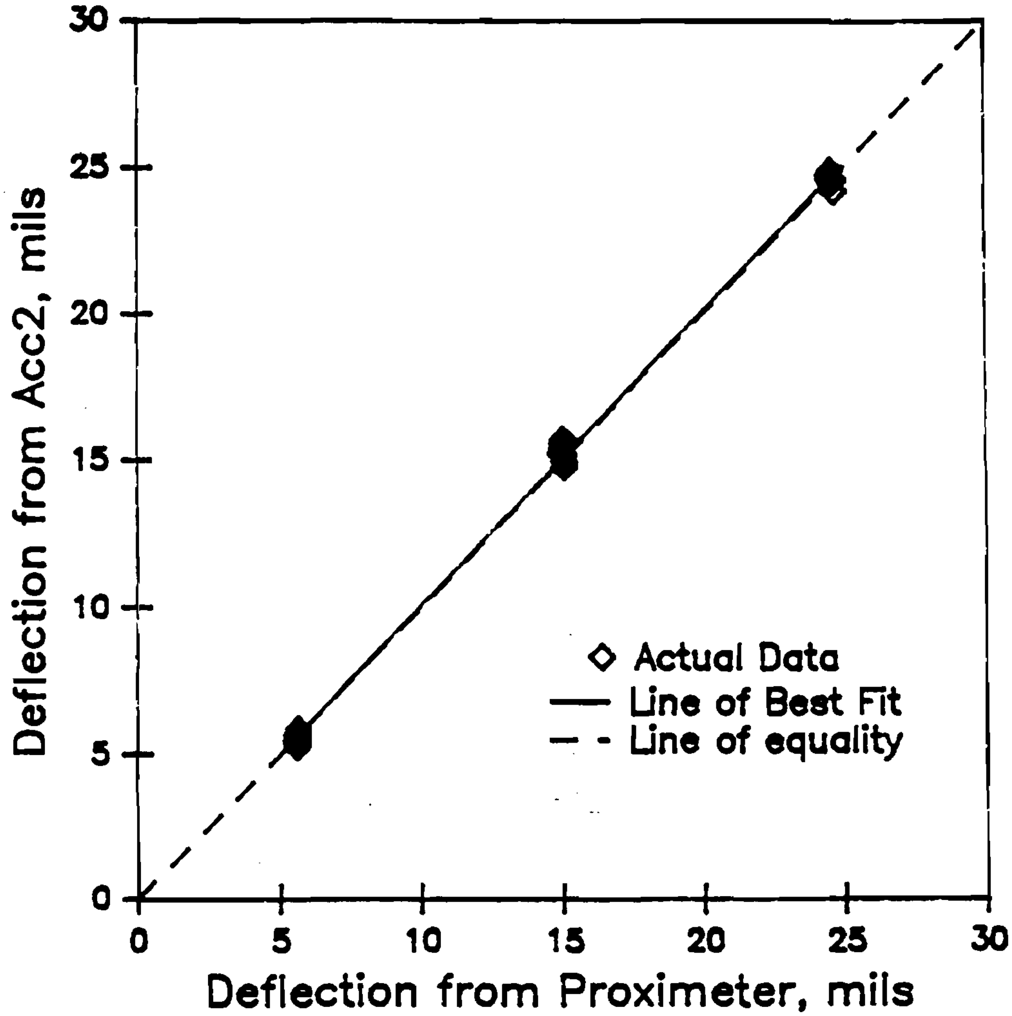


Figure M.7 Evaluation of Accuracy of Accelerometer 2 for Triangular Wave at Pulse Width of 50 msec. (Slope of Line is 1.00)

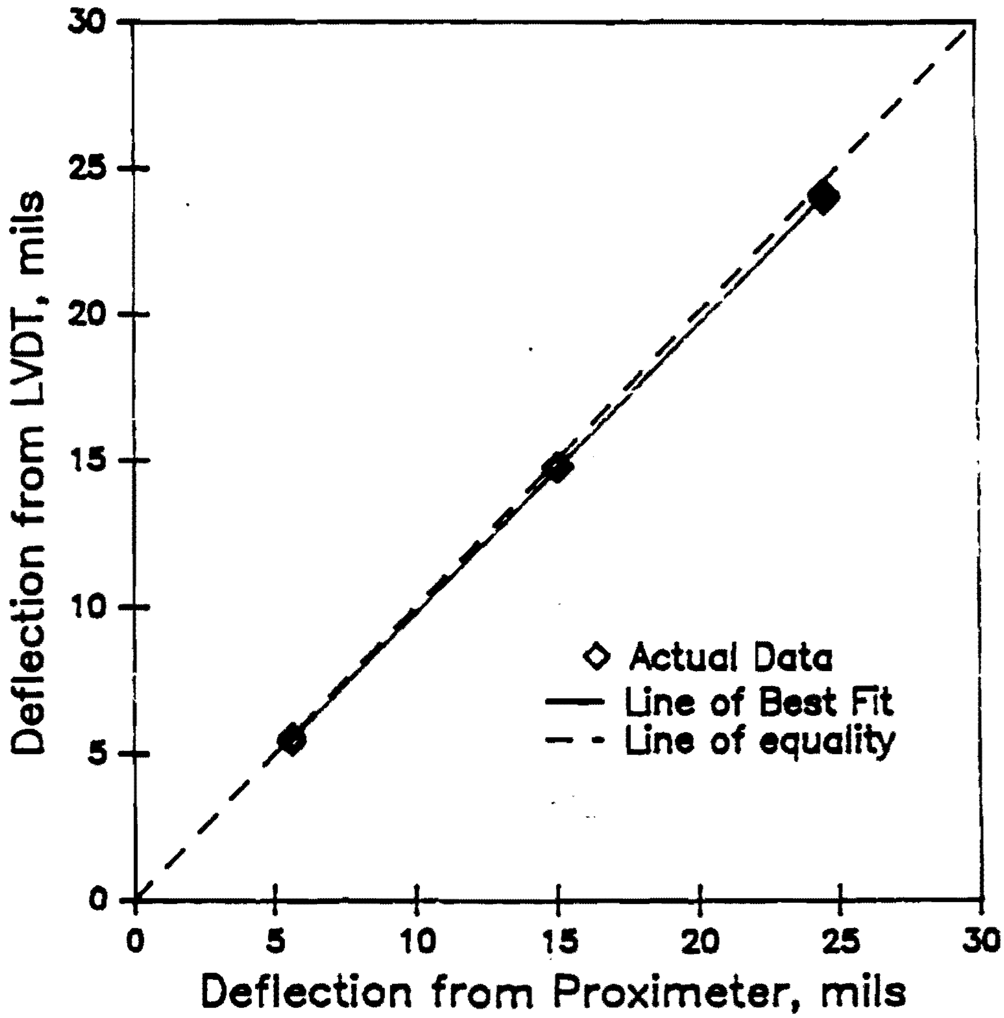


Figure M.8 Evaluation of Accuracy of LVDT for Triangular Wave at Pulse Width of 50 msec. (Slope of Line is 1.02)

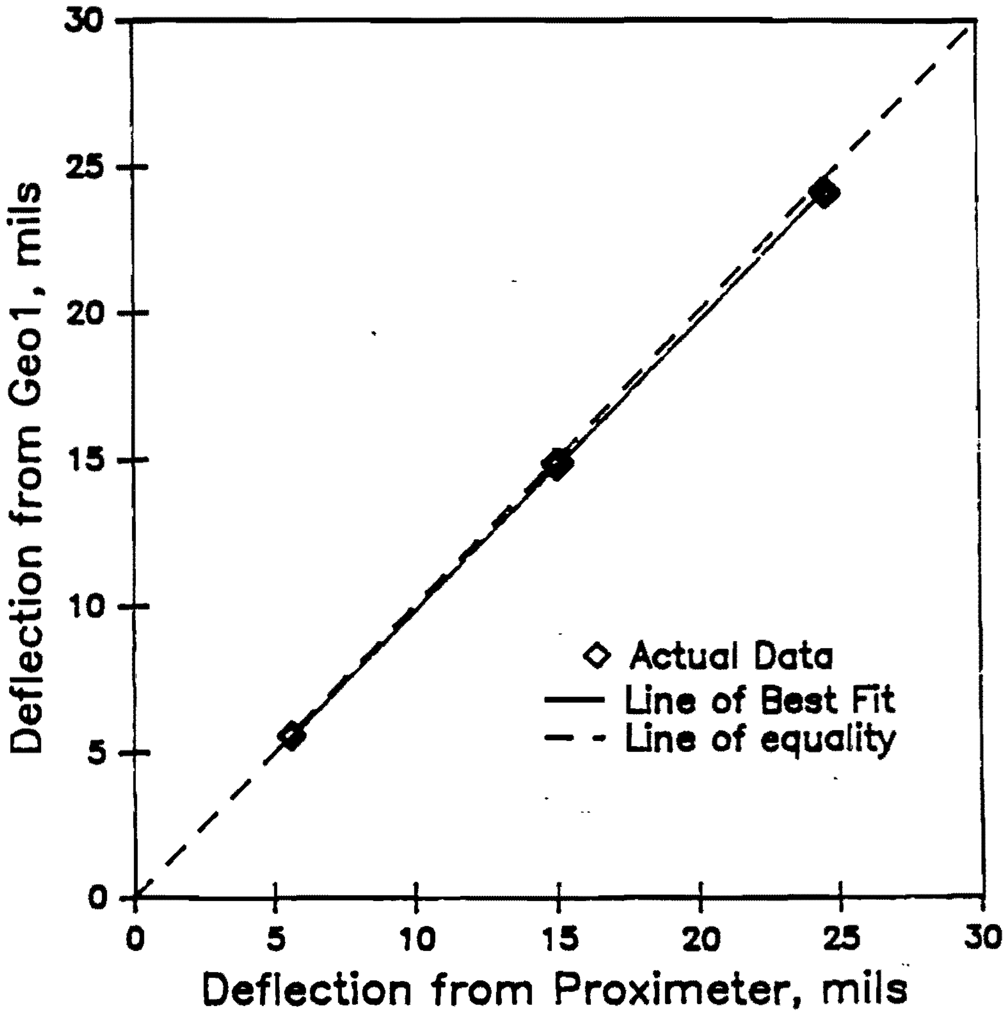


Figure M.9 Evaluation of Accuracy of Geophone 1 for Triangular Wave at Pulse Width of 50 msec. (Slope of Line is 1.01)

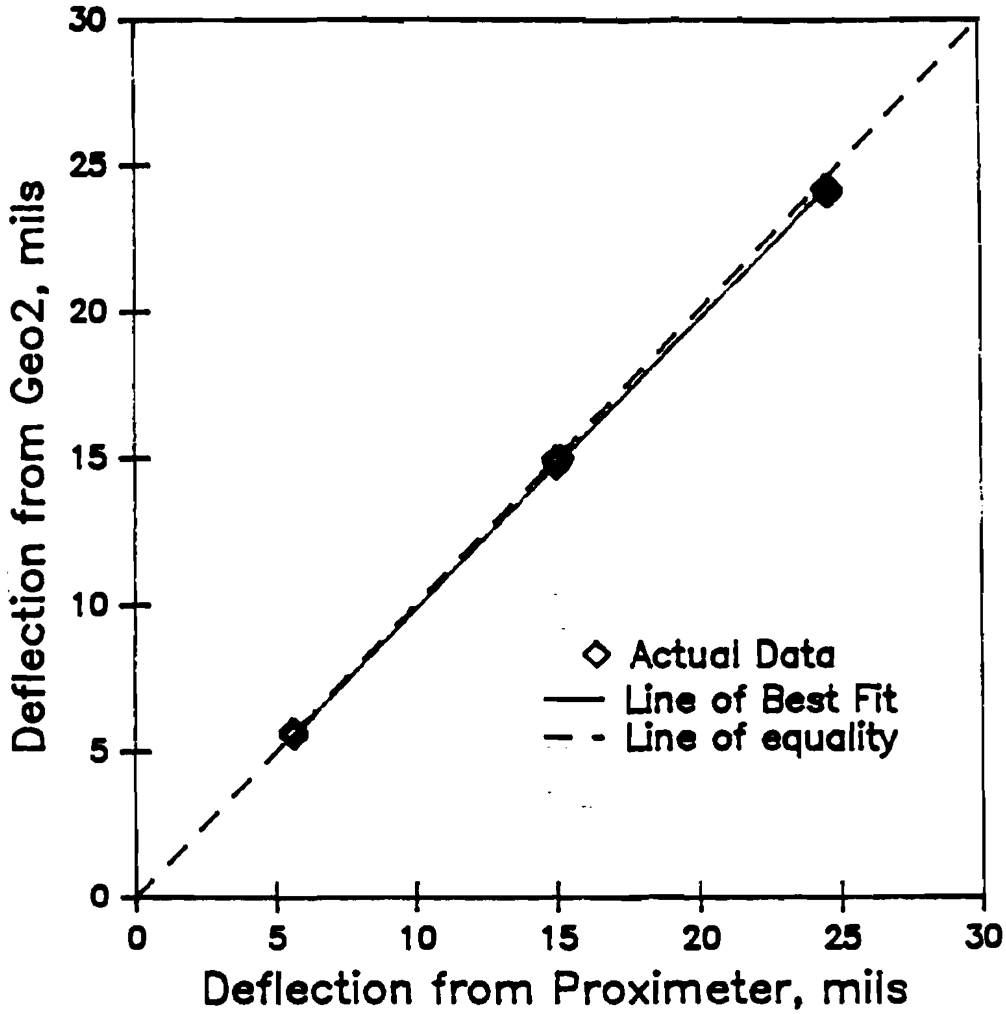


Figure M.10 Evaluation of Accuracy of Geophone 2 for Triangular Wave at Pulse Width of 50 msec. (Slope of Line is 1.00)

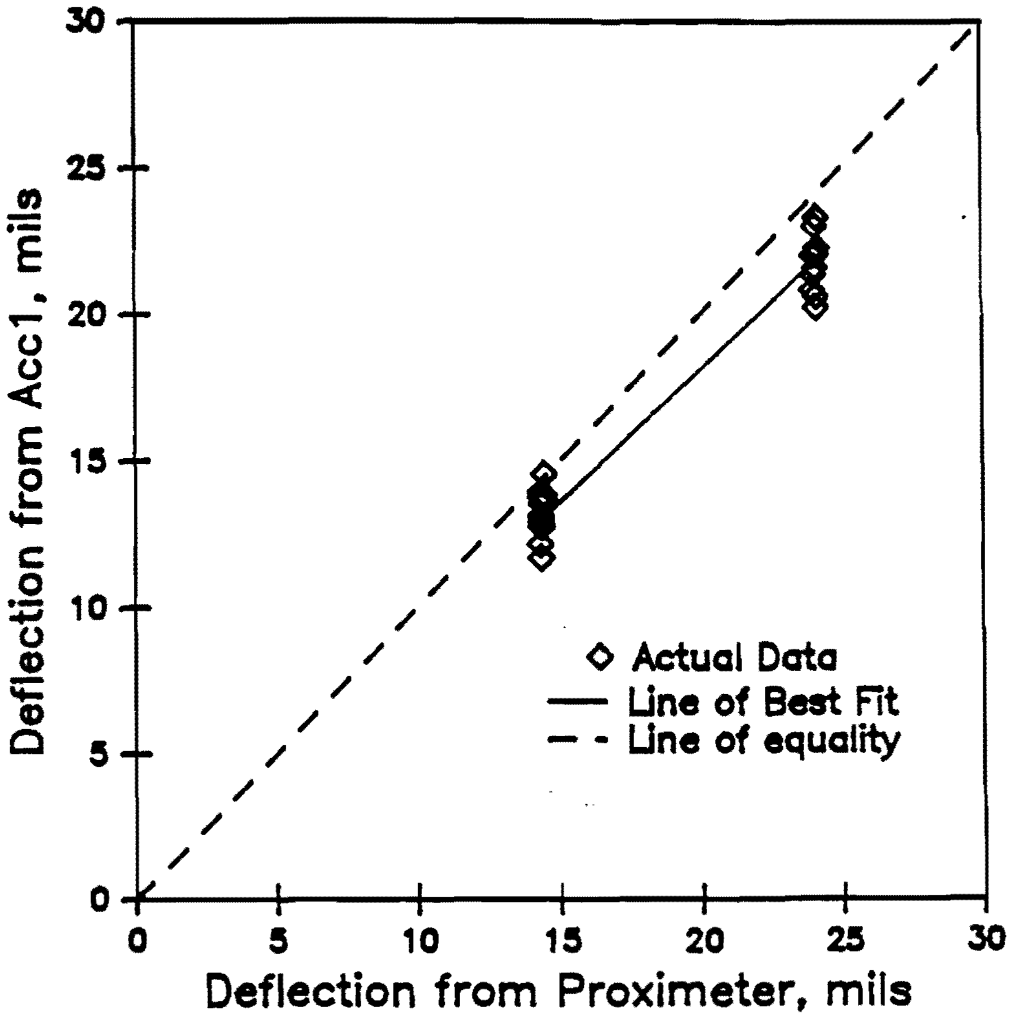


Figure M.11 Evaluation of Accuracy of Accelerometer 1 for Triangular Wave at Pulse Width of 100 msec. (Slope of Line is 1.02)

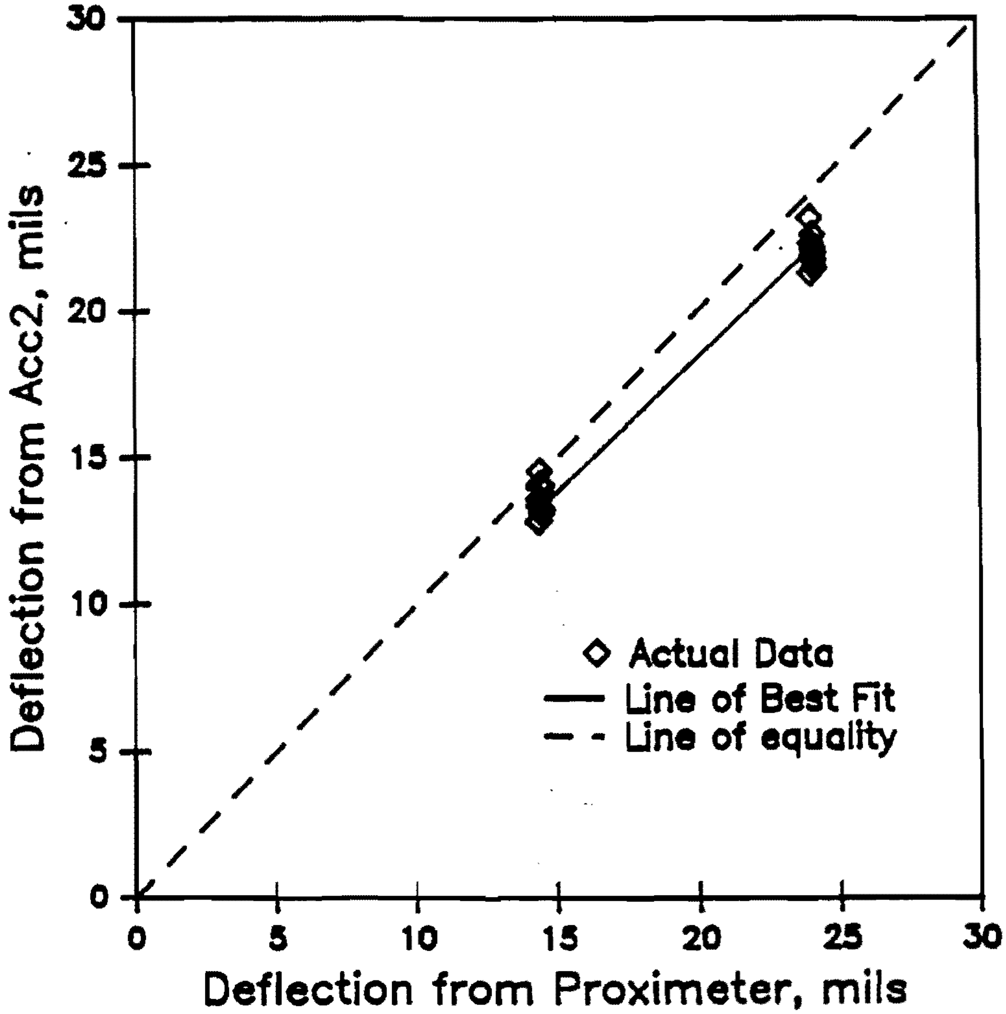


Figure M.12 Evaluation of Accuracy of Accelerometer 2 for Triangular Wave at Pulse Width of 100 msec. (Slope of Line is 0.99)

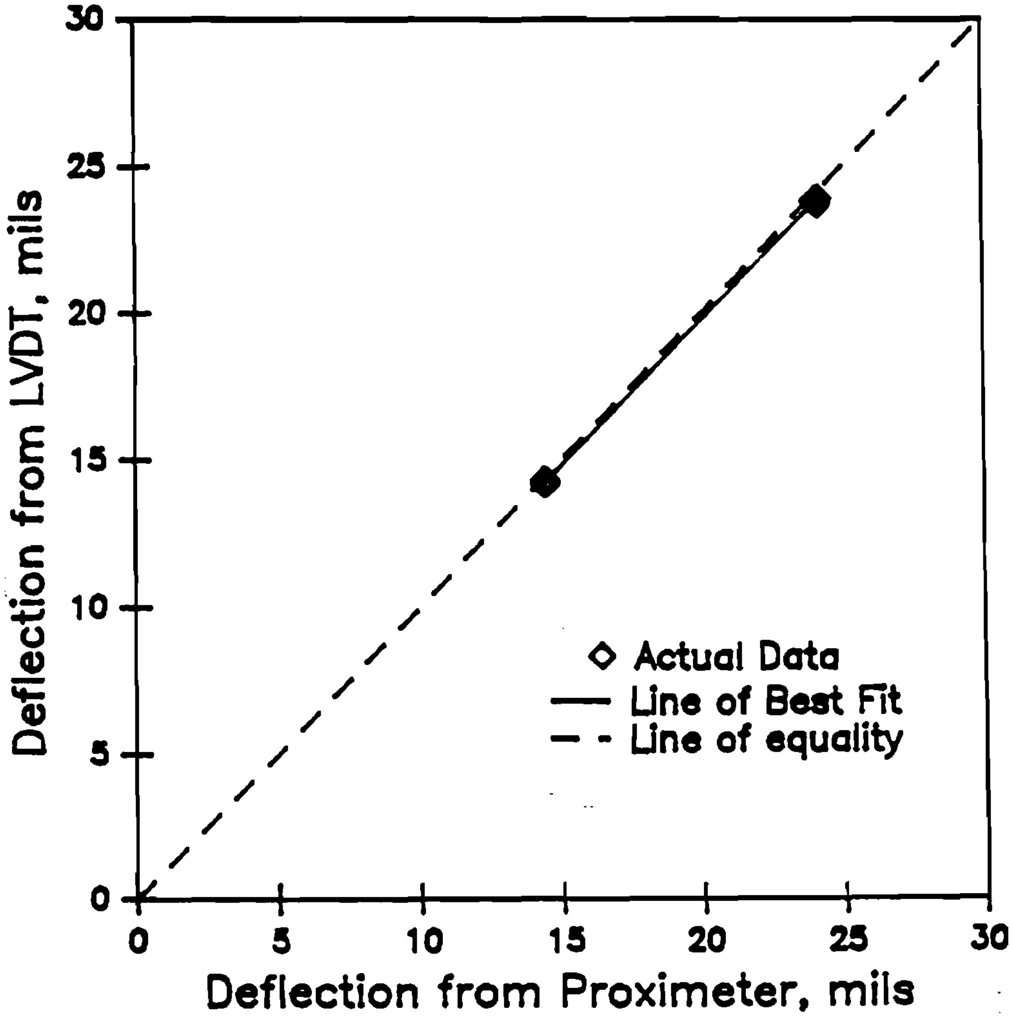


Figure M.13 Evaluation of Accuracy of LVDT for Triangular Wave at Pulse Width of 100 msec. (Slope of Line is 1.02)

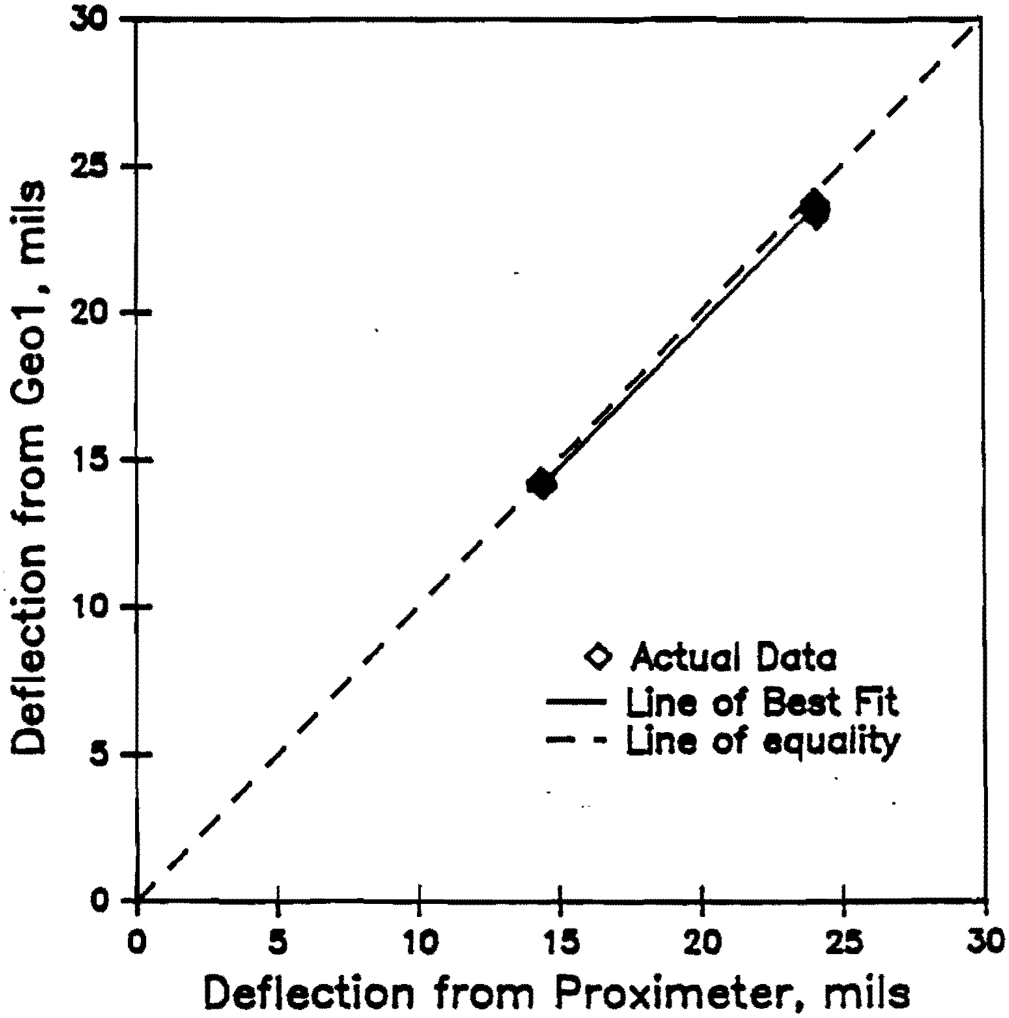


Figure M.14 Evaluation of Accuracy of Geophone 1 for Triangular Wave at Pulse Width of 100 msec. (Slope of Line is 1.01)

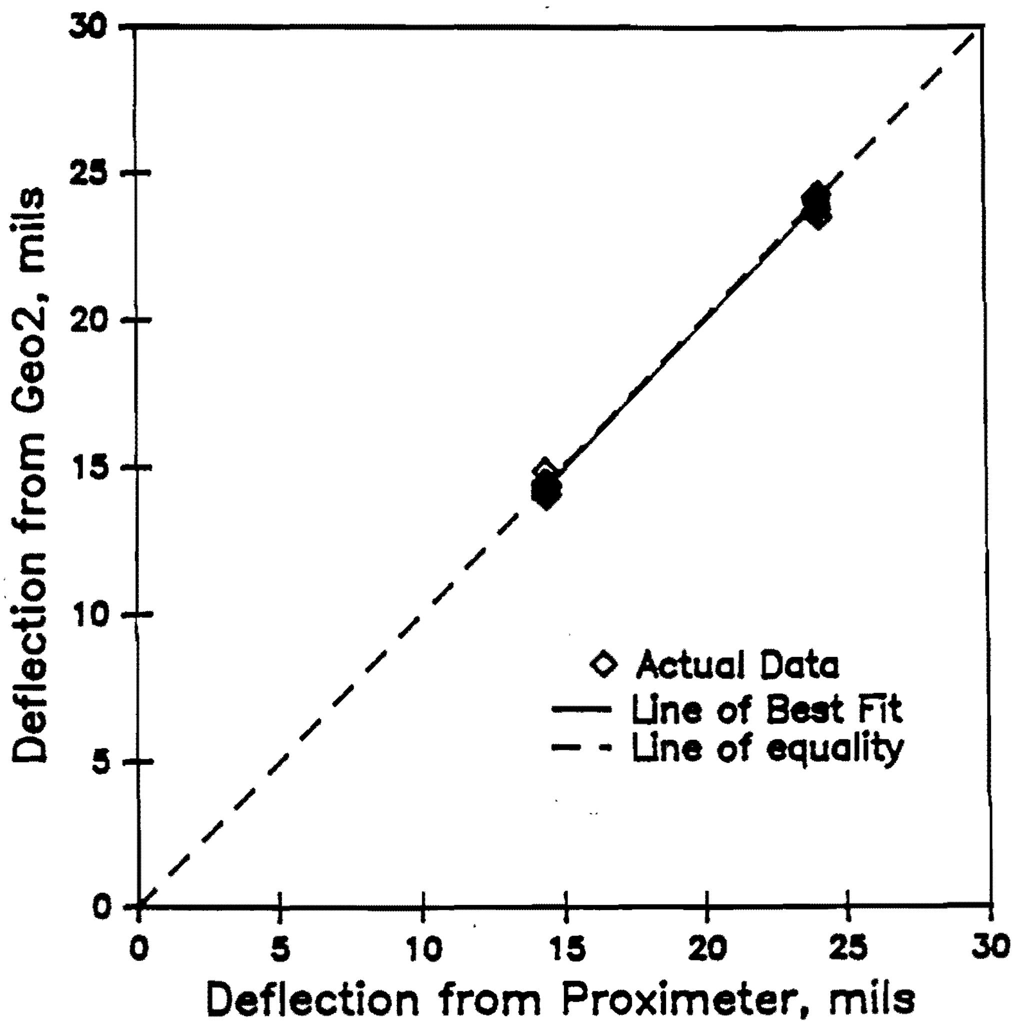
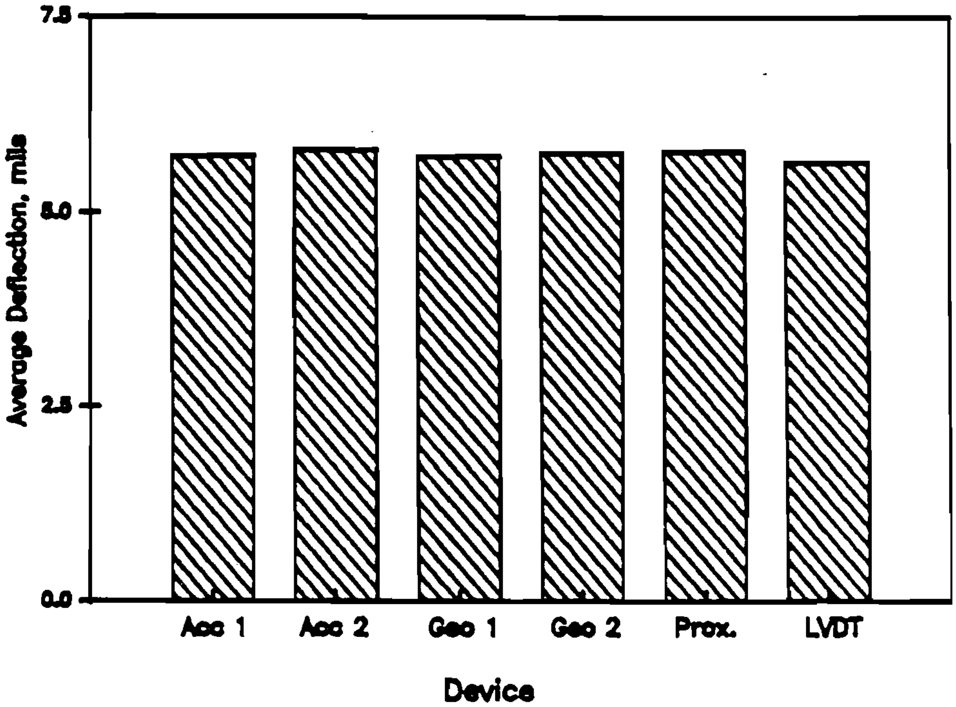


Figure M.15 Evaluation of Accuracy of Geophone 2 for Triangular Wave at Pulse Width of 100 msec (Slope of Line is 1.00)

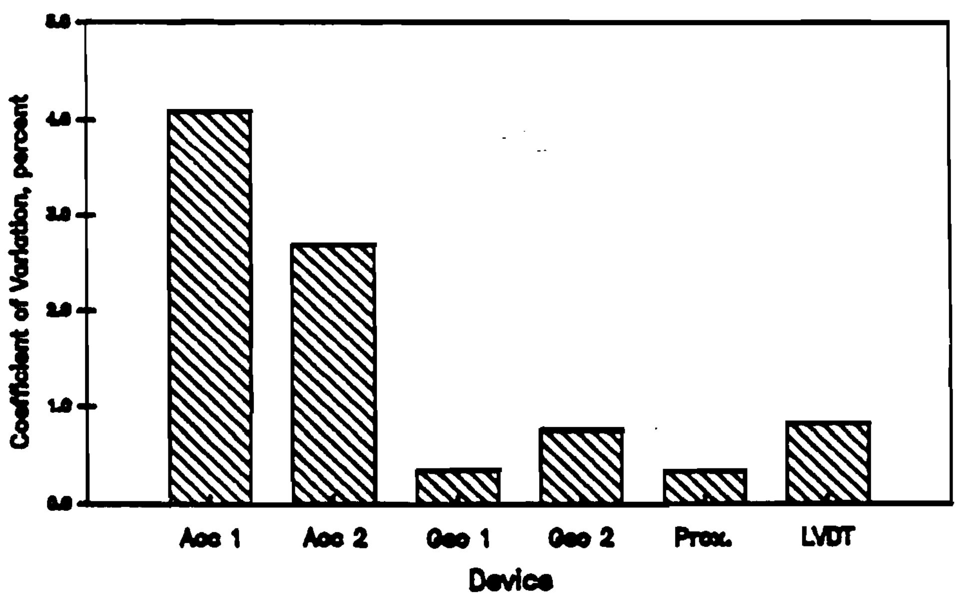
APPENDIX N

EVALUATION OF PRECISION OF EACH SENSOR

FOR TRIANGULAR WAVE MOTION

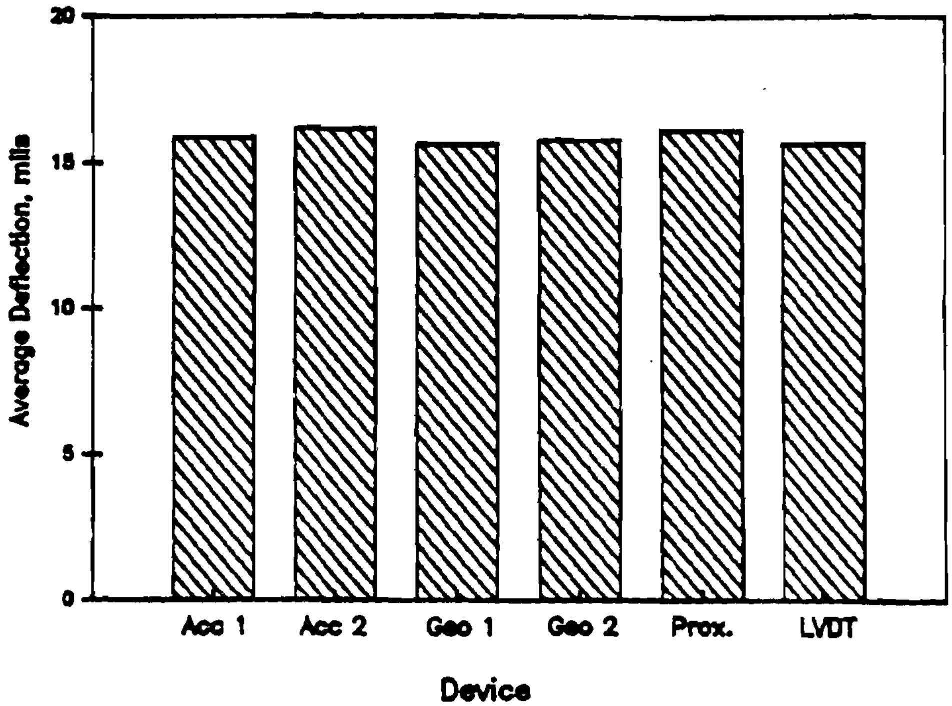


a) Average Deflection, mils

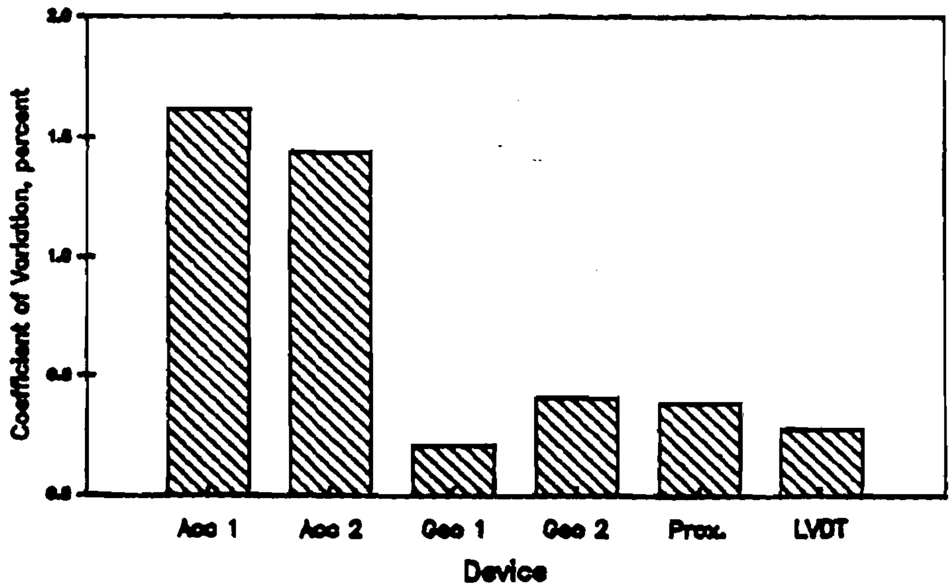


b) Coefficient of Variation

Figure N.1 Evaluation of Precision of All Sensors for Impulse Motion for Triangular Wave at Pulse Width of 25 msec. and a Nominal Deflection of 5.0 mils (without Laser)

