125-
Seismiclock mechanics Calibration Data
Book 1 of 2

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PROJECT No 20-3704-034
-035

SEISMIC ROCK MECHANICS RESERCH PROJECT 8/30/90

TASK 4 - Field Studies of Mine Seismic Events (& TASK 5)

A. Chowdhury - Principal Investigator
Res. Proj. Staff - Simon Hsiung (SwRI-20)
B. W. Vanzant (SwRI-06)
Steve McKinnon (Itasca)
Dan Powerening (SwRI-04)

A. Experimental Objectives (From Seismic/Rock Mechanics Research Project Plan)

2.2.4.2 *Field Studies of Mine Seismic Events*

Seismic events in mines (called rockbursts when they result in excavation damage) are by far the most prolific source of information on the response of underground excavations to seismic loading. There are two distinct modes of mine rockburst. The first mode involves violent failure by crushing and the second mode involves unstable slip on a plane of weakness. It is notable that no systematic differences have been observed between these mine seismic events and natural earthquakes. Thus, most of the physical and geomechanical principles which have been established for natural earthquakes also apply to mine seismic events (McGarr; 1984). This observation is extremely important in that observed underground mine response to mine seismic events may be applied to predicting repository response to natural earthquakes. Since there appears to be little data available on subsurface motion generation from natural earthquakes for the study of rock structural response, study of mine seismic events offers an attractive alternative. The purpose of this study is to investigate mechanical response of underground mine facilities associated with seismic events, to generate a reliable data set for a particular site which has been geologically and mechanically characterized, and to reconcile and validate the computer codes with the data set.

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2.2.4.2.2 *Site Instrumentation and Observation*

Data required to describe the response of jointed rock at the test site include

(a) the deformation of the immediate sub-surface profile of the excavation cross-section;

(b) displacements in the interior of the host rock, at depths up to about the equivalent diameter of the excavation; and

(c) time histories of ground motion in the host rock for all seismic events which the excavation experiences over the time span of rock mass deformation measurements.

The data sets (a) and (b) may be obtained by installing and monitoring an array of multiple-position borehole extensometers at various orientations in the test section. A data acquisition and logging system is required to generate a complete set of rock mass deformation measurements. Data on transient ground motion due to mine seismic events will be obtained from the mine's macro-seismic monitoring system. Thus, the choice of a suitable mine site will be determined by the mine's possession and operation of a suitable full-waveform monitoring system.

Because site specific factors determine instrumentation requirements, detailed specification of instrumentation will be provided when the mine site and underground test locations are defined.

2.2.5 *Task 5 – Groundwater Hydrology Field Studies and Code Validation*

OBJECTIVE

The purposes of conducting field studies of seismic effects on geohydrologic response of jointed and fractured rock are to clarify and quantify the relation between seismically-induced ground motion and changes in groundwater conditions, to generate a reliable data set for a particular site expressing this relation, and to evaluate analytical methods for simulation of the effects of seismic activity on groundwater hydrology.

2.2.5.2 *Equipment Installation and Site Observation*

Rockburst-prone mine sites are well-equipped with mine-wide seismic detection transducers connected to suitable data logging equipment. Therefore, the only major instrumentation required for a seismic/hydrologic field study is an array of piezometers designed to intersect the principal hydraulic features in the host rock mass. Such equipment may be purchased off the shelf. Capped exploration or geophone boreholes may be used for installation of piezometers. The array may be linked to a data logging system to provide for continuous data collection and transmission.

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B. EQUIPMENT & CALIBRATION

1. Deformation of subsurface profiles and displacements of host rocks shall be measured by using Geokon A6G Multiple Position Extensometers w/ hydraulic anchors. These devices provide measurements of relative displacements along the lengths of boreholes at approximately 5' intervals.

Calibration was performed by Walter Smithson, SwRI QA machine shop Inspector, using Do All Gage Block Set SwRI #4482 (Grade A+), Cal 2-22-88, Due 2-22-91. The required accuracy for the calibration of the extensmeters is 0.01 inch. Grade A+ exceeds this 0.01 value by more than 100.

Calibration Technique: With the extensmeter shafts unlocked from the expandable packers, the five (5) extensmeter shafts were locked (rigidly clamped) together at the terminal end and moved to the

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various calibrating positions as a unit. Gage blocks were positioned between a fixed surface on the extensometer housing (terminal cylinder) and the clamping device ~~use~~ used to move the five extensometer shafts in unison. Output was measured at nine (9) points over a range of approximately 1.6 inches. (This arrangement allowed the system to cycle for readings in the same manner as it will cycle when installed at depth in the mine.) The gage block thicknesses were recorded along with the corresponding computer readout for each extensometer within the group. [That is, the 10 extensometers were calibrated one at ~~a~~ a time, with the monitoring system cycling through each of the five extensometers of the unit being calibrated.] The extensometer and data acquisition system were assembled in the same configuration as they will be assembled in the field.

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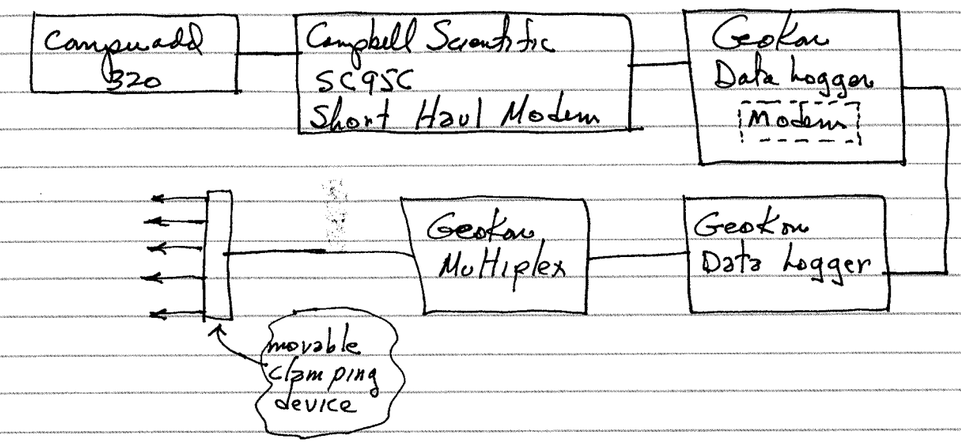
the schematic as used for calibration:



<u>Data Analysis</u>: (Refer to charts on following pages)

Values were subtracted from gage block & extensometer readouts to set an arbitrary reference point at the 2.385 gage block location of the extensometer shafts. These original and shifted data are indicated as "Readout" and "Norm" data columns respectively in the Extensometer Calibration Data Charts.

Regression analyses were performed on the shifted data, which illustrate the highly linear response of the extensometers (R^2 values of 0.997). The Regression analysis values of the y intercept (labeled "constant") and slope (labeled "X-~~#~~coefficient")

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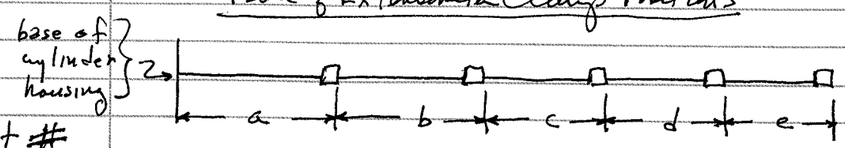
will be used in the data acquisition system, applying a calibration relation slope of $x = \frac{y-b}{m}$ where x = corrected value and y = uncorrected response of the extensometer, m = slope and b = y intercept. Regression analyses were performed using LOTUS 1,2,3 version 2.0.

Table of Extensometer Clamp Positions



Ext #	a	b	c	d	e
A	45½	61	60	59¾	59¾
B	48¾	59½	60¾	60	59½
C	48¾	60¼	60	60	59¼
D	48¾	60¼	59¼	61¼	58½
E	48¾	60½	59¼	60	59¾
F	48½	60¼	59	59½	60
G	48½	60	59¾	60	60½
H	48½	60¼	60½	59	59½
I	48¾	60½	60¾	58¾	60
J	48½	60	60	60	60½

all dimensions in inches

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Extensometer Calibration Data Chart
For MPBX No. A

Block Gage Length

Nominal Gage Length

Gage Block Readout	Norm	Pos#1 Readout	Norm	Pos#2 Readout	Norm	Pos#3 Readout	Norm	Pos#4 Readout	Norm	Pos#5 Readout	Norm
2.385	0	0.159	0	0.19	0	0.162	0	0.15	0	0.165	0
2	0.385	0.538	0.379	0.569	0.379	0.546	0.384	0.538	0.388	0.549	0.384
1.6	0.785	0.925	0.766	0.96	0.77	0.934	0.772	0.929	0.779	0.941	0.776
1.2	1.185	1.31	1.151	1.35	1.16	1.32	1.158	1.32	1.17	1.33	1.165
0.8	1.585	1.7	1.541	1.74	1.55	1.72	1.558	1.71	1.56	1.72	1.555
1	1.385	1.51	1.351	1.55	1.36	1.52	1.358	1.52	1.37	1.53	1.365
1.4	0.985	1.12	0.961	1.16	0.97	1.14	0.978	1.13	0.98	1.14	0.975
1.8	0.585	0.728	0.569	0.76	0.57	0.735	0.573	0.733	0.583	0.743	0.578
2.2	0.185	0.342	0.183	0.37	0.18	0.344	0.182	0.336	0.186	0.349	0.184
2.385	0	0.157	-0.002	0.195	0.005	0.171	0.009	0.162	0.012	0.171	0.006

** All units are in inches.

Pos 1

Regression Output:

Constant	0.002259
Std Err of Y Est	0.002307
R Squared	0.999983
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.971845
Std Err of Coef.	0.001497

b = Constant

m = X Coefficient(s)

Pos 2

Regression Output:

Constant	0.000014
Std Err of Y Est	0.002875
R Squared	0.999974
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.980066
Std Err of Coef.	0.001865

Pos 3

Regression Output:

Constant	0.001965
Std Err of Y Est	0.005042
R Squared	0.999922
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.980975
Std Err of Coef.	0.003271

Pos 4

Regression Output:

Constant	0.005235
Std Err of Y Est	0.003956
R Squared	0.999952
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.984305
Std Err of Coef.	0.002566

Pos 5

Regression Output:

Constant	0.003491
Std Err of Y Est	0.003181
R Squared	0.999969
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.981720
Std Err of Coef.	0.002064

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Extensometer Calibration Data Chart
For MPBX No. B

Gage Block Readout	Gage Block Norm	Pos#1 Readout	Pos#1 Norm	Pos#2 Readout	Pos#2 Norm	Pos#3 Readout	Pos#3 Norm	Pos#4 Readout	Pos#4 Norm	Pos Readout
2.385	0	0.189	0	0.181	0	0.171	0	0.116	0	0.101
2	0.385	0.557	0.368	0.565	0.384	0.535	0.364	0.491	0.375	0.476
1.6	0.785	0.943	0.754	0.95	0.769	0.912	0.741	0.875	0.759	0.861
1.2	1.185	1.347	1.158	1.35	1.169	1.306	1.135	1.26	1.144	1.25
0.8	1.585	1.727	1.538	1.74	1.559	1.686	1.515	1.66	1.544	1.64
1	1.385	1.534	1.345	1.54	1.359	1.478	1.307	1.46	1.344	1.44
1.4	0.985	1.14	0.951	1.16	0.979	1.078	0.907	1.08	0.964	1.06
1.8	0.585	0.766	0.577	0.773	0.592	0.717	0.546	0.689	0.573	0.674
2.2	0.185	0.378	0.189	0.374	0.193	0.326	0.155	0.286	0.17	0.276
2.385	0	0.212	0.023	0.197	0.016	0.166	-0.005	0.111	-0.005	0.099

** All units are in inches.

Regression output for Pos#1:

Constant	0.001901
Std Err of Y Est	0.007021
R Squared	0.999845
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.969334
Std Err of Coef.	0.004554

Regression Output for Pos#2

Constant	0.008000
Std Err of Y Est	0.006905
R Squared	0.999853
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.979095
Std Err of Coef.	0.004479

Regression Output for Pos#3

Constant	-0.00449
Std Err of Y Est	0.005183
R Squared	0.999916
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.975070
Std Err of Coef.	0.003362

Regression Output for Pos#4

Constant	-0.00238
Std Err of Y Est	0.005818
R Squared	0.999894
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.973800
Std Err of Coef.	0.003774

Regression Output for Pos#5

Constant	0.000143
Std Err of Y Est	0.003583
R Squared	0.999959
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.970015
Std Err of Coef.	0.002324

Witnessed Carolyn A. Brust

D.W. Wright

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Extensometer Calibration Data Chart
For MPBX No. C

Gage Block Readout	Gage Block Norm	Pos#1 Readout	Pos#1 Norm	Pos#2 Readout	Pos#2 Norm	Pos#3 Readout	Pos#3 Norm	Pos#4 Readout	Pos#4 Norm	Pos#5 Readout	Pos#5 Norm
2.385	0	0.193	0	0.198	0	0.195	0	0.154	0	0.167	0
2	0.385	0.559	0.366	0.563	0.365	0.558	0.363	0.516	0.362	0.532	0.365
1.6	0.785	0.964	0.771	0.969	0.771	0.963	0.768	0.921	0.767	0.938	0.771
1.2	1.185	1.35	1.157	1.35	1.152	1.34	1.145	1.3	1.146	1.32	1.153
0.8	1.585	1.74	1.547	1.75	1.552	1.74	1.545	1.7	1.546	1.72	1.553
1	1.385	1.55	1.357	1.55	1.352	1.54	1.345	1.5	1.346	1.52	1.353
1.4	0.985	1.16	0.967	1.16	0.962	1.15	0.955	1.11	0.956	1.13	0.963
1.8	0.585	0.764	0.571	0.767	0.569	0.762	0.567	0.721	0.567	0.737	0.57
2.2	0.185	0.371	0.178	0.375	0.177	0.37	0.175	0.328	0.174	0.345	0.178
2.385	0	0.19	-0.003	0.194	-0.004	0.188	-0.007	0.149	-0.005	0.165	-0.002

** All units are in inches.

Regression output for Pos#1:

Constant	-0.00284
Std Err of Y Est	0.004499
R Squared	0.999937
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.980168
Std Err of Coef.	0.002918

Regression Output for Pos#2

Constant	-0.00420
Std Err of Y Est	0.004697
R Squared	0.999932
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.979925
Std Err of Coef.	0.003047

Regression Output for Pos#3

Constant	-0.00449
Std Err of Y Est	0.005183
R Squared	0.999916
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.975070
Std Err of Coef.	0.003362

Regression Output for Pos#4

Constant	-0.00538
Std Err of Y Est	0.005167
R Squared	0.999917
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.976331
Std Err of Coef.	0.003352

Regression Output for Pos#5

Constant	-0.00393
Std Err of Y Est	0.004654
R Squared	0.999933
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.980426
Std Err of Coef.	0.003019

Witnessed Carolyn A. Brust

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Extensometer Calibration Data Chart
For MPBX No. D

Gage Block		Pos#1		Pos#2		Pos#3		Pos#4		Pos#5	
Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm
2.385	0	0.184	0	0.202	0	0.181	0	0.188	0	0.195	0
2	0.385	0.56	0.376	0.58	0.378	0.558	0.377	0.565	0.377	0.572	0.377
1.6	0.785	0.96	0.776	0.982	0.78	0.962	0.781	0.969	0.781	0.972	0.777
1.2	1.185	1.35	1.166	1.37	1.168	1.35	1.169	1.36	1.172	1.36	1.165
0.8	1.585	1.74	1.556	1.75	1.548	1.73	1.549	1.74	1.552	1.75	1.555
1	1.385	1.54	1.356	1.56	1.358	1.54	1.359	1.55	1.362	1.55	1.355
1.4	0.985	1.15	0.966	1.17	0.968	1.14	0.959	1.15	0.962	1.16	0.965
1.8	0.585	0.76	0.576	0.78	0.578	0.757	0.576	0.763	0.575	0.771	0.576
2.2	0.185	0.363	0.179	0.383	0.181	0.361	0.18	0.365	0.177	0.373	0.178
2.385	0	0.179	-0.005	0.199	-0.003	0.176	-0.005	0.179	-0.009	0.189	-0.006

** All units are in inches.

Regression output for Pos#1:

Constant	-0.00016
Std Err of Y Est	0.003014
R Squared	0.999972
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.981994
Std Err of Coef.	0.001955

Regression Output for Pos#2

Constant	0.002843
Std Err of Y Est	0.004922
R Squared	0.999925
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.979295
Std Err of Coef.	0.003193

Regression Output for Pos#3

Constant	0.001374
Std Err of Y Est	0.005992
R Squared	0.999889
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.979890
Std Err of Coef.	0.003887

Regression Output for Pos#4

Constant	-0.00038
Std Err of Y Est	0.005851
R Squared	0.999895
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.983251
Std Err of Coef.	0.003796

Regression Output for Pos#5

Constant	0.000092
Std Err of Y Est	0.003497
R Squared	0.999962
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.981238
Std Err of Coef.	0.002268

Witnessed [illegible]

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Extensometer Calibration Data Chart
For MPBX No. E

Gage Block		Pos#1		Pos#2		Pos#3		Pos#4		Pos#5	
Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm
2.385	0	0.23	0	0.275	0	0.176	0	0.141	0	0.202	0
2	0.385	0.618	0.388	0.668	0.393	0.567	0.391	0.552	0.411	0.59	0.388
1.6	0.785	1.01	0.78	1.06	0.785	0.962	0.786	0.946	0.805	0.982	0.78
1.2	1.185	1.4	1.17	1.46	1.185	1.36	1.184	1.34	1.199	1.37	1.168
0.8	1.585	1.8	1.57	1.85	1.575	1.75	1.574	1.73	1.589	1.77	1.568
1	1.385	1.59	1.36	1.65	1.375	1.55	1.374	1.52	1.379	1.56	1.358
1.4	0.985	1.2	0.97	1.26	0.985	1.15	0.974	1.13	0.989	1.17	0.968
1.8	0.585	0.811	0.581	0.865	0.59	0.757	0.581	0.739	0.598	0.777	0.575
2.2	0.185	0.416	0.186	0.465	0.19	0.362	0.186	0.328	0.187	0.382	0.18
2.385	0	0.238	0.008	0.285	0.01	0.185	0.009	0.154	0.013	0.208	0.006

** All units are in inches.

Regression output for Pos#1:

Constant	0.003874
Std Err of Y Est	0.004686
R Squared	0.999933
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.984481
Std Err of Coef.	0.003040

Regression Output for Pos#2

Constant	0.006795
Std Err of Y Est	0.004216
R Squared	0.999946
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.991079
Std Err of Coef.	0.002735

Regression Output for Pos#3

Constant	0.003337
Std Err of Y Est	0.004584
R Squared	0.999937
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.991520
Std Err of Coef.	0.002974

Regression Output for Pos#4

Constant	0.011312
Std Err of Y Est	0.010856
R Squared	0.999650
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.996495
Std Err of Coef.	0.007042

Regression Output for Pos#5

Constant	0.001376
Std Err of Y Est	0.005418
R Squared	0.999910
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.984832
Std Err of Coef.	0.003515

Witnessed [illegible]

[illegible]

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Extensometer Calibration Data Chart
For MPBX No. F

Gage Block Readout	Gage Block Norm	Pos#1 Readout	Pos#1 Norm	Pos#2 Readout	Pos#2 Norm	Pos#3 Readout	Pos#3 Norm	Pos#4 Readout	Pos#4 Norm	Pos#5 Readout	Pos#5 Norm
2.385	0	0.168	0	0.199	0	0.158	0	0.142	0	0.173	0
2	0.385	0.552	0.384	0.582	0.383	0.541	0.383	0.536	0.394	0.561	0.388
1.6	0.785	0.944	0.776	0.975	0.776	0.931	0.773	0.924	0.782	0.951	0.778
1.2	1.185	1.33	1.162	1.36	1.161	1.31	1.152	1.3	1.158	1.33	1.157
0.8	1.585	1.72	1.552	1.75	1.551	1.7	1.542	1.69	1.548	1.72	1.547
1	1.385	1.52	1.352	1.56	1.361	1.5	1.342	1.49	1.348	1.52	1.347
1.4	0.985	1.13	0.962	1.16	0.961	1.11	0.952	1.1	0.958	1.13	0.957
1.8	0.585	0.742	0.574	0.772	0.573	0.723	0.565	0.712	0.57	0.742	0.569
2.2	0.185	0.342	0.174	0.373	0.174	0.321	0.163	0.303	0.161	0.337	0.164
2.385	0	0.164	-0.004	0.19	-0.009	0.142	-0.016	0.124	-0.018	0.163	-0.01