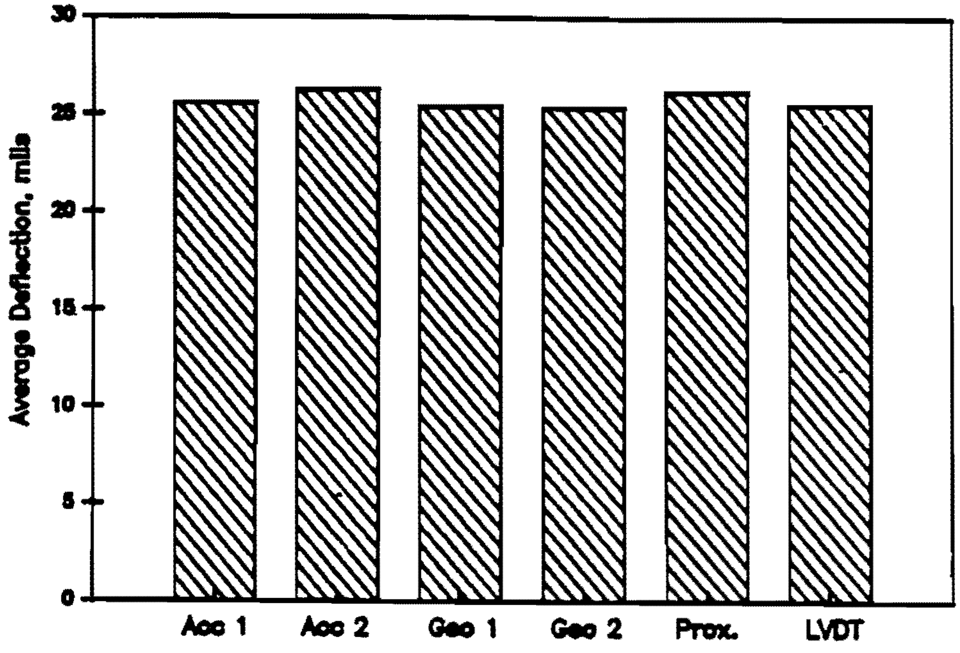


a) Average Deflection, mils

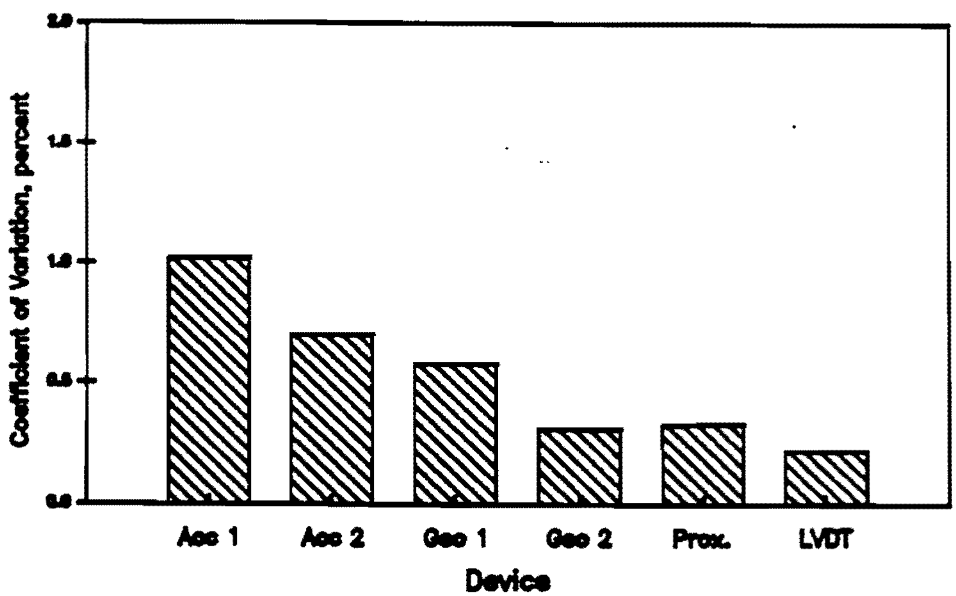


b) Coefficient of Variation

Figure N.2 Evaluation of Precision of All Sensors for Impulse Motion for Triangular Wave at Pulse Width of 25 msec. and a Nominal Deflection of 15.0 mils (without Laser)

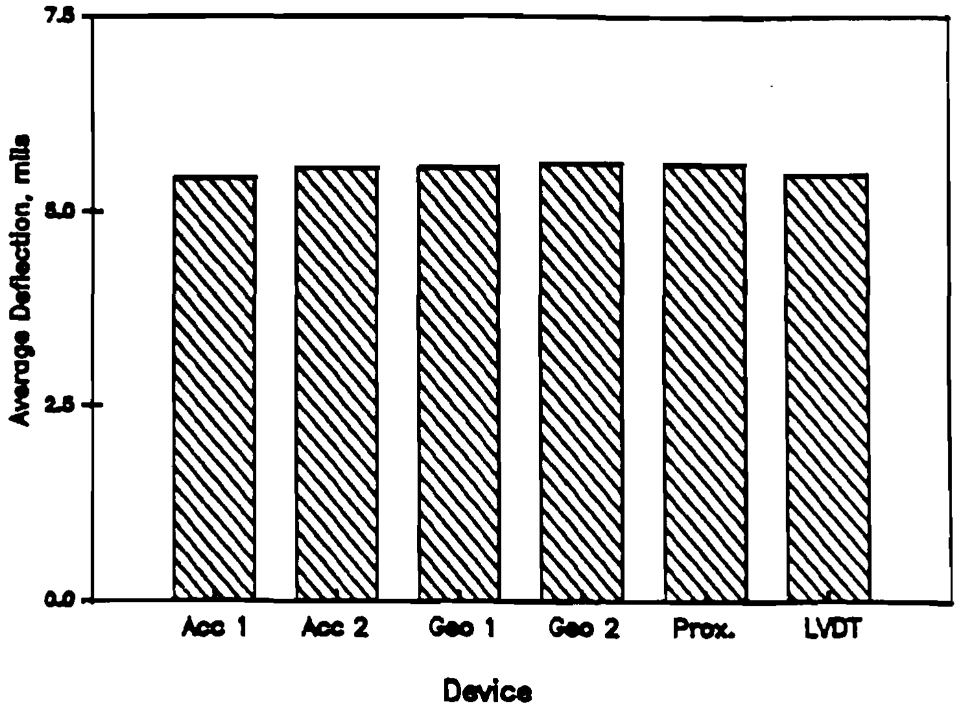


a) Average Deflection, mils

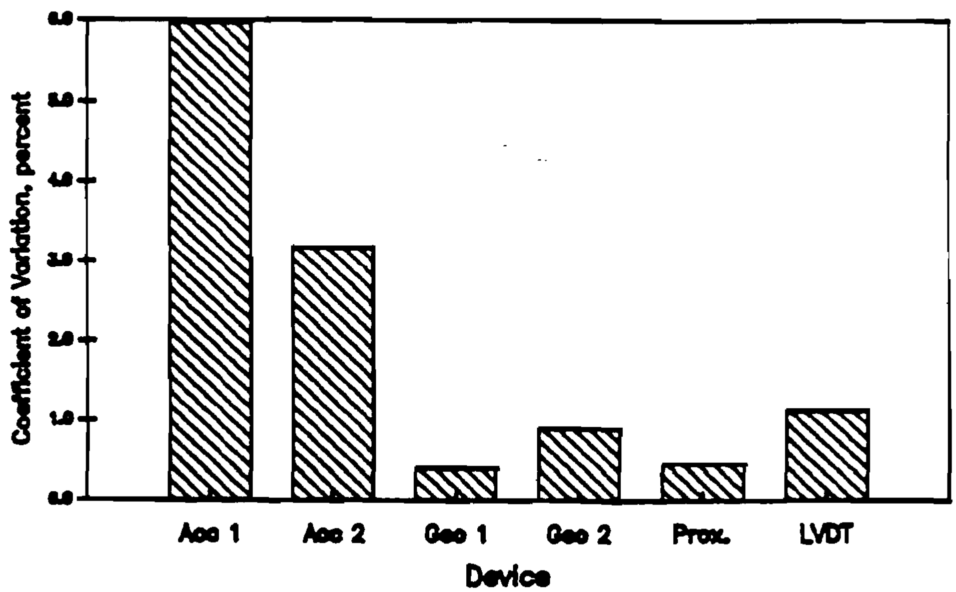


b) Coefficient of Variation

Figure N.3 Evaluation of Precision of All Sensors for Impulse Motion for Triangular Wave at Pulse Width of 25 msec. and a Nominal Deflection of 25.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure N.4 Evaluation of Precision of All Sensors for Impulse Motion for Triangular Wave at Pulse Width of 50 msec. and a Nominal Deflection of 5.0 mils (without Laser)

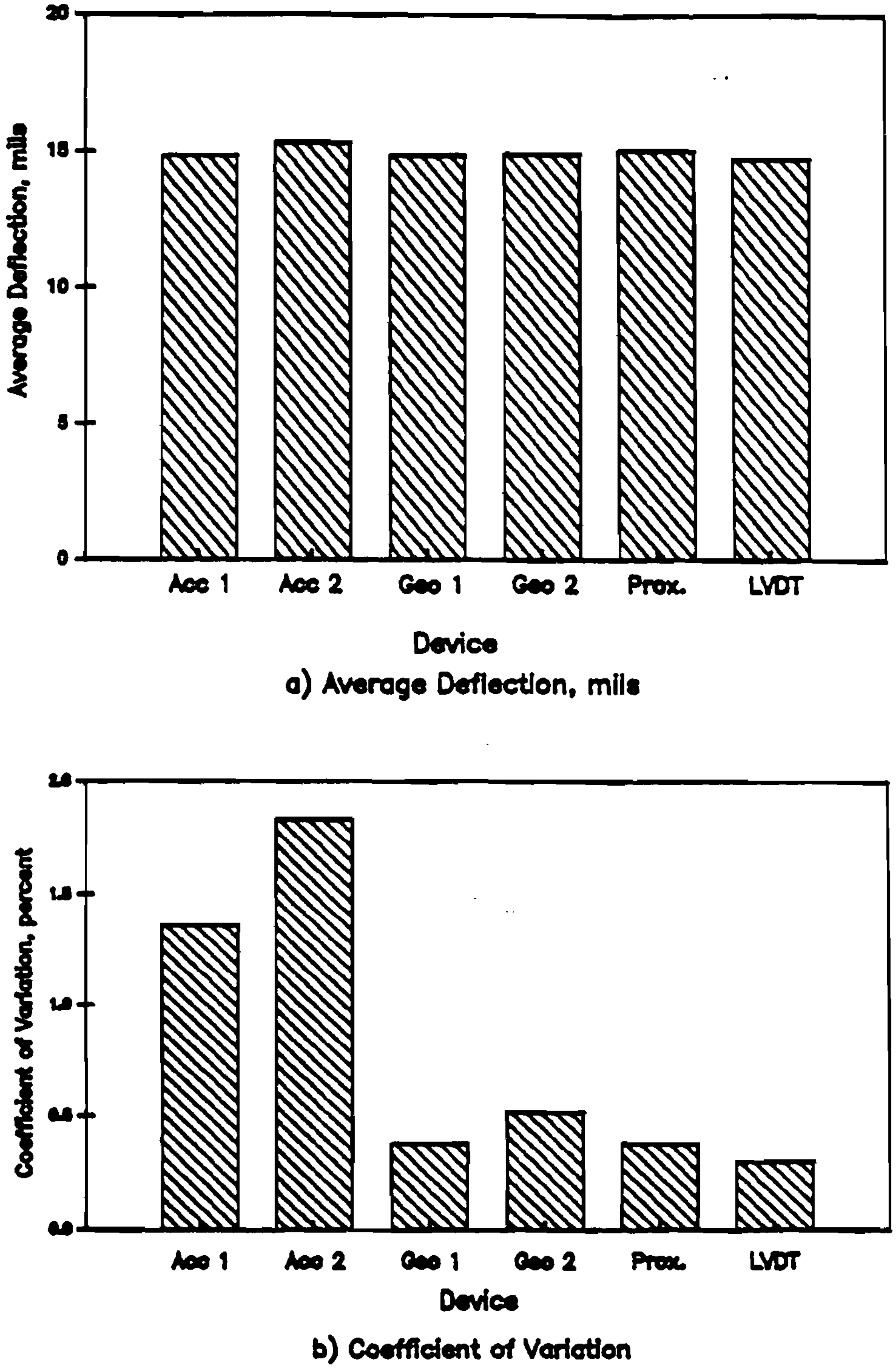
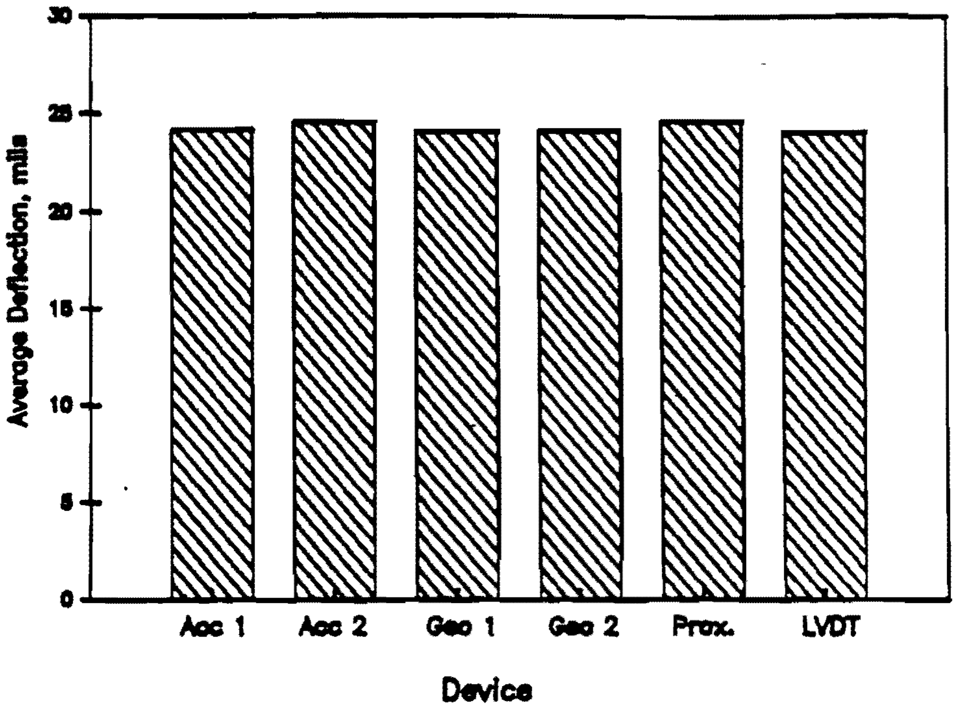
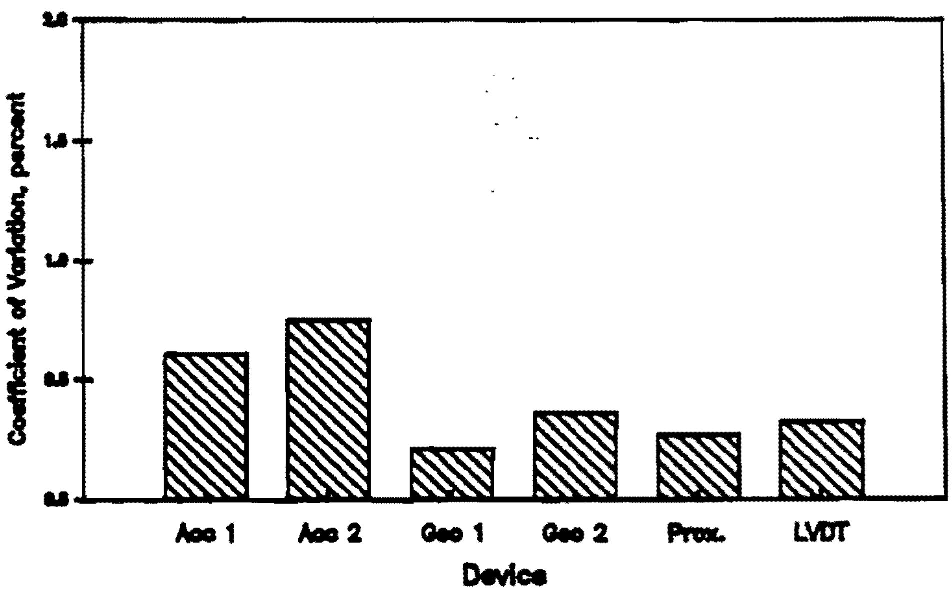


Figure N.5 Evaluation of Precision of All Sensors for Impulse Motion for Triangular Wave at Pulse Width of 50 msec. and a Nominal Deflection of 15.0 mils (without Laser)

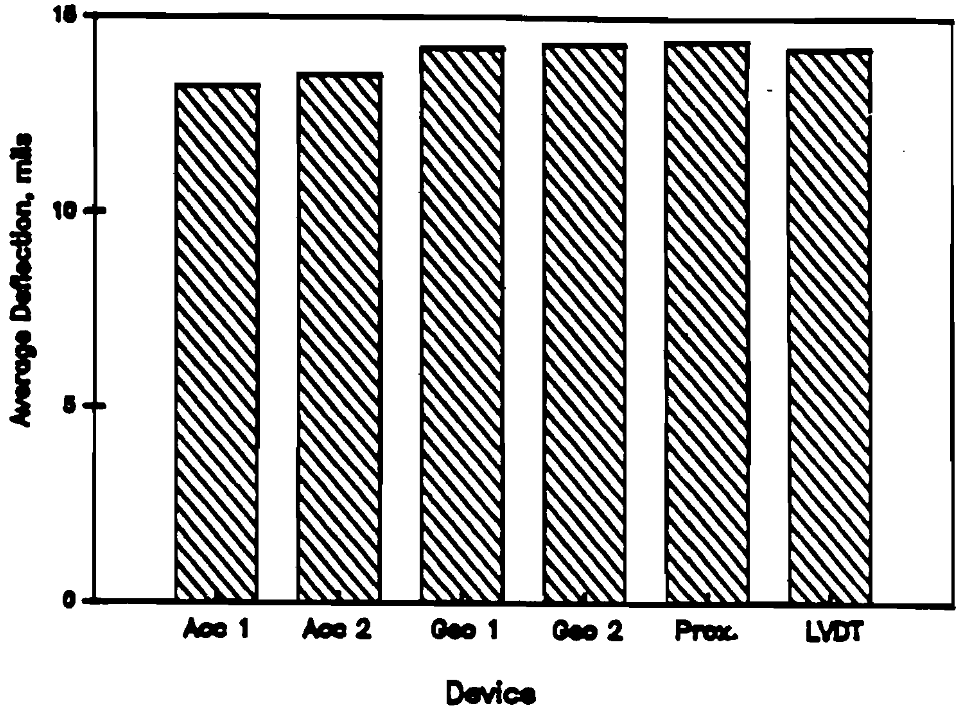


a) Average Deflection, mils

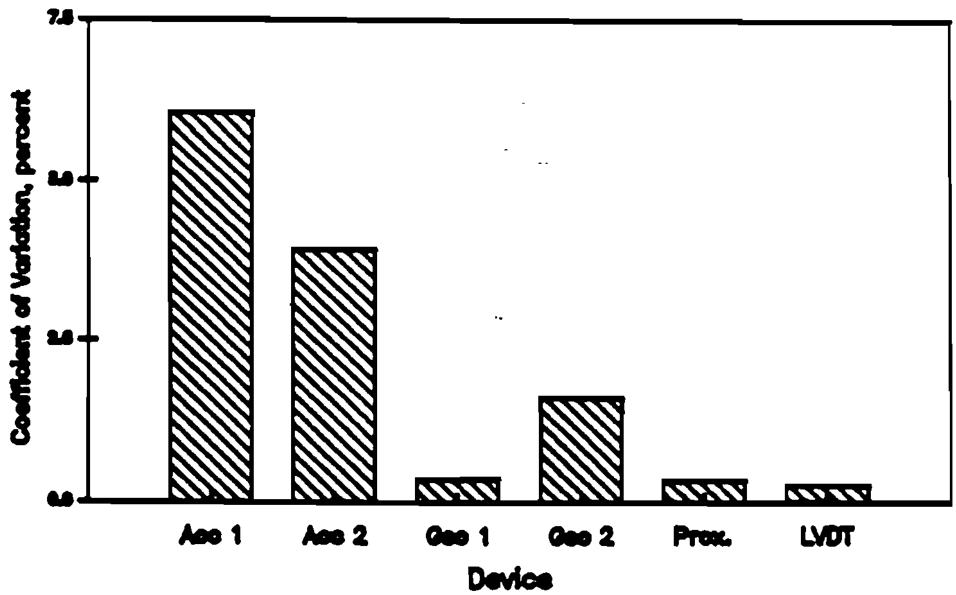


b) Coefficient of Variation

Figure N.6 Evaluation of Precision of All Sensors for Impulse Motion for Triangular Wave at Pulse Width of 50 msec. and a Nominal Deflection of 25.0 mils (without Laser)

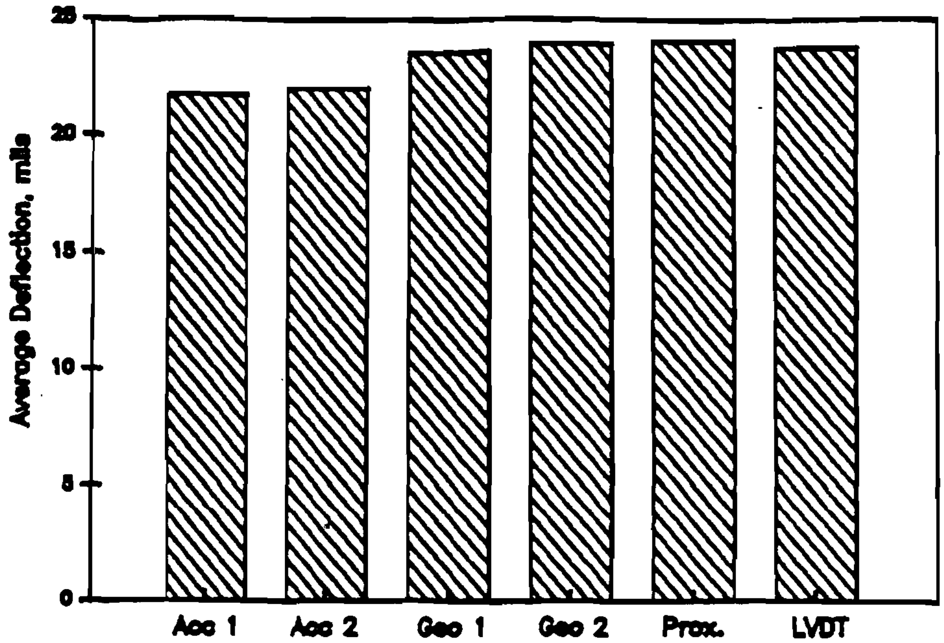


a) Average Deflection, mils

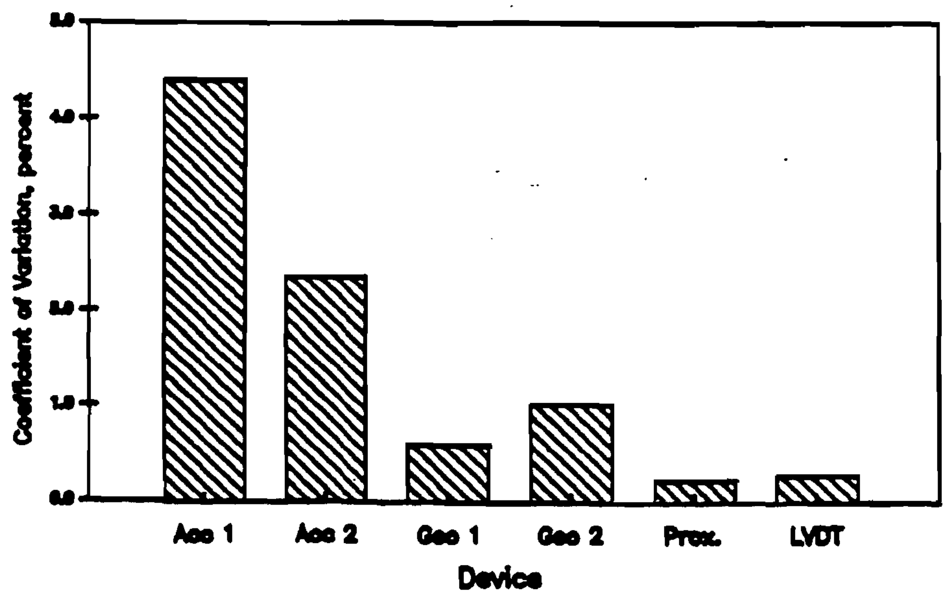


b) Coefficient of Variation

Figure N.7 Evaluation of Precision of All Sensors for Impulse Motion for Triangular Wave at Pulse Width of 100 msec. and a Nominal Deflection of 5.0 mils (without Laser)



a) Average Deflection, mils



b) Coefficient of Variation

Figure N.8 Evaluation of Precision of All Sensors for Impulse Motion for Triangular Wave at Pulse Width of 100 msec. and a Nominal Deflection of 15.0 mils (without Laser)

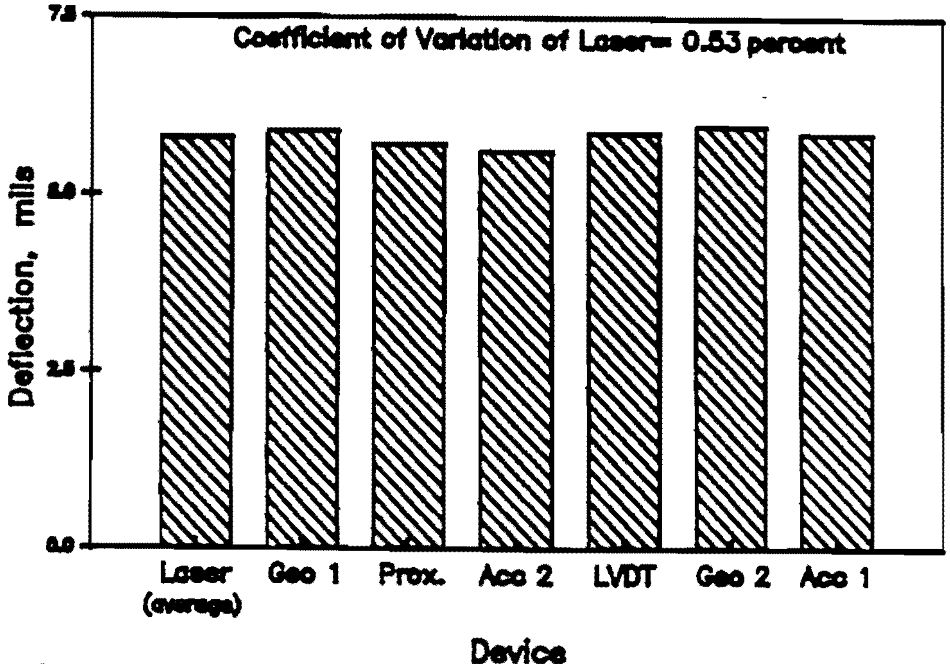


Figure N.9 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 25.0 msec. and a Nominal Deflection of 5.0 mils (with Laser)

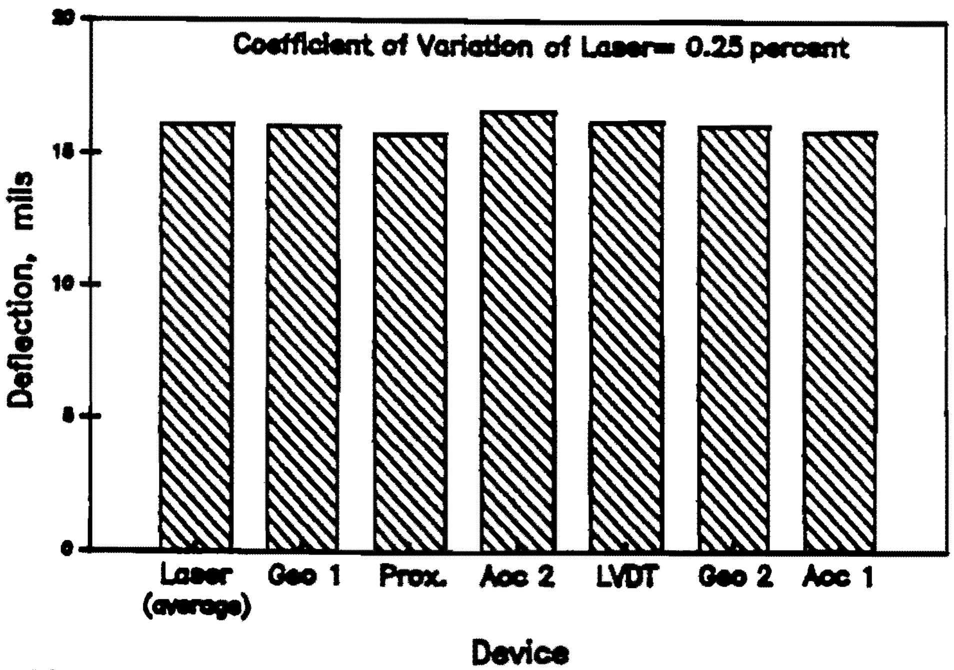


Figure N.10 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 25.0 msec. and a Nominal Deflection of 15.0 mils (with Laser)

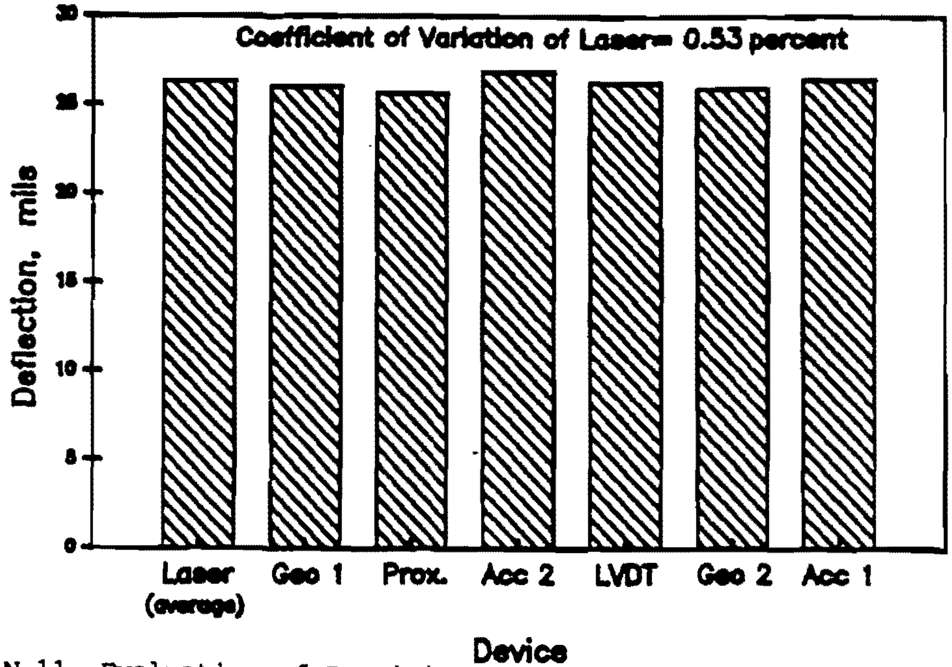


Figure N.11 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 25.0 msec. and a Nominal Deflection of 25.0 mils (with Laser)

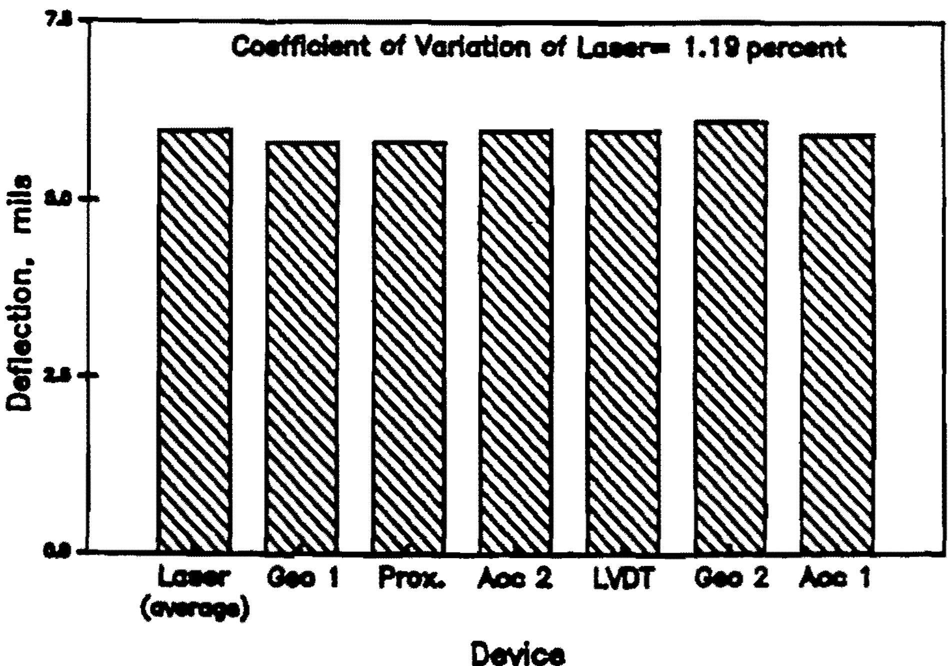


Figure N.12 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 50.0 msec. and a Nominal Deflection of 5.0 mils (with Laser)

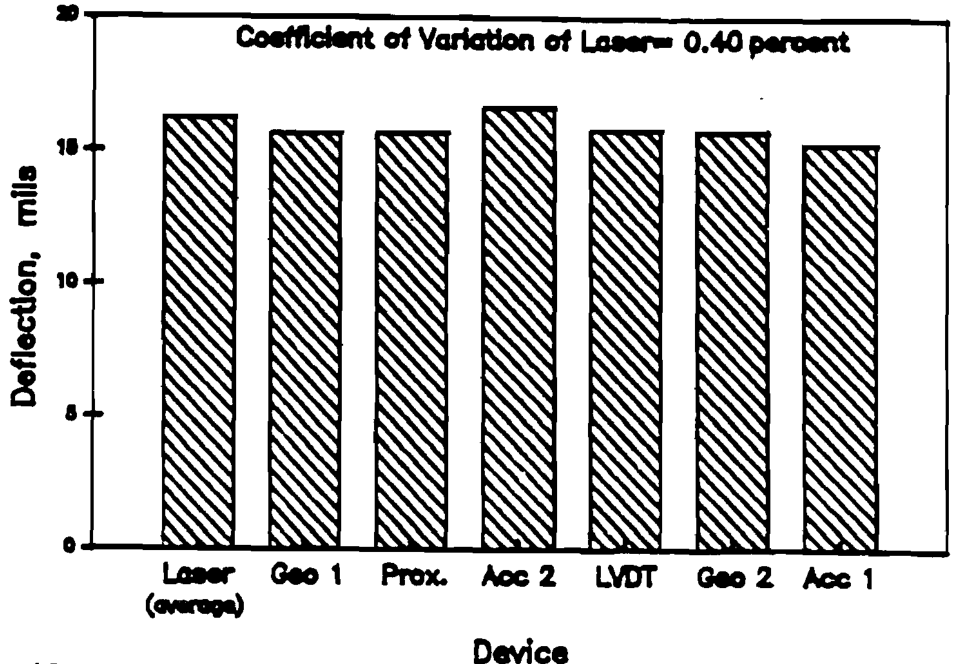


Figure N.13 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 50.0 msec. and a Nominal Deflection of 15.0 mils (with Laser)

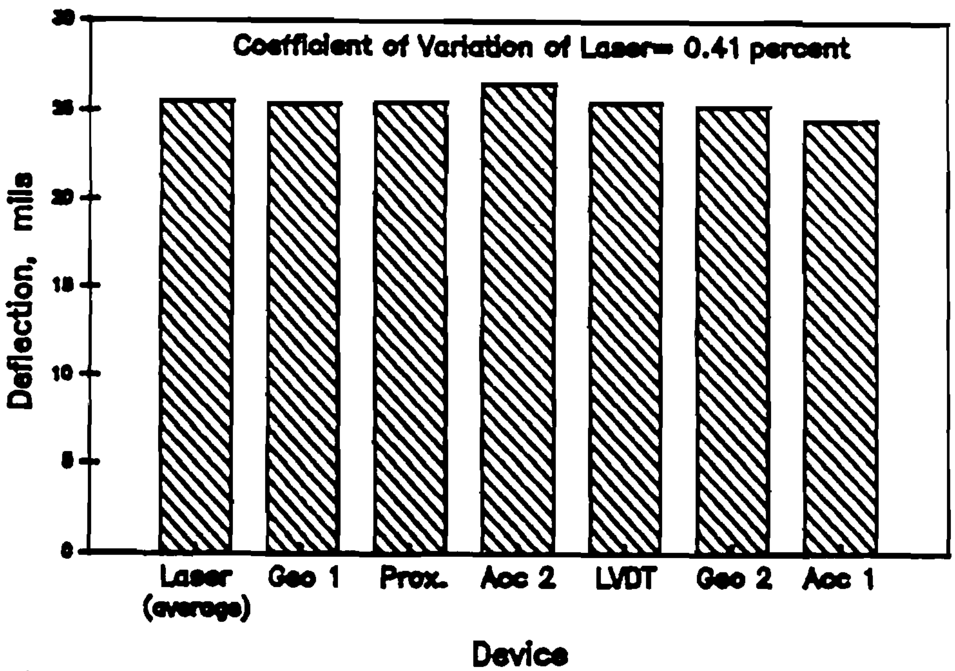


Figure N.14 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 50.0 msec. and a Nominal Deflection of 25.0 mils (with Laser)

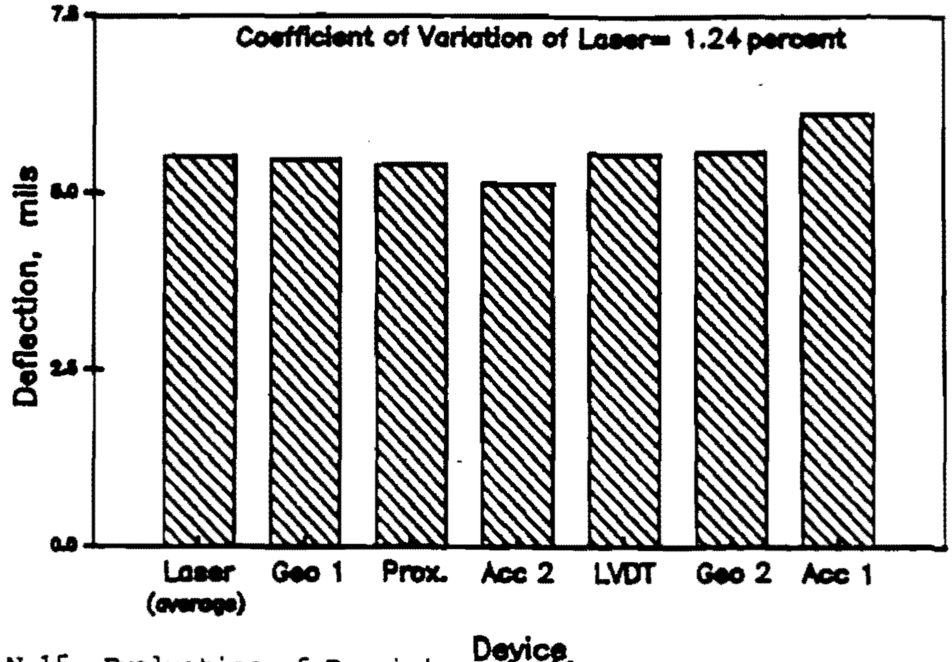


Figure N.15 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 75.0 msec. and a Nominal Deflection of 5.0 mils (with Laser)

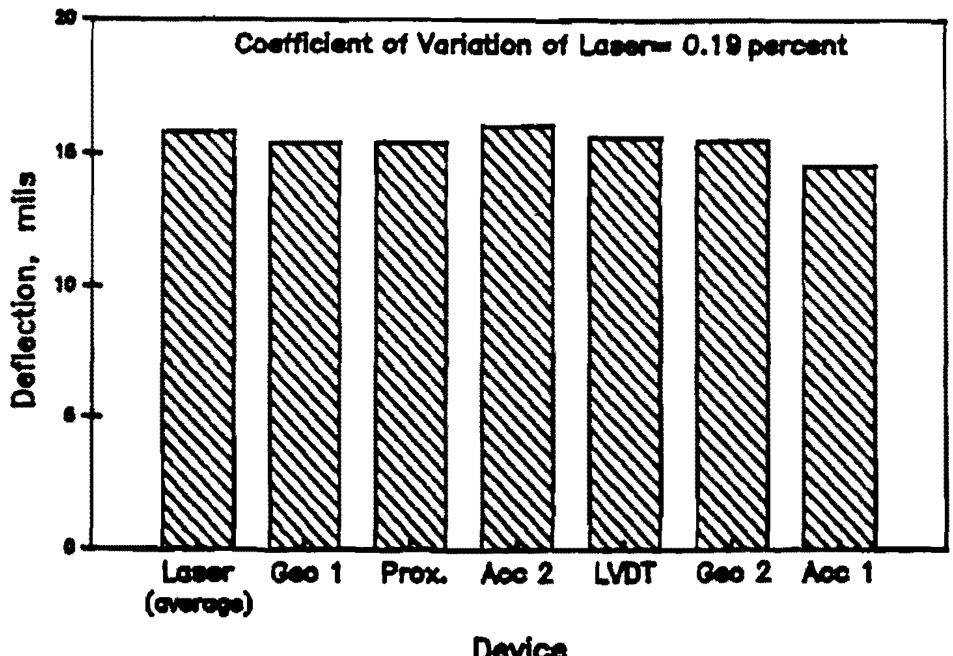


Figure N.16 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 75.0 msec. and a Nominal Deflection of 15.0 mils (with Laser)

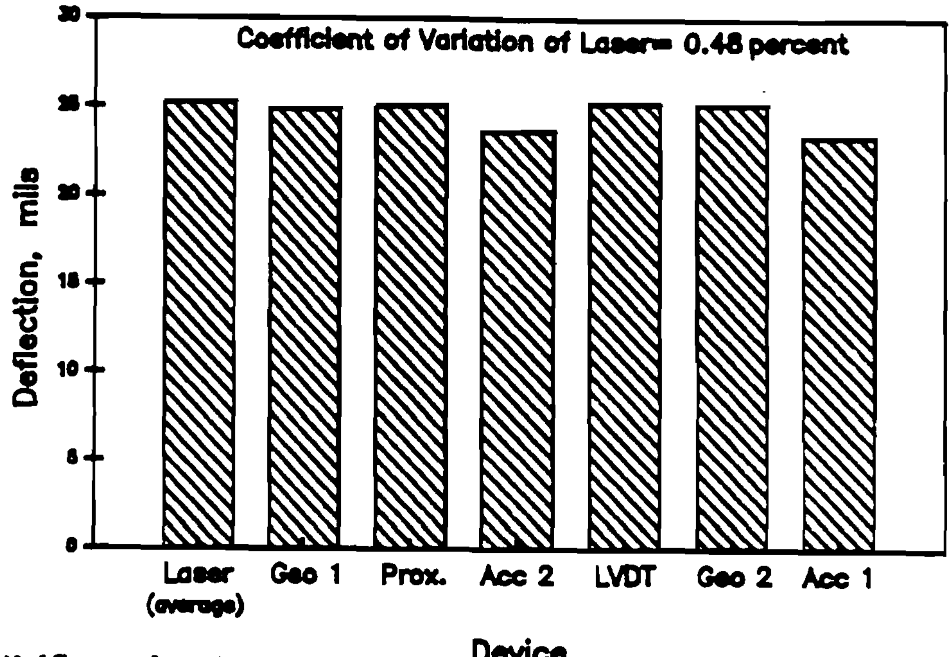


Figure N.17 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 75.0 msec. and a Nominal Deflection of 25.0 mils (with Laser)

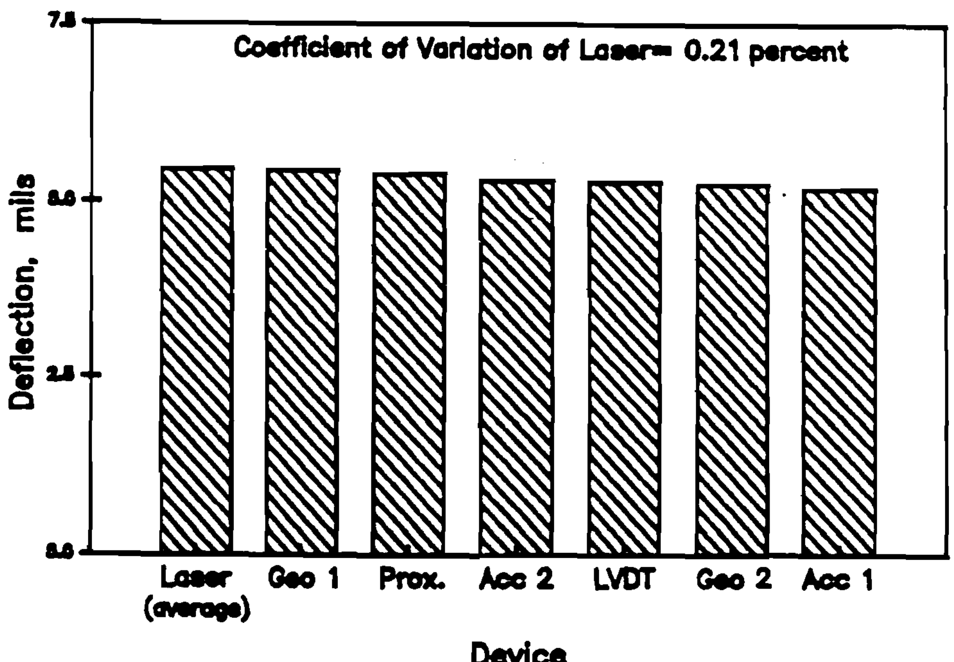


Figure N.18 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 100 msec. and a Nominal Deflection of 5.0 mils (with Laser)

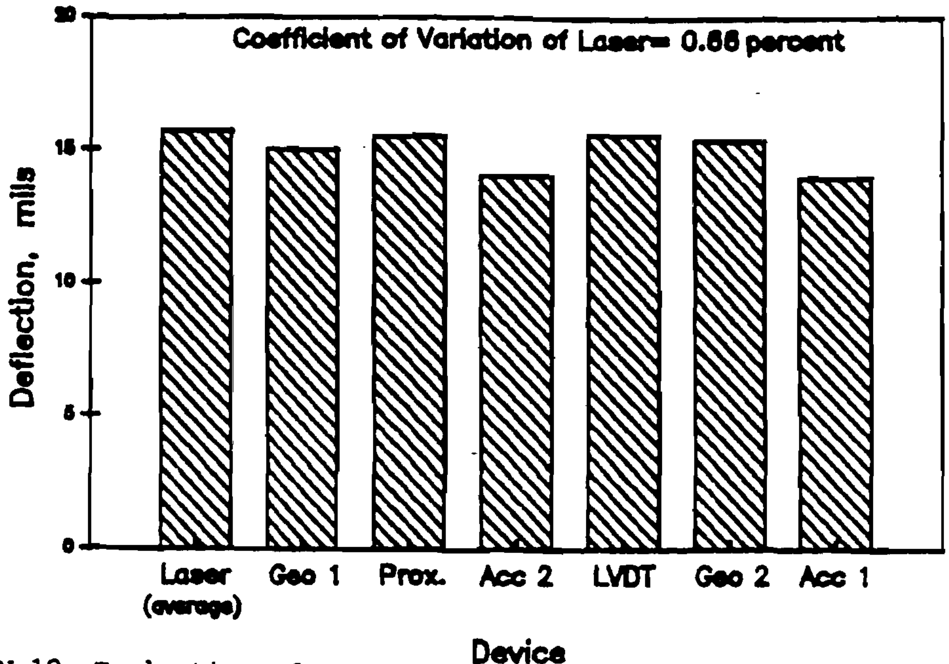


Figure N.19 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 100 msec. and a Nominal Deflection of 15.0 mils (with Laser)

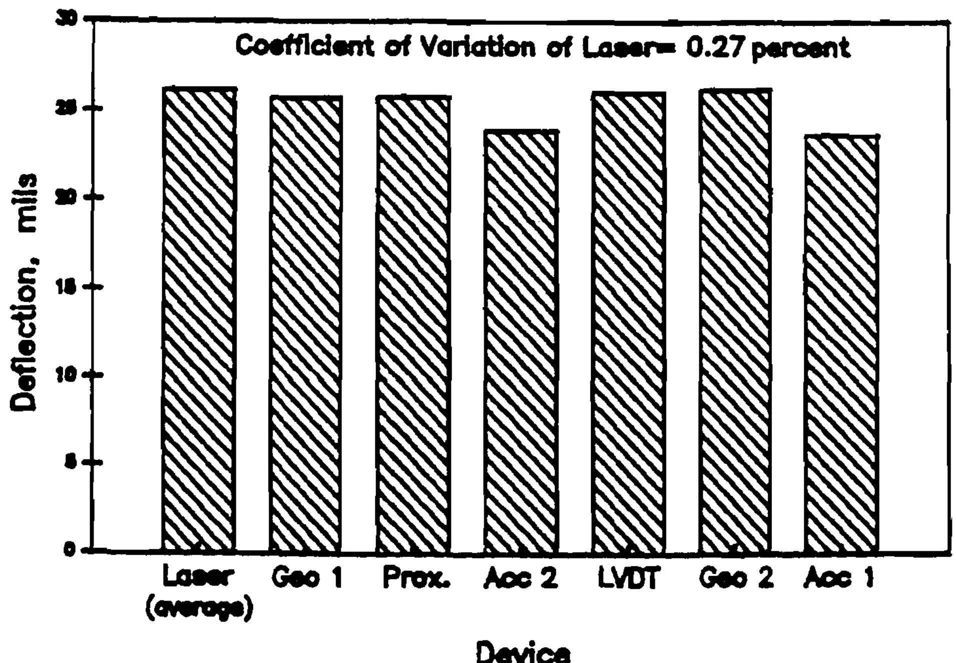


Figure N.20 Evaluation of Precision of All Sensors for Impulse Motion for Triangle Wave at Pulse Width of 100 msec. and a Nominal Deflection of 25.0 mils (with Laser)

APPENDIX O

DATA COLLECTED FOR EVALUATION OF FWD LOAD CELL

Table O.1 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 1, on Concrete Site at Zero Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips): Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	2.09	1.77	2.24	2.03	6.10	6.51	6.37
2	2.13	1.77	2.23	2.04	6.13	6.56	6.62
3	2.09	1.76	2.26	2.03	6.10	6.52	6.37
4	2.09	1.79	2.27	2.05	6.15	6.54	5.91
5	2.07	1.79	2.26	2.04	6.13	6.56	6.62
6	2.06	1.76	2.27	2.03	6.09	6.50	6.38
7	2.08	1.77	2.25	2.03	6.10	6.50	6.13
8	2.07	1.78	2.26	2.04	6.11	6.54	6.53
9	2.10	1.78	2.25	2.04	6.13	6.54	6.36
10	2.07	1.78	2.26	2.04	6.12	6.59	7.18
Average					6.11	6.53	6.44
Coefficent of Variation (percent)					0.28	0.43	

b) Results of Wraps

Test No.	Load from Calibration System (kips): Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	2.11	1.76	2.22	2.03	6.10	6.46	5.70
2	2.08	1.78	2.28	2.05	6.14	6.50	5.61
3	2.06	1.78	2.29	2.04	6.13	6.50	5.81
4	2.11	1.80	2.28	2.06	6.19	6.55	5.56
5	2.10	1.82	2.28	2.07	6.20	6.59	5.99
6	2.05	1.79	2.30	2.05	6.14	6.56	6.45
7	2.09	1.81	2.25	2.05	6.15	6.53	5.81
8	2.06	1.79	2.28	2.04	6.13	6.56	6.52
9	2.08	1.79	2.25	2.04	6.11	6.51	6.14
10	2.06	1.80	2.29	2.05	6.16	6.55	6.04
Average					6.14	6.53	5.96
Coefficent of Variation(percent)					0.48	0.54	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.2 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 2, on Concrete Site at Zero Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	2.90	2.49	3.30	2.90	8.69	9.33	6.82
2	2.92	2.50	3.29	2.90	8.70	9.29	6.28
3	2.91	2.45	3.22	2.86	8.58	9.24	7.16
4	2.91	2.45	3.21	2.86	8.57	9.23	7.22
5	2.94	2.47	3.24	2.88	8.65	9.28	6.75
6	2.92	2.49	3.25	2.89	8.67	9.32	7.02
7	2.94	2.51	3.26	2.91	8.72	9.34	6.70
8	2.86	2.47	3.27	2.87	8.60	9.25	6.99
9	2.96	2.53	3.31	2.93	8.80	9.39	6.33
10	2.88	2.45	3.23	2.85	8.56	9.24	7.33
Average					8.65	9.29	6.86
Coefficent of Variation (percent)					0.84	0.55	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	2.99	2.51	3.33	2.94	8.82	9.34	5.50
2	2.92	2.47	3.26	2.88	8.65	9.27	6.68
3	2.96	2.53	3.31	2.93	8.80	9.41	6.52
4	2.85	2.43	3.20	2.83	8.48	9.30	8.86
5	2.96	2.53	3.30	2.93	8.79	9.37	6.17
6	2.94	2.53	3.30	2.92	8.77	9.39	6.57
7	2.90	2.53	3.28	2.90	8.71	9.40	7.33
8	2.95	2.49	3.21	2.88	8.65	9.39	7.91
9	2.94	2.51	3.25	2.90	8.70	9.46	8.08
10	2.98	2.53	3.22	2.91	8.73	9.41	7.21
Average					8.71	9.37	7.08
Coefficent of Variation(percent)					1.09	0.57	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.3 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 3, on Concrete Site at Zero Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	3.53	3.38	4.00	3.64	10.91	11.10	1.72
2	3.49	3.35	3.98	3.61	10.82	11.06	2.23
3	3.50	3.34	4.00	3.61	10.84	11.09	2.26
4	3.57	3.33	3.98	3.62	10.87	11.10	2.04
5	3.57	3.37	4.02	3.65	10.96	11.18	1.97
6	3.53	3.32	3.98	3.61	10.83	11.10	2.38
7	3.55	3.32	4.04	3.64	10.91	11.13	1.95
8	3.51	3.34	4.04	3.63	10.89	11.13	2.16
9	3.50	3.35	4.04	3.63	10.89	11.08	1.71
10	3.53	3.37	4.04	3.65	10.94	11.16	1.94
Average					10.89	11.11	2.03
Coefficent of Variation (percent)					0.41	0.30	

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	3.60	3.32	4.06	3.66	10.98	11.18	1.74
2	3.60	3.30	4.06	3.65	10.96	11.16	1.77
3	3.56	3.28	4.04	3.63	10.88	11.10	2.05
4	3.53	3.30	4.02	3.62	10.85	11.10	2.26
5	3.57	3.32	4.06	3.65	10.95	11.17	1.96
6	3.55	3.30	4.04	3.63	10.89	11.10	1.93
7	3.57	3.30	4.06	3.64	10.93	11.16	2.07
8	3.59	3.32	4.06	3.66	10.97	11.20	2.07
9	3.59	3.28	4.06	3.64	10.93	11.13	1.79
10	3.60	3.28	4.06	3.65	10.95	11.17	1.97
Average					10.93	11.15	1.96
Coefficent of Variation(percent)					0.37	0.29	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.4 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 4, on Concrete Site at Zero Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	5.19	4.84	5.61	5.21	15.64	15.62	-0.13
2	5.40	4.84	5.58	5.27	15.82	15.98	0.98
3	5.40	4.90	5.60	5.30	15.90	16.06	0.96
4	5.38	4.90	5.63	5.30	15.91	16.03	0.75
5	5.38	4.90	5.63	5.30	15.91	16.04	0.83
6	5.36	4.90	5.65	5.31	15.92	16.07	0.97
7	5.38	4.90	5.67	5.32	15.95	16.06	0.68
8	5.35	4.92	5.67	5.31	15.94	16.10	0.97
9	5.34	4.90	5.66	5.30	15.90	16.02	0.70
10	5.32	4.92	5.64	5.29	15.88	16.05	1.02
Average					15.88	16.00	0.77
Coefficent of Variation (percent)					0.55	0.82	

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	5.36	4.88	5.60	5.28	15.85	16.02	1.05
2	5.40	4.94	5.67	5.34	16.01	16.22	1.25
3	5.40	4.94	5.67	5.34	16.01	16.22	1.25
4	5.36	4.86	5.62	5.28	15.84	16.04	1.22
5	5.32	4.88	5.60	5.27	15.80	16.01	1.29
6	5.35	4.88	5.62	5.29	15.86	16.05	1.17
7	5.31	4.90	5.60	5.27	15.81	16.03	1.36
8	5.26	4.90	5.58	5.25	15.74	15.98	1.47
9	5.24	4.92	5.57	5.24	15.73	16.00	1.68
10	5.24	4.92	5.58	5.25	15.74	15.99	1.56
Average					15.84	16.05	1.32
Coefficent of Variation(percent)					0.61	0.52	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table 0.5 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 1, on Concrete Site at 120 Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test	Load from Calibration System (kips)					Load from FWD	Difference+
No.	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	(Kips)	(percent)
1	2.36	2.01	2.16	2.18	6.53	7.00	6.75
2	2.37	2.01	2.16	2.18	6.54	7.08	7.66
3	2.39	2.03	2.18	2.20	6.60	7.04	6.24
4	2.38	1.98	2.15	2.17	6.51	6.99	6.85
5	2.34	2.02	2.12	2.16	6.48	6.96	6.91
6	2.35	2.00	2.13	2.16	6.47	6.98	7.21
7	2.36	2.02	2.17	2.18	6.55	7.00	6.39
8	2.36	2.01	2.17	2.18	6.53	6.99	6.61
9	2.36	2.05	2.16	2.19	6.57	6.99	6.03
10	2.36	2.05	2.16	2.19	6.57	6.97	5.76
Average					6.53	7	6.64
Coefficent of Variation (percent)					0.58	0.48	

b) Results of Wraps

Test	Load from Calibration System (kips)					Load from FWD	Difference+
No.	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	(Kips)	(percent)
1	2.33	2.01	2.12	2.15	6.45	6.96	7.27
2	2.31	2.01	2.09	2.14	6.41	6.94	7.64
3	2.31	2.04	2.11	2.15	6.46	6.88	6.10
4	2.31	2.05	2.09	2.15	6.44	6.90	6.66
5	2.31	2.05	2.10	2.15	6.46	6.93	6.81
6	2.31	2.01	2.11	2.14	6.42	6.91	7.06
7	2.32	2.03	2.10	2.15	6.46	6.94	7.04
8	2.28	2.04	2.06	2.13	6.38	6.94	8.11
9	2.31	2.12	2.09	2.17	6.51	6.98	6.62
10	2.31	1.99	2.12	2.14	6.41	6.91	7.21
Average					6.44	6.93	7.05
Coefficent of Variation(percent)					0.53	0.39	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.6 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 2, on Concrete Site at 120 Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.08	2.78	2.90	2.92	8.77	9.32	5.90
2	3.10	2.75	2.91	2.92	8.75	9.25	5.37
3	3.11	2.70	2.90	2.90	8.71	9.22	5.56
4	3.08	2.76	2.88	2.91	8.73	9.24	5.54
5	3.12	2.73	2.88	2.91	8.73	9.27	5.88
6	3.13	2.75	2.90	2.93	8.79	9.26	5.15
7	3.10	2.75	2.88	2.91	8.73	9.23	5.44
8	3.13	2.73	2.90	2.92	8.77	9.23	5.02
9	3.11	2.79	2.88	2.93	8.79	9.27	5.22
10	3.15	2.78	2.93	2.95	8.85	9.35	5.35
Average					8.76	9.26	5.44
Coefficent of Variation (percent)					0.45	0.42	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.13	2.71	2.88	2.91	8.72	9.22	5.42
2	3.09	2.71	2.88	2.89	8.68	9.22	5.87
3	3.11	2.77	2.90	2.93	8.78	9.30	5.61
4	3.12	2.73	2.86	2.90	8.71	9.20	5.29
5	3.11	2.77	2.90	2.93	8.78	9.26	5.17
6	3.13	2.71	2.90	2.92	8.75	9.22	5.14
7	3.13	2.71	2.91	2.92	8.76	9.22	4.98
8	3.15	2.73	2.90	2.93	8.78	9.22	4.78
9	3.15	2.72	2.89	2.92	8.75	9.22	5.09
10	3.13	2.72	2.89	2.91	8.74	9.24	5.41
Average					8.75	9.23	5.27
Coefficent of Variation(percent)					0.36	0.30	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table 0.7 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 3, on Concrete Site at 120 Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.81	3.61	3.69	3.70	11.11	11.92	6.80
2	3.84	3.71	3.69	3.74	11.23	11.92	5.75
3	3.85	3.63	3.73	3.73	11.20	11.93	6.08
4	3.77	3.67	3.58	3.67	11.02	11.81	6.63
5	3.80	3.71	3.61	3.70	11.11	11.86	6.28
6	3.82	3.65	3.67	3.71	11.13	11.88	6.32
7	3.82	3.67	3.67	3.72	11.15	11.89	6.20
8	3.81	3.67	3.65	3.71	11.13	11.89	6.38
9	3.82	3.62	3.67	3.70	11.11	11.86	6.38
10	3.79	3.65	3.65	3.69	11.08	11.85	6.48
Average					11.13	11.88	6.33
Coefficent of Variation (percent)					0.50	0.30	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.83	3.63	3.67	3.71	11.12	11.75	5.34
2	3.85	3.71	3.76	3.77	11.32	12.06	6.18
3	3.82	3.57	3.67	3.68	11.05	11.76	6.02
4	3.81	3.63	3.69	3.71	11.12	11.81	5.80
5	3.78	3.65	3.65	3.69	11.08	11.85	6.51
6	3.75	3.66	3.61	3.67	11.02	11.82	6.81
7	3.82	3.64	3.65	3.70	11.11	11.82	5.96
8	3.74	3.69	3.65	3.69	11.08	11.86	6.57
9	3.92	3.83	3.71	3.82	11.46	11.85	3.31
10	3.79	3.69	3.71	3.73	11.19	11.87	5.74
Average					11.15	11.84	5.82
Coefficent of Variation(percent)					1.15	0.69	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.8 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 1, on Concrete Site at 240 Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.39	1.59	2.18	2.05	6.16	6.70	8.17
2	2.31	1.60	2.17	2.03	6.08	6.59	7.79
3	2.40	1.63	2.21	2.08	6.23	6.75	7.67
4	2.29	1.58	2.17	2.01	6.04	6.58	8.19
5	2.31	1.61	2.19	2.04	6.11	6.66	8.15
6	2.38	1.60	2.21	2.06	6.19	6.73	7.95
7	2.31	1.61	2.17	2.03	6.08	6.65	8.53
8	2.34	1.58	2.16	2.03	6.08	6.66	8.60
9	2.29	1.61	2.17	2.02	6.07	6.58	7.83
10	2.36	1.61	2.19	2.05	6.15	6.66	7.57
Average					6.12	6.65	8.04
Coefficent of Variation (percent)					0.97	0.86	

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.32	1.65	2.17	2.04	6.13	6.65	7.74
2	2.28	1.60	2.15	2.01	6.04	6.58	8.33
3	2.32	1.62	2.18	2.04	6.12	6.64	7.83
4	2.34	1.65	2.19	2.06	6.17	6.67	7.59
5	2.39	1.64	2.25	2.09	6.28	6.88	8.68
6	2.29	1.58	2.19	2.02	6.06	6.60	8.18
7	2.32	1.61	2.22	2.05	6.14	6.68	8.07
8	2.31	1.60	2.21	2.04	6.12	6.70	8.59
9	2.33	1.60	2.21	2.05	6.14	6.70	8.23
10	2.31	1.61	2.17	2.03	6.08	6.67	8.90
Average					6.13	6.68	8.21
Coefficent of Variation(percent)					1.05	1.15	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.9 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 2, on Concrete Site at 240 Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.33	2.34	3.01	2.89	8.68	9.11	4.75
2	3.28	2.38	2.98	2.88	8.64	9.08	4.87
3	3.35	2.42	3.06	2.94	8.82	9.31	5.24
4	3.30	2.38	2.97	2.88	8.65	9.07	4.66
5	3.32	2.39	3.02	2.91	8.74	9.14	4.39
6	3.29	2.36	2.95	2.87	8.60	9.04	4.88
7	3.35	2.38	2.97	2.90	8.70	9.16	5.05
8	3.36	2.38	3.00	2.91	8.74	9.18	4.74
9	3.32	2.34	2.94	2.87	8.60	9.09	5.34
10	3.34	2.36	3.00	2.90	8.71	9.27	6.12
Average					8.69	9.14	5.00
Coefficent of Variation (percent)					0.76	0.92	

b) Results of Wraps

Test No.	Load from Calibration System.(kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.28	2.33	2.94	2.85	8.55	9.03	5.31
2	3.36	2.36	2.99	2.90	8.71	9.22	5.52
3	3.32	2.33	2.93	2.86	8.57	9.08	5.57
4	3.36	2.35	2.98	2.90	8.69	9.22	5.74
5	3.29	2.31	2.92	2.84	8.52	9.03	5.69
6	3.36	2.33	2.95	2.88	8.64	9.15	5.62
7	3.30	2.30	2.93	2.85	8.54	9.07	5.87
8	3.34	2.33	2.91	2.86	8.59	9.12	5.85
9	3.32	2.30	2.92	2.85	8.54	9.08	5.95
10	3.33	2.34	2.98	2.88	8.64	9.18	5.81
Average					8.60	9.12	5.69
Coefficent of Variation(percent)					0.74	0.74	

+Difference= {Load from FWD − Load from Calibration System}*100/{Load from FWD}

Table O.10 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 3, on Concrete Site at 240 Degree Rotation (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	4.01	2.61	4.10	3.57	10.72	11.06	3.10
2	4.01	2.69	4.02	3.57	10.72	11.12	3.60
3	4.08	2.76	4.06	3.63	10.89	11.24	3.10
4	4.08	2.78	4.04	3.63	10.90	11.23	2.97
5	4.08	2.78	4.04	3.63	10.89	11.21	2.84
6	4.04	2.76	4.04	3.61	10.84	11.16	2.90
7	4.07	2.73	4.03	3.61	10.83	11.18	3.06
8	4.03	2.85	4.06	3.65	10.94	11.22	2.49
9	4.10	2.82	4.06	3.66	10.98	11.28	2.69
10	4.06	2.82	4.04	3.64	10.91	11.24	2.91
Average					10.86	11.19	2.96
Coefficent of Variation (percent)					0.75	0.55	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	4.06	2.82	4.02	3.63	10.89	11.22	2.93
2	4.08	2.86	4.04	3.66	10.98	11.27	2.62
3	4.10	2.82	4.04	3.65	10.95	11.28	2.90
4	4.04	2.82	4.02	3.63	10.88	11.22	3.01
5	4.08	2.86	4.05	3.66	10.99	11.28	2.58
6	4.08	2.82	4.01	3.63	10.90	11.28	3.35
7	4.08	2.82	4.01	3.63	10.90	11.27	3.29
8	4.06	2.80	4.00	3.62	10.86	11.24	3.40
9	4.06	2.80	4.00	3.62	10.85	11.23	3.38
10	4.04	2.84	4.00	3.63	10.88	11.24	3.18
Average					10.91	11.25	3.06
Coefficent of Variation(percent)					0.42	0.22	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.11 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 1, on Concrete Site at Zero Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.18	1.67	2.18	2.01	6.03	7.04	14.40
2	2.18	1.65	2.18	2.00	6.01	7.06	14.96
3	2.23	1.68	2.20	2.03	6.10	7.14	14.63
4	2.16	1.65	2.11	1.98	5.93	6.90	14.03
5	2.14	1.64	2.08	1.96	5.87	6.85	14.34
6	2.16	1.65	2.11	1.97	5.92	6.90	14.14
7	2.18	1.65	2.12	1.98	5.95	6.94	14.27
8	2.18	1.66	2.13	1.99	5.98	6.94	13.94
9	2.22	1.70	2.15	2.02	6.07	7.04	13.84
10	2.23	1.70	2.13	2.02	6.06	6.98	13.21
Average					5.99	6.98	14.17
Coefficent of Variation (percent)					1.18	1.24	

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.17	1.66	2.08	1.97	5.91	6.85	13.75
2	2.30	1.76	2.23	2.10	6.29	7.25	13.22
3	2.16	1.68	2.11	1.99	5.96	6.89	13.54
4	2.19	1.65	2.09	1.97	5.92	6.85	13.48
5	2.18	1.67	2.09	1.98	5.95	6.90	13.76
6	2.24	1.70	2.11	2.01	6.04	6.94	12.96
7	2.24	1.73	2.12	2.03	6.09	6.98	12.63
8	2.27	1.74	2.11	2.04	6.12	6.97	12.14
9	2.23	1.72	2.09	2.02	6.05	6.98	13.37
10	2.27	1.74	2.13	2.05	6.14	7.02	12.63
Average					6.05	6.96	13.14
Coefficent of Variation(percent)					1.87	1.59	

+Difference= (Load from FWD - Load from Calibration System)*100/(Load from FWD)

Table O.12 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 2, on Concrete Site at Zero Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.87	2.41	2.98	2.75	8.25	9.22	10.52
2	2.79	2.33	2.85	2.66	7.97	9.14	12.77
3	2.83	2.33	2.86	2.67	8.02	9.22	13.00
4	2.88	2.36	2.89	2.71	8.12	9.19	11.63
5	2.87	2.34	2.89	2.70	8.10	9.23	12.30
6	2.83	2.31	2.91	2.68	8.05	9.17	12.16
7	2.89	2.34	2.91	2.71	8.13	9.22	11.83
8	2.81	2.32	2.87	2.67	8.00	9.18	12.89
9	2.88	2.38	2.89	2.72	8.15	9.22	11.65
10	2.89	2.36	2.91	2.72	8.16	9.25	11.75
Average					8.10	9.20	12.05
Coefficent of Variation (percent)					0.99	0.35	5.88

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.85	2.34	2.94	2.71	8.13	9.11	10.82
2	2.85	2.34	2.86	2.68	8.05	9.15	12.02
3	2.88	2.36	2.91	2.72	8.16	9.19	11.25
4	2.86	2.34	2.87	2.69	8.07	9.18	12.15
5	2.89	2.34	2.89	2.71	8.12	9.18	11.53
6	2.83	2.30	2.85	2.66	7.99	9.13	12.51
7	2.83	2.32	2.87	2.67	8.02	9.18	12.60
8	2.88	2.33	2.87	2.69	8.08	9.16	11.79
9	2.91	2.35	2.90	2.72	8.16	9.19	11.28
10	2.89	2.35	2.88	2.71	8.12	9.18	11.59
Average					8.09	9.17	11.75
Coefficent of Variation(percent)					0.67	0.28	4.62

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.13 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 3, on Concrete Site at Zero Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	3.71	2.92	3.77	3.47	10.40	11.51	9.69
2	3.88	2.96	3.81	3.55	10.65	11.60	8.16
3	3.88	2.98	3.77	3.54	10.63	11.58	8.21
4	3.89	2.98	3.76	3.54	10.62	11.58	8.32
5	3.83	2.92	3.65	3.46	10.39	11.46	9.27
6	3.86	2.92	3.69	3.49	10.46	11.49	8.91
7	3.78	2.92	3.67	3.46	10.37	11.47	9.64
8	3.76	2.92	3.69	3.45	10.36	11.42	9.31
9	3.64	2.85	3.65	3.38	10.14	11.37	10.81
10	3.57	2.83	3.63	3.34	10.03	11.30	11.28
Average					10.41	11.47	9.35
Coefficent of Variation (percent)					1.87	0.80	

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	3.60	2.90	3.63	3.38	10.13	11.38	10.99
2	3.53	2.88	3.63	3.35	10.04	11.35	11.60
3	3.52	2.84	3.61	3.32	9.96	11.31	11.97
4	3.48	2.88	3.65	3.33	10.00	11.37	12.00
5	3.48	2.86	3.67	3.33	10.00	11.33	11.70
6	3.48	2.86	3.67	3.33	10.00	11.32	11.65
7	3.48	2.86	3.69	3.34	10.02	11.34	11.63
8	3.50	2.86	3.73	3.36	10.08	11.31	10.86
9	3.50	2.84	3.73	3.35	10.06	11.33	11.17
10	3.52	2.86	3.71	3.36	10.08	11.30	10.77
Average					10.04	11.33	11.43
Coefficent of Variation(percent)					0.47	0.22	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.14 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 4, on Concrete Site at Zero Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	4.94	4.51	5.21	4.89	14.66	16.32	10.19
2	5.12	4.60	5.37	5.03	15.08	16.50	8.56
3	5.08	4.59	5.36	5.01	15.03	16.54	9.16
4	5.04	4.56	5.31	4.97	14.90	16.45	9.38
5	5.04	4.54	5.25	4.95	14.84	16.38	9.40
6	5.06	4.53	5.27	4.95	14.86	16.49	9.87
7	5.08	4.56	5.27	4.97	14.91	16.53	9.79
8	5.01	4.54	5.29	4.95	14.84	16.50	10.03
9	4.93	4.47	5.27	4.89	14.68	16.32	10.05
10	4.96	4.48	5.23	4.89	14.66	16.30	10.03
Average					14.85	16.43	9.64
Coefficent of Variation (percent)					0.94	0.54	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	5.01	4.49	5.23	4.91	14.73	16.38	10.07
2	4.96	4.48	5.19	4.88	14.63	16.32	10.38
3	4.97	4.46	5.23	4.89	14.66	16.30	10.08
4	5.01	4.44	5.21	4.89	14.66	16.30	10.05
5	4.99	4.47	5.17	4.88	14.63	16.36	10.57
6	4.96	4.44	5.21	4.87	14.61	16.30	10.37
7	5.01	4.44	5.19	4.88	14.64	16.30	10.18
8	4.94	4.44	5.13	4.84	14.51	16.24	10.67
9	4.85	4.42	5.16	4.81	14.42	16.20	10.97
10	4.90	4.46	5.17	4.84	14.53	16.30	10.82
Average					14.60	16.30	10.41
Coefficent of Variation(percent)					0.58	0.30	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.15 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 1, on Concrete Site at 120 Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test	Load from Calibration System (kips)					Load from FWD	Difference+
No.	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	(Kips)	(percent)
1	1.95	1.84	2.05	1.95	5.85	6.66	12.25
2	1.97	1.84	2.07	1.96	5.89	6.78	13.24
3	1.97	1.86	2.05	1.96	5.88	6.71	12.46
4	1.97	1.87	2.05	1.96	5.88	6.74	12.72
5	1.99	1.88	2.07	1.98	5.94	6.77	12.27
6	1.98	1.88	2.07	1.98	5.93	6.77	12.33
7	1.97	1.86	2.08	1.97	5.91	6.71	11.93
8	1.99	1.91	2.08	1.99	5.97	6.80	12.17
9	1.98	1.89	2.08	1.98	5.94	6.78	12.38
10	1.99	1.89	2.08	1.99	5.96	6.78	12.21
Average					5.91	6.75	12.39
Coefficent of Variation (percent)					0.65	0.61	

b) Results of Wraps

Test	Load from Calibration System (kips)					Load from FWD	Difference+
No.	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	(Kips)	(percent)
1	1.98	1.89	2.08	1.98	5.95	6.81	12.57
2	1.99	1.91	2.08	1.99	5.97	6.78	11.95
3	1.99	1.91	2.09	2.00	5.99	6.82	12.20
4	1.99	1.92	2.10	2.00	6.01	6.85	12.19
5	1.99	1.93	2.10	2.01	6.02	6.86	12.29
6	1.97	1.91	2.10	1.99	5.98	6.79	11.93
7	1.99	1.89	2.11	1.99	5.98	6.85	12.62
8	1.99	1.90	2.10	2.00	5.99	6.88	12.91
9	1.99	1.90	2.10	2.00	5.99	6.87	12.76
10	1.99	1.90	2.12	2.00	6.01	6.88	12.60
Average					5.99	6.84	12.40
Coefficent of Variation(percent)					0.32	0.50	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.16 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 2, on Concrete Site at 120 Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.79	2.55	2.93	2.76	8.27	9.03	8.39
2	2.93	2.63	2.94	2.84	8.51	9.20	7.53
3	2.91	2.56	2.95	2.81	8.42	9.22	8.68
4	2.88	2.55	2.92	2.78	8.35	9.18	9.05
5	2.89	2.53	2.96	2.80	8.39	9.16	8.44
6	2.89	2.49	2.95	2.78	8.33	9.17	9.10
7	2.88	2.51	2.90	2.77	8.30	9.16	9.39
8	2.87	2.48	2.90	2.75	8.25	9.13	9.59
9	2.90	2.46	2.91	2.75	8.26	9.14	9.59
10	2.86	2.46	2.88	2.73	8.19	9.14	10.31
Average					8.33	9.15	9.00
Coefficent of Variation (percent)					1.05	0.53	