** All units are in inches.

Regression output for Pos#1:

Constant	0.000738
Std Err of Y Est	0.005073
R Squared	0.999920
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.978722
Std Err of Coef.	0.003291

Regression Output for Pos#2

Constant	-0.00033
Std Err of Y Est	0.004884
R Squared	0.999926
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.980655
Std Err of Coef.	0.003168

Regression Output for Pos#3

Constant	-0.00270
Std Err of Y Est	0.008461
R Squared	0.999777
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.974053
Std Err of Coef.	0.005489

Regression Output for Pos#4

Constant	-0.00003
Std Err of Y Est	0.011849
R Squared	0.999567
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.977303
Std Err of Coef.	0.007686

Regression Output for Pos#5

Constant	-0.00097
Std Err of Y Est	0.009314
R Squared	0.999732
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.976806
Std Err of Coef.	0.006042

Witnessed Cawwa QA RBriet

DWright

9/4/90

Extensometer Calibration Data Chart
For MPBX No. G

Gage Block Readout	Gage Block Norm	Pos#1 Readout	Pos#1 Norm	Pos#2 Readout	Pos#2 Norm	Pos#3 Readout	Pos#3 Norm	Pos#4 Readout	Pos#4 Norm	Pos#5 Readout	Pos#5 Norm
2.385	0	0.239	0	0.247	0	0.231	0	0.227	0	0.265	0
2	0.385	0.623	0.384	0.631	0.384	0.613	0.382	0.607	0.38	0.647	0.382
1.6	0.785	1.02	0.781	1.03	0.783	1.01	0.779	1	0.773	1.04	0.775
1.2	1.185	1.41	1.171	1.42	1.173	1.39	1.159	1.38	1.153	1.43	1.165
0.8	1.585	1.8	1.561	1.81	1.563	1.78	1.549	1.78	1.553	1.83	1.565
1	1.385	1.61	1.371	1.62	1.373	1.59	1.359	1.59	1.363	1.63	1.365
1.4	0.985	1.21	0.971	1.22	0.973	1.19	0.959	1.18	0.953	1.22	0.955
1.8	0.585	0.819	0.58	0.828	0.581	0.8	0.569	0.791	0.564	0.837	0.572
2.2	0.185	0.422	0.183	0.43	0.183	0.404	0.173	0.396	0.169	0.441	0.176
2.385	0	0.241	0.002	0.249	0.002	0.224	-0.007	0.216	-0.011	0.259	-0.006

** All units are in inches.

Regression output for Pos#1:

Constant	0.002347
Std Err of Y Est	0.003120
R Squared	0.999970
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.985998
Std Err of Coef.	0.002024

Regression Output for Pos#2

Constant	0.002317
Std Err of Y Est	0.003300
R Squared	0.999967
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.987590
Std Err of Coef.	0.002141

Regression Output for Pos#3

Constant	-0.00083
Std Err of Y Est	0.006093
R Squared	0.999886
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.979737
Std Err of Coef.	0.003953

Regression Output for Pos#4

Constant	-0.00523
Std Err of Y Est	0.007517
R Squared	0.999827
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.982361
Std Err of Coef.	0.004876

Regression Output for Pos#5

Constant	-0.00309
Std Err of Y Est	0.006277
R Squared	0.999880
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.986284
Std Err of Coef.	0.004072

Witnessed Cawwa QA RBriet

DWright

9/4/90

Extensometer Calibration Data Chart
For MPBX No. H

Gage Block Readout	Gage Block Norm	Pos#1 Readout	Pos#1 Norm	Pos#2 Readout	Pos#2 Norm	Pos#3 Readout	Pos#3 Norm	Pos#4 Readout	Pos#4 Norm	Pos#5 Readout	Pos#5 Norm
2.385	0	0.138	0	0.194	0	0.192	0	0.116	0	0.116	0
2	0.385	0.521	0.383	0.576	0.382	0.571	0.379	0.495	0.379	0.495	0.379
1.6	0.785	0.908	0.77	0.97	0.776	0.968	0.776	0.887	0.771	0.886	0.77
1.2	1.185	1.29	1.152	1.36	1.166	1.36	1.168	1.27	1.154	1.27	1.154
0.8	1.585	1.68	1.542	1.76	1.566	1.76	1.568	1.66	1.544	1.66	1.544
1	1.385	1.49	1.352	1.56	1.366	1.56	1.368	1.47	1.354	1.47	1.354
1.4	0.985	1.1	0.962	1.16	0.966	1.16	0.968	1.08	0.964	1.08	0.964
1.8	0.585	0.714	0.576	0.77	0.576	0.767	0.575	0.687	0.571	0.689	0.573
2.2	0.185	0.318	0.18	0.378	0.184	0.369	0.177	0.294	0.178	0.297	0.181
2.385	0	0.138	0	0.193	-0.001	0.188	-0.004	0.116	0	0.116	0

** All units are in inches.

Regression output for Pos#1:

Constant	0.003781
Std Err of Y Est	0.003752
R Squared	0.999956
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.972170
Std Err of Coef.	0.002434

Regression Output for Pos#2

Constant	0.000445
Std Err of Y Est	0.002818
R Squared	0.999975
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.985591
Std Err of Coef.	0.001828

Regression Output for Pos#3

Constant	-0.00306
Std Err of Y Est	0.002624
R Squared	0.999979
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.989634
Std Err of Coef.	0.001702

Regression Output for Pos#4

Constant	0.000975
Std Err of Y Est	0.003032
R Squared	0.999971
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.975454
Std Err of Coef.	0.001967

Regression Output for Pos#5

Constant	0.002150
Std Err of Y Est	0.002475
R Squared	0.999980
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.974525
Std Err of Coef.	0.001605

Witnessed [illegible]

[illegible]

9/4/90

Extensometer Calibration Data Chart
For MPBX No. I

Gage Block Readout	Gage Block Norm	Pos#1 Readout	Pos#1 Norm	Pos#2 Readout	Pos#2 Norm	Pos#3 Readout	Pos#3 Norm	Pos#4 Readout	Pos#4 Norm	Pos#5 Readout	Pos#5 Norm
2.385	0	0.195	0	0.177	0	0.175	0	0.18	0	0.205	0
2	0.385	0.575	0.38	0.556	0.379	0.551	0.376	0.556	0.376	0.583	0.378
1.6	0.785	0.97	0.775	0.95	0.773	0.945	0.77	0.951	0.771	0.975	0.77
1.2	1.185	1.36	1.165	1.35	1.173	1.34	1.165	1.35	1.17	1.37	1.165
0.8	1.585	1.75	1.555	1.73	1.553	1.73	1.555	1.74	1.56	1.76	1.555
1	1.385	1.56	1.365	1.54	1.363	1.54	1.365	1.55	1.37	1.57	1.365
1.4	0.985	1.16	0.965	1.14	0.963	1.14	0.965	1.15	0.97	1.17	0.965
1.8	0.585	0.773	0.578	0.75	0.573	0.748	0.573	0.757	0.577	0.783	0.578
2.2	0.185	0.376	0.181	0.354	0.177	0.354	0.179	0.364	0.184	0.39	0.185
2.385	0	0.2	0.005	0.183	0.006	0.185	0.01	0.195	0.015	0.217	0.012

** All units are in inches.

Regression output for Pos#1:

Constant	0.001017
Std Err of Y Est	0.002733
R Squared	0.999977
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.982321
Std Err of Coef.	0.001773

Regression Output for Pos#2

Constant	-0.00135
Std Err of Y Est	0.004570
R Squared	0.999936
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.983928
Std Err of Coef.	0.002964

Regression Output for Pos#3

Constant	-0.00202
Std Err of Y Est	0.002284
R Squared	0.999984
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.983932
Std Err of Coef.	0.001482

Regression Output for Pos#4

Constant	-0.00072
Std Err of Y Est	0.002783
R Squared	0.999976
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.986520
Std Err of Coef.	0.001805

Regression Output for Pos#5

Constant	0.001212
Std Err of Y Est	0.002659
R Squared	0.999978
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.981650
Std Err of Coef.	0.001724

Witnessed [illegible]

[illegible]

9/4/90

Extensometer Calibration Data Chart
For MPBX No. J

Gage Block		Pos#1		Pos#2		Pos#3		Pos#4		Pos#5	
Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm	Readout	Norm
2.385	0	0.21	0	0.185	0	0.183	0	0.172	0	0.192	0
2	0.385	0.589	0.379	0.562	0.377	0.561	0.378	0.549	0.377	0.569	0.377
1.6	0.785	0.985	0.775	0.957	0.772	0.959	0.776	0.943	0.771	0.963	0.771
1.2	1.185	1.37	1.16	1.34	1.155	1.34	1.157	1.33	1.158	1.35	1.158
0.8	1.585	1.76	1.55	1.73	1.545	1.74	1.557	1.72	1.548	1.74	1.548
1	1.385	1.57	1.36	1.54	1.355	1.54	1.357	1.53	1.358	1.55	1.358
1.4	0.985	1.18	0.97	1.15	0.965	1.15	0.967	1.14	0.968	1.16	0.968
1.8	0.585	0.796	0.586	0.768	0.583	0.77	0.587	0.753	0.581	0.773	0.581
2.2	0.185	0.389	0.179	0.362	0.177	0.361	0.178	0.349	0.177	0.37	0.178
2.385	0	0.21	0	0.185	0	0.181	-0.002	0.171	-0.001	0.191	-0.001

** All units are in inches.

Regression output for Pos#1:

Constant	0.003108
Std Err of Y Est	0.005267
R Squared	0.999914
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.978958
Std Err of Coef.	0.003416

Regression Output for Pos#2

Constant	0.002208
Std Err of Y Est	0.005119
R Squared	0.999918
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.975865
Std Err of Coef.	0.003321

Regression Output for Pos#3

Constant	0.001957
Std Err of Y Est	0.005863
R Squared	0.999894
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.980138
Std Err of Coef.	0.003803

Regression Output for Pos#4

Constant	0.001094
Std Err of Y Est	0.004183
R Squared	0.999946
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.978552
Std Err of Coef.	0.002714

Regression Output for Pos#5

Constant	0.001404
Std Err of Y Est	0.004017
R Squared	0.999950
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.978299
Std Err of Coef.	0.002606

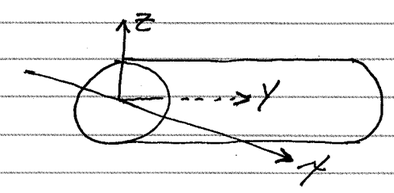
Witnessed Cnwrkgr Board

D W Wright

9/5/90

Calibration of Electrolab 1130GS Velocity Transducers.