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.83	2.70	3.03	2.85	8.56	9.17	6.61
2	2.89	2.61	3.01	2.84	8.51	9.21	7.61
3	2.90	2.67	3.05	2.88	8.63	9.28	7.01
4	2.89	2.56	3.01	2.82	8.46	9.18	7.90
5	2.89		3.01	2.84	8.52	9.23	7.74
6	2.89	2.58	3.02	2.83	8.48	9.23	8.17
7	2.91	2.56	3.03	2.83	8.50	9.29	8.52
8	2.87	2.58	3.01	2.82	8.45	9.18	7.97
9	2.89	2.56	3.01	2.82	8.46	9.22	8.27
10	2.89	2.58	3.01	2.82	8.47	9.23	8.22
Average					8.50	9.22	7.79
Coefficent of Variation(percent)					0.62	0.41	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.17 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 3, on Concrete Site at 120 Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.57	3.40	3.58	3.52	10.56	11.45	7.79
2	3.62	3.42	3.61	3.55	10.64	11.54	7.73
3	3.53	3.28	3.67	3.49	10.48	11.41	8.12
4	3.53	3.32	3.69	3.52	10.55	11.43	7.74
5	3.58	3.32	3.67	3.52	10.56	11.48	8.00
6	3.58	3.38	3.65	3.54	10.61	11.43	7.22
7	3.53	3.38	3.67	3.53	10.58	11.39	7.13
8	3.56	3.42	3.61	3.53	10.59	11.44	7.43
9	3.53	3.38	3.67	3.53	10.58	11.41	7.29
10	3.56	3.38	3.60	3.52	10.55	11.42	7.67
Average					10.57	11.44	7.61
Coefficent of Variation (percent)					0.38	0.35	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.59	3.31	3.67	3.52	10.57	11.45	7.68
2	3.51	3.32	3.65	3.49	10.48	11.33	7.46
3	3.52	3.40	3.69	3.53	10.60	11.43	7.26
4	3.53	3.36	3.71	3.53	10.60	11.42	7.21
5	3.50	3.32	3.69	3.50	10.51	11.30	6.98
6	3.51	3.32	3.73	3.52	10.56	11.37	7.08
7	3.55	3.40	3.77	3.57	10.72	11.42	6.17
8	3.56	3.42	3.79	3.59	10.78	11.46	5.94
9	3.53	3.42	3.77	3.57	10.72	11.43	6.20
10	3.53	3.42	3.77	3.57	10.72	11.43	6.19
Average					10.63	11.40	6.81
Coefficent of Variation(percent)					0.91	0.45	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.18 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 1, on Concrete Site at 240 Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips): Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	2.13	2.02	1.99	2.05	6.14	6.79	9.56
2	2.10	2.00	1.96	2.02	6.06	6.77	10.39
3	2.10	1.99	1.99	2.03	6.09	6.74	9.77
4	2.10	2.00	1.97	2.02	6.07	6.74	10.02
5	2.12	2.00	1.98	2.03	6.10	6.76	9.70
6	2.08	1.99	1.94	2.01	6.02	6.66	9.70
7	2.10	1.99	1.97	2.02	6.05	6.74	10.26
8	2.11	2.00	1.96	2.02	6.07	6.74	9.99
9	2.15	2.05	2.00	2.07	6.20	6.86	9.53
10	2.12	2.00	1.97	2.03	6.09	6.70	9.09
Average					6.09	6.75	9.80
Coefficent of Variation (percent)					0.80	0.71	

b) Results of Wraps

Test No.	Load from Calibration System (kips): Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	2.08	1.99	1.95	2.01	6.02	6.69	10.06
2	2.11	1.98	1.95	2.01	6.04	6.73	10.27
3	2.11	1.97	1.93	2.00	6.00	6.63	9.51
4	2.12	2.00	1.95	2.02	6.07	6.71	9.61
5	2.09	1.99	1.94	2.01	6.02	6.66	9.62
6	2.11	2.02	1.98	2.04	6.11	6.74	9.45
7	2.11	1.99	1.98	2.03	6.08	6.71	9.36
8	2.09	1.98	1.95	2.01	6.02	6.66	9.56
9	2.13	2.01	1.98	2.04	6.12	6.75	9.32
10	2.11	1.99	1.97	2.02	6.06	6.69	9.35
Average					6.05	6.70	9.60
Coefficent of Variation(percent)					0.65	0.55	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table 0.19 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 2, on Concrete Site at 240 Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	2.80	2.57	2.78	2.72	8.16	8.97	9.05
2	2.79	2.52	2.73	2.68	8.05	8.95	10.09
3	2.79	2.53	2.70	2.67	8.02	8.89	9.78
4	2.87	2.56	2.76	2.73	8.19	9.05	9.47
5	2.84	2.50	2.70	2.68	8.04	8.93	9.96
6	2.88	2.56	2.74	2.73	8.19	8.97	8.73
7	2.92	2.59	2.70	2.74	8.21	8.98	8.48
8	2.95	2.63	2.76	2.78	8.34	9.06	7.98
9	2.92	2.57	2.70	2.73	8.19	8.98	8.83
10	2.96	2.59	2.74	2.76	8.29	9.06	8.53
Average					8.17	8.98	9.08
Coefficent of Variation (percent)					1.24	0.62	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	2.94	2.59	2.71	2.75	8.25	8.92	7.57
2	2.94	2.57	2.68	2.73	8.20	8.94	8.36
3	2.97	2.59	2.72	2.76	8.28	9.08	8.80
4	2.94	2.56	2.68	2.73	8.18	8.92	8.25
5	3.01		2.72	2.77	8.31	9.07	8.37
6	2.96	2.54	2.66	2.72	8.15	8.90	8.44
7	2.99	2.59	2.72	2.76	8.29	9.06	8.40
8	2.99	2.57	2.70	2.75	8.26	9.07	8.96
9	3.13	2.69	2.82	2.88	8.63	9.34	7.66
10	3.06	2.62	2.78	2.82	8.46	9.25	8.51
Average					8.30	9.06	8.33
Coefficent of Variation(percent)					1.64	1.54	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.20 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 3, on Concrete Site at 240 Degree Rotation (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.34	2.94	3.52	3.27	9.80	11.20	12.50
2	3.40	2.92	3.56	3.29	9.88	11.14	11.36
3	3.41	2.92	3.56	3.30	9.89	11.16	11.41
4	3.39	2.92	3.54	3.28	9.85	11.16	11.74
5	3.39	2.92	3.54	3.28	9.85	11.16	11.77
6	3.41	2.93	3.56	3.30	9.90	11.18	11.38
7	3.41	2.94	3.54	3.30	9.89	11.19	11.64
8	3.43	2.91	3.54	3.29	9.88	11.18	11.60
9	3.40	2.91	3.52	3.28	9.84	11.19	12.09
10	3.41	2.93	3.52	3.29	9.86	11.21	12.01
Average					9.86	11.17	11.74
Coefficent of Variation (percent)					0.29	0.18	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	3.41	2.93	3.52	3.29	9.86	11.20	11.94
2	3.43	2.91	3.54	3.29	9.88	11.20	11.77
3	3.41	2.90	3.54	3.28	9.85	11.19	11.96
4	3.43	2.90	3.54	3.29	9.87	11.20	11.88
5	3.41	2.93	3.52	3.29	9.87	11.20	11.90
6	3.41	2.92	3.52	3.28	9.85	11.20	12.10
7	3.43	2.95	3.52	3.30	9.90	11.24	11.93
8	3.41	2.93	3.52	3.29	9.87	11.23	12.15
9	3.41	2.92	3.52	3.29	9.86	11.17	11.75
10	3.43	2.96	3.54	3.31	9.93	11.26	11.81
Average					9.87	11.21	11.91
Coefficent of Variation(percent)					0.23	0.22	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table 0.21 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 1, on Asphalt Site (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference[+] (percent)
1	2.14	2.02	2.15	2.10	6.30	6.77	6.87
2	2.18	2.00	2.14	2.10	6.31	6.77	6.74
3	2.17	1.99	2.15	2.11	6.32	6.77	6.57
4	2.16	1.97	2.15	2.09	6.28	6.73	6.60
5	2.16	1.98	2.16	2.10	6.30	6.73	6.42
6	2.15	1.98	2.14	2.09	6.26	6.69	6.42
7	2.14	1.96	2.13	2.08	6.24	6.68	6.59
8	2.16	1.99	2.16	2.10	6.31	6.78	6.84
9	2.16	1.99	2.15	2.10	6.31	6.73	6.27
10	2.14	1.97	2.13	2.08	6.24	6.69	6.64
Average					6.29	6.73	6.59
Coefficent of Variation (percent)					0.46	0.52	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference[+] (percent)
1	2.16	1.98	2.15	2.10	6.29	6.74	6.55
2	2.16	1.99	2.16	2.10	6.31	6.76	6.59
3	2.18	2.02	2.18	2.13	6.38	6.83	6.67
4	2.17	1.99	2.13	2.10	6.29	6.72	6.37
5	2.17	1.99	2.15	2.10	6.31	6.77	6.73
6	2.16	1.99	2.18	2.11	6.33	6.78	6.55
7	2.16	1.99	2.17	2.11	6.32	6.78	6.70
8	2.17	1.98	2.15	2.10	6.30	6.75	6.67
9	2.17	2.00	2.17	2.11	6.34	6.78	6.39
10	2.17	1.99	2.15	2.10	6.31	6.74	6.48
Average					6.32	6.76	6.57
Coefficent of Variation(percent)					0.38	0.43	

[+]Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.22 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 4, on Asphalt Site (without Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	5.04	4.72	5.23	5.00	15.00	15.90	5.70
2	5.06	4.74	5.25	5.02	15.06	15.88	5.19
3	5.03	4.73	5.25	5.00	15.01	15.90	5.58
4	5.04	4.74	5.23	5.00	15.01	15.90	5.55
5	5.06	4.74	5.21	5.00	15.01	15.86	5.36
6	5.04	4.72	5.27	5.01	15.03	15.89	5.39
7	5.08	4.72	5.19	5.00	14.99	15.84	5.39
8	5.08	4.74	5.19	5.00	15.01	15.86	5.34
9	5.01	4.70	5.19	4.97	14.90	15.77	5.49
10	5.04	4.70	5.19	4.98	14.94	15.80	5.47
Average					15.00	15.85	5.44
Coefficent of Variation (percent)					0.29	0.27	

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	5.06	4.66	5.25	4.99	14.97	15.78	5.10
2	5.03	4.68	5.23	4.98	14.94	15.80	5.45
3	5.03	4.67	5.27	4.99	14.97	15.82	5.42
4	5.02	4.68	5.25	4.99	14.96	15.84	5.58
5	5.04	4.68	5.22	4.98	14.95	15.82	5.48
6	5.08	4.73	5.29	5.03	15.10	15.99	5.55
7	5.02	4.63	5.27	4.98	14.93	15.78	5.38
8	5.01	4.64	5.27	4.97	14.92	15.75	5.26
9	5.01	4.62	5.25	4.96	14.88	15.75	5.52
10	4.99	4.62	5.25	4.96	14.87	15.71	5.38
Average					14.95	15.80	5.41
Coefficent of Variation(percent)					0.41	0.46	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

Table O.23 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 1, on Asphalt Site (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.16	1.85	2.17	2.06	6.18	6.67	7.35
2	2.13	1.83	2.14	2.04	6.11	6.62	7.81
3	2.15	1.81	2.15	2.04	6.11	6.62	7.80
4	2.14	1.83	2.18	2.05	6.15	6.62	7.16
5	2.15	1.83	2.18	2.05	6.16	6.62	7.03
6	2.13	1.81	2.16	2.03	6.10	6.59	7.43
7	2.16	1.82	2.20	2.06	6.19	6.66	7.18
8	2.16	1.83	2.18	2.06	6.17	6.63	7.02
9	2.15	1.82	2.18	2.05	6.16	6.67	7.70
10	2.16	1.83	2.18	2.06	6.17	6.63	7.03
Average					6.15	6.63	7.34
Coefficent of Variation (percent)					0.49	0.37	

b) Results of Wraps

Test No.	Load from Calibration System (kips)					Load from FWD (Kips)	Difference+ (percent)
	Load Cell 1	Load Cell 2	Load Cell 3	Average	Total		
1	2.17	1.79	2.15	2.04	6.11	6.54	6.69
2	2.15	1.82	2.13	2.03	6.10	6.50	6.16
3	2.15	1.83	2.18	2.05	6.16	6.58	6.47
4	2.15	1.83	2.14	2.04	6.12	6.56	6.74
5	2.17	1.83	2.17	2.06	6.17	6.64	7.02
6	2.16	1.84	2.16	2.05	6.15	6.62	7.01
7	2.13	1.81	2.14	2.03	6.08	6.56	7.24
8	2.21	1.86	2.20	2.09	6.28	6.75	7.00
9	2.18	1.84	2.20	2.07	6.22	6.67	6.72
10	2.16	1.82	2.18	2.05	6.16	6.60	6.68
Average					6.16	6.60	6.77
Coefficent of Variation(percent)					0.93	1.04	

+Difference= {Load from FWD − Load from Calibration System}*100/{Load from FWD}

Table 0.24 Comparison of Loads Obtained with Calibration System and FWD Device for Drop Height of 4, on Asphalt Site (with Rubber Padding)

a) Results of Repetitions

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	4.86	4.42	5.31	4.86	14.59	15.63	6.66
2	4.89	4.40	5.31	4.86	14.59	15.62	6.60
3	4.90	4.42	5.31	4.88	14.63	15.66	6.59
4	4.86	4.40	5.29	4.85	14.55	15.60	6.76
5	4.87	4.40	5.27	4.85	14.54	15.58	6.67
6	4.87	4.38	5.29	4.84	14.53	15.58	6.75
7	4.87	4.42	5.31	4.87	14.60	15.63	6.60
8	4.85	4.41	5.27	4.84	14.53	15.57	6.64
9	4.85	4.38	5.29	4.84	14.53	15.55	6.56
10	4.83	4.39	5.23	4.82	14.46	15.51	6.77
Average					14.56	15.59	6.65
Coefficent of Variation (percent)					0.32	0.27	

b) Results of Wraps

Test No.	Load from Calibration System (kips) Load Cell 1	Load Cell 2	Load Cell 3	Average	Total	Load from FWD (Kips)	Difference+ (percent)
1	4.96	4.42	5.31	4.90	14.69	15.74	6.70
2	4.94	4.46	5.38	4.92	14.77	15.82	6.59
3	4.94	4.46	5.36	4.92	14.75	15.78	6.54
4	4.96	4.52	5.44	4.97	14.91	15.94	6.46
5	4.92	4.46	5.34	4.90	14.71	15.74	6.54
6	4.90	4.44	5.29	4.88	14.64	15.66	6.57
7	4.90	4.44	5.34	4.89	14.68	15.71	6.59
8	4.92	4.42	5.34	4.89	14.67	15.71	6.61
9	4.89	4.43	5.34	4.89	14.66	14.00	-4.69
10	4.89	4.41	5.34	4.88	14.64	15.66	6.49
Average					14.71	15.58	5.44
Coefficent of Variation(percent)					0.54	3.41	

+Difference= {Load from FWD - Load from Calibration System}*100/{Load from FWD}

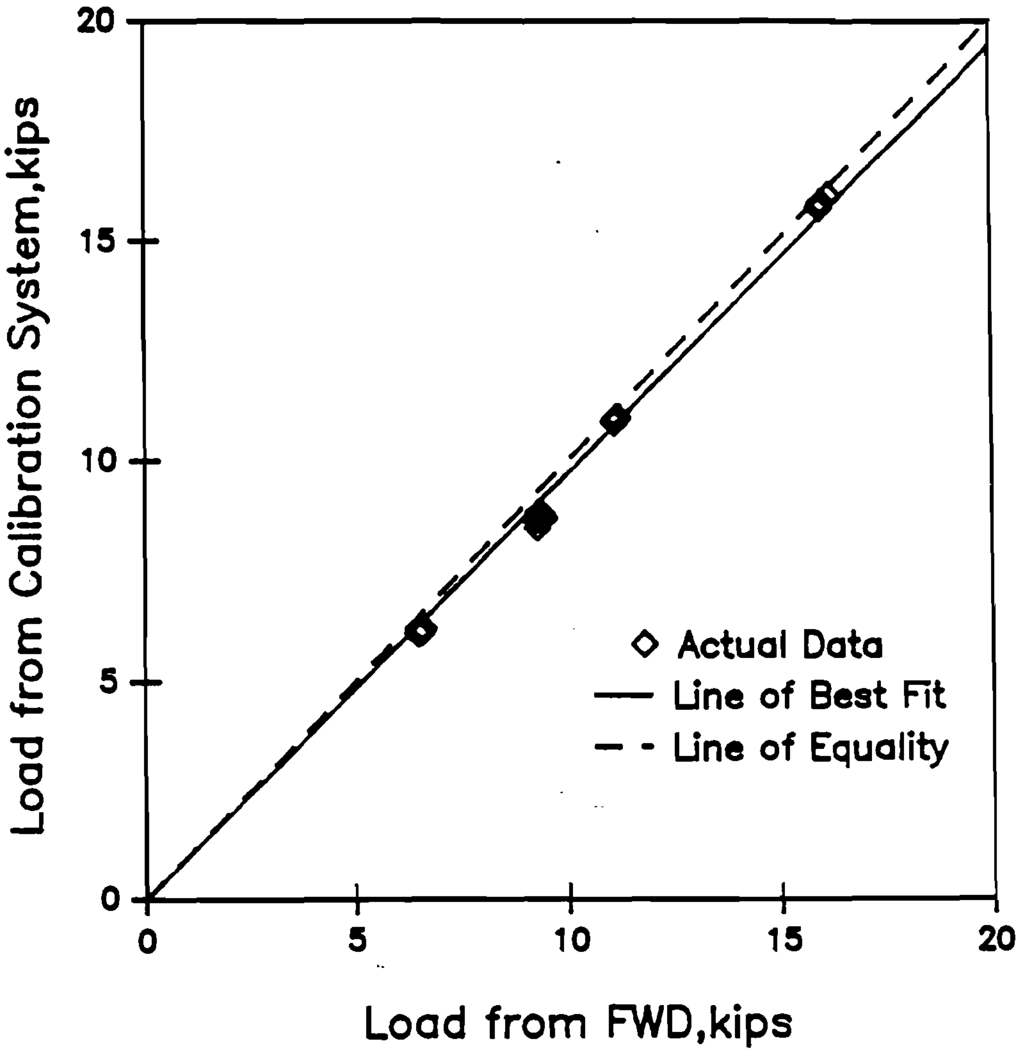


Figure O.2 Calibration Curve for Load Cell (Wraps) without rubber padding, Slope of Line is 0.97

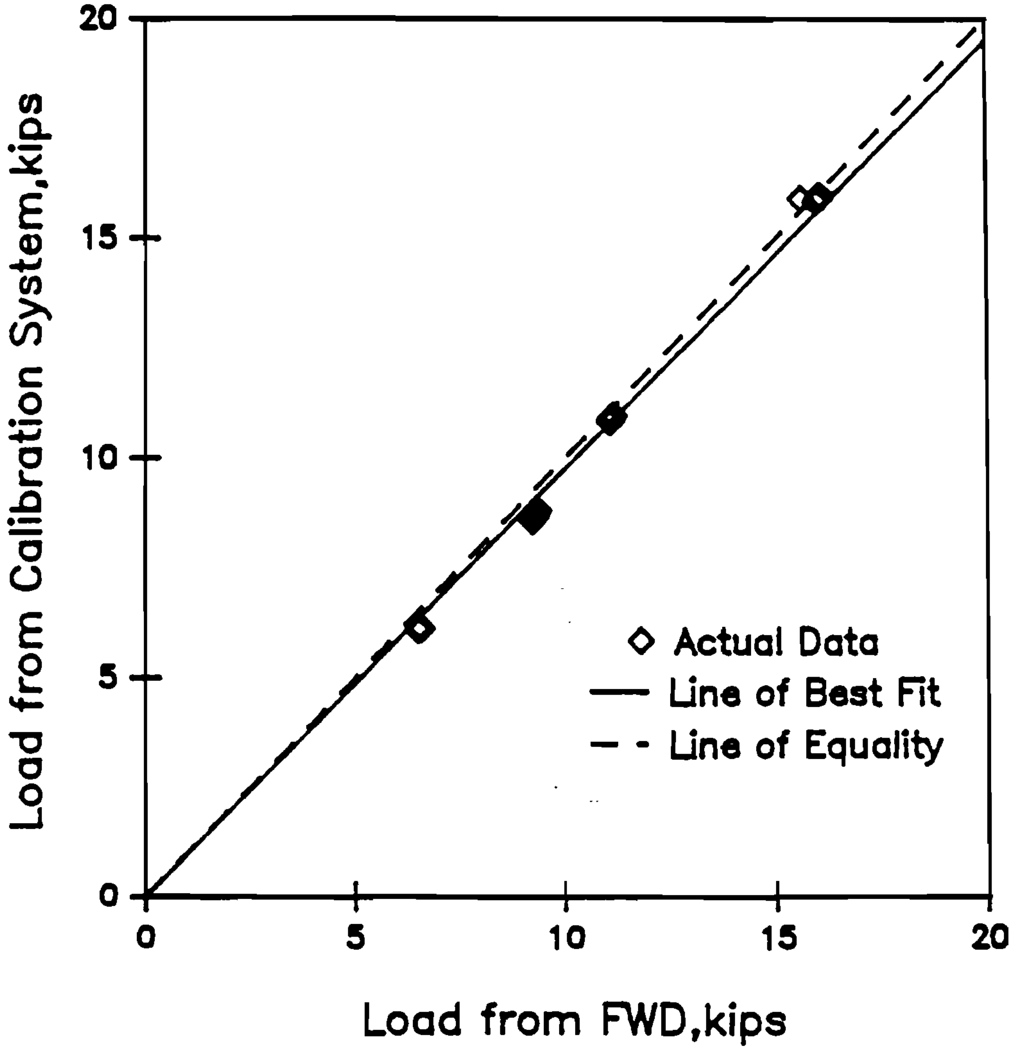


Figure O.1 Calibration Curve for Load Cell (Repetition) without rubber padding, Slope of Line is 0.97

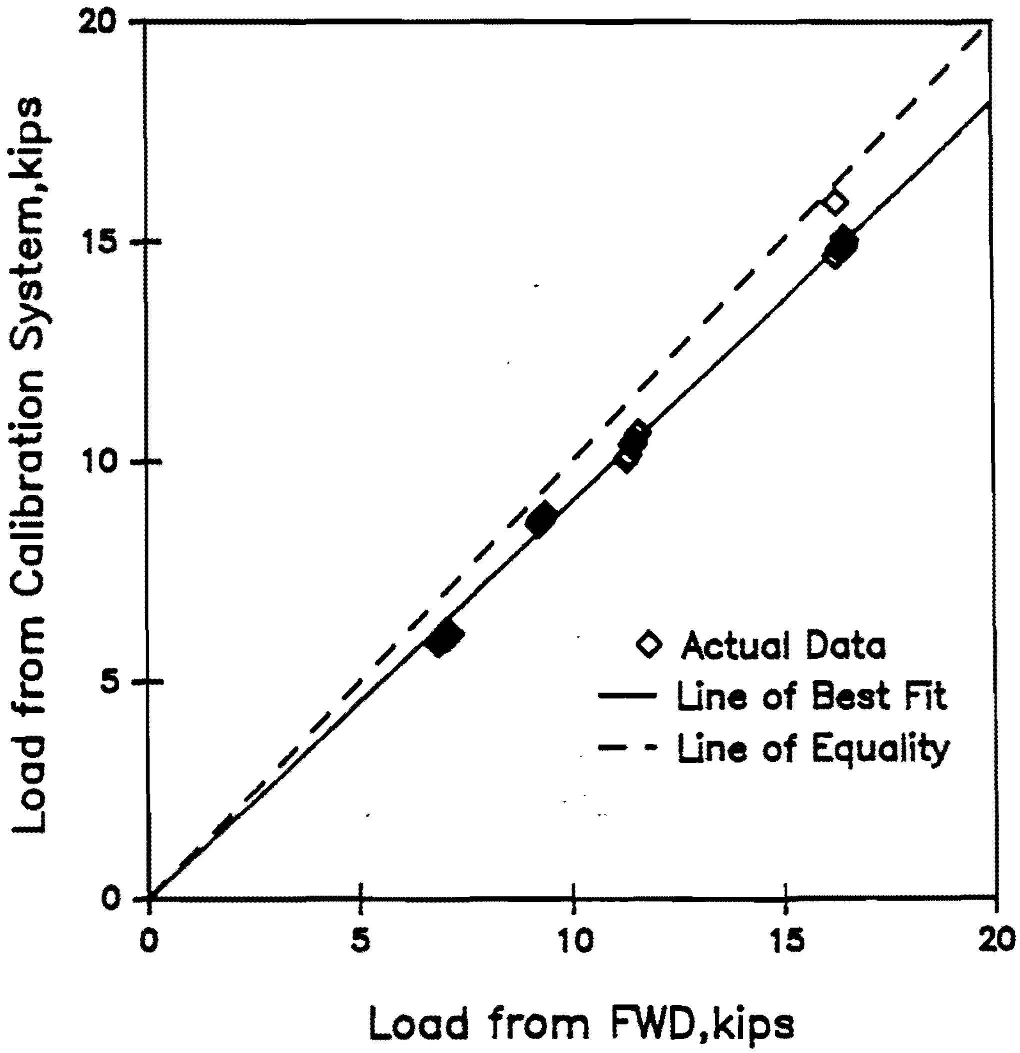


Figure O.3 Calibration Curve for Load Cell (Repetition) with rubber padding, Slope of line is 0.90

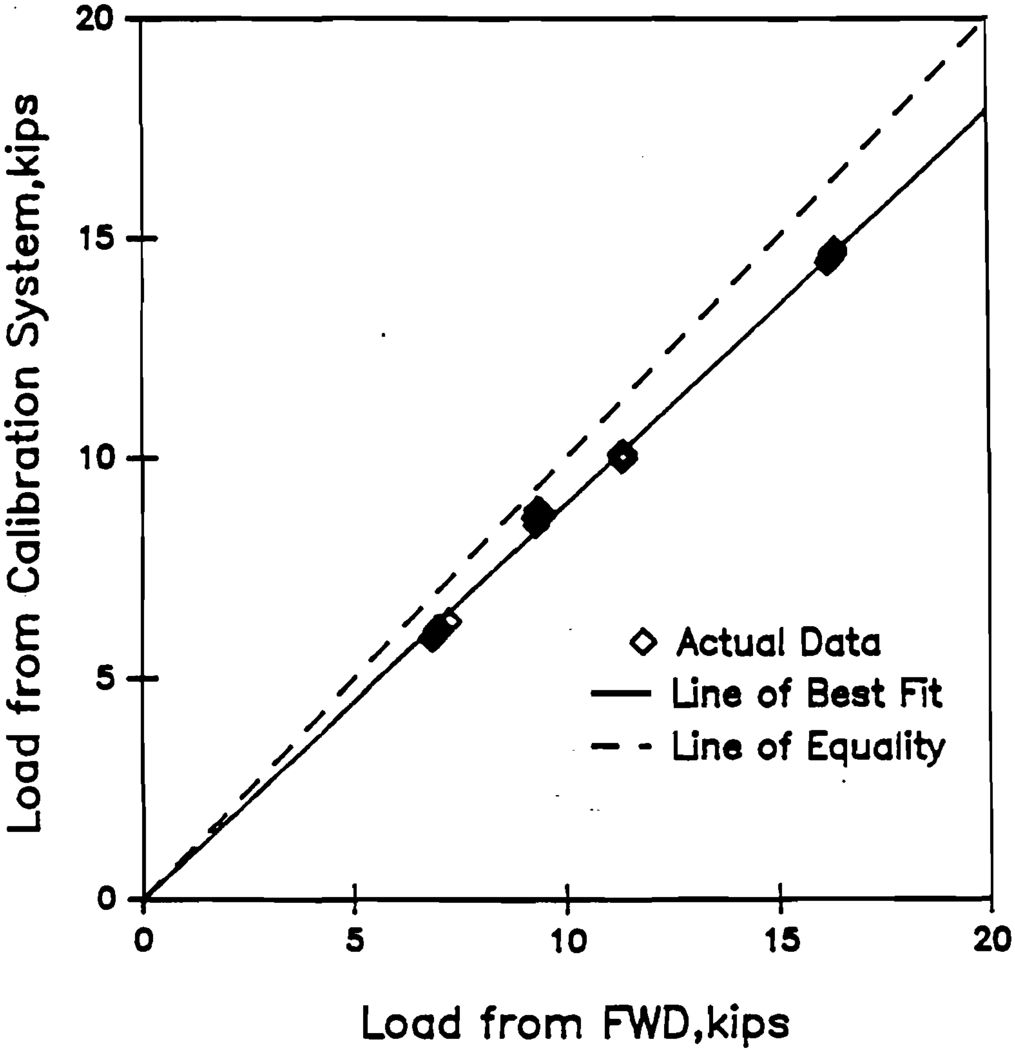


Figure O.4 Calibration Curve for Load Cell (Wraps) with rubber padding, Slope of line is 0.90

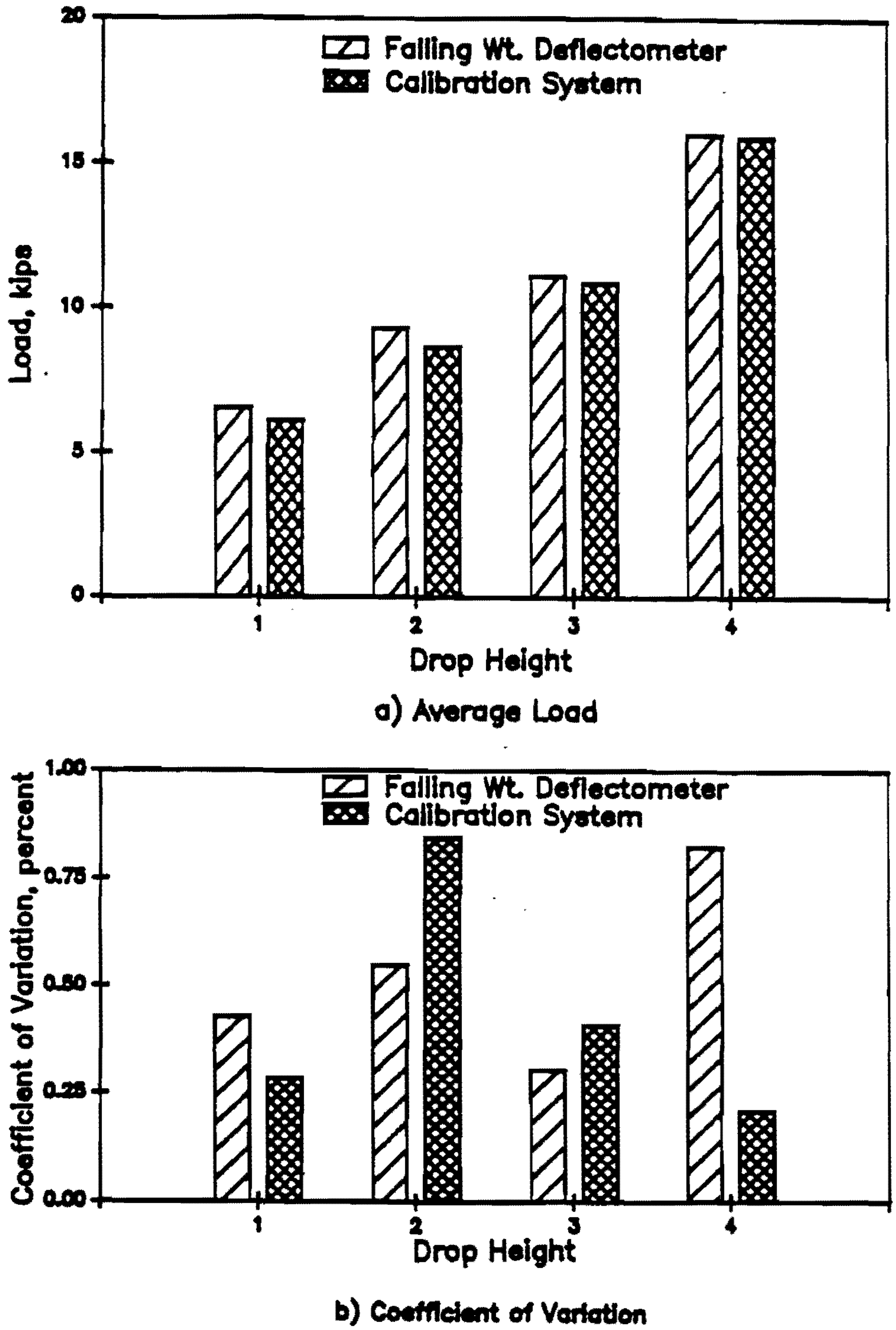


Figure 0.5 Average and Coefficient of Variation for Load Cell (Repetition) without Rubber Padding

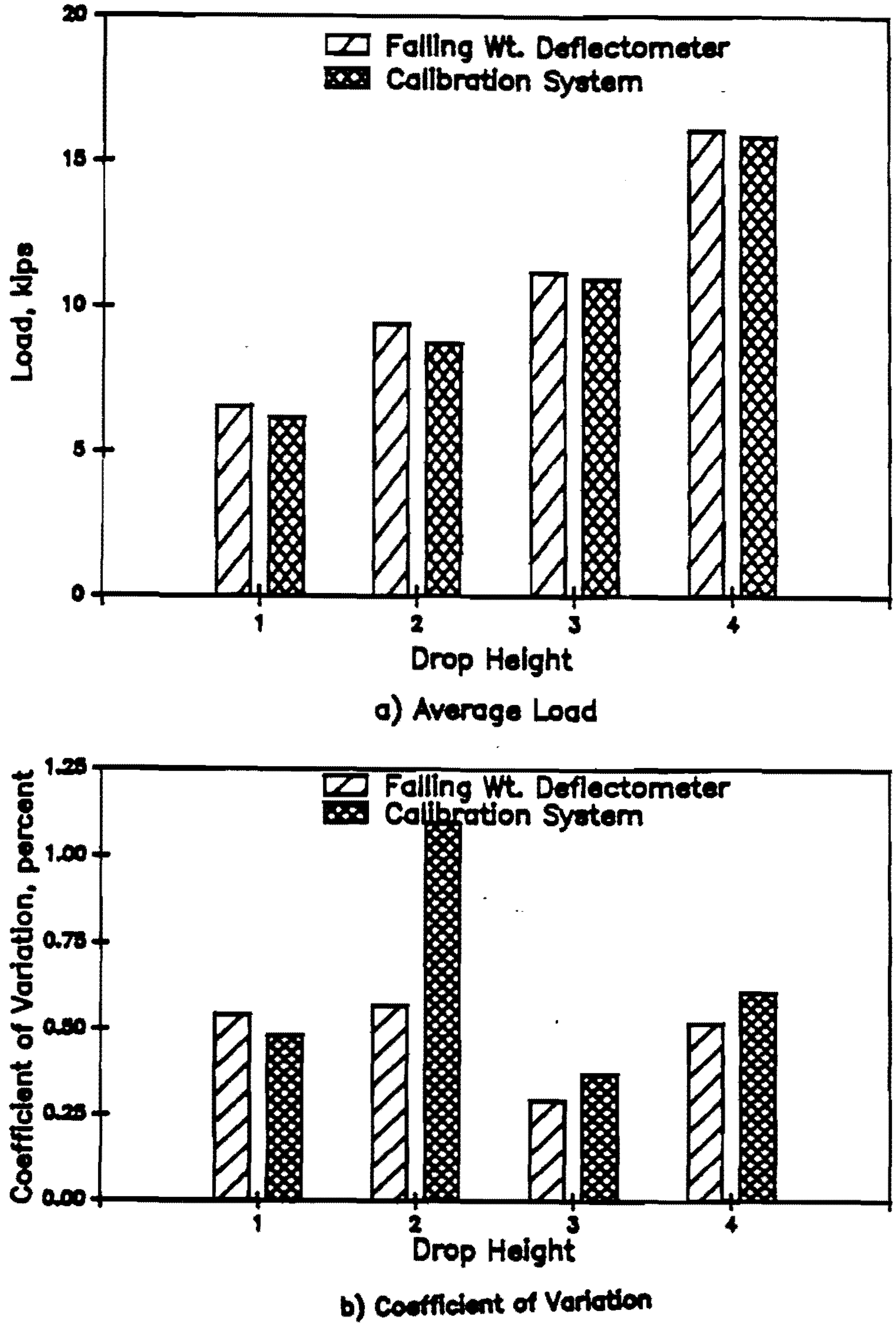


Figure O.6 Average and Coefficient of Variation for Load Cell (Wraps) without Rubber Padding