Electrolab 1130GS (Model) Velocity Xducers S/N's 127 & 128 were calibrated (in the system schematically shown on p 18) as matched pairs of Transducers and amplifiers. The Transducers were mounted on the shaker table such that the z-axis was vertical and in the direction of vibration for the initial cal run. Directions on the Transducers were denoted as



z = vertical
y = along axis of transducer
x = direction transverse to x-y plane

For the schematic on page 18 the Zonic channels are

Direction	Zonic Channel (volts response)
x	12
y	13
z	14

(The Zonic is a signal processor)

The transducers were vibrated in each principal direction and cross talk in the other two directions was monitored along with response in the principal direction, ~~as well as~~ ~~trans~~

Witnessed Cnwrkgr Board

D W Wright

9/5/90

Results of the tests are presented in tabular form on the following page for 400 data points. Amplitude [F1(N)] and Phase [F2(N)] as determined from transfer functions $\left(\frac{\text{output}}{\text{input}}\right)$ are tabulated against frequencies. A summary of test criteria and results precedes each table. These data are to be used by the U.S. Bureau of Mines to design and assemble an inverse filter so that the velocity may be read directly from computer displays and print outs during field monitoring.

Transducer #128 did not function properly on original tests. It was sent for repair, returned and re-calibrated successfully. The following page contains only results for response in the direction of vibration. Results for cross-talk are maintained by the Element Manager.

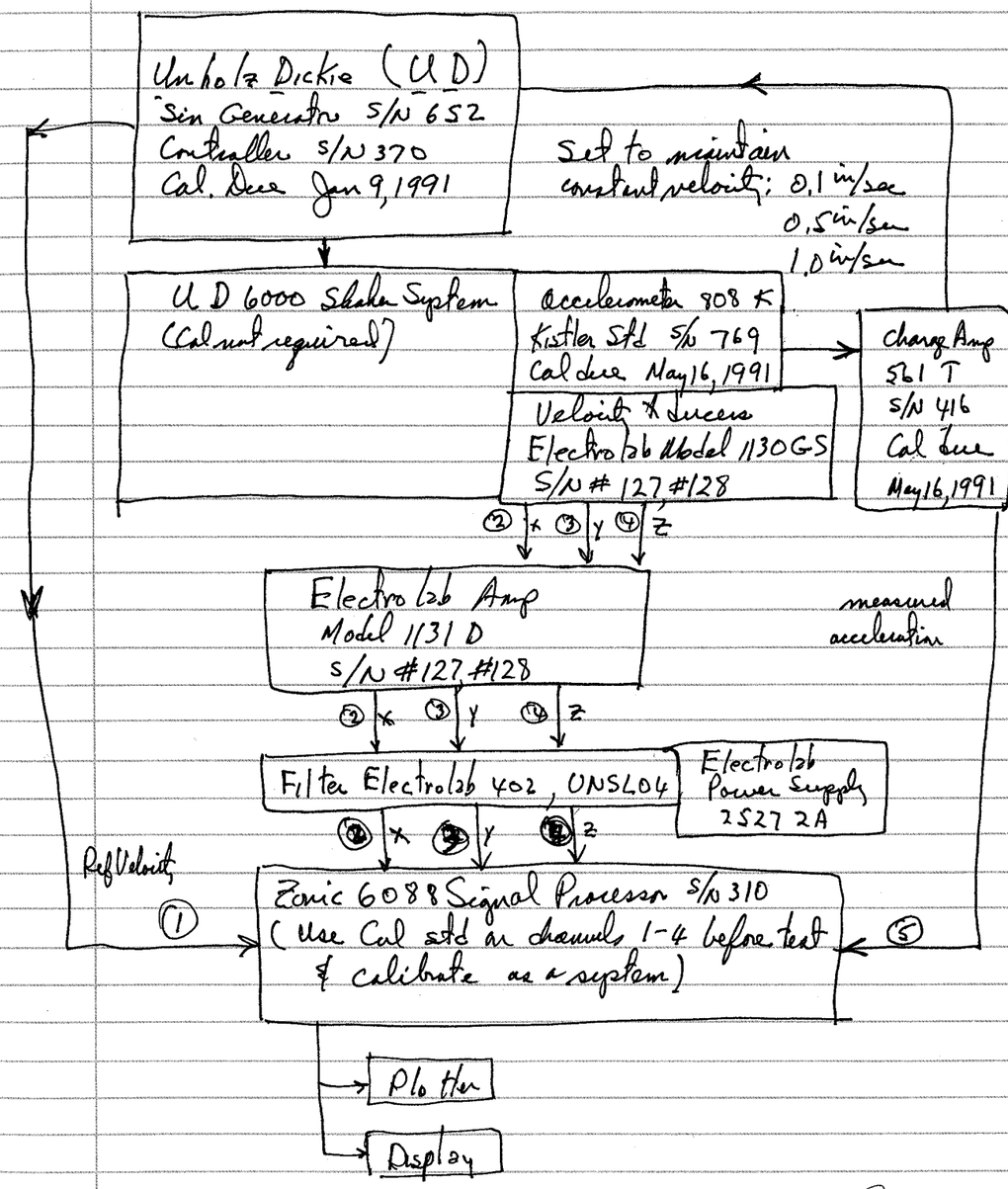
"Drive" represents direction of excitation on following pages.

Witnessed CWWRQA R Brick

D M Wright

9/5/90

Schematic of System for Calibrating Electrolab Triaxial Velocity Xducers.



D M Wright

Witnessed CWWRQA R Brick

#127

9/6/90

INITIAL TEST SERIES

SWEEP 2 to 600 Hz — 2 to 100 Hz
15 minutes — 15 minutes
1.0 in/sec input — 1.0 in/sec input

@ 2.0 Hz
VEL = 1.0 in/sec
DISP = 0.16 in peak to peak
ACCEL = 0.032 g's

@ 100.0 Hz
VEL = 1.0 in/sec
DISP = 0.0032 inches peak to peak
ACCEL = 1.62 g's

@ 600.0 Hz
VEL = 1.0 in/sec
DISP = 5.30×10^{-4} inches peak to peak
ACCEL = 9.74 g's

TEST SN 127 & SN 128

ZONIC CHANNEL

X - INPUT
Y - INPUT
Z - INPUT

1 CONSTANT AMP SINE WAVE ⇒ VELOCITY IN
2 X-AXIS VOLTAGE OF TRANSDUCER
3 Y-AXIS VOLTAGE OF TRANSDUCER
4 Z-AXIS VOLTAGE OF TRANSDUCER
5 ACCELERATION INPUT (STANDARD ACCEL)

SN 127
X-AXIS ACCEPTABLE
Y-AXIS ACCEPTABLE
Z-AXIS ACCEPTABLE

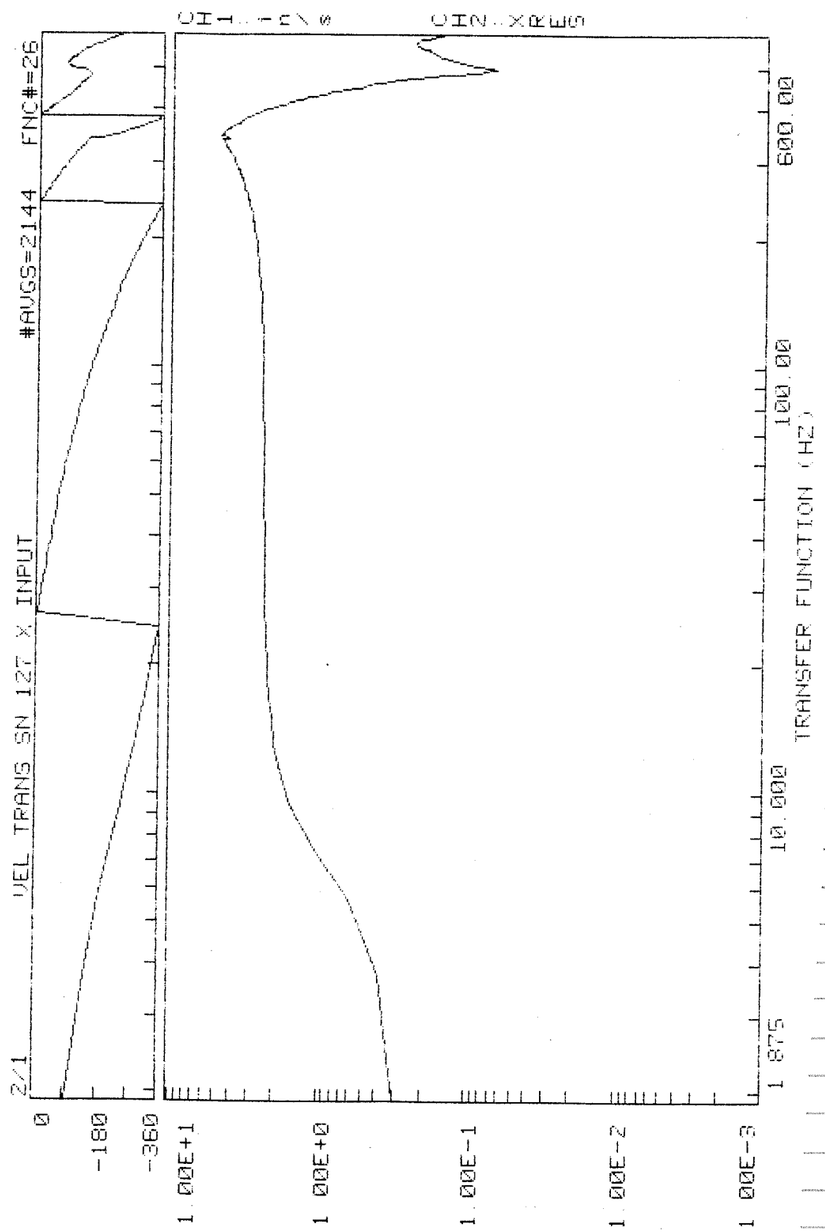
SN 128
X-AXIS ACCEPTABLE
Y-AXIS PROBLEMS — Returned for repair
Z-AXIS ACCEPTABLE

Witnessed Quality Control

Sine wave relationship

Freq Hz	Disp Inches	Vel In/sec	Accel g's
2	1.592E-02	0.10	3.260E-03
10	3.183E-03	0.10	1.630E-02
20	1.592E-03	0.10	3.260E-02
50	6.366E-04	0.10	8.150E-02
60	5.305E-04	0.10	9.780E-02
100	3.183E-04	0.10	1.630E-01
200	1.592E-04	0.10	3.260E-01
500	6.366E-05	0.10	8.150E-01
2	7.958E-02	0.50	1.630E-02
10	1.592E-02	0.50	8.150E-02
20	7.958E-03	0.50	1.630E-01
50	3.183E-03	0.50	4.075E-01
60	2.653E-03	0.50	4.890E-01
100	1.592E-03	0.50	8.150E-01
2	1.592E-01	1.00	3.260E-02
10	3.183E-02	1.00	1.630E-01
20	1.592E-02	1.00	3.260E-01
50	6.366E-03	1.00	8.150E-01
60	5.305E-03	1.00	9.780E-01
100	3.183E-03	1.00	1.630E+00
200	1.592E-03	1.00	3.260E+00
500	6.366E-04	1.00	8.150E+00
600	5.305E-04	1.00	9.780E+00

#127, x drive, X response 9/6/90



9/6/90

#127 Vibrate in X-direction; X-response values

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
1	1.875	3.04E-1	-9.05E+1
2	3.750	3.83E-1	-1.45E+2
3	5.625	6.02E-1	-1.84E+2
4	7.500	1.08E+0	-2.18E+2
5	9.375	1.52E+0	-2.48E+2
6	11.250	1.80E+0	-2.72E+2
7	13.125	1.97E+0	-2.91E+2
8	15.000	2.08E+0	-3.06E+2
9	16.875	2.15E+0	-3.18E+2
10	18.750	2.20E+0	-3.29E+2
11	20.625	2.24E+0	-3.38E+2
12	22.500	2.26E+0	-3.47E+2
13	24.375	2.28E+0	-3.55E+2
14	26.250	2.30E+0	-2.31E+0
15	28.125	2.31E+0	-8.32E+0
16	30.000	2.32E+0	-1.36E+1
17	31.875	2.33E+0	-1.87E+1
18	33.750	2.34E+0	-2.40E+1
19	35.625	2.34E+0	-2.94E+1
20	37.500	2.35E+0	-3.46E+1
21	39.375	2.36E+0	-3.95E+1
22	41.250	2.36E+0	-4.40E+1
23	43.125	2.37E+0	-4.82E+1
24	45.000	2.37E+0	-5.23E+1
25	46.875	2.38E+0	-5.61E+1
26	48.750	2.38E+0	-5.99E+1
27	50.625	2.38E+0	-6.38E+1
28	52.500	2.38E+0	-6.77E+1
29	54.375	2.39E+0	-7.17E+1
30	56.250	2.39E+0	-7.56E+1
31	58.125	2.40E+0	-7.94E+1

9/6/90

#127, X Drive, X response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
30	56.250	2.39E+0	-7.56E+1
31	58.125	2.40E+0	-7.94E+1
32	60.000	2.40E+0	-8.32E+1
33	61.875	2.40E+0	-8.70E+1
34	63.750	2.40E+0	-9.08E+1
35	65.625	2.40E+0	-9.46E+1
36	67.500	2.40E+0	-9.82E+1
37	69.375	2.40E+0	-1.02E+2
38	71.250	2.41E+0	-1.05E+2
39	73.125	2.41E+0	-1.09E+2
40	75.000	2.41E+0	-1.12E+2
41	76.875	2.41E+0	-1.16E+2
42	78.750	2.42E+0	-1.19E+2
43	80.625	2.42E+0	-1.23E+2
44	82.500	2.42E+0	-1.26E+2
45	84.375	2.42E+0	-1.30E+2
46	86.250	2.43E+0	-1.33E+2
47	88.125	2.43E+0	-1.36E+2
48	90.000	2.43E+0	-1.39E+2
49	91.875	2.44E+0	-1.43E+2
50	93.750	2.44E+0	-1.46E+2
51	95.625	2.44E+0	-1.49E+2
52	97.500	2.44E+0	-1.52E+2
53	99.375	2.45E+0	-1.56E+2
54	101.25	2.45E+0	-1.59E+2
55	103.12	2.45E+0	-1.62E+2
56	105.00	2.46E+0	-1.65E+2
57	106.87	2.46E+0	-1.68E+2
58	108.75	2.46E+0	-1.71E+2
59	110.62	2.47E+0	-1.75E+2
60	112.50	2.46E+0	-1.78E+2
61	114.37	2.45E+0	-1.81E+2

repeat from p.23

9/6/90

#127, X Drive, X-response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
60	112.50	2.46E+0	-1.78E+2
61	114.37	2.45E+0	-1.81E+2
62	116.25	2.45E+0	-1.84E+2
63	118.12	2.45E+0	-1.86E+2
64	120.00	2.46E+0	-1.89E+2
65	121.87	2.47E+0	-1.93E+2
66	123.75	2.48E+0	-1.96E+2
67	125.62	2.49E+0	-1.99E+2
68	127.50	2.49E+0	-2.02E+2
69	129.37	2.49E+0	-2.05E+2
70	131.25	2.49E+0	-2.08E+2
71	133.12	2.49E+0	-2.11E+2
72	135.00	2.50E+0	-2.14E+2
73	136.87	2.51E+0	-2.17E+2
74	138.75	2.52E+0	-2.19E+2
75	140.62	2.54E+0	-2.22E+2
76	142.50	2.55E+0	-2.23E+2
77	144.37	2.56E+0	-2.25E+2
78	146.25	2.56E+0	-2.27E+2
79	148.12	2.57E+0	-2.29E+2
80	150.00	2.57E+0	-2.31E+2
81	151.87	2.57E+0	-2.34E+2
82	153.75	2.57E+0	-2.36E+2
83	155.62	2.58E+0	-2.39E+2
84	157.50	2.59E+0	-2.42E+2
85	159.37	2.60E+0	-2.45E+2
86	161.25	2.61E+0	-2.48E+2
87	163.12	2.61E+0	-2.51E+2
88	165.00	2.62E+0	-2.54E+2
89	166.87	2.63E+0	-2.56E+2
90	168.75	2.63E+0	-2.59E+2
91	170.62	2.64E+0	-2.61E+2

repeat from p.24

9/6/90

#127, X time, X response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
90	168.75	2.63E+0	-2.59E+2
91	170.62	2.64E+0	-2.61E+2
92	172.50	2.65E+0	-2.64E+2
93	174.37	2.66E+0	-2.66E+2
94	176.25	2.67E+0	-2.69E+2
95	178.12	2.68E+0	-2.72E+2
96	180.00	2.69E+0	-2.75E+2
97	181.87	2.70E+0	-2.78E+2
98	183.75	2.71E+0	-2.80E+2
99	185.62	2.72E+0	-2.83E+2
100	187.50	2.72E+0	-2.86E+2
101	189.37	2.73E+0	-2.89E+2
102	191.25	2.74E+0	-2.91E+2
103	193.12	2.76E+0	-2.94E+2
104	195.00	2.77E+0	-2.97E+2
105	196.87	2.78E+0	-2.99E+2
106	198.75	2.79E+0	-3.02E+2
107	200.62	2.80E+0	-3.04E+2
108	202.50	2.81E+0	-3.07E+2
109	204.37	2.82E+0	-3.10E+2
110	206.25	2.84E+0	-3.12E+2
111	208.12	2.85E+0	-3.15E+2
112	210.00	2.86E+0	-3.18E+2
113	211.87	2.88E+0	-3.20E+2
114	213.75	2.89E+0	-3.23E+2
115	215.62	2.90E+0	-3.26E+2
116	217.50	2.92E+0	-3.28E+2
117	219.37	2.93E+0	-3.31E+2
118	221.25	2.95E+0	-3.34E+2
119	223.12	2.96E+0	-3.36E+2
120	225.00	2.97E+0	-3.39E+2
121	226.87	2.98E+0	-3.41E+2

repeat from p.25

9/6/90

#127, X time, X response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
120	225.00	2.97E+0	-3.39E+2
121	226.87	2.98E+0	-3.41E+2
122	228.75	2.99E+0	-3.44E+2
123	230.62	3.01E+0	-3.46E+2
124	232.50	3.02E+0	-3.49E+2
125	234.37	3.04E+0	-3.52E+2
126	236.25	3.06E+0	-3.54E+2
127	238.12	3.08E+0	-3.57E+2
128	240.00	3.10E+0	-3.59E+2
129	241.87	3.11E+0	-1.47E+0
130	243.75	3.13E+0	-4.10E+0
131	245.62	3.15E+0	-6.75E+0
132	247.50	3.17E+0	-9.39E+0
133	249.37	3.18E+0	-1.20E+1
134	251.25	3.20E+0	-1.47E+1
135	253.12	3.22E+0	-1.75E+1
136	255.00	3.24E+0	-2.03E+1
137	256.87	3.27E+0	-2.30E+1
138	258.75	3.30E+0	-2.56E+1
139	260.62	3.32E+0	-2.81E+1
140	262.50	3.34E+0	-3.07E+1
141	264.37	3.35E+0	-3.32E+1
142	266.25	3.37E+0	-3.58E+1
143	268.12	3.39E+0	-3.84E+1
144	270.00	3.41E+0	-4.10E+1
145	271.87	3.43E+0	-4.35E+1
146	273.75	3.45E+0	-4.61E+1
147	275.62	3.47E+0	-4.87E+1
148	277.50	3.50E+0	-5.14E+1
149	279.37	3.54E+0	-5.41E+1
150	281.25	3.58E+0	-5.67E+1
151	283.12	3.62E+0	-5.92E+1