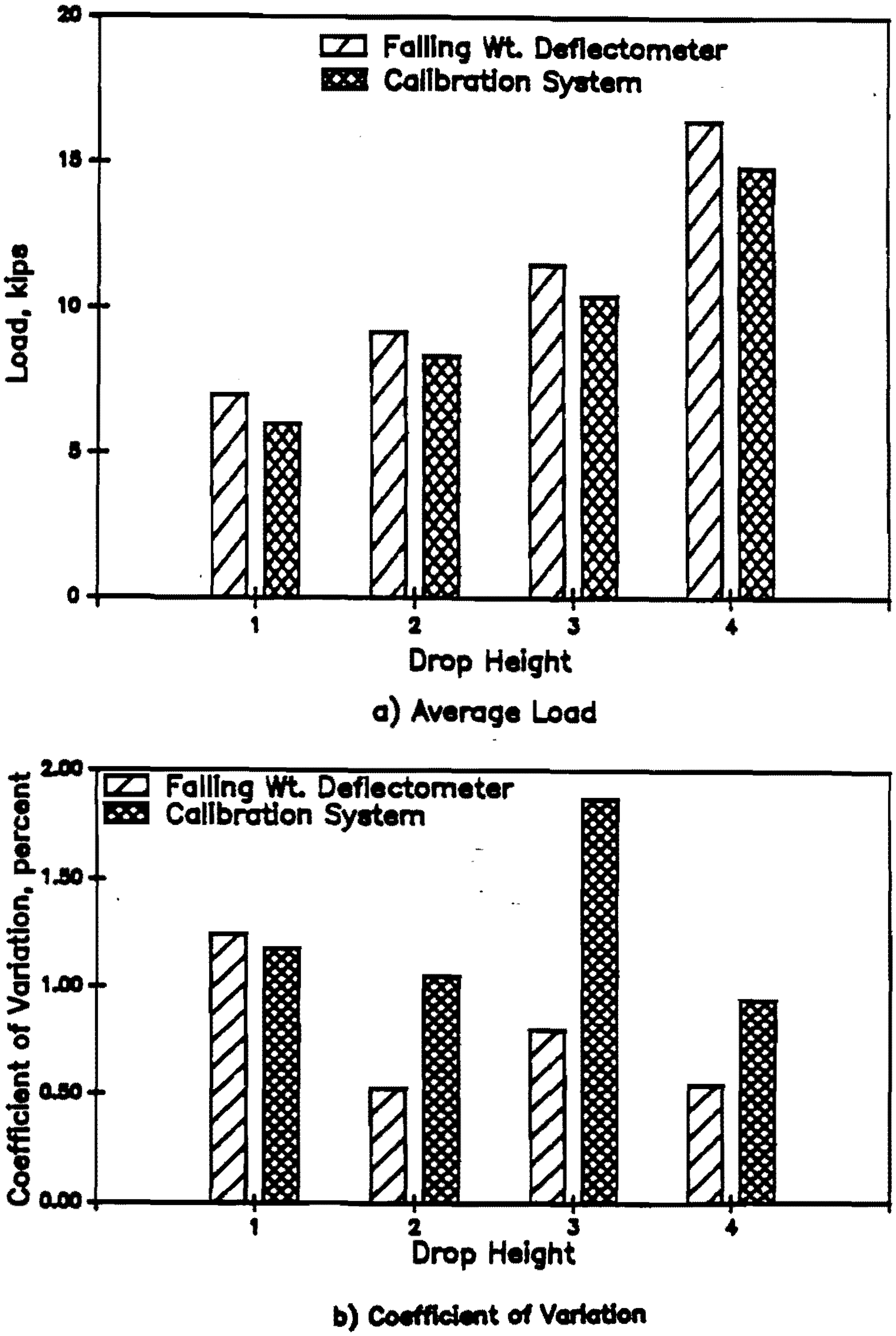


Figure O.7 Average and Coefficient of Variation for Load Cell (Repetition) with Rubber Padding

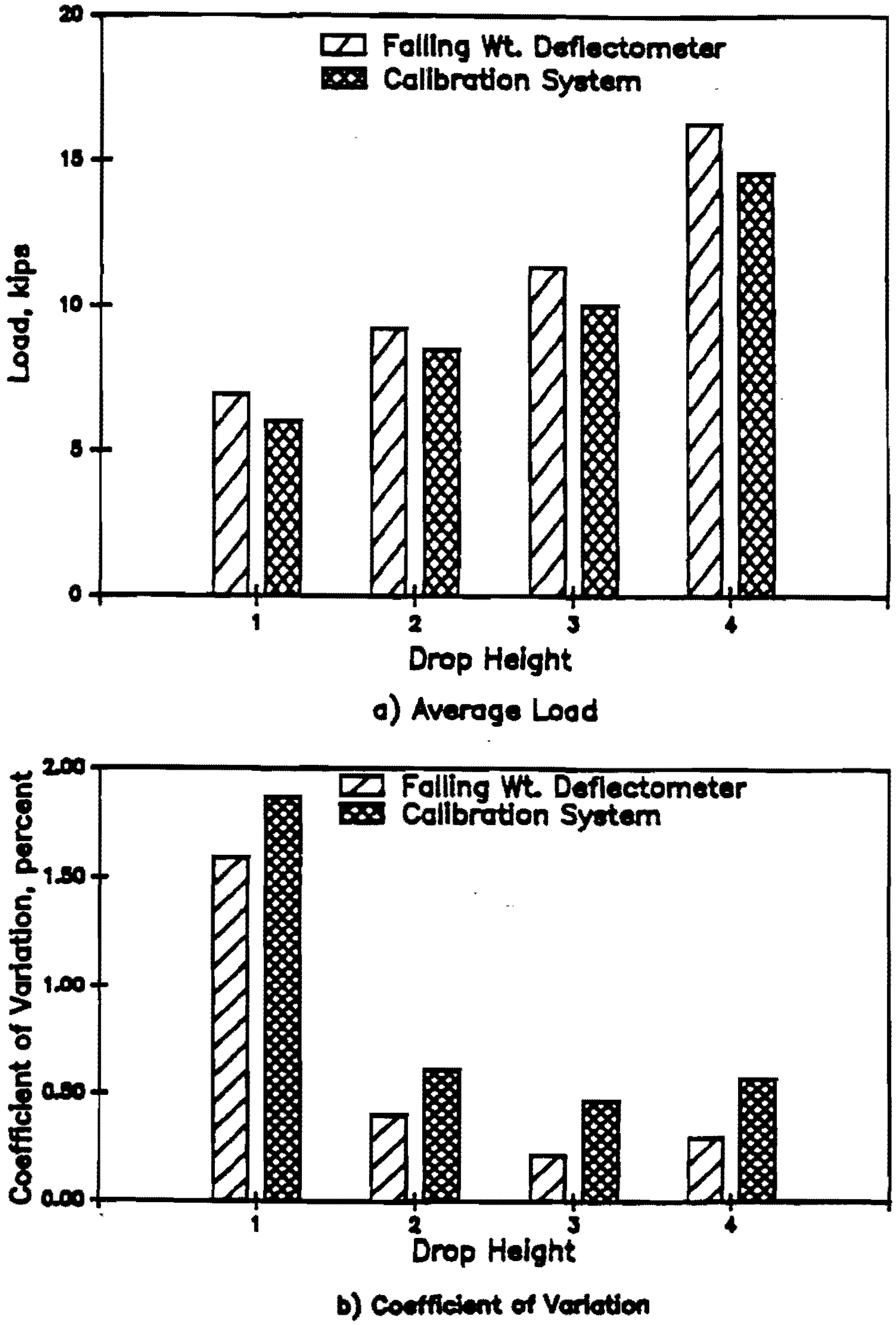


Figure O.8 Average and Coefficient of Variation for Load Cell (Wraps) with Rubber Padding

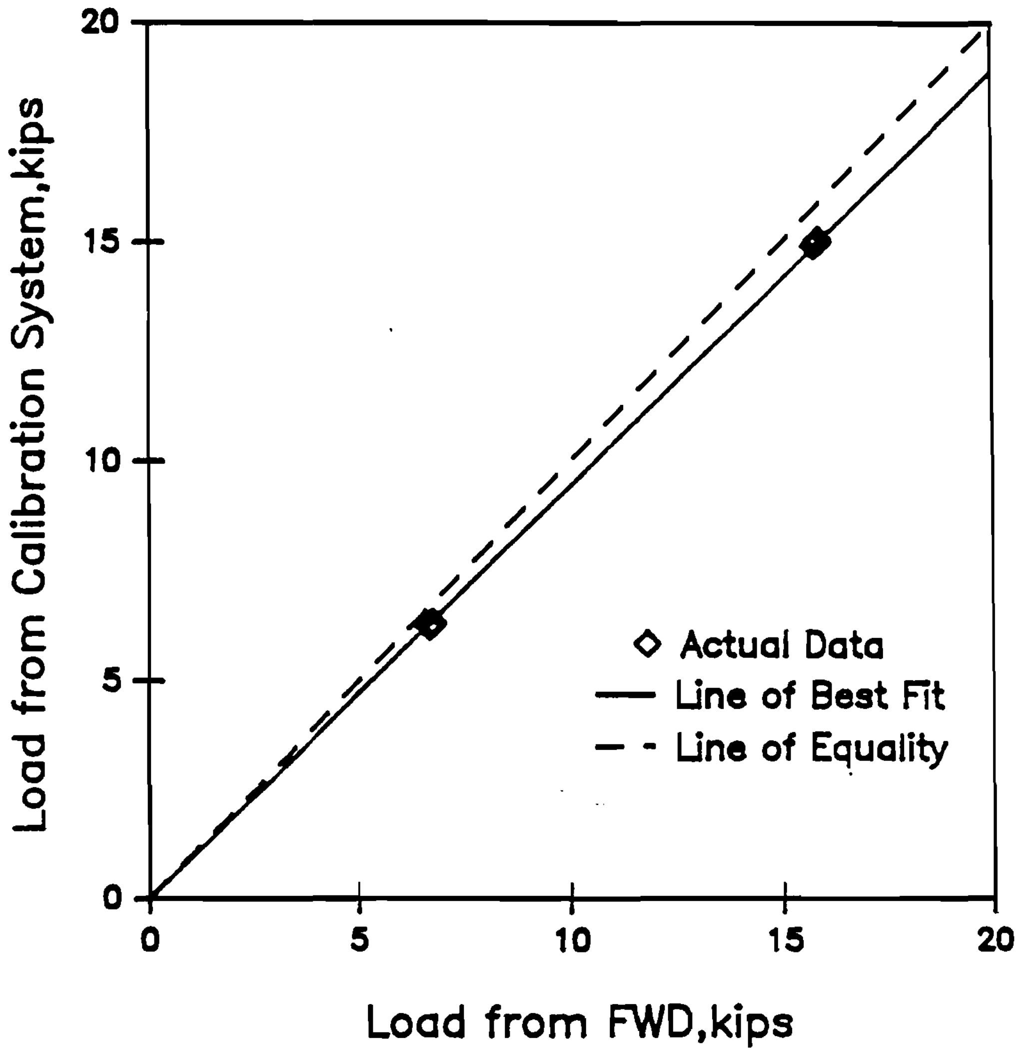


Figure O.9 Calibration Curve for Load Cell on Asphalt (Repetition) without Rubber Padding, Slope of Line is 0.94

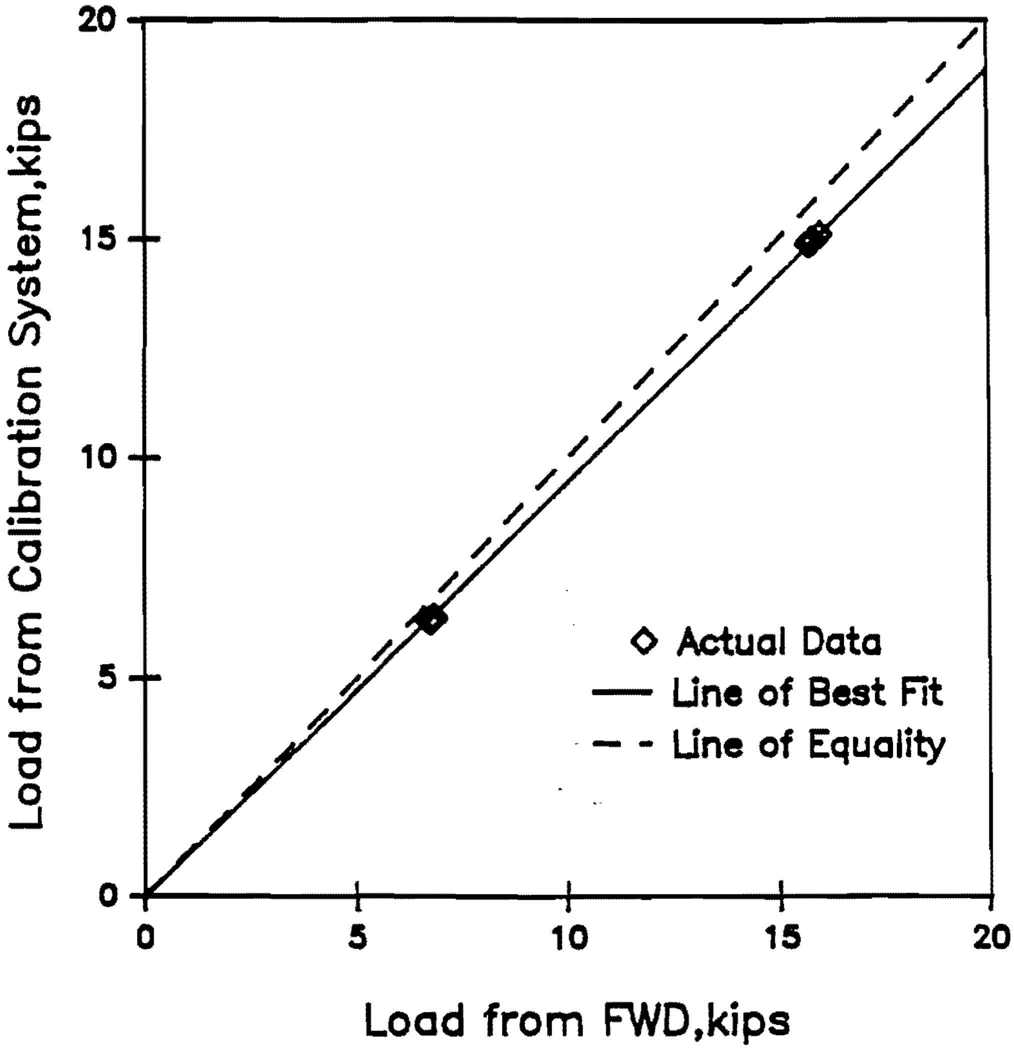


Figure O.10 Calibration Curve for Load Cell on Asphalt (Wraps) without Rubber Padding, Slope of Line is 0.94

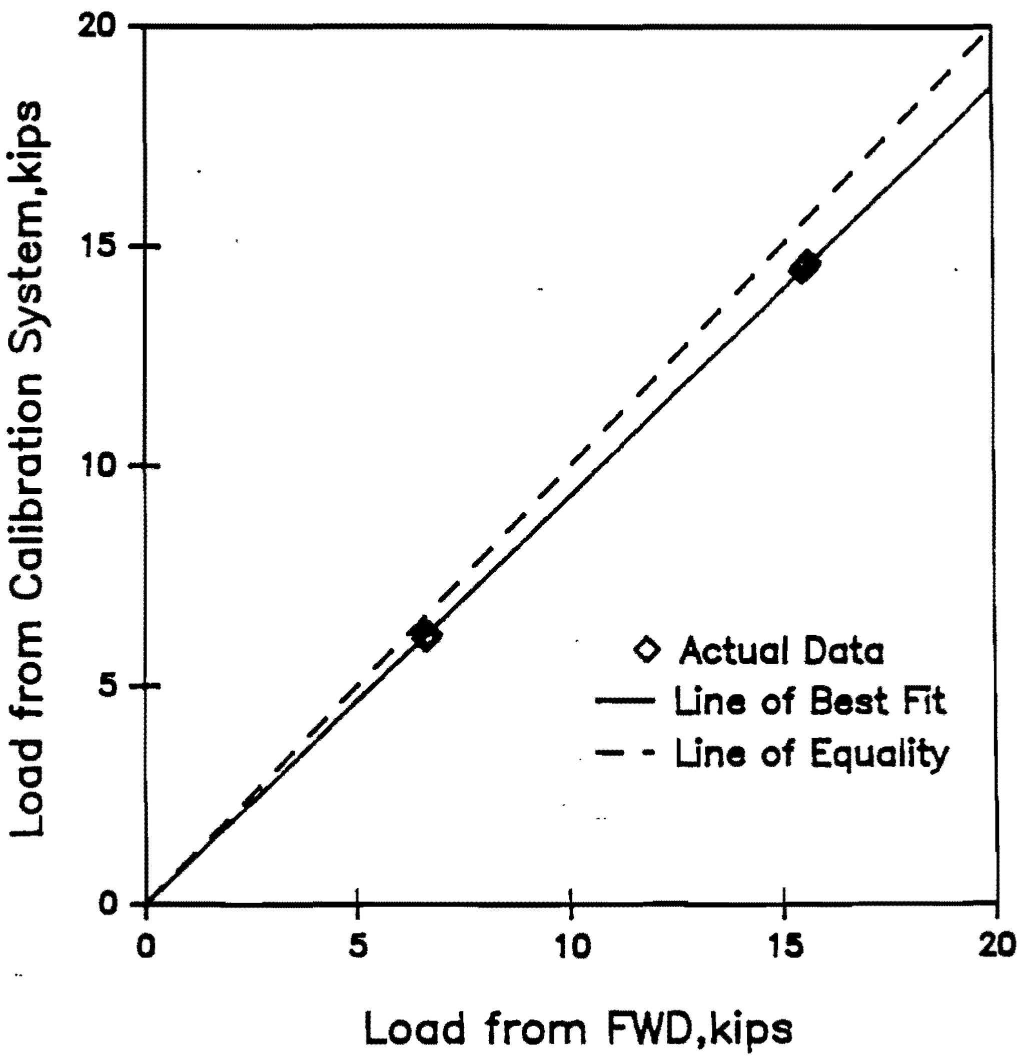


Figure O.11 Calibration Curve for Load Cell on Asphalt (Repetition) with Rubber Padding, Slope of Line is 0.93

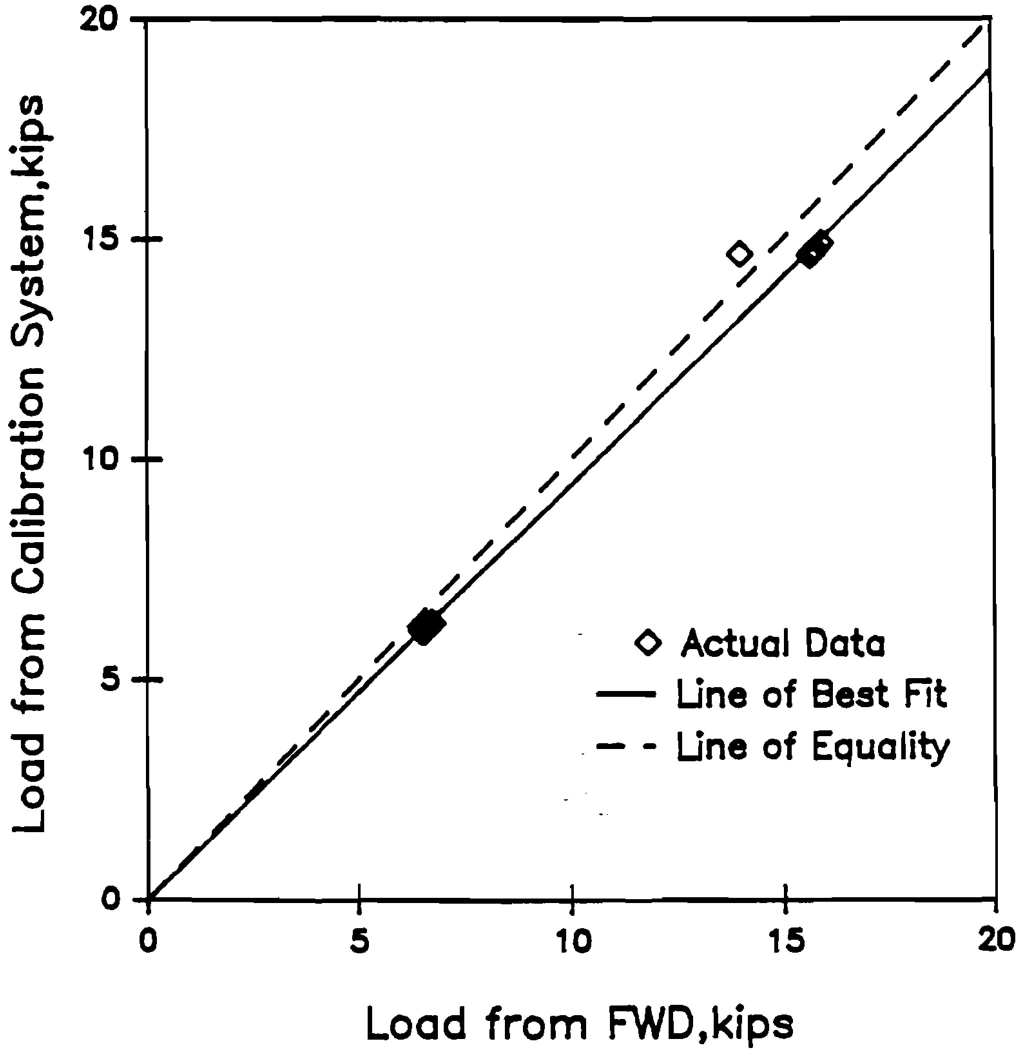


Figure O.12 Calibration Curve for Load Cell on Asphalt (Wraps) with Rubber Padding, Slope of Line is 0.94

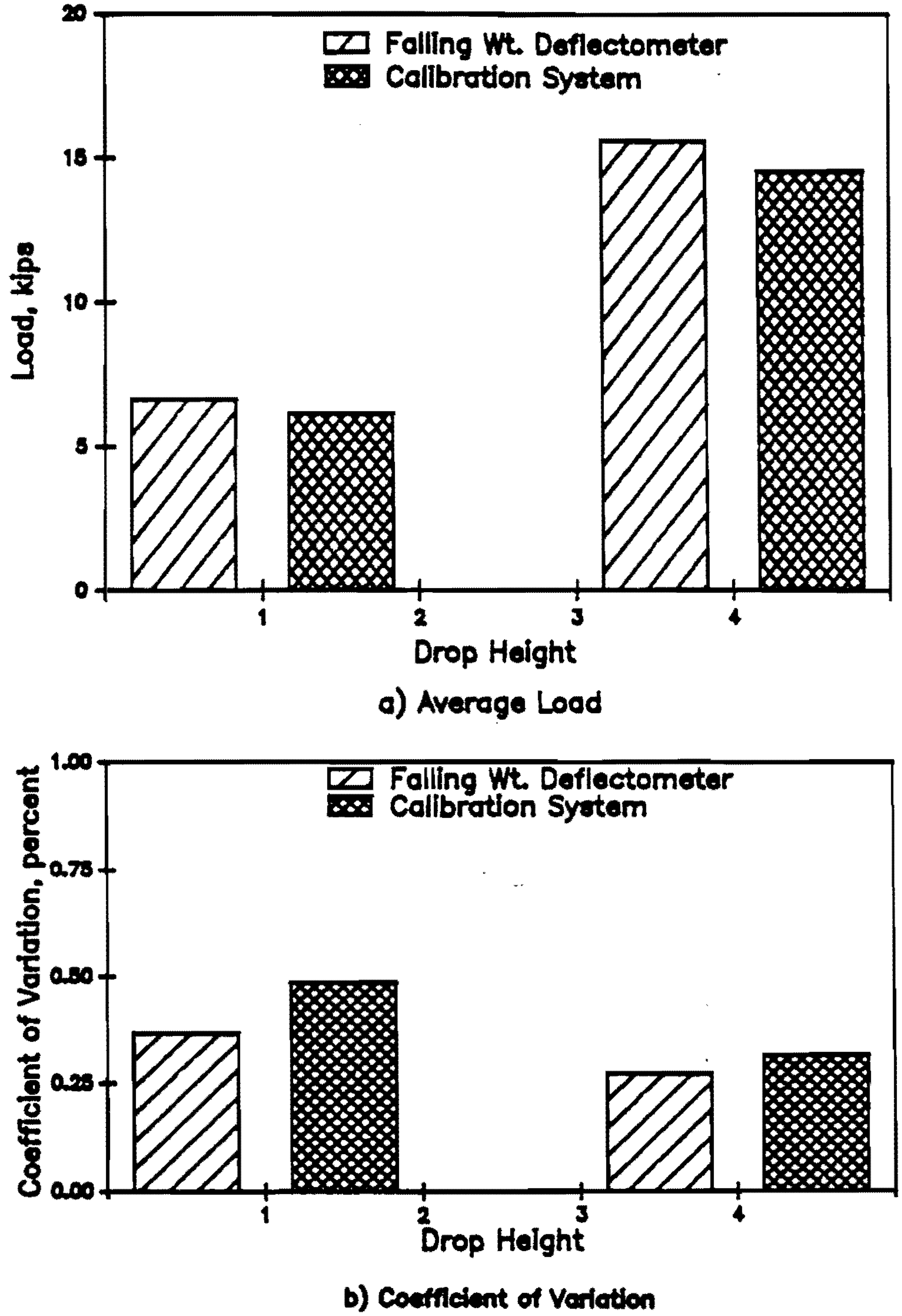


Figure O.13 Average and Coefficient of Variation for Load Cell on Asphalt (Repetition) without Rubber Padding

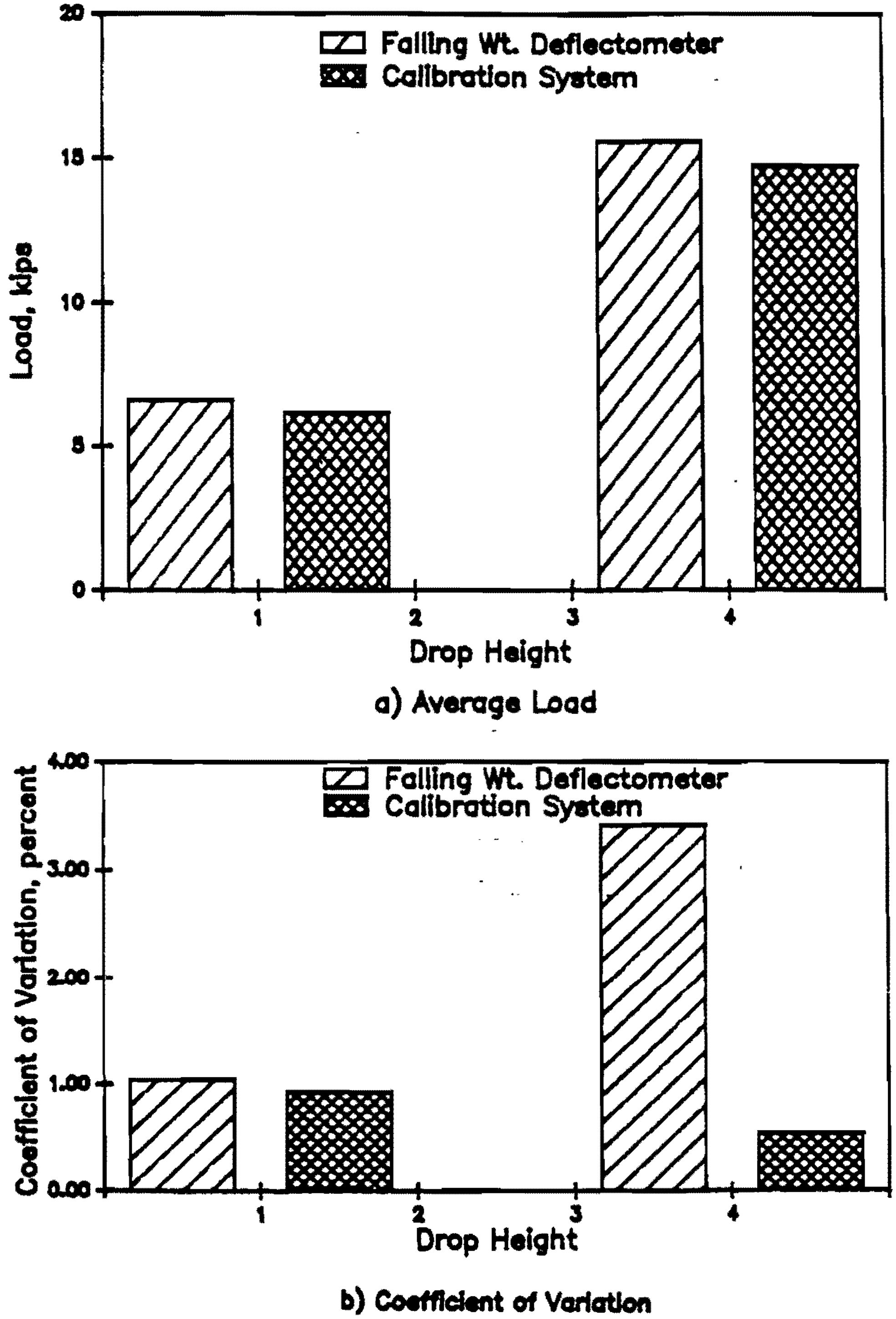
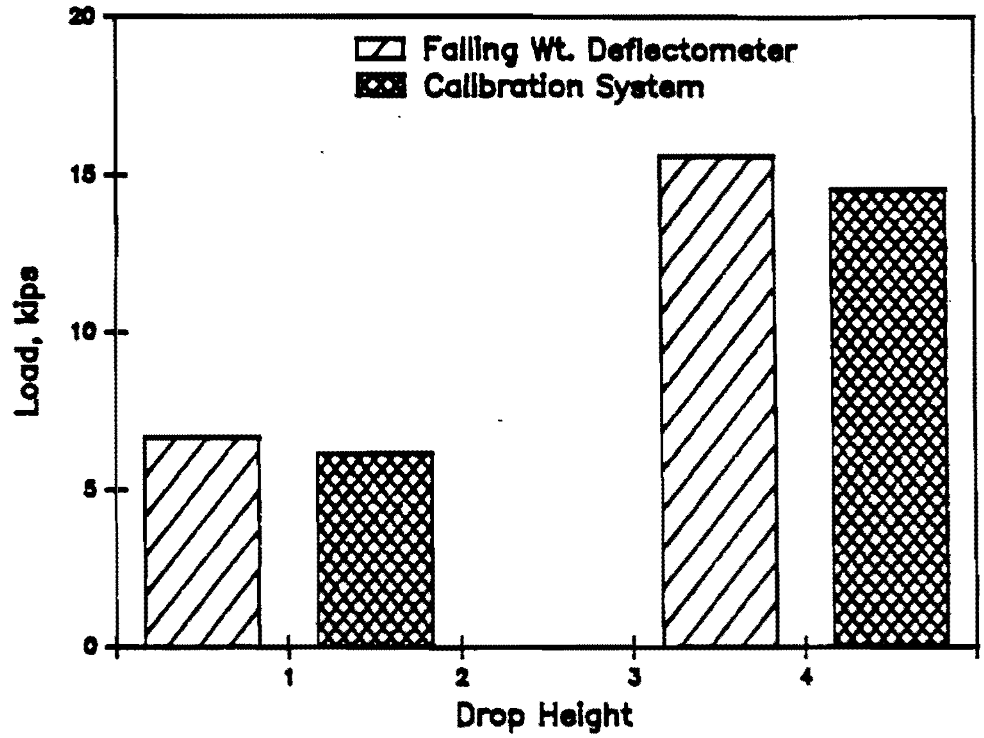
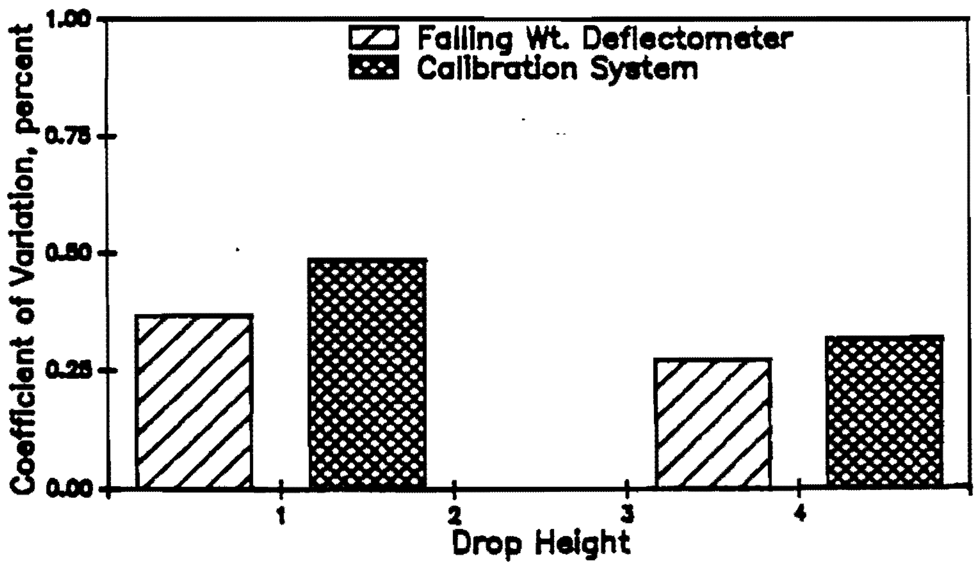


Figure O.14 Average and Coefficient of Variation for Load Cell on Asphalt (Wraps) without Rubber Padding



a) Average Load



b) Coefficient of Variation

Figure O.15 Average and Coefficient of Variation for Load Cell on Asphalt (Repetition) with Rubber Padding

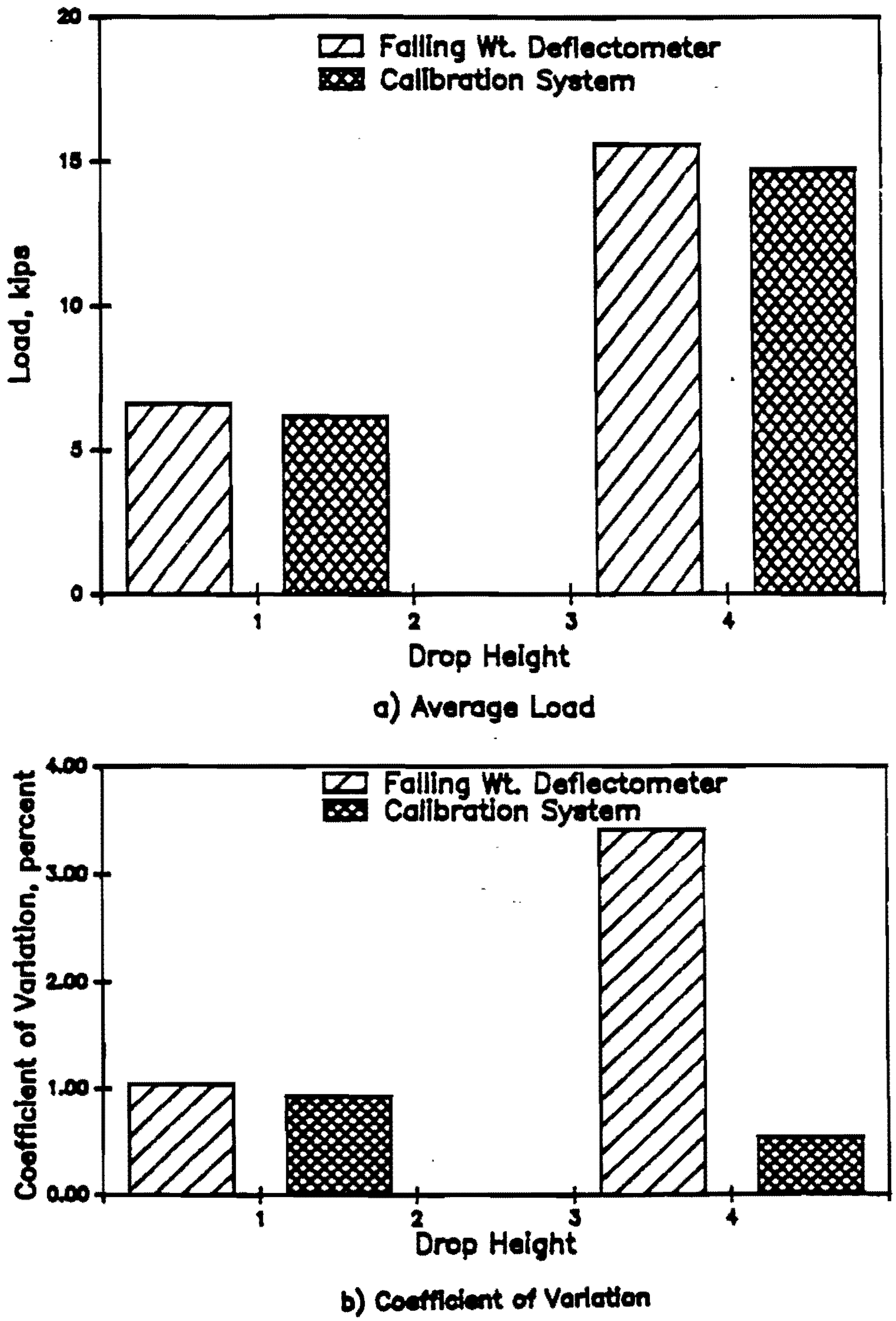


Figure O.16 Average and Coefficient of Variation for Load Cell on Asphalt (Wraps) with Rubber Padding