repeat from p.26

9/6/90

#127, X-Live, X response

repeat from p.27

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
150	281.25	3.58E+0	-5.67E+1
151	283.12	3.62E+0	-5.92E+1
152	285.00	3.65E+0	-6.17E+1
153	286.87	3.68E+0	-6.43E+1
154	288.75	3.70E+0	-6.70E+1
155	290.62	3.73E+0	-6.98E+1
156	292.50	3.76E+0	-7.28E+1
157	294.37	3.79E+0	-7.57E+1
158	296.25	3.82E+0	-7.85E+1
159	298.12	3.87E+0	-8.11E+1
160	300.00	3.90E+0	-8.38E+1
161	301.87	3.90E+0	-8.66E+1
162	303.75	3.89E+0	-8.95E+1
163	305.62	3.90E+0	-9.23E+1
164	307.50	3.93E+0	-9.48E+1
165	309.37	3.97E+0	-9.70E+1
166	311.25	4.02E+0	-9.93E+1
167	313.12	4.07E+0	-1.02E+2
168	315.00	4.13E+0	-1.05E+2
169	316.87	4.19E+0	-1.07E+2
170	318.75	4.25E+0	-1.11E+2
171	320.62	4.33E+0	-1.14E+2
172	322.50	4.39E+0	-1.18E+2
173	324.37	4.42E+0	-1.21E+2
174	326.25	4.44E+0	-1.24E+2
175	328.12	4.44E+0	-1.26E+2
176	330.00	4.46E+0	-1.29E+2
177	331.87	4.50E+0	-1.32E+2
178	333.75	4.54E+0	-1.34E+2
179	335.62	4.58E+0	-1.37E+2
180	337.50	4.63E+0	-1.40E+2
181	339.37	4.65E+0	-1.46E+2

9/6/90

#127, X-Live, X-response

repeat from p.28

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
180	337.50	4.63E+0	-1.40E+2
181	339.37	4.65E+0	-1.46E+2
182	341.25	4.52E+0	-1.58E+2
183	343.12	4.34E+0	-1.78E+2
184	345.00	4.46E+0	-2.01E+2
185	346.87	4.71E+0	-2.18E+2
186	348.75	4.80E+0	-2.28E+2
187	350.62	4.72E+0	-2.36E+2
188	352.50	4.63E+0	-2.45E+2
189	354.37	4.58E+0	-2.54E+2
190	356.25	4.53E+0	-2.62E+2
191	358.12	4.46E+0	-2.69E+2
192	360.00	4.38E+0	-2.77E+2
193	361.87	4.30E+0	-2.84E+2
194	363.75	4.22E+0	-2.92E+2
195	365.62	4.10E+0	-2.99E+2
196	367.50	3.94E+0	-3.07E+2
197	369.37	3.78E+0	-3.16E+2
198	371.25	3.67E+0	-3.25E+2
199	373.12	3.61E+0	-3.33E+2
200	375.00	3.56E+0	-3.38E+2
201	376.87	3.50E+0	-3.43E+2
202	378.75	3.43E+0	-3.47E+2
203	380.62	3.35E+0	-3.50E+2
204	382.50	3.27E+0	-3.54E+2
205	384.37	3.19E+0	-3.58E+2
206	386.25	3.09E+0	-1.85E+0
207	388.12	2.99E+0	-5.41E+0
208	390.00	2.90E+0	-8.81E+0
209	391.87	2.80E+0	-1.21E+1
210	393.75	2.70E+0	-1.54E+1
211	395.62	2.61E+0	-1.86E+1

9/6/90

#127 X-drive, X response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
210	393.75	2.70E+0	-1.54E+1
211	395.62	2.61E+0	-1.86E+1
212	397.50	2.52E+0	-2.19E+1
213	399.37	2.43E+0	-2.51E+1
214	401.25	2.34E+0	-2.84E+1
215	403.12	2.25E+0	-3.16E+1
216	405.00	2.15E+0	-3.47E+1
217	406.87	2.06E+0	-3.79E+1
218	408.75	1.97E+0	-4.10E+1
219	410.62	1.88E+0	-4.43E+1
220	412.50	1.80E+0	-4.76E+1
221	414.37	1.73E+0	-5.11E+1
222	416.25	1.66E+0	-5.46E+1
223	418.12	1.59E+0	-5.81E+1
224	420.00	1.52E+0	-6.15E+1
225	421.87	1.45E+0	-6.50E+1
226	423.75	1.38E+0	-6.84E+1
227	425.62	1.31E+0	-7.18E+1
228	427.50	1.24E+0	-7.52E+1
229	429.37	1.17E+0	-7.85E+1
230	431.25	1.11E+0	-8.17E+1
231	433.12	1.04E+0	-8.48E+1
232	435.00	9.76E-1	-8.79E+1
233	436.87	9.14E-1	-9.09E+1
234	438.75	8.56E-1	-9.37E+1
235	440.62	8.01E-1	-9.65E+1
236	442.50	7.51E-1	-9.90E+1
237	444.37	7.07E-1	-1.02E+2
238	446.25	6.65E-1	-1.04E+2
239	448.12	6.26E-1	-1.06E+2
240	450.00	5.89E-1	-1.09E+2

repeat from p.29

9/6/90

#127 X-drive, X response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
239	448.12	6.26E-1	-1.06E+2
240	450.00	5.89E-1	-1.09E+2
241	451.87	5.56E-1	-1.11E+2
242	453.75	5.25E-1	-1.13E+2
243	455.62	4.97E-1	-1.14E+2
244	457.50	4.71E-1	-1.16E+2
245	459.37	4.44E-1	-1.19E+2
246	461.25	4.17E-1	-1.21E+2
247	463.12	3.91E-1	-1.24E+2
248	465.00	3.65E-1	-1.28E+2
249	466.87	3.39E-1	-1.31E+2
250	468.75	3.15E-1	-1.33E+2
251	470.62	2.91E-1	-1.36E+2
252	472.50	2.68E-1	-1.39E+2
253	474.37	2.45E-1	-1.41E+2
254	476.25	2.22E-1	-1.44E+2
255	478.12	1.99E-1	-1.46E+2
256	480.00	1.77E-1	-1.47E+2
257	481.87	1.56E-1	-1.48E+2
258	483.75	1.36E-1	-1.47E+2
259	485.62	1.18E-1	-1.46E+2
260	487.50	1.02E-1	-1.43E+2
261	489.37	8.91E-2	-1.39E+2
262	491.25	7.89E-2	-1.33E+2
263	493.12	7.19E-2	-1.26E+2
264	495.00	6.80E-2	-1.17E+2
265	496.87	6.71E-2	-1.08E+2
266	498.75	6.94E-2	-1.00E+2
267	500.62	7.37E-2	-9.37E+1
268	502.50	7.92E-2	-8.90E+1
269	504.37	8.51E-2	-8.56E+1
270	506.25	9.13E-2	-8.32E+1

repeat from p30

#127, X-Drive, X response

9/6/90

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
269	504.37	8.51E-2	-8.56E+1
270	506.25	9.13E-2	-8.32E+1
271	508.12	9.74E-2	-8.15E+1
272	510.00	1.03E-1	-8.08E+1
273	511.87	1.09E-1	-8.05E+1
274	513.75	1.14E-1	-8.07E+1
275	515.62	1.19E-1	-8.16E+1
276	517.50	1.25E-1	-8.29E+1
277	519.37	1.30E-1	-8.43E+1
278	521.25	1.35E-1	-8.62E+1
279	523.12	1.40E-1	-8.83E+1
280	525.00	1.44E-1	-9.05E+1
281	526.87	1.47E-1	-9.28E+1
282	528.75	1.51E-1	-9.51E+1
283	530.62	1.55E-1	-9.75E+1
284	532.50	1.59E-1	-1.00E+2
285	534.37	1.63E-1	-1.03E+2
286	536.25	1.66E-1	-1.05E+2
287	538.12	1.70E-1	-1.08E+2
288	540.00	1.73E-1	-1.11E+2
289	541.87	1.76E-1	-1.14E+2
290	543.75	1.79E-1	-1.17E+2
291	545.62	1.83E-1	-1.20E+2
292	547.50	1.87E-1	-1.24E+2
293	549.37	1.90E-1	-1.28E+2
294	551.25	1.95E-1	-1.32E+2
295	553.12	2.00E-1	-1.35E+2
296	555.00	2.05E-1	-1.38E+2
297	556.87	2.10E-1	-1.42E+2
298	558.75	2.16E-1	-1.45E+2
299	560.62	2.22E-1	-1.48E+2
300	562.50	2.27E-1	-1.52E+2

repeat from p.32

BWaugh

9/6/90

#127, X-Drive, X response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
299	560.62	2.22E-1	-1.48E+2
300	562.50	2.27E-1	-1.52E+2
301	564.37	2.31E-1	-1.57E+2
302	566.25	2.35E-1	-1.61E+2
303	568.12	2.37E-1	-1.66E+2
304	570.00	2.39E-1	-1.70E+2
305	571.87	2.39E-1	-1.75E+2
306	573.75	2.37E-1	-1.80E+2
307	575.62	2.33E-1	-1.84E+2
308	577.50	2.29E-1	-1.89E+2
309	579.37	2.23E-1	-1.94E+2
310	581.25	2.17E-1	-1.98E+2
311	583.12	2.10E-1	-2.02E+2
312	585.00	2.03E-1	-2.07E+2
313	586.87	1.95E-1	-2.11E+2
314	588.75	1.87E-1	-2.15E+2
315	590.62	1.80E-1	-2.19E+2