APPENDIX P

DATA COLLECTED FOR EVALUATION OF FWD GEOPHONES

Table P.1 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 1, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 3 Deflection (mils) Calibration	Sensor 3 Deflection (mils) FWD	Sensor 3 Difference+ (percent)	Sensor 2 Deflection (mils) Calibration	Sensor 2 Deflection (mils) FWD	Sensor 2 Difference+ (percent)
1	4.35	4.50	-3.33	10.56	11.86	-10.96
2	4.37	4.42	-1.13	10.57	11.78	-10.27
3	4.37	4.46	-2.02	10.57	11.82	-10.58
4	4.37	4.50	-2.89	10.60	11.86	-10.62
5	4.40	4.46	-1.35	10.60	11.82	-10.32
6	4.39	4.46	-1.57	10.60	11.82	-10.32
7	4.36	4.46	-2.24	10.48	11.74	-10.73
8	4.36	4.46	-2.24	10.57	11.74	-9.97
9	4.38	4.46	-1.79	10.60	11.82	-10.32
10	4.38	4.50	-2.67	10.57	11.82	-10.58
AVG*	4.37	4.46	-2.12	10.57	11.81	-10.46
COF#	0.32	0.54		0.32	0.34	

b) Results of Wraps

Test No.	Sensor 3 Deflection (mils) Calibration	Sensor 3 Deflection (mils) FWD	Sensor 3 Difference+ (percent)	Sensor 2 Deflection (mils) Calibration	Sensor 2 Deflection (mils) FWD	Sensor 2 Difference+ (percent)
1	4.38	4.46	-1.79	10.56	11.74	-10.05
2	4.34	4.46	-2.69	10.54	11.70	-9.91
3	4.38	4.50	-2.67	10.65	11.74	-9.28
4	4.40	4.54	-3.08	10.65	11.86	-10.20
5	4.41	4.50	-2.00	10.71	11.78	-9.08
6	4.40	4.50	-2.22	10.70	11.78	-9.17
7	4.40	4.50	-2.22	10.63	11.74	-9.45
8	4.35	4.46	-2.47	10.61	11.74	-9.63
9	4.38	4.50	-2.67	10.71	11.78	-9.08
10	4.36	4.46	-2.24	10.55	11.74	-10.14
AVG*	4.38	4.49	-2.12	10.63	11.76	-9.60
COF#	0.51	0.57		0.58	0.35	

+Difference=(Calibration System Geophone - FWD Geophone)*100/(FWD Geophone)
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.2 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 2, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 3 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 2 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	6.49	6.42	1.09	18.36	20.26	-9.38
2	6.39	6.38	0.16	18.16	20.01	-9.25
3	6.49	6.50	-0.15	18.34	20.09	-8.71
4	6.44	6.46	-0.31	18.32	20.05	-8.63
5	6.46	6.46	0.00	18.36	20.09	-8.61
6	6.42	6.42	0.00	18.29	20.17	-9.32
7	6.51	6.46	0.77	18.42	20.05	-8.13
8	6.46	6.42	0.62	18.31	20.09	-8.86
9	6.42	6.46	-0.62	18.22	19.97	-8.76
10	6.40	6.46	-0.93	18.18	20.09	-9.51
AVG*	6.45	6.44	0.06	18.30	20.09	-8.91
COF#	0.60	0.50		0.44	0.38	

b) Results of Wraps

Test No.	Sensor 3 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 2 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	6.45	6.46	-0.15	18.33	20.26	-9.53
2	6.43	6.46	-0.46	18.27	20.17	-9.42
3	6.46	6.46	0.00	18.35	20.38	-9.96
4	6.44	6.46	-0.31	18.30	20.30	-9.85
5	6.51	6.42	1.40	18.40	20.30	-9.36
6	6.54	6.50	0.62	18.40	20.38	-9.72
7	6.40	6.46	-0.93	18.32	20.21	-9.35
8	6.56	6.46	1.55	18.55	20.30	-8.62
9	6.44	6.42	0.31	18.33	20.17	-9.12
10	6.47	6.46	0.15	18.38	20.01	-8.15
AVG*	6.47	6.46	0.22	18.36	20.25	-9.31
COF#	0.75	0.33		0.40	0.53	

+Difference={Calibration System Geophone - FWD Geophone}*100/{FWD Geophone}
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.3 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 3, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 3 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 2 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	7.70	7.65	0.65	18.48	19.02	-2.84
2	7.70	7.65	0.65	18.48	19.02	-2.84
3	7.74	7.64	1.31	18.55	19.02	-2.47
4	7.73	7.65	1.05	18.46	19.02	-2.94
5	7.75	7.65	1.31	18.47	18.97	-2.64
6	7.74	7.61	1.71	18.45	18.97	-2.74
7	7.75	7.65	1.31	18.45	18.93	-2.54
8	7.74	7.65	1.18	18.47	18.93	-2.43
9	7.73	7.61	1.58	18.52	18.93	-2.17
10	7.75	7.65	1.31	18.48	18.93	-2.38
AVG*	7.73	7.64	1.20	18.48	18.97	-2.59
COF#	0.23	0.21		0.16	0.21	

b) Results of Wraps

Test No.	Sensor 3 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 2 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	7.79	7.65	1.83	18.66	19.14	-2.51
2	7.79	7.73	0.78	18.70	19.22	-2.71
3	7.79	7.69	1.30	18.70	19.18	-2.50
4	7.78	7.69	1.17	18.60	19.10	-2.62
5	7.78	7.65	1.70	18.60	19.14	-2.82
6	7.78	7.69	1.17	18.66	19.14	-2.51
7	7.80	7.69	1.43	18.72	19.14	-2.19
8	7.80	7.69	1.43	18.70	19.14	-2.30
9	7.81	7.69	1.56	18.70	19.14	-2.30
10	7.80	7.65	1.96	18.63	19.10	-2.46
AVG*	7.79	7.68	1.43	18.67	19.14	-2.49
COF#	0.13	0.31		1.43	0.17	

+Difference={Calibration System Geophone - FWD Geophone}*100/{FWD Geophone}
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.4 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 4, on Asphalt Site

a) Results of Repetitions

Test No.	Deflection (mils)		Difference+ (percent)	Deflection (mils)		Difference+ (percent)
	Calibration	FWD		Calibration	FWD	
1	11.50	12.19	-5.66	27.01	30.51	-11.47
2	11.48	12.19	-5.82	27.03	30.55	-11.52
3	12.01	12.19	-1.48	26.99	30.55	-11.65
4	12.06	12.27	-1.71	27.09	30.63	-11.56
5	12.07	12.23	-1.31	27.10	30.63	-11.52
6	12.06	12.27	-1.71	27.08	30.63	-11.59
7	12.03	12.23	-1.64	27.03	30.59	-11.64
8	12.04	12.23	-1.55	27.08	30.63	-11.59
9	12.06	12.23	-1.39	27.10	30.67	-11.64
10	12.04	12.23	-1.55	27.08	30.63	-11.59
AVG*	11.94	12.22	-2.38	27.06	30.60	-11.57
COF#	1.87	0.23		0.14	0.16	

b) Results of Wraps

Test No.	Deflection (mils)		Difference+ (percent)	Deflection (mils)		Difference+ (percent)
	Calibration	FWD		Calibration	FWD	
1	12.05	12.23	-1.47	27.10	30.71	-11.76
2	12.06	12.27	-1.71	27.15	30.71	-11.59
3	12.09	12.27	-1.47	27.18	30.76	-11.64
4	12.08	12.27	-1.55	27.19	30.80	-11.72
5	12.07	12.27	-1.63	27.14	30.71	-11.62
6	12.10	12.27	-1.39	27.19	30.80	-11.72
7	12.09	12.27	-1.47	27.17	30.76	-11.67
8	12.09	12.31	-1.79	27.20	30.80	-11.69
9	12.08	12.27	-1.55	27.19	30.76	-11.61
10	12.06	12.27	-1.71	27.14	30.71	-11.62
AVG*	12.08	12.27	1.57	27.17	30.75	-11.66
COF#	0.13	0.15		0.11	0.12	

+Difference=(Calibration System Geophone - FWD Geophone)*100/(FWD Geophone)
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.5 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 1, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 5 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 4 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	1.80	1.83	-1.64	2.41	2.53	-4.74
2	1.80	1.83	-1.64	2.43	2.57	-5.45
3	1.84	1.91	-3.66	2.46	2.57	-4.28
4	1.82	1.83	-0.55	2.44	2.61	-6.51
5	1.84	1.87	-1.60	2.47	2.57	-3.89
6	1.81	1.87	-3.21	2.43	2.57	-5.45
7	1.81	1.83	-1.09	2.44	2.57	-5.06
8	1.82	1.83	-0.55	2.44	2.57	-5.06
9	1.82	1.83	-0.55	2.44	2.57	-5.06
10	1.83	1.87	-2.14	2.46	2.57	-4.28
AVG*	1.82	1.85	-1.66	2.44	2.57	-4.97
COF#	0.76	1.45		0.68	0.70	

b) Results of Wraps

Test No.	Sensor 5 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 4 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	1.82	1.83	-0.55	2.46	2.57	-4.28
2	1.81	1.83	-1.09	2.44	2.61	-6.51
3	1.82	1.87	-2.67	2.46	2.57	-4.28
4	1.82	1.79	1.68	2.45	2.57	-4.67
5	1.83	1.83	0.00	2.46	2.61	-5.75
6	1.82	1.83	-0.55	2.46	2.57	-4.28
7	1.83	1.83	0.00	2.47	2.61	-5.36
8	1.83	1.83	0.00	2.46	2.61	-5.75
9	1.86	1.87	-0.53	2.50	2.65	-5.66
10	1.82	1.83	-0.55	2.46	2.61	-5.75
AVG*	1.83	1.83	-0.43	2.46	2.60	-5.23
COF#	0.70	1.17		0.60	0.99	

+Difference=(Calibration System Geophone - FWD Geophone)*100/(FWD Geophone)
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.6 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 2, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 5 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 4 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	2.43	2.54	-4.33	3.60	3.75	-4.00
2	2.44	2.54	-3.94	3.54	3.75	-5.60
3	2.47	2.50	-1.20	3.50	3.75	-6.67
4	2.47	2.54	-2.76	3.50	3.79	-7.65
5	2.47	2.50	-1.20	3.55	3.75	-5.33
6	2.46	2.54	-3.15	3.52	3.75	-6.13
7	2.46	2.50	-1.60	3.54	3.75	-5.60
8	2.41	2.50	-3.60	3.52	3.71	-5.12
9	2.45	2.50	-2.00	3.50	3.71	-5.66
10	2.44	2.46	-0.81	3.48	3.71	-6.20
AVG*	2.45	2.51	-2.45	3.53	3.74	-5.79
COF#	0.77	1.02		0.93	0.64	

b) Results of Wraps

Test No.	Sensor 5 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 4 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	2.47	2.54	-2.76	3.60	3.75	-4.00
2	2.28	2.62	-12.98	3.67	3.79	-3.17
3	2.32	2.54	-8.66	3.64	3.79	-3.96
4	2.34	2.54	-7.87	3.63	3.79	-4.22
5	2.41	2.58	-6.59	3.58	3.79	-5.54
6	2.42	2.58	-6.20	3.54	3.83	-7.57
7	2.42	2.58	-6.20	3.58	3.79	-5.54
8	2.40	2.50	-4.00	3.56	3.75	-5.07
9	2.44	2.58	-5.43	3.54	3.79	-6.60
10	2.37	2.54	-6.69	3.57	3.75	-4.80
AVG*	2.39	2.56	-6.74	3.59	3.78	-5.05
COF#	2.33	1.26		1.15	0.63	

+Difference=(Calibration System Geophone - FWD Geophone)*100/(FWD Geophone)
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.7 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 3, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 5 Deflection (mils) Calibration	Sensor 5 Deflection (mils) FWD	Sensor 5 Difference+ (percent)	Sensor 4 Deflection (mils) Calibration	Sensor 4 Deflection (mils) FWD	Sensor 4 Difference+ (percent)
1	3.12	3.16	-1.27	4.38	4.50	-2.67
2	3.11	3.16	-1.58	4.38	4.50	-2.67
3	3.13	3.20	-2.19	4.39	4.50	-2.44
4	3.14	3.16	-0.63	4.41	4.54	-2.86
5	3.15	3.16	-0.32	4.41	4.50	-2.00
6	3.14	3.16	-0.63	4.41	4.54	-2.86
7	3.13	3.25	-3.69	4.41	4.54	-2.86
8	3.14	3.20	-1.88	4.41	4.50	-2.00
9	3.13	3.16	-0.95	4.41	4.54	-2.86
10	3.14	3.16	-0.63	4.41	4.54	-2.86
AVG*	3.13	3.17	-1.37	4.40	4.52	-2.60
COF#	0.35	0.91		0.28	0.44	

b) Results of Wraps

Test No.	Deflection (mils) Calibration	Deflection (mils) FWD	Difference+ (percent)	Deflection (mils) Calibration	Deflection (mils) FWD	Difference+ (percent)
1	3.15	3.25	-3.08	4.42	4.50	-1.78
2	3.15	3.20	-1.56	4.42	4.54	-2.64
3	3.16	3.20	-1.25	4.40	4.50	-2.22
4	3.16	3.20	-1.25	4.40	4.50	-2.22
5	3.17	3.20	-0.94	4.42	4.54	-2.64
6	3.17	3.20	-0.94	4.42	4.50	-1.78
7	3.16	3.20	-1.25	4.41	4.50	-2.00
8	3.16	3.20	-1.25	4.42	4.50	-1.78
9	3.17	3.20	-0.94	4.41	4.50	-2.00
10	3.17	3.20	-0.94	4.41	4.50	-2.00
AVG*	3.16	3.21	-1.34	4.41	4.51	-2.11
COF#	0.24	0.47		0.18	0.35	

+Difference={Calibration System Geophone - FWD Geophone}*100/{FWD Geophone}
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.8 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 4, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 5: Deflection (mils) Calibration	Sensor 5: Deflection (mils) FWD	Sensor 5: Difference+ (percent)	Sensor 4: Deflection (mils) Calibration	Sensor 4: Deflection (mils) FWD	Sensor 4: Difference+ (percent)
1	4.55	4.66	-2.36	6.59	6.87	-4.08
2	4.55	4.66	-2.36	6.60	6.87	-3.93
3	4.54	4.66	-2.58	6.59	6.87	-4.08
4	4.55	4.70	-3.19	6.59	6.87	-4.08
5	4.55	4.70	-3.19	6.59	6.87	-4.08
6	4.54	4.70	-3.40	6.59	6.91	-4.63
7	4.54	4.66	-2.58	6.59	6.87	-4.08
8	4.55	4.70	-3.19	6.59	6.87	-4.08
9	4.53	4.70	-3.62	6.57	6.87	-4.37
10	4.53	4.70	-3.62	6.58	6.87	-4.22
AVG*	4.54	4.68	-3.00	6.59	6.87	-4.16
COF#	0.17	0.42		0.11	0.17	

b) Results of Wraps

Test No.	Sensor 5: Deflection (mils) Calibration	Sensor 5: Deflection (mils) FWD	Sensor 5: Difference+ (percent)	Sensor 4: Deflection (mils) Calibration	Sensor 4: Deflection (mils) FWD	Sensor 4: Difference+ (percent)
1	4.54	4.66	-2.58	6.57	6.87	-4.37
2	4.57	4.66	-1.93	6.61	6.91	-4.34
3	4.56	4.70	-2.98	6.61	6.91	-4.34
4	4.57	4.70	-2.77	6.62	6.91	-4.20
5	4.50	4.66	-3.43	6.61	6.91	-4.34
6	4.54	4.66	-2.58	6.59	6.91	-4.63
7	4.55	4.70	-3.19	6.60	6.91	-4.49
8	4.57	4.66	-1.93	6.61	6.91	-4.34
9	4.56	4.66	-2.15	6.61	6.91	-4.34
10	4.56	4.66	-2.15	6.60	6.91	-4.49
AVG*	4.55	4.67	-2.57	6.60	6.91	-4.39
COF#	0.45	0.39		0.20	0.17	

+Difference={Calibration System Geophone - FWD Geophone}*100/{FWD Geophone}
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.9 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 1, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 7 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 6 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	1.15	1.17	-1.71	1.34	1.37	-2.19
2	1.16	1.17	-0.85	1.35	1.41	-4.26
3	1.18	1.21	-2.48	1.36	1.41	-3.55
4	1.16	1.21	-4.13	1.34	1.41	-4.96
5	1.16	1.17	-0.85	1.35	1.41	-4.26
6	1.16	1.17	-0.85	1.34	1.37	-2.19
7	1.16	1.17	-0.85	1.35	1.41	-4.26
8	1.17	1.17	0.00	1.35	1.41	-4.26
9	1.17	1.17	0.00	1.35	1.41	-4.26
10	1.18	1.21	-2.48	1.35	1.41	-4.26
AVG*	1.17	1.18	-1.42	1.35	1.40	-3.84
COF#	0.79	1.55		0.45	1.14	

b) Results of Wraps

Test No.	Sensor 7 Deflection (mils) Calibration	FWD	Difference+ (percent)	Sensor 6 Deflection (mils) Calibration	FWD	Difference+ (percent)
1	1.16	1.13	2.65	1.33	1.41	-5.67
2	1.17	1.13	3.54	1.34	1.41	-4.96
3	1.18	1.13	4.42	1.34	1.41	-4.96
4	1.18	1.13	4.42	1.35	1.45	-6.90
5	1.19	1.13	5.31	1.36	1.45	-6.21
6	1.17	1.17	0.00	1.34	1.41	-4.96
7	1.18	1.13	4.42	1.35	1.45	-6.90
8	1.18	1.17	0.85	1.35	1.45	-6.90
9	1.18	1.17	0.85	1.35	1.41	-4.26
10	1.18	1.17	0.85	1.35	1.41	-4.26
AVG*	1.18	1.15	2.73	1.35	1.43	-5.60
COF#	0.66	1.71		0.59	1.37	

+Difference={Calibration System Geophone - FWD Geophone}*100/{FWD Geophone}
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.10 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 2, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 7 Deflection (mils) Calibration	Sensor 7 Deflection (mils) FWD	Sensor 7 Difference+ (percent)	Sensor 6 Deflection (mils) Calibration	Sensor 6 Deflection (mils) FWD	Sensor 6 Difference+ (percent)
1	1.34	1.65	-18.79	1.95	1.97	-1.02
2	1.40	1.61	-13.04	1.87	1.93	-3.11
3	1.40	1.65	-15.15	1.90	1.97	-3.55
4	1.47	1.65	-10.91	1.88	2.01	-6.47
5	1.45	1.66	-12.65	1.92	2.01	-4.48
6	1.44	1.65	-12.73	1.91	2.01	-4.98
7	1.39	1.65	-15.76	1.89	1.97	-4.06
8	1.36	1.65	-17.58	1.93	1.97	-2.03
9	1.34	1.61	-16.77	1.93	2.01	-3.98
10	1.37	1.65	-16.97	1.87	2.01	-6.97
AVG*	1.40	1.64	-15.03	1.91	1.99	-4.06
COF#	3.09	1.02		1.37	1.34	

b) Results of Wraps

Test No.	Sensor 7 Deflection (mils) Calibration	Sensor 7 Deflection (mils) FWD	Sensor 7 Difference+ (percent)	Sensor 6 Deflection (mils) Calibration	Sensor 6 Deflection (mils) FWD	Sensor 6 Difference+ (percent)
1	1.48	1.61	-8.07	1.87	2.01	-6.97
2	1.45	1.61	-9.94	1.92	2.01	-4.48
3	1.44	1.61	-10.56	1.90	2.05	-7.32
4	1.43	1.57	-8.92	1.97	2.05	-3.90
5	1.32	1.57	-15.92	2.04	2.05	-0.49
6	1.33	1.57	-15.29	2.04	2.05	-0.49
7	1.39	1.57	-11.46	1.97	2.05	-3.90
8	1.40	1.61	-13.04	1.94	2.05	-5.37
9	1.40	1.57	-10.83	2.01	2.05	-1.95
10	1.44	1.61	-10.56	1.92	2.05	-6.34
AVG*	1.41	1.59	-11.46	1.96	2.04	-4.12
COF#	3.46	1.26		2.83	0.78	

+Difference=(Calibration System Geophone - FWD Geophone)*100/(FWD Geophone)
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.11 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 3, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 7 Deflection (mils) Calibration	Sensor 7 Deflection (mils) FWD	Sensor 7 Difference⁺ (percent)	Sensor 6 Deflection (mils) Calibration	Sensor 6 Deflection (mils) FWD	Sensor 6 Difference⁺ (percent)
1	2.05	2.09	-1.91	2.38	2.45	-2.86
2	2.06	2.09	-1.44	2.39	2.45	-2.45
3	2.07	2.09	-0.96	2.40	2.45	-2.04
4	2.07	2.09	-0.96	2.39	2.45	-2.45
5	2.07	2.09	-0.96	2.41	2.45	-1.63
6	2.07	2.09	-0.96	2.39	2.45	-2.45
7	2.08	2.09	-0.48	2.41	2.45	-1.63
8	2.07	2.09	-0.96	2.40	2.45	-2.04
9	2.07	2.09	-0.96	2.39	2.45	-2.45
10	2.07	2.09	-0.96	2.39	2.45	-2.45
AVG*	2.07	2.09	-1.05	2.40	2.45	-2.24
COF#	0.36	ERR		0.38	ERR	

b) Results of Wraps

Test No.	Sensor 7 Deflection (mils) Calibration	Sensor 7 Deflection (mils) FWD	Sensor 7 Difference⁺ (percent)	Sensor 6 Deflection (mils) Calibration	Sensor 6 Deflection (mils) FWD	Sensor 6 Difference⁺ (percent)
1	2.08	2.09	-0.48	2.41	2.45	-1.63
2	2.09	2.09	0.00	2.42	2.45	-1.22
3	2.08	2.09	-0.48	2.42	2.49	-2.81
4	2.09	2.09	0.00	2.43	2.53	-3.95
5	2.09	2.09	0.00	2.43	2.49	-2.41
6	2.10	2.09	0.48	2.43	2.45	-0.82
7	2.08	2.09	-0.48	2.41	2.45	-1.63
8	2.11	2.09	0.96	2.45	2.49	-1.61
9	2.10	2.09	0.48	2.44	2.45	-0.41
10	2.11	2.09	0.96	2.46	2.49	-1.20
AVG*	2.09	2.09	0.14	2.43	2.47	-1.77
COF#	0.53	0.00		0.64	1.07	

⁺Difference=(Calibration System Geophone - FWD Geophone)*100/(FWD Geophone)
#COF : Coefficient of Variation (percent)
*AVG : Average

Table P.12 Comparison of Deflections Obtained with Calibration System and FWD Device for Drop Height of 4, on Asphalt Site

a) Results of Repetitions

Test No.	Sensor 7 Deflection (mils) Calibration	Sensor 7 Deflection (mils) FWD	Sensor 7 Difference+ (percent)	Sensor 6 Deflection (mils) Calibration	Sensor 6 Deflection (mils) FWD	Sensor 6 Difference+ (percent)
1	2.76	2.89	-4.50	3.29	3.54	-7.06
2	2.76	2.89	-4.50	3.29	3.54	-7.06
3	2.77	2.89	-4.15	3.31	3.54	-6.50
4	2.78	2.89	-3.81	3.32	3.54	-6.21
5	2.77	2.89	-4.15	3.31	3.54	-6.50
6	2.77	2.89	-4.15	3.30	3.54	-6.78
7	2.77	2.89	-4.15	3.30	3.50	-5.71
8	2.76	2.85	-3.16	3.31	3.50	-5.43
9	2.77	2.89	-4.15	3.31	3.54	-6.50
10	2.77	2.89	-4.15	3.30	3.54	-6.78
AVG*	2.77	2.88	-4.08	3.30	3.53	-6.45
COF#	0.22	0.42		0.28	0.45	

b) Results of Wraps

Test No.	Sensor 7 Deflection (mils) Calibration	Sensor 7 Deflection (mils) FWD	Sensor 7 Difference+ (percent)	Sensor 6 Deflection (mils) Calibration	Sensor 6 Deflection (mils) FWD	Sensor 6 Difference+ (percent)
1	2.77	2.89	-4.15	3.30	3.54	-6.78
2	2.77	2.89	-4.15	3.31	3.54	-6.50
3	2.78	2.89	-3.81	3.31	3.54	-6.50
4	2.77	2.89	-4.15	3.31	3.54	-6.50
5	2.77	2.89	-4.15	3.30	3.54	-6.78
6	2.77	2.89	-4.15	3.30	3.54	-6.78
7	2.77	2.89	-4.15	3.30	3.54	-6.78
8	2.77	2.89	-4.15	3.30	3.50	-5.71
9	2.77	2.89	-4.15	3.30	3.50	-5.71
10	2.77	2.89	-4.15	3.30	3.50	-5.71
AVG*	2.77	2.89	-4.12	3.30	3.53	-6.38
COF#	0.11	0.00		0.14	0.52	

+Difference={Calibration System Geophone - FWD Geophone}*100/{FWD Geophone}
#COF : Coefficient of Variation (percent)
*AVG : Average

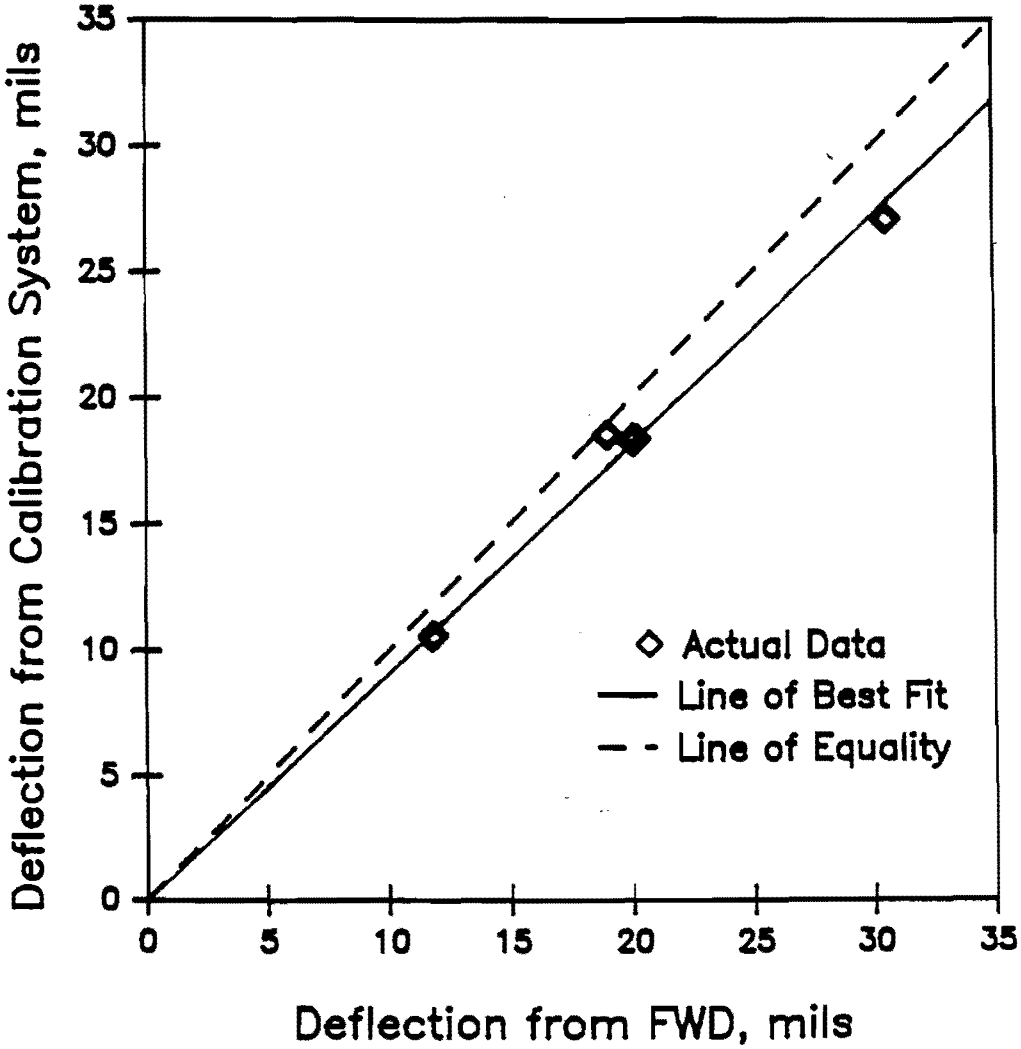


Figure P.1 Calibration Curve for Sensor 2 (Repetition) without rubber padding, Slope of Line is 0.91

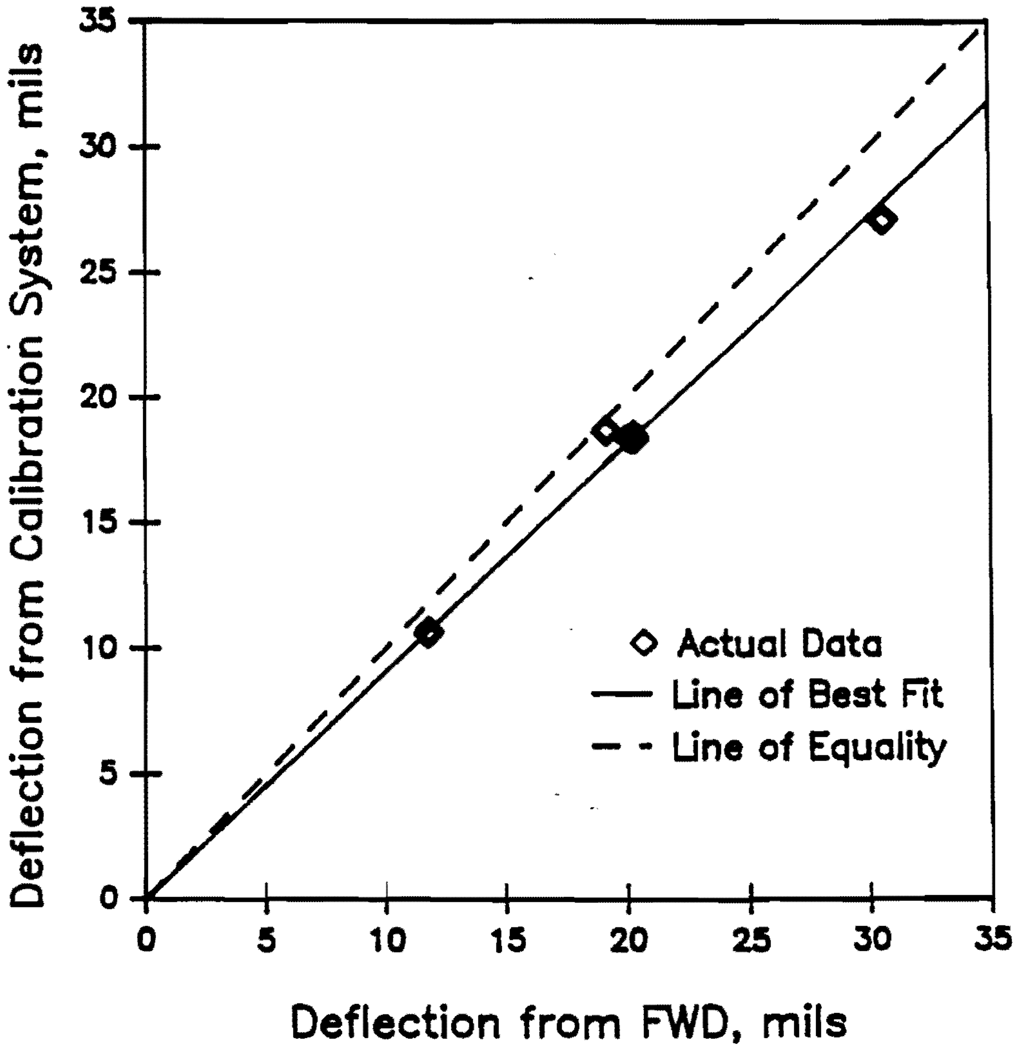


Figure P.2 Calibration Curve for Sensor 2 (Wraps) without rubber padding, Slope of Line is 0.91

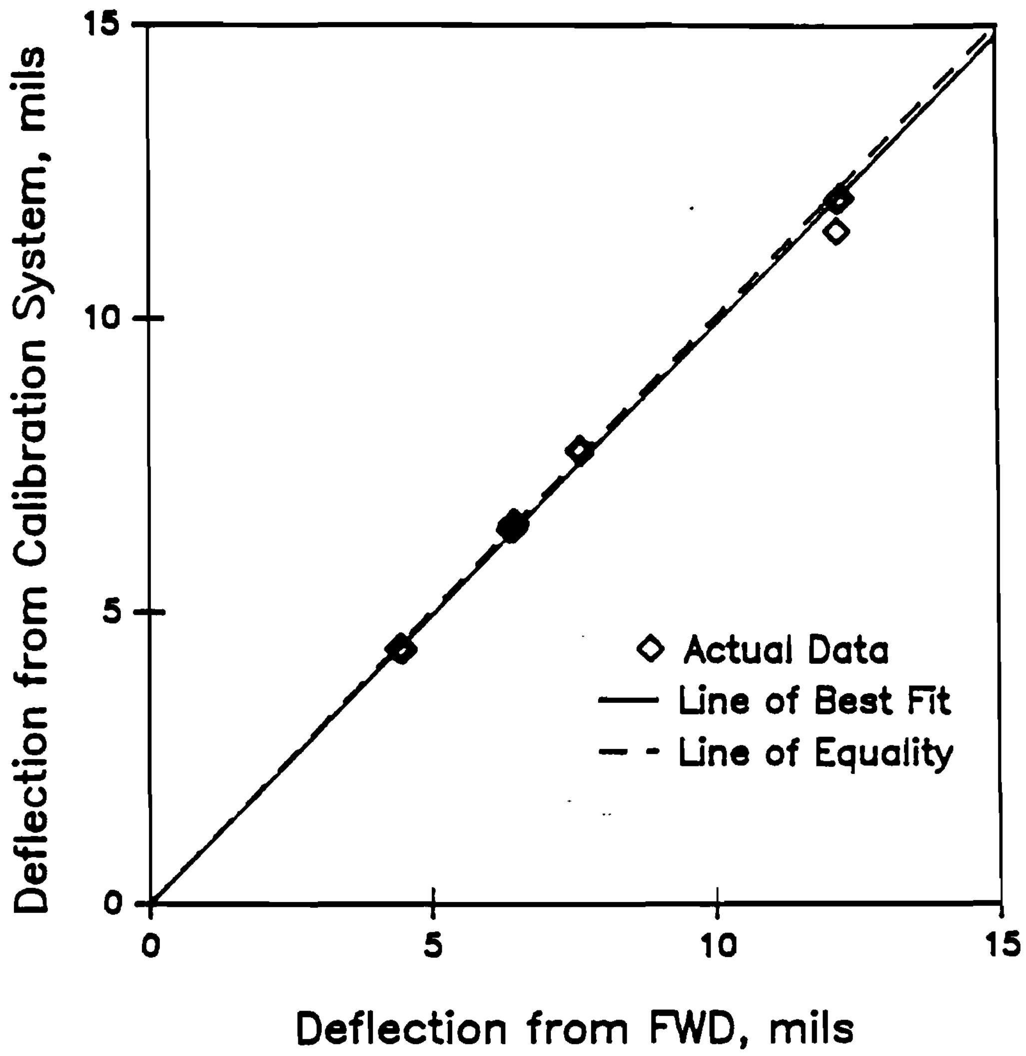


Figure P.3 Calibration Curve for Sensor 3 (Repetition) without rubber padding, Slope of Line is 0.99

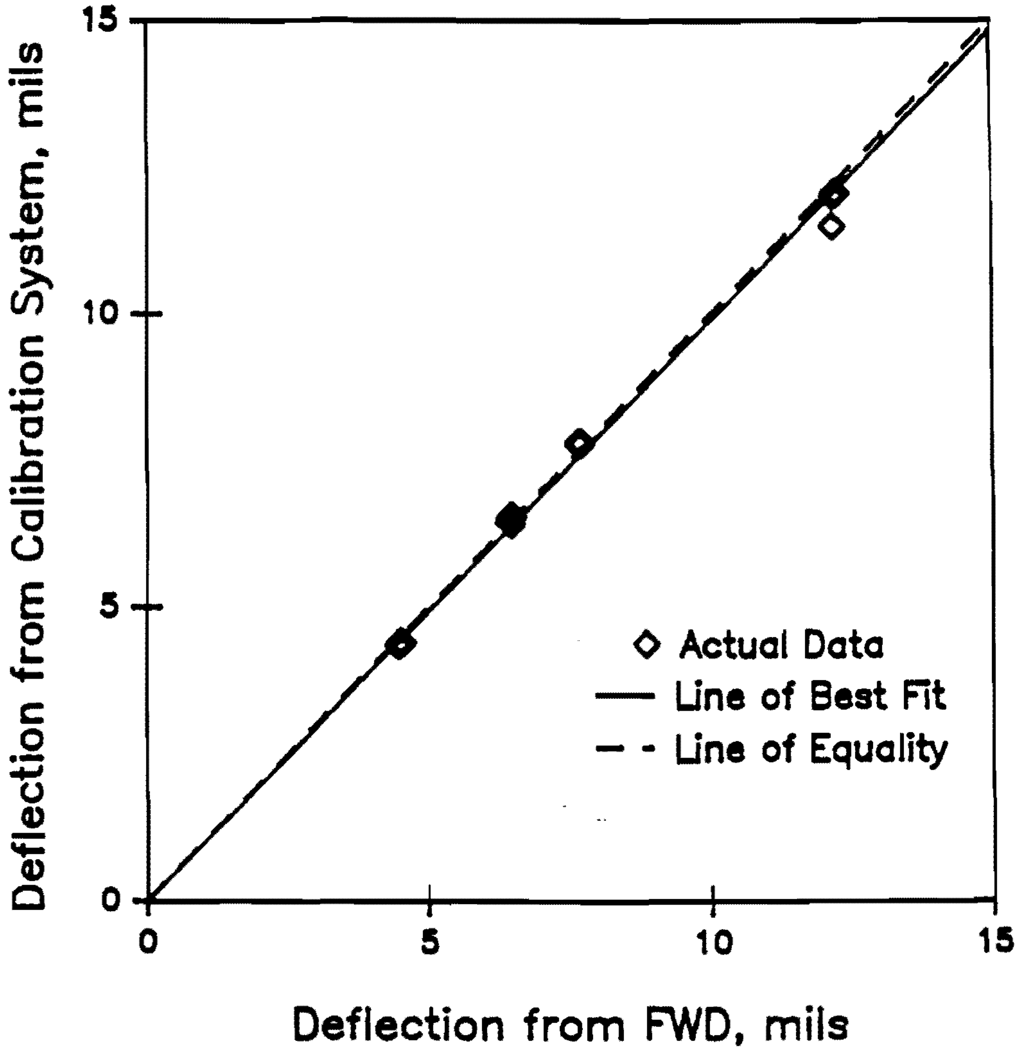


Figure P.4 Calibration Curve for Sensor 3 (Wraps) without rubber padding, Slope of Line is 0.99

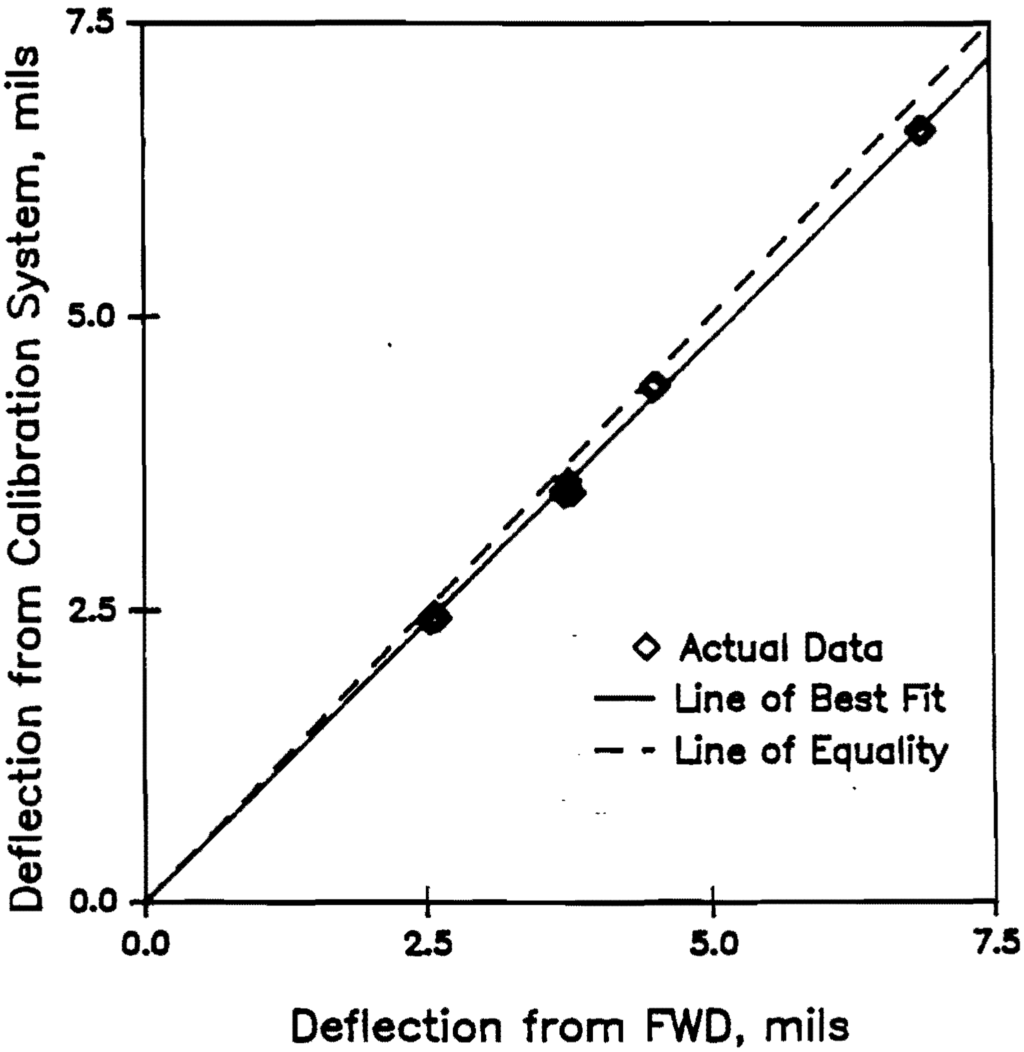


Figure P.5 Calibration Curve for Sensor 4 (Repetition) without rubber padding, Slope of Line is 0.96

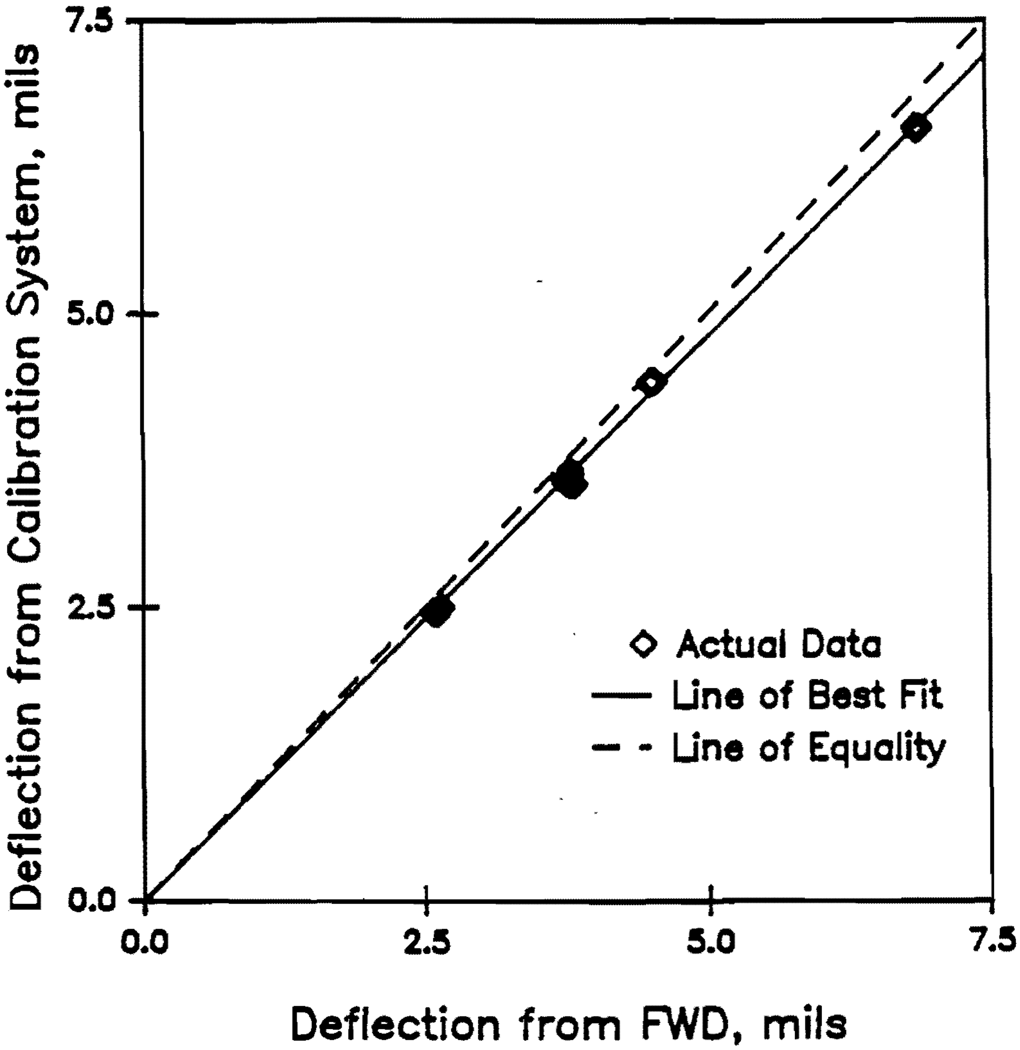


Figure P.6 Calibration Curve for Sensor 4 (Wraps) without rubber padding, Slope of Line is 0.96

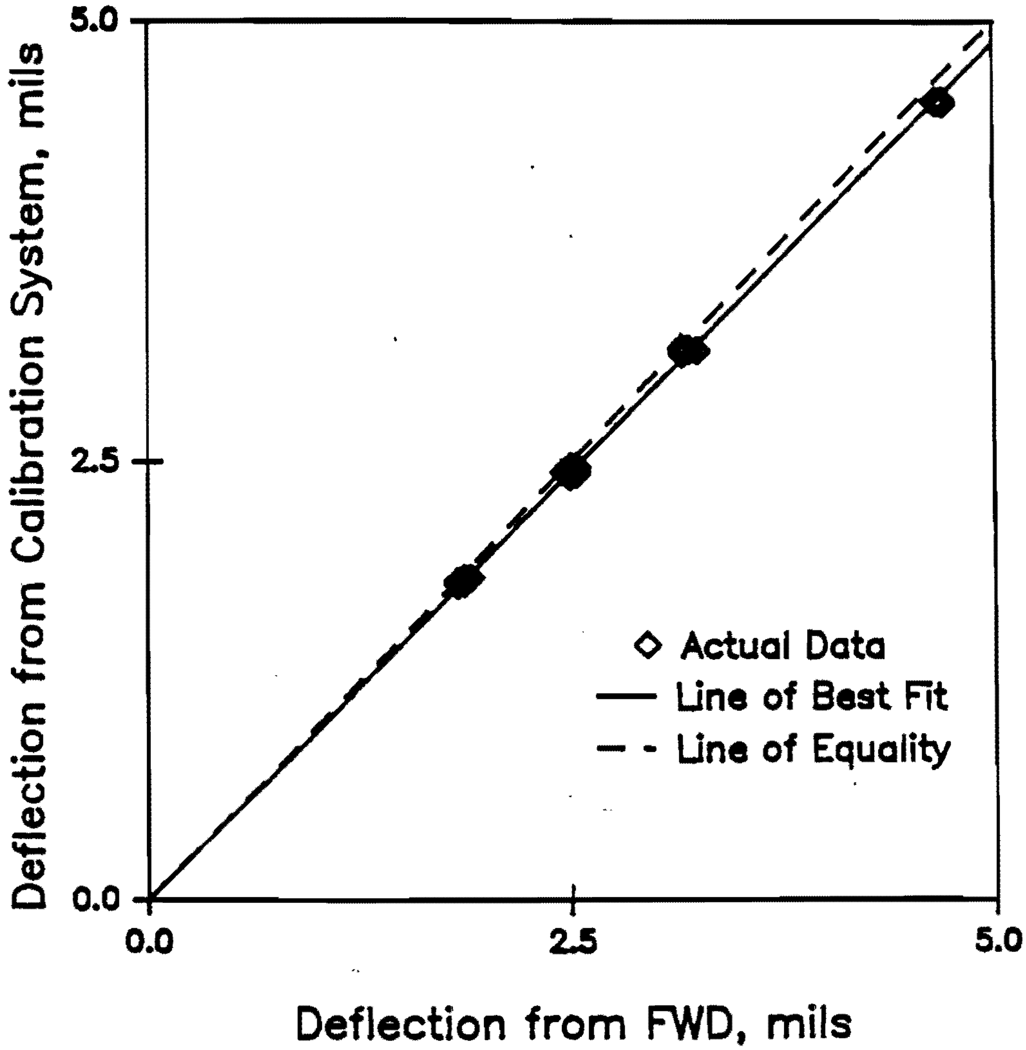


Figure P.7 Calibration Curve for Sensor 5 (Repetition) without rubber padding, Slope of Line is 0.97

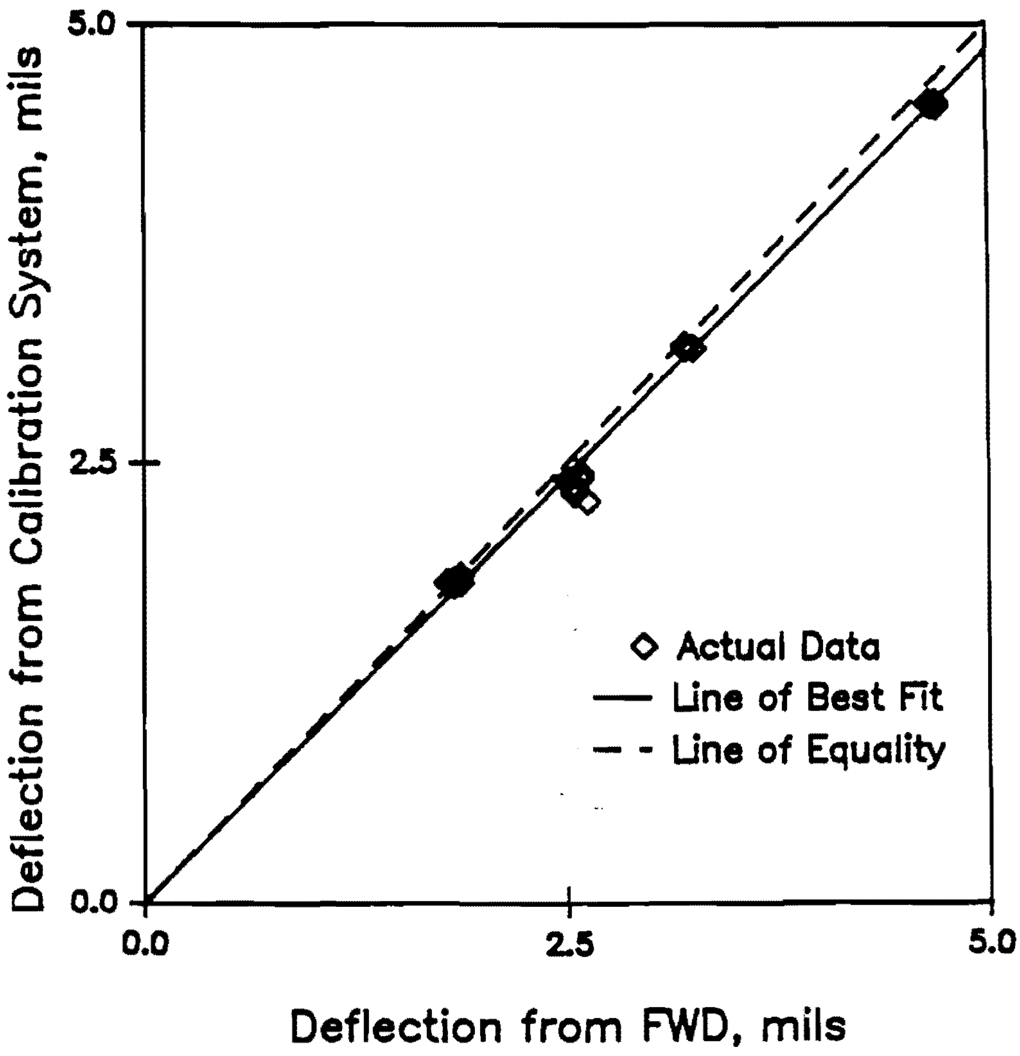


Figure P.8 Calibration Curve for Sensor 5 (Wraps) without rubber padding, Slope of Line is 0.97

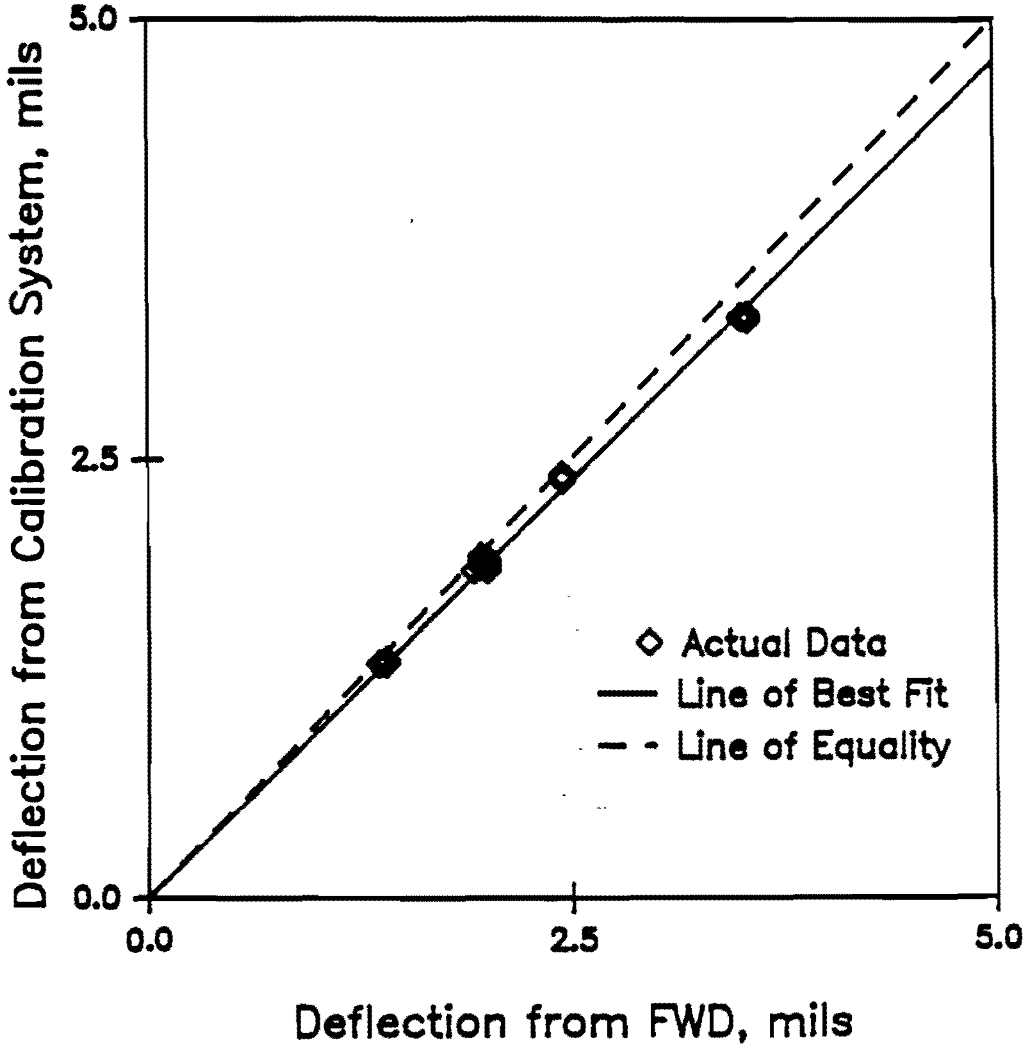


Figure P.9 Calibration Curve for Sensor 6 (Repetition) without rubber padding, Slope of Line is 0.95

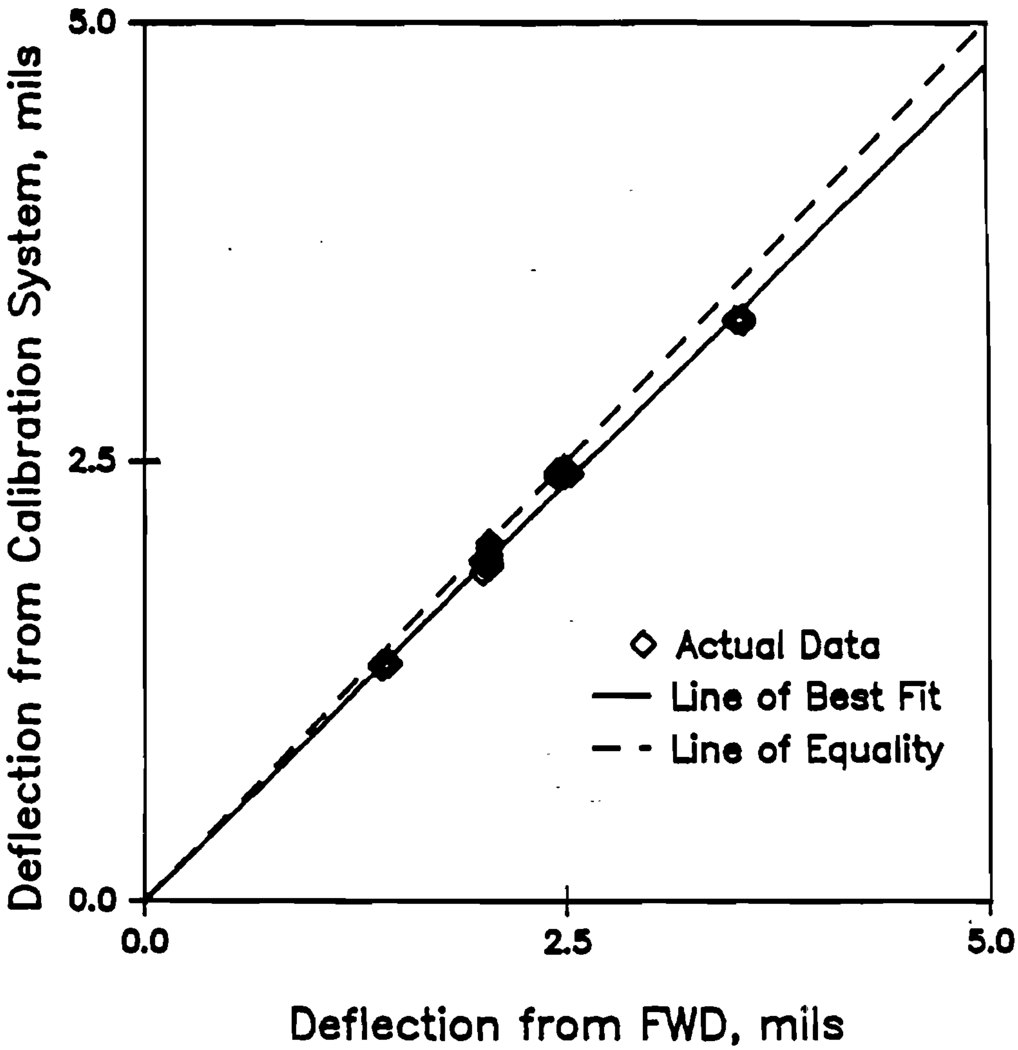


Figure P.10 Calibration Curve for Sensor 6 (Wraps) without rubber padding, Slope of Line is 0.95

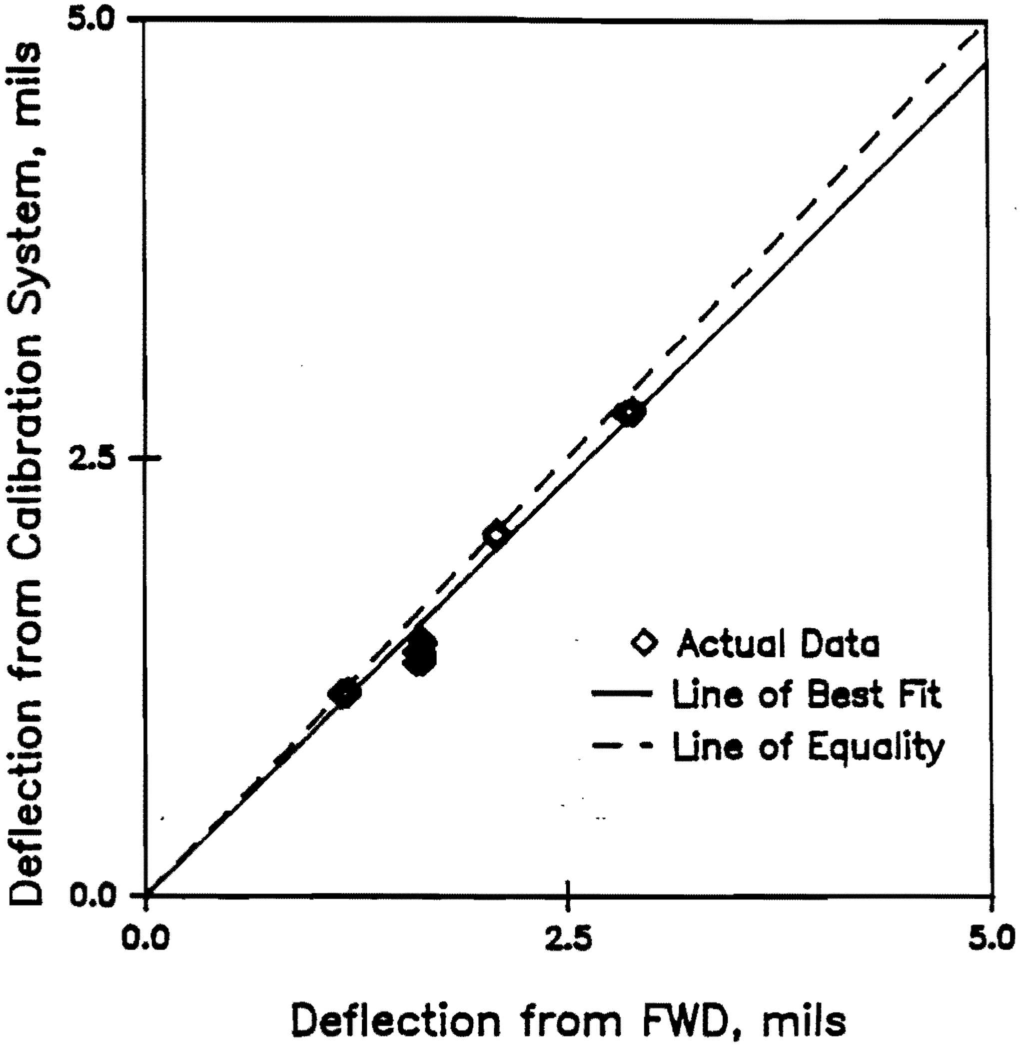


Figure P.11 Calibration Curve for Sensor 7 (Repetition) without rubber padding, Slope of Line is 0.95

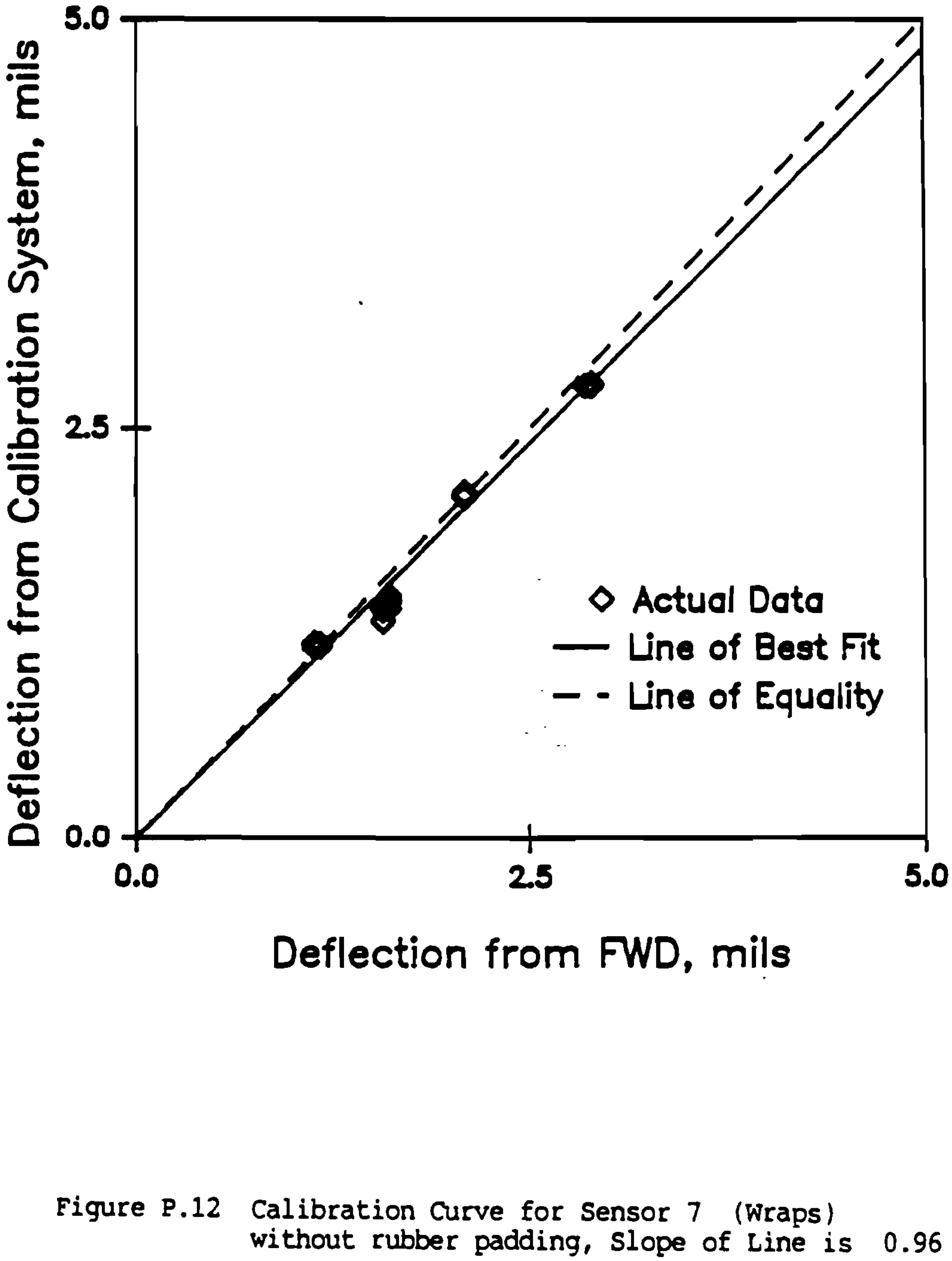


Figure P.12 Calibration Curve for Sensor 7 (Wraps) without rubber padding, Slope of Line is 0.96

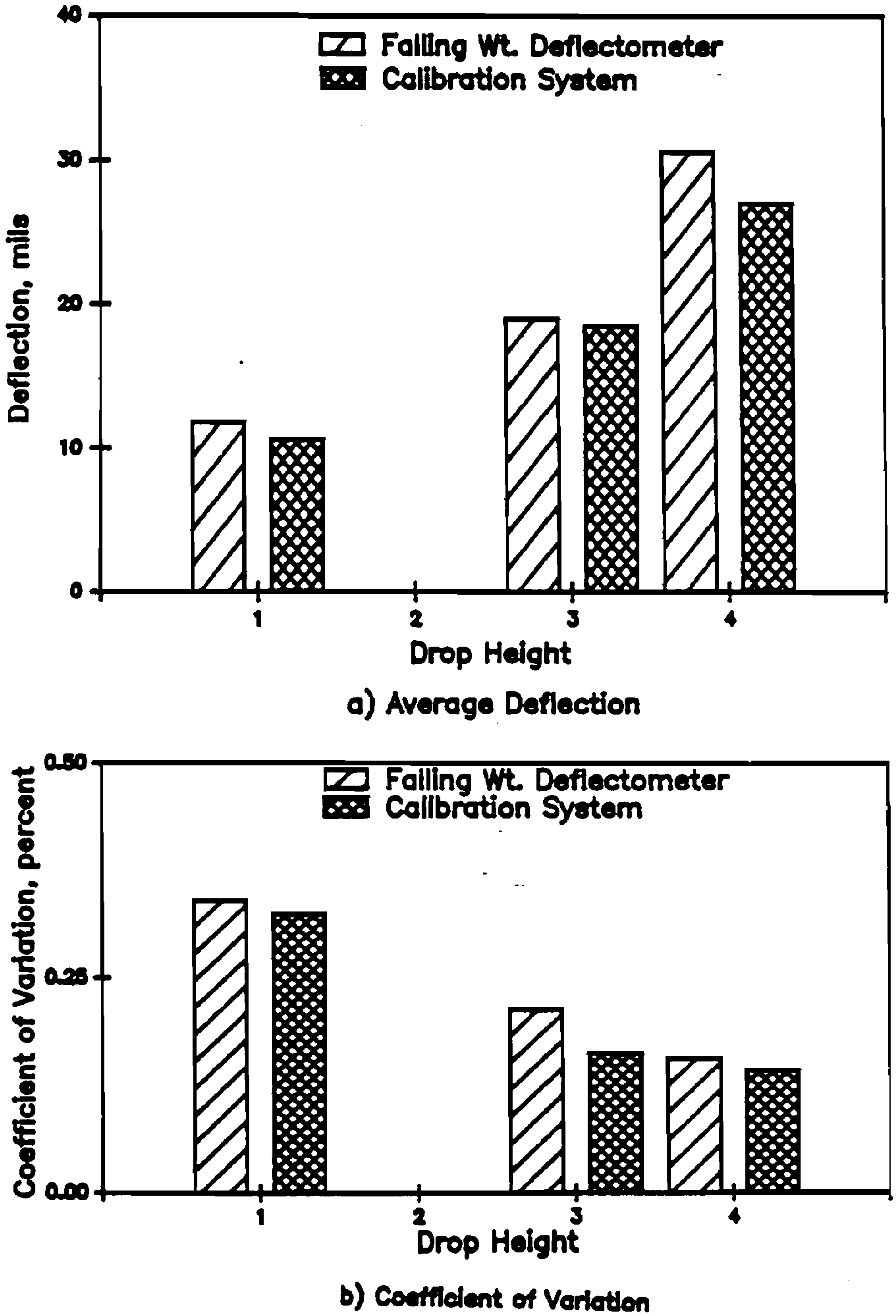
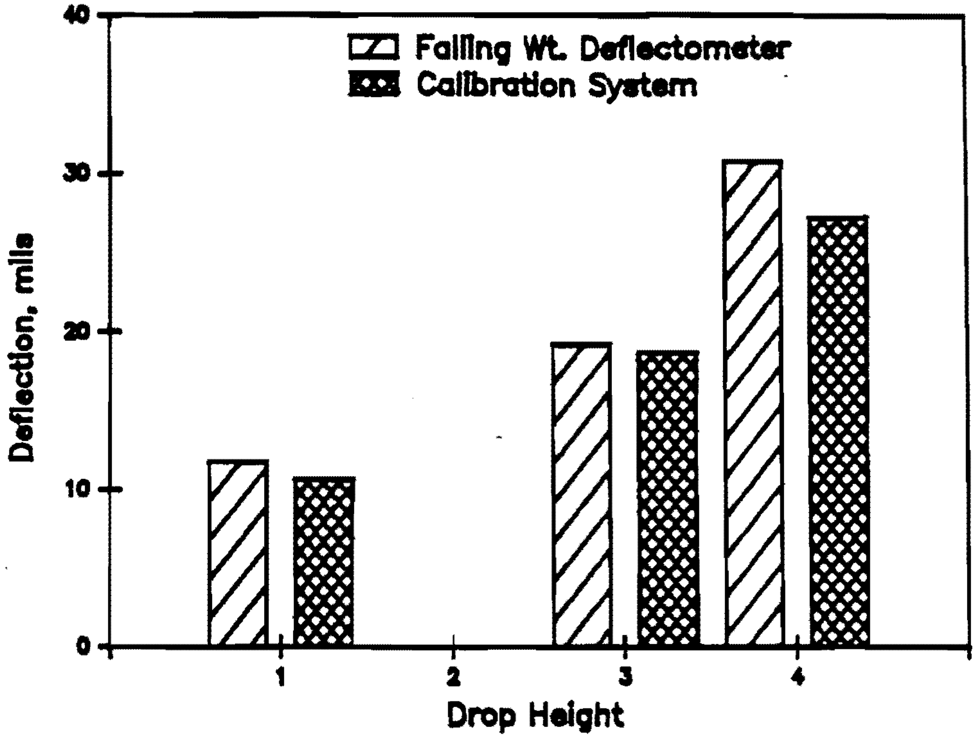
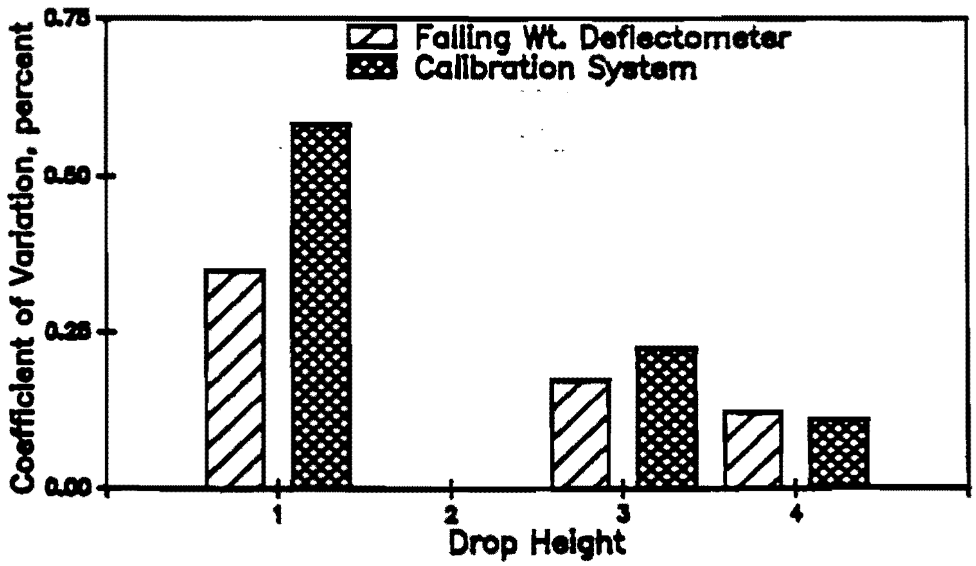


Figure P.13 Average and Coefficient of Variation for Sensor 2 without Rubber Padding