repeat from p32

BWaugh

9/7/90

No Data

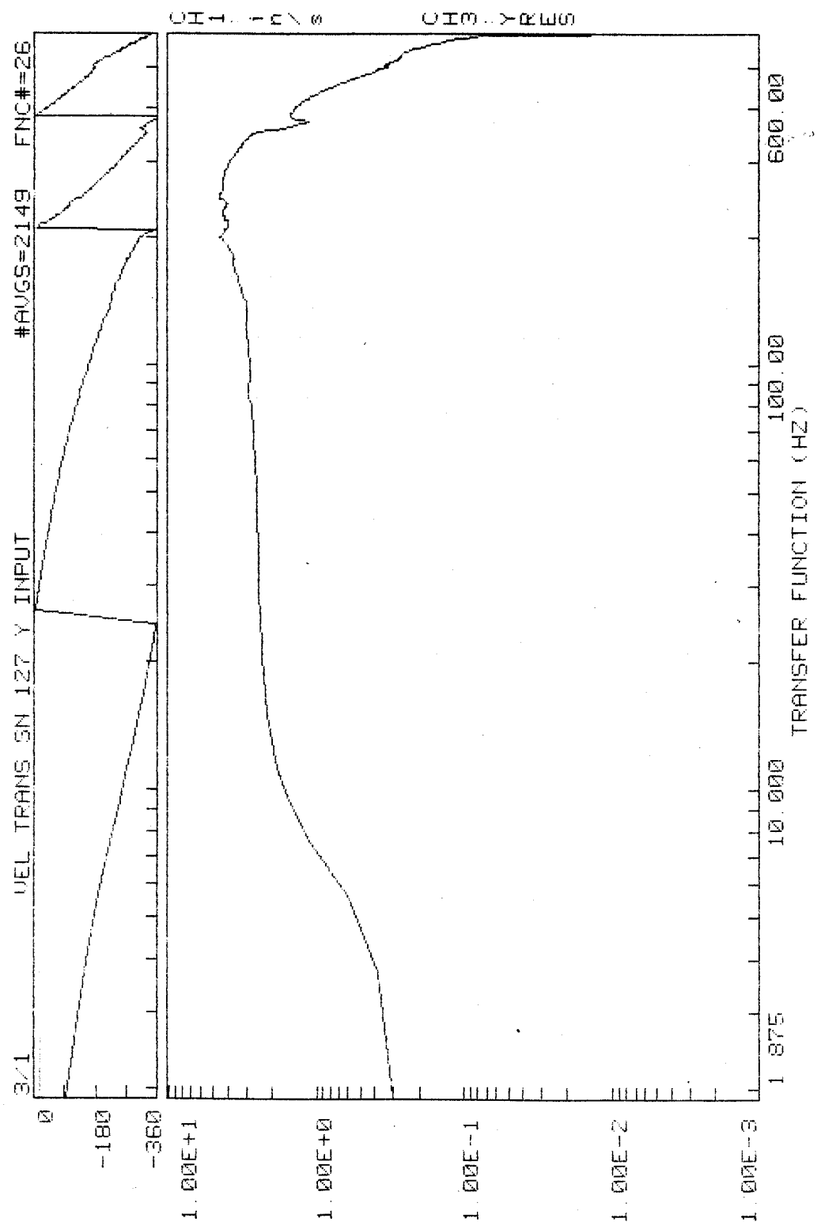
DWright

9/7/90

No Data

DWright

#127, Ydrive, Y response 9/7/90



9/7/90

#127, Ydrive, Yresponse

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
1	1.875	3.05E-1	-9.05E+1
2	3.750	3.88E-1	-1.45E+2
3	5.625	6.08E-1	-1.83E+2
4	7.500	1.09E+0	-2.17E+2
5	9.375	1.53E+0	-2.47E+2
6	11.250	1.82E+0	-2.71E+2
7	13.125	2.00E+0	-2.89E+2
8	15.000	2.12E+0	-3.04E+2
9	16.875	2.21E+0	-3.17E+2
10	18.750	2.27E+0	-3.27E+2
11	20.625	2.31E+0	-3.37E+2
12	22.500	2.35E+0	-3.46E+2
13	24.375	2.37E+0	-3.54E+2
14	26.250	2.40E+0	-7.91E-1
15	28.125	2.42E+0	-6.83E+0
16	30.000	2.43E+0	-1.21E+1
17	31.875	2.44E+0	-1.73E+1
18	33.750	2.45E+0	-2.26E+1
19	35.625	2.46E+0	-2.80E+1
20	37.500	2.47E+0	-3.32E+1
21	39.375	2.49E+0	-3.82E+1
22	41.250	2.50E+0	-4.27E+1
23	43.125	2.51E+0	-4.69E+1
24	45.000	2.52E+0	-5.10E+1
25	46.875	2.53E+0	-5.48E+1
26	48.750	2.53E+0	-5.87E+1
27	50.625	2.54E+0	-6.26E+1
28	52.500	2.55E+0	-6.66E+1
29	54.375	2.56E+0	-7.06E+1
30	56.250	2.57E+0	-7.45E+1
31	58.125	2.59E+0	-7.85E+1

#127, y drive, y response

9/7/90

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
30	56.250	2.57E+0	-7.45E+1
31	58.125	2.59E+0	-7.85E+1
32	60.000	2.60E+0	-8.23E+1
33	61.875	2.61E+0	-8.61E+1
34	63.750	2.61E+0	-9.00E+1
35	65.625	2.62E+0	-9.37E+1
36	67.500	2.63E+0	-9.74E+1
37	69.375	2.65E+0	-1.01E+2
38	71.250	2.66E+0	-1.05E+2
39	73.125	2.68E+0	-1.08E+2
40	75.000	2.70E+0	-1.12E+2
41	76.875	2.72E+0	-1.16E+2
42	78.750	2.74E+0	-1.19E+2
43	80.625	2.77E+0	-1.23E+2
44	82.500	2.81E+0	-1.27E+2
45	84.375	2.83E+0	-1.31E+2
46	86.250	2.84E+0	-1.34E+2
47	88.125	2.84E+0	-1.37E+2
48	90.000	2.83E+0	-1.40E+2
49	91.875	2.83E+0	-1.43E+2
50	93.750	2.82E+0	-1.47E+2
51	95.625	2.82E+0	-1.50E+2
52	97.500	2.82E+0	-1.53E+2
53	99.375	2.81E+0	-1.56E+2
54	101.25	2.82E+0	-1.60E+2
55	103.12	2.82E+0	-1.63E+2
56	105.00	2.83E+0	-1.66E+2
57	106.87	2.84E+0	-1.69E+2
58	108.75	2.85E+0	-1.72E+2
59	110.62	2.85E+0	-1.75E+2
60	112.50	2.87E+0	-1.78E+2
61	114.37	2.89E+0	-1.81E+2

regd from p.37

9/7/90

#127, y drive, y response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
60	112.50	2.87E+0	-1.78E+2
61	114.37	2.89E+0	-1.81E+2
62	116.25	2.93E+0	-1.84E+2
63	118.12	2.95E+0	-1.87E+2
64	120.00	2.97E+0	-1.90E+2
65	121.87	2.98E+0	-1.94E+2
66	123.75	2.99E+0	-1.97E+2
67	125.62	2.99E+0	-2.00E+2
68	127.50	3.00E+0	-2.04E+2
69	129.37	3.00E+0	-2.07E+2
70	131.25	2.99E+0	-2.10E+2
71	133.12	2.98E+0	-2.14E+2
72	135.00	2.97E+0	-2.17E+2
73	136.87	2.97E+0	-2.19E+2
74	138.75	2.99E+0	-2.21E+2
75	140.62	3.01E+0	-2.23E+2
76	142.50	3.05E+0	-2.25E+2
77	144.37	3.10E+0	-2.26E+2
78	146.25	3.14E+0	-2.28E+2
79	148.12	3.18E+0	-2.29E+2
80	150.00	3.21E+0	-2.31E+2
81	151.87	3.25E+0	-2.34E+2
82	153.75	3.29E+0	-2.37E+2
83	155.62	3.32E+0	-2.40E+2
84	157.50	3.35E+0	-2.43E+2
85	159.37	3.39E+0	-2.46E+2
86	161.25	3.42E+0	-2.49E+2
87	163.12	3.46E+0	-2.52E+2
88	165.00	3.50E+0	-2.55E+2
89	166.87	3.53E+0	-2.57E+2
90	168.75	3.57E+0	-2.60E+2
91	170.62	3.62E+0	-2.63E+2

regd from p.38

9/7/90

#127 Y Line, Y response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
90	168.75	3.57E+0	-2.60E+2
91	170.62	3.62E+0	-2.63E+2
92	172.50	3.65E+0	-2.66E+2
93	174.37	3.64E+0	-2.69E+2
94	176.25	3.61E+0	-2.72E+2
95	178.12	3.59E+0	-2.76E+2
96	180.00	3.61E+0	-2.78E+2
97	181.87	3.67E+0	-2.81E+2
98	183.75	3.73E+0	-2.84E+2
99	185.62	3.80E+0	-2.87E+2
100	187.50	3.86E+0	-2.90E+2
101	189.37	3.93E+0	-2.93E+2
102	191.25	4.01E+0	-2.96E+2
103	193.12	4.10E+0	-2.99E+2
104	195.00	4.19E+0	-3.02E+2
105	196.87	4.28E+0	-3.05E+2
106	198.75	4.37E+0	-3.08E+2
107	200.62	4.45E+0	-3.12E+2
108	202.50	4.30E+0	-3.23E+2
109	204.37	4.10E+0	-3.39E+2
110	206.25	4.09E+0	-3.56E+2
111	208.12	4.12E+0	-8.83E+0
112	210.00	4.07E+0	-1.20E+1
113	211.87	3.99E+0	-1.39E+1
114	213.75	3.93E+0	-2.02E+1
115	215.62	3.93E+0	-3.04E+1
116	217.50	4.01E+0	-4.15E+1
117	219.37	4.11E+0	-5.08E+1
118	221.25	4.15E+0	-5.79E+1
119	223.12	4.20E+0	-6.59E+1
120	225.00	4.24E+0	-7.42E+1
121	226.87	4.28E+0	-8.09E+1