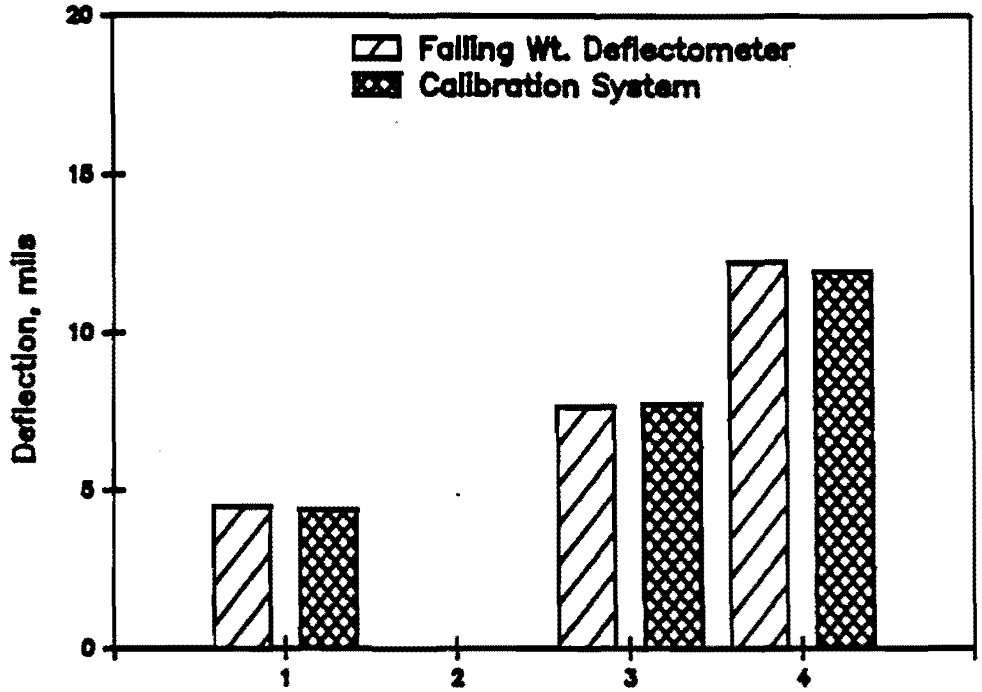


a) Average Deflection

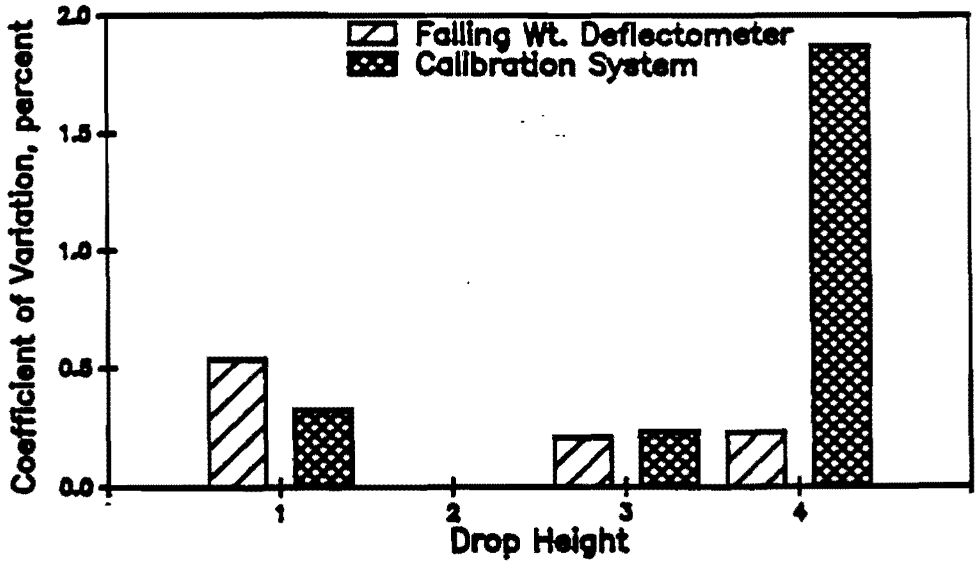


b) Coefficient of Variation

Figure P.14 Average and Coefficient of Variation for Sensor 2 (Wraps) without Rubber Padding



a) Average Deflection



b) Coefficient of Variation

Figure P.15 Average and Coefficient of Variation for Sensor 3 without Rubber Padding

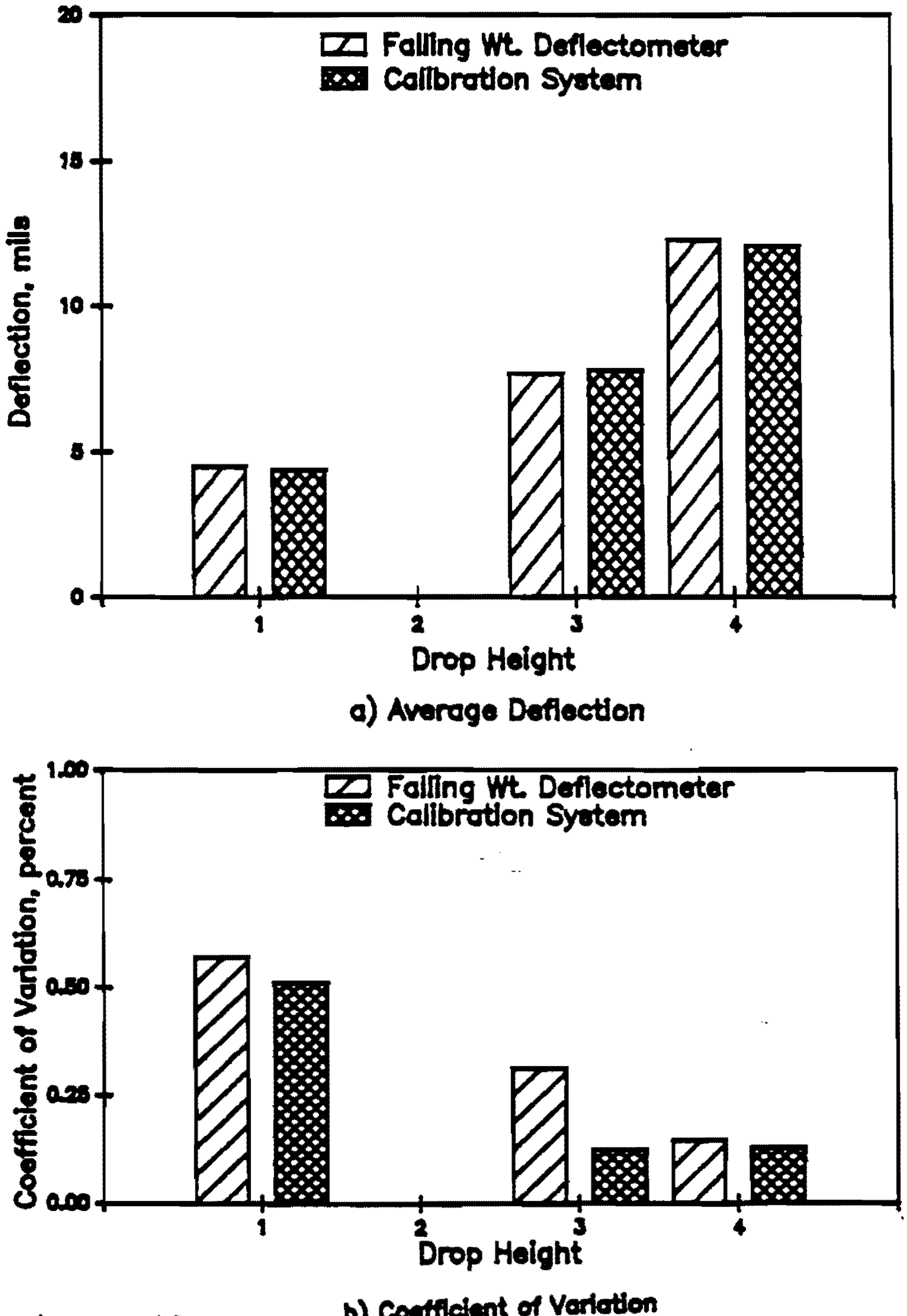


Figure P.16 Average and Coefficient of Variation for Sensor 3 (Wraps) without Rubber Padding

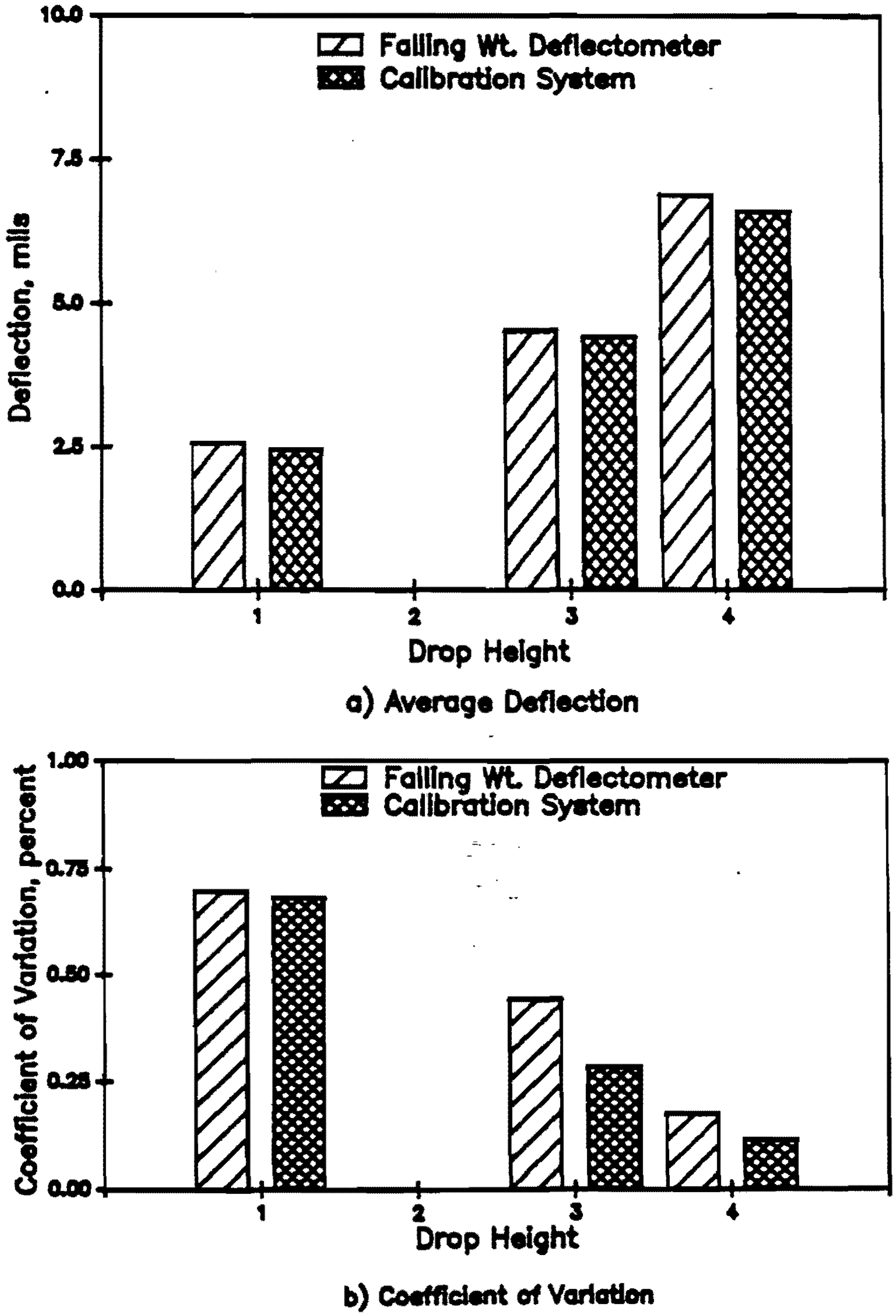
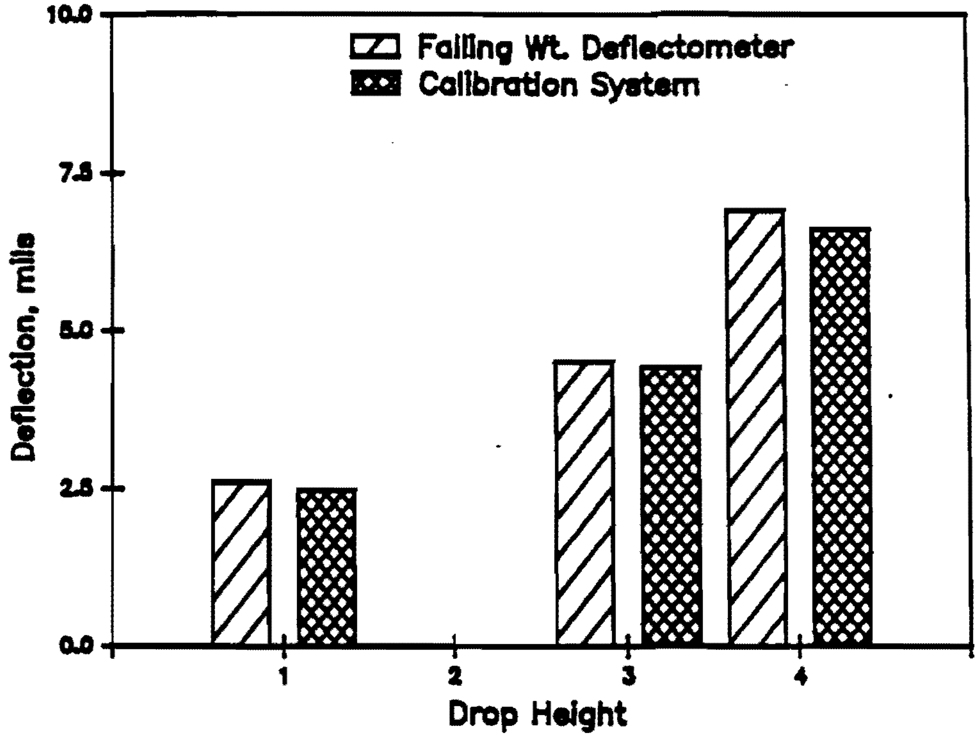
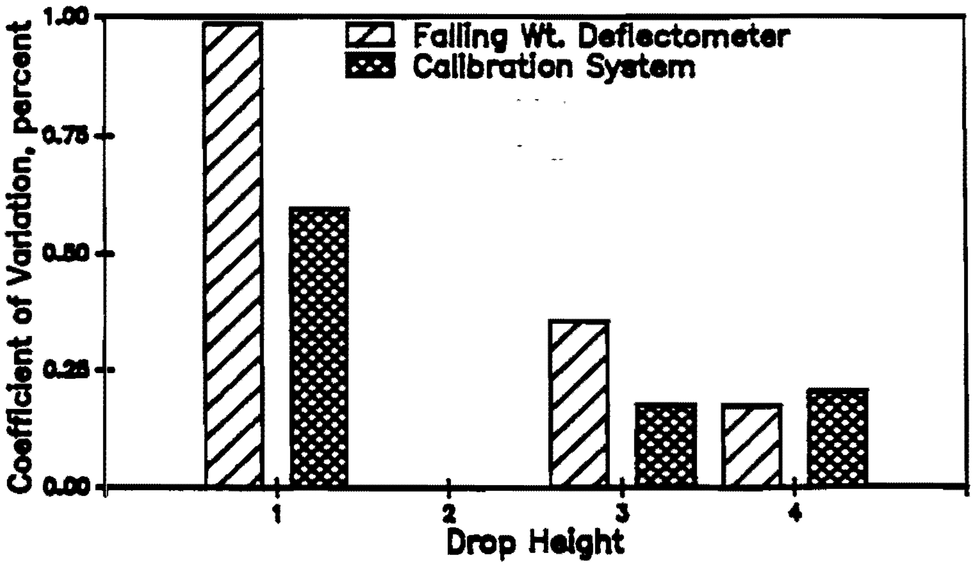


Figure P.17 Average and Coefficient of Variation for Sensor 4 without Rubber Padding



a) Average Deflection



b) Coefficient of Variation

Figure P.18 Average and Coefficient of Variation for Sensor 4 (Wraps) without Rubber Padding

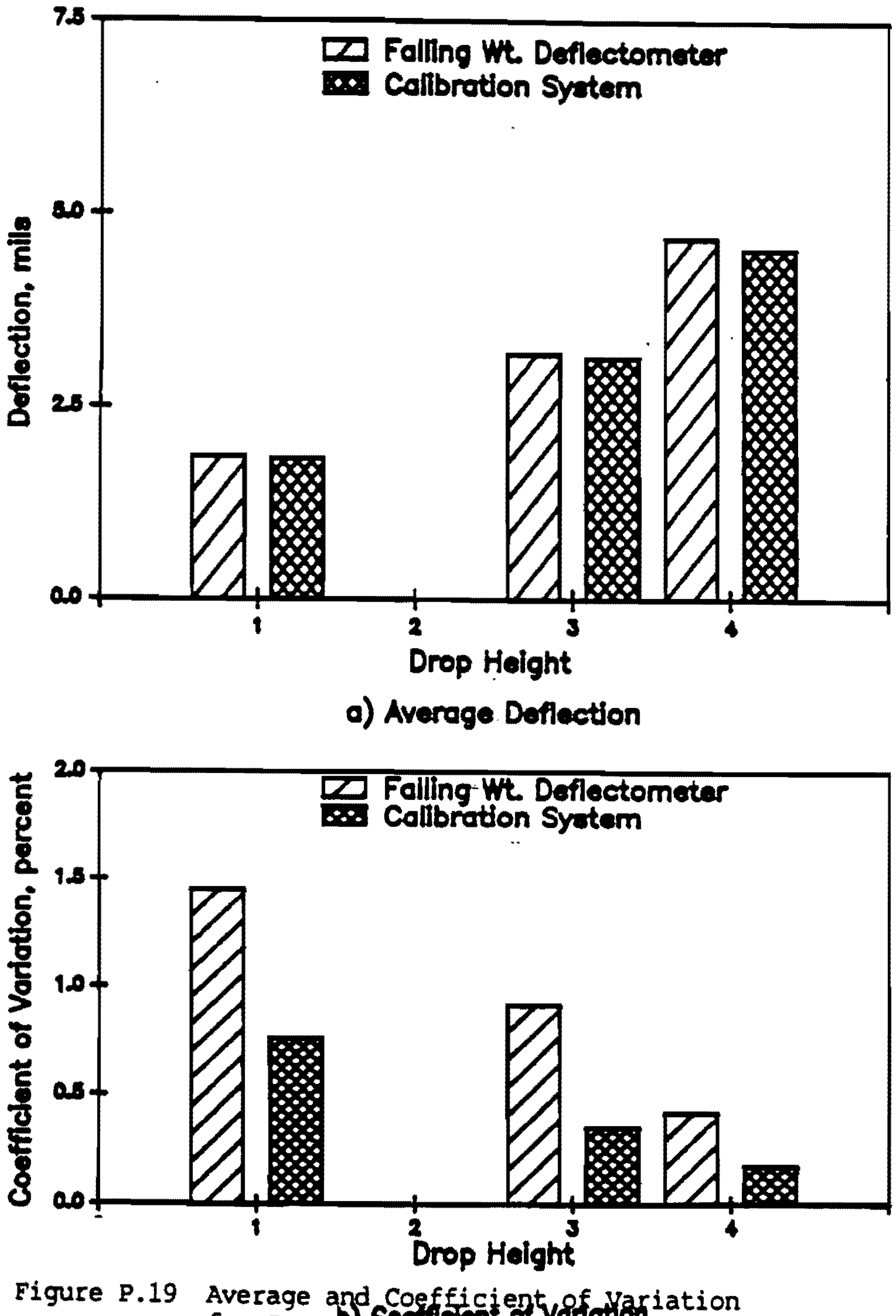
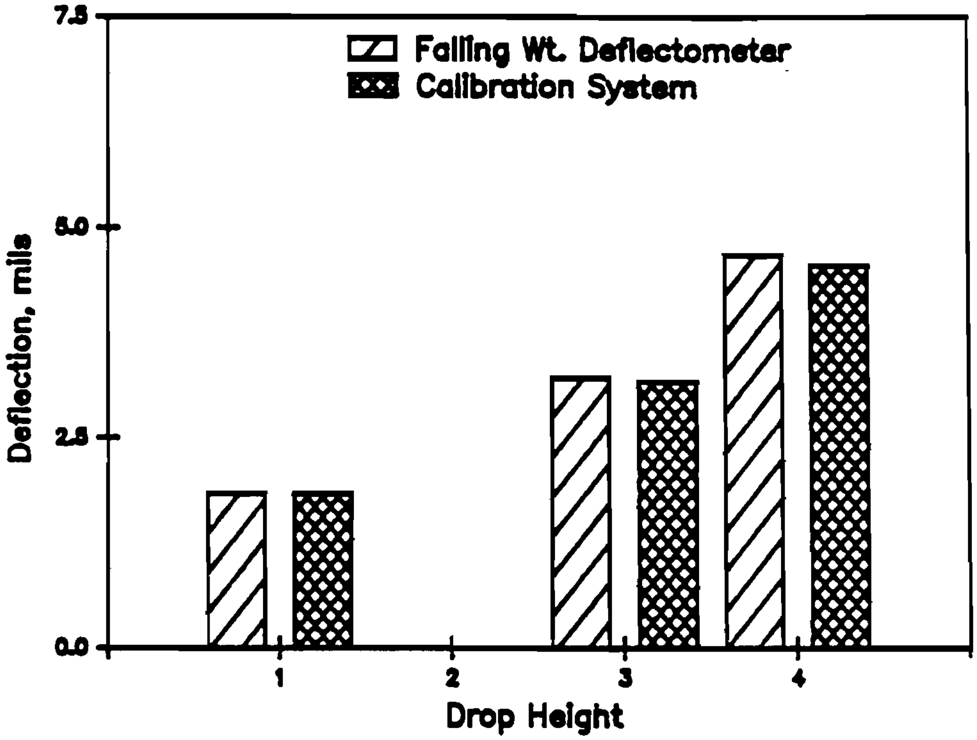
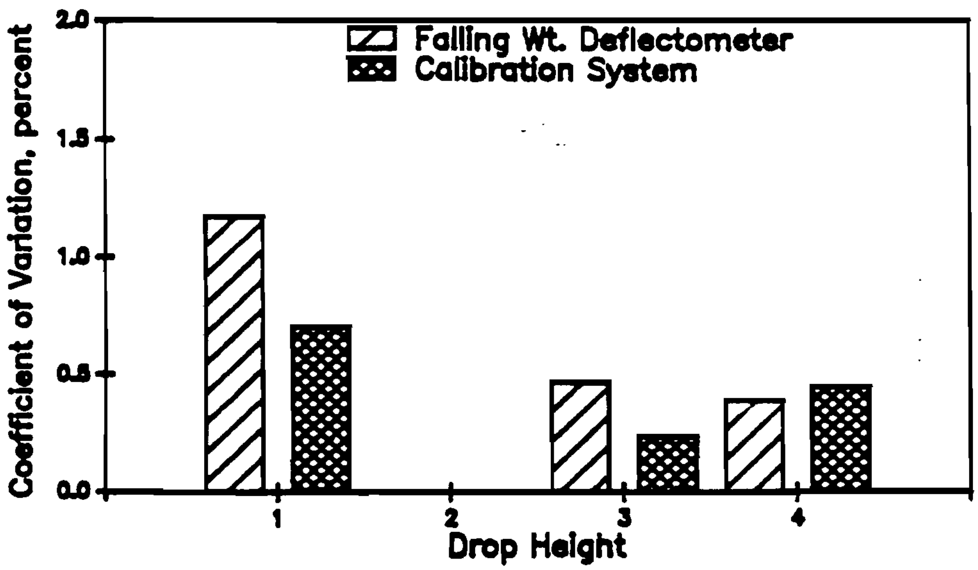


Figure P.19 Average and Coefficient of Variation for Sensor 5 without Rubber Padding



a) Average Deflection



b) Coefficient of Variation

Figure P.20 Average and Coefficient of Variation for Sensor 5 (Wraps) without Rubber Padding

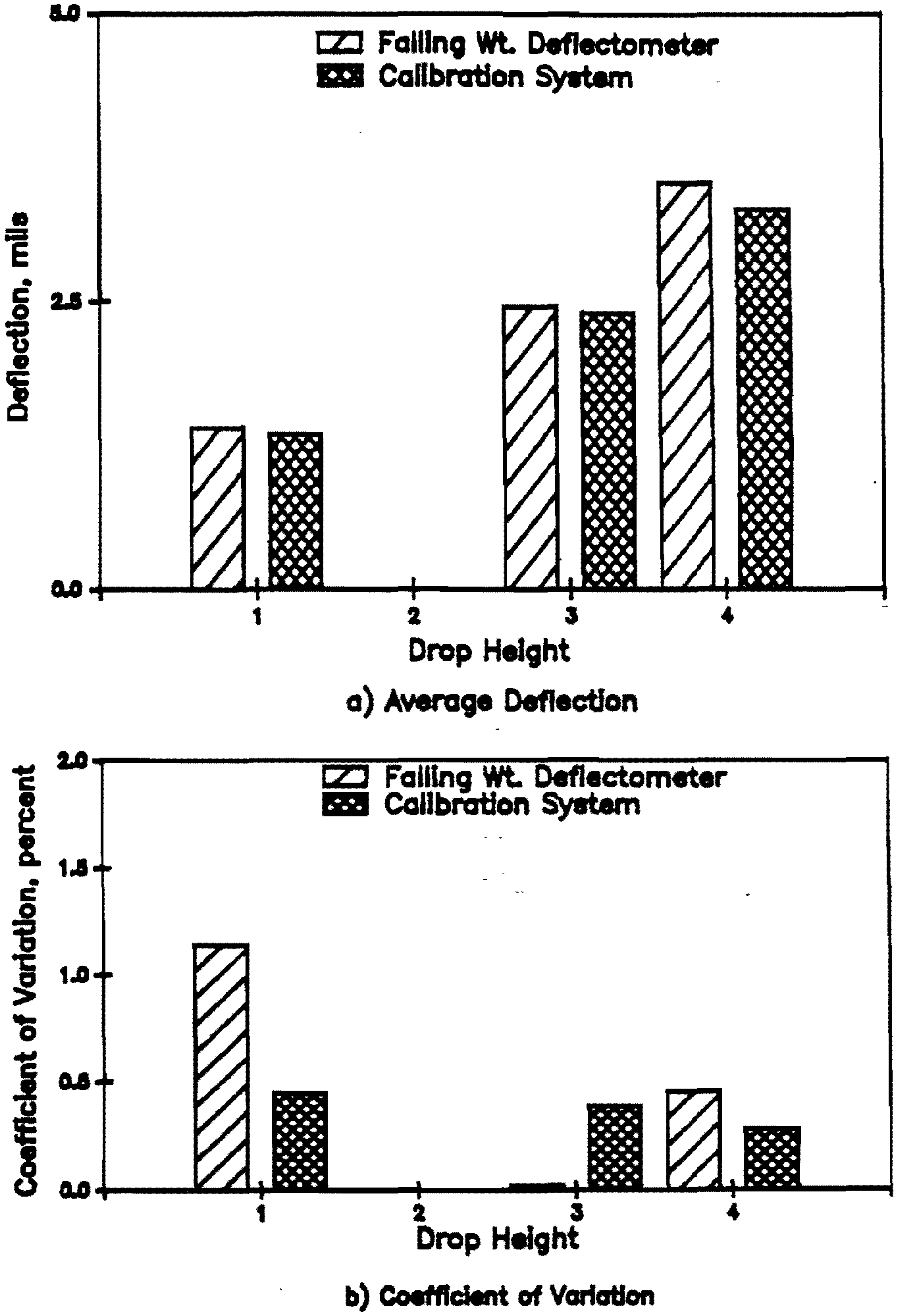
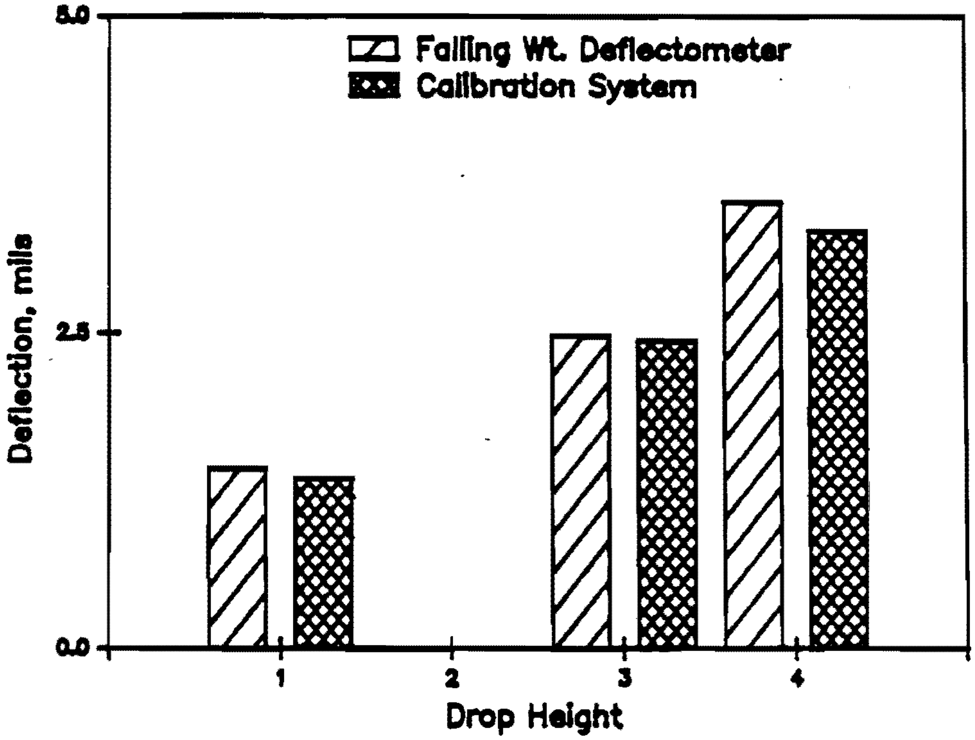
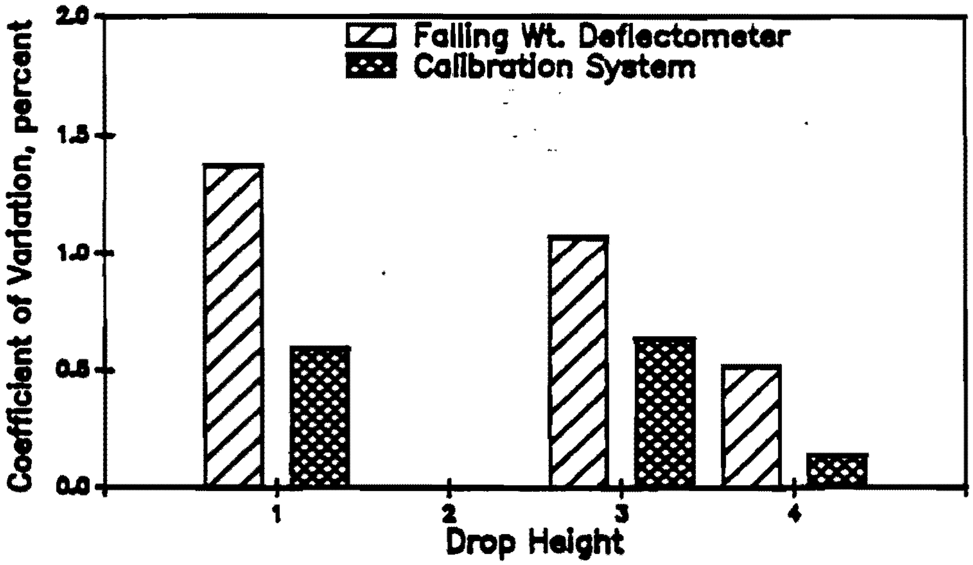


Figure P.21 Average and Coefficient of Variation for Sensor 6 without Rubber Padding

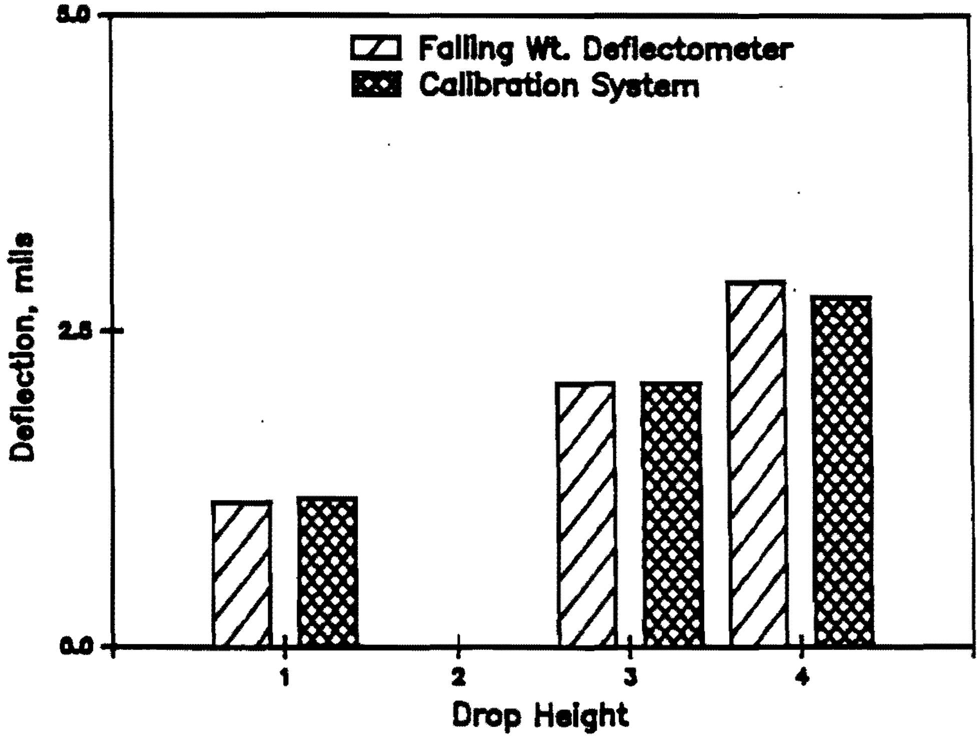


a) Average Deflection

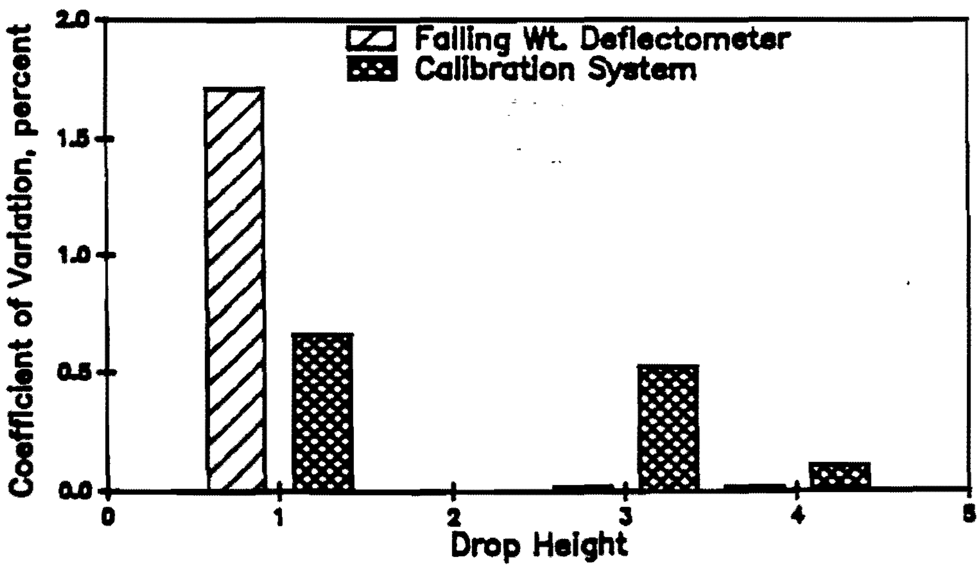


b) Coefficient of Variation

Figure P.22 Average and Coefficient of Variation for Sensor 6 (Wraps) without Rubber Padding



a) Average Deflection



b) Coefficient of Variation

Figure P.23 Average and Coefficient of Variation for Sensor 7 without Rubber Padding

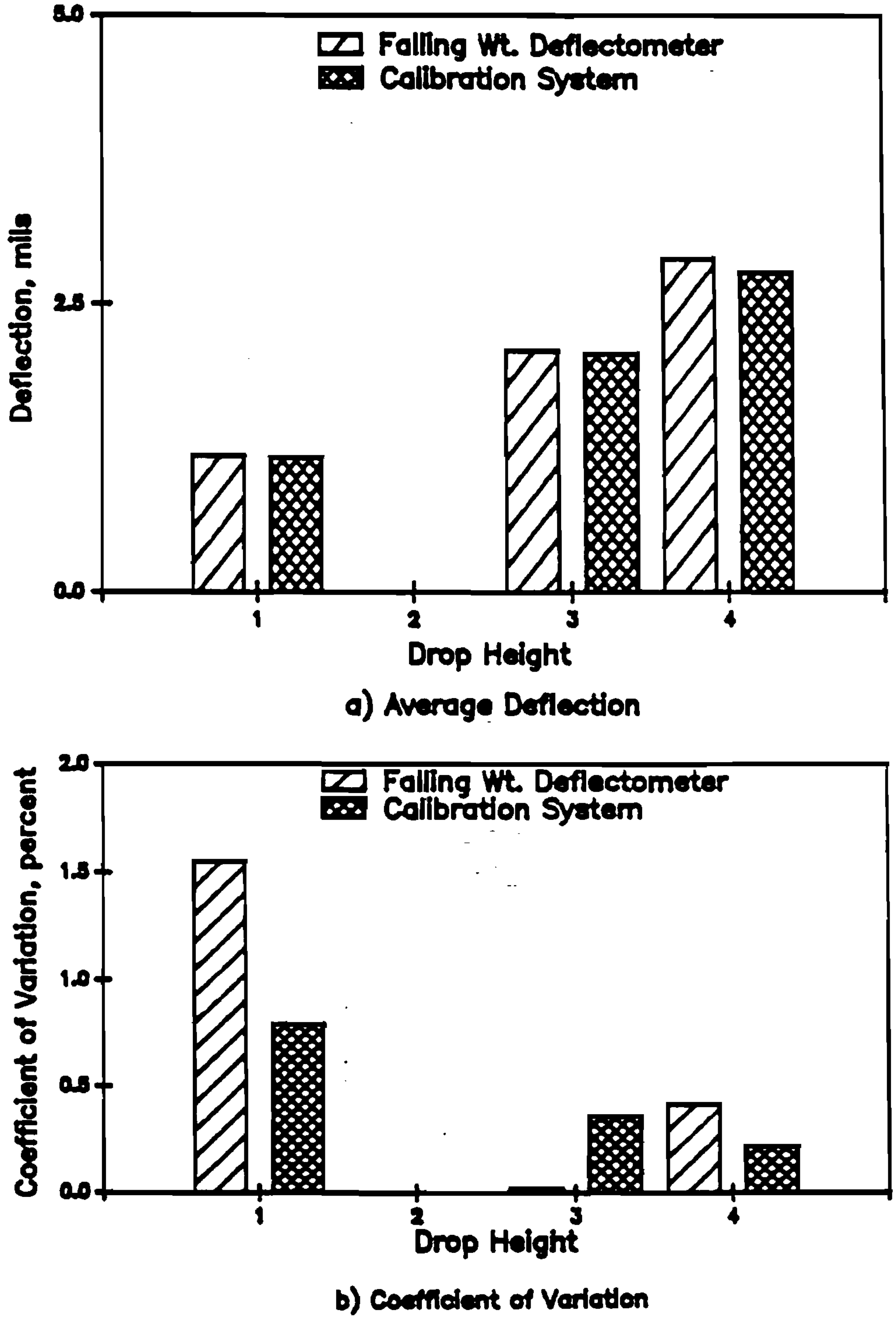


Figure P.24 Average and Coefficient of Variation for Sensor 7 (Wraps) without Rubber Padding