repeat from p.39

9/7/90

#127, Y Line, Y response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
120	225.00	4.24E+0	-7.42E+1
121	226.87	4.28E+0	-8.09E+1
122	228.75	4.28E+0	-8.60E+1
123	230.62	4.24E+0	-8.98E+1
124	232.50	4.18E+0	-9.33E+1
125	234.37	4.12E+0	-9.65E+1
126	236.25	4.07E+0	-9.91E+1
127	238.12	4.03E+0	-1.01E+2
128	240.00	4.01E+0	-1.03E+2
129	241.87	4.05E+0	-1.09E+2
130	243.75	4.16E+0	-1.19E+2
131	245.62	4.33E+0	-1.29E+2
132	247.50	4.47E+0	-1.37E+2
133	249.37	4.49E+0	-1.42E+2
134	251.25	4.45E+0	-1.47E+2
135	253.12	4.41E+0	-1.52E+2
136	255.00	4.37E+0	-1.56E+2
137	256.87	4.34E+0	-1.60E+2
138	258.75	4.33E+0	-1.64E+2
139	260.62	4.32E+0	-1.68E+2
140	262.50	4.31E+0	-1.72E+2
141	264.37	4.32E+0	-1.75E+2
142	266.25	4.32E+0	-1.79E+2
143	268.12	4.31E+0	-1.83E+2
144	270.00	4.29E+0	-1.87E+2
145	271.87	4.27E+0	-1.91E+2
146	273.75	4.25E+0	-1.95E+2
147	275.62	4.24E+0	-1.98E+2
148	277.50	4.22E+0	-2.02E+2
149	279.37	4.21E+0	-2.06E+2
150	281.25	4.18E+0	-2.09E+2
151	283.12	4.16E+0	-2.14E+2

repeat from p.40

9/7/90

#127, Y line, Y response

repeat from p.41

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
150	281.25	4.18E+0	-2.09E+2
151	283.12	4.16E+0	-2.14E+2
152	285.00	4.14E+0	-2.18E+2
153	286.87	4.11E+0	-2.21E+2
154	288.75	4.08E+0	-2.25E+2
155	290.62	4.05E+0	-2.29E+2
156	292.50	4.02E+0	-2.33E+2
157	294.37	3.99E+0	-2.36E+2
158	296.25	3.96E+0	-2.40E+2
159	298.12	3.92E+0	-2.43E+2
160	300.00	3.88E+0	-2.46E+2
161	301.87	3.83E+0	-2.49E+2
162	303.75	3.78E+0	-2.52E+2
163	305.62	3.73E+0	-2.55E+2
164	307.50	3.68E+0	-2.57E+2
165	309.37	3.63E+0	-2.60E+2
166	311.25	3.59E+0	-2.63E+2
167	313.12	3.54E+0	-2.66E+2
168	315.00	3.50E+0	-2.69E+2
169	316.87	3.46E+0	-2.71E+2
170	318.75	3.42E+0	-2.74E+2
171	320.62	3.38E+0	-2.77E+2
172	322.50	3.34E+0	-2.80E+2
173	324.37	3.31E+0	-2.83E+2
174	326.25	3.28E+0	-2.86E+2
175	328.12	3.24E+0	-2.89E+2
176	330.00	3.20E+0	-2.92E+2
177	331.87	3.16E+0	-2.96E+2
178	333.75	3.12E+0	-2.99E+2
179	335.62	3.07E+0	-3.02E+2
180	337.50	3.02E+0	-3.05E+2
181	339.37	2.97E+0	-3.08E+2

9/7/90

#127, Y line, Y response

repeat from p.42

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
180	337.50	3.02E+0	-3.05E+2
181	339.37	2.97E+0	-3.08E+2
182	341.25	2.93E+0	-3.10E+2
183	343.12	2.89E+0	-3.13E+2
184	345.00	2.85E+0	-3.16E+2
185	346.87	2.81E+0	-3.19E+2
186	348.75	2.78E+0	-3.22E+2
187	350.62	2.74E+0	-3.25E+2
188	352.50	2.63E+0	-3.27E+2
189	354.37	2.38E+0	-3.25E+2
190	356.25	2.09E+0	-3.20E+2
191	358.12	1.86E+0	-3.13E+2
192	360.00	1.72E+0	-3.10E+2
193	361.87	1.63E+0	-3.13E+2
194	363.75	1.54E+0	-3.17E+2
195	365.62	1.46E+0	-3.21E+2
196	367.50	1.36E+0	-3.25E+2
197	369.37	1.26E+0	-3.28E+2
198	371.25	1.18E+0	-3.31E+2
199	373.12	1.13E+0	-3.37E+2
200	375.00	1.16E+0	-3.44E+2
201	376.87	1.27E+0	-3.50E+2
202	378.75	1.39E+0	-3.54E+2
203	380.62	1.46E+0	-3.56E+2
204	382.50	1.48E+0	-3.59E+2
205	384.37	1.49E+0	-3.00E+0
206	386.25	1.49E+0	-6.59E+0
207	388.12	1.49E+0	-1.00E+1
208	390.00	1.48E+0	-1.34E+1
209	391.87	1.47E+0	-1.66E+1
210	393.75	1.46E+0	-1.99E+1
211	395.62	1.44E+0	-2.33E+1

#127, y/time, y/response 9/7/90

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
210	393.75	1.46E+0	-1.99E+1
211	395.62	1.44E+0	-2.33E+1
212	397.50	1.43E+0	-2.68E+1
213	399.37	1.41E+0	-3.04E+1
214	401.25	1.40E+0	-3.42E+1
215	403.12	1.38E+0	-3.78E+1
216	405.00	1.36E+0	-4.14E+1
217	406.87	1.34E+0	-4.47E+1
218	408.75	1.32E+0	-4.80E+1
219	410.62	1.30E+0	-5.12E+1
220	412.50	1.28E+0	-5.44E+1
221	414.37	1.26E+0	-5.76E+1
222	416.25	1.23E+0	-6.08E+1
223	418.12	1.21E+0	-6.40E+1
224	420.00	1.19E+0	-6.71E+1
225	421.87	1.16E+0	-7.02E+1
226	423.75	1.13E+0	-7.33E+1
227	425.62	1.11E+0	-7.64E+1
228	427.50	1.08E+0	-7.95E+1
229	429.37	1.06E+0	-8.27E+1
230	431.25	1.03E+0	-8.58E+1
231	433.12	1.01E+0	-8.90E+1
232	435.00	9.81E-1	-9.22E+1
233	436.87	9.56E-1	-9.54E+1
234	438.75	9.31E-1	-9.85E+1
235	440.62	9.07E-1	-1.02E+2
236	442.50	8.83E-1	-1.04E+2
237	444.37	8.59E-1	-1.07E+2
238	446.25	8.35E-1	-1.10E+2
239	448.12	8.12E-1	-1.13E+2
240	450.00	7.89E-1	-1.16E+2

repeat from p.43

#127, y/time, y/response 9/7/90

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
239	448.12	8.12E-1	-1.13E+2
240	450.00	7.89E-1	-1.16E+2
241	451.87	7.66E-1	-1.19E+2
242	453.75	7.43E-1	-1.22E+2
243	455.62	7.21E-1	-1.24E+2
244	457.50	7.00E-1	-1.27E+2
245	459.37	6.79E-1	-1.30E+2
246	461.25	6.58E-1	-1.33E+2
247	463.12	6.38E-1	-1.36E+2
248	465.00	6.18E-1	-1.39E+2
249	466.87	5.97E-1	-1.42E+2
250	468.75	5.78E-1	-1.44E+2
251	470.62	5.59E-1	-1.47E+2
252	472.50	5.41E-1	-1.49E+2
253	474.37	5.24E-1	-1.52E+2
254	476.25	5.07E-1	-1.54E+2
255	478.12	4.90E-1	-1.57E+2
256	480.00	4.73E-1	-1.59E+2
257	481.87	4.57E-1	-1.61E+2
258	483.75	4.42E-1	-1.62E+2
259	485.62	4.28E-1	-1.64E+2
260	487.50	4.15E-1	-1.66E+2
261	489.37	4.02E-1	-1.67E+2
262	491.25	3.89E-1	-1.69E+2
263	493.12	3.78E-1	-1.70E+2
264	495.00	3.69E-1	-1.72E+2
265	496.87	3.62E-1	-1.73E+2
266	498.75	3.55E-1	-1.75E+2
267	500.62	3.43E-1	-1.77E+2
268	502.50	3.31E-1	-1.75E+2
269	504.37	3.31E-1	-1.72E+2
270	506.25	3.37E-1	-1.69E+2

repeat from p.44

#27, Y drive, Y response 9/7/90

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
269	504.37	3.31E-1	-1.72E+2
270	506.25	3.37E-1	-1.69E+2
271	508.12	3.38E-1	-1.70E+2
272	510.00	3.28E-1	-1.74E+2
273	511.87	3.19E-1	-1.78E+2
274	513.75	3.11E-1	-1.82E+2
275	515.62	3.04E-1	-1.86E+2
276	517.50	2.96E-1	-1.90E+2
277	519.37	2.89E-1	-1.93E+2
278	521.25	2.81E-1	-1.97E+2
279	523.12	2.75E-1	-2.00E+2
280	525.00	2.70E-1	-2.03E+2
281	526.87	2.68E-1	-2.06E+2
282	528.75	2.69E-1	-2.10E+2
283	530.62	2.71E-1	-2.14E+2
284	532.50	2.72E-1	-2.19E+2
285	534.37	2.69E-1	-2.23E+2
286	536.25	2.65E-1	-2.27E+2
287	538.12	2.60E-1	-2.31E+2
288	540.00	2.54E-1	-2.35E+2
289	541.87	2.49E-1	-2.39E+2
290	543.75	2.43E-1	-2.43E+2
291	545.62	2.37E-1	-2.46E+2
292	547.50	2.31E-1	-2.50E+2
293	549.37	2.25E-1	-2.53E+2
294	551.25	2.19E-1	-2.57E+2
295	553.12	2.13E-1	-2.60E+2
296	555.00	2.06E-1	-2.63E+2
297	556.87	1.98E-1	-2.66E+2
298	558.75	1.89E-1	-2.69E+2
299	560.62	1.81E-1	-2.71E+2
300	562.50	1.74E-1	-2.74E+2

repeat from p.45

#127, Y drive, Y response 9/7/90

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
299	560.62	1.81E-1	-2.71E+2
300	562.50	1.74E-1	-2.74E+2
301	564.37	1.68E-1	-2.77E+2
302	566.25	1.62E-1	-2.80E+2
303	568.12	1.56E-1	-2.83E+2
304	570.00	1.50E-1	-2.87E+2
305	571.87	1.44E-1	-2.91E+2
306	573.75	1.38E-1	-2.95E+2
307	575.62	1.31E-1	-2.99E+2
308	577.50	1.25E-1	-3.04E+2
309	579.37	1.19E-1	-3.07E+2
310	581.25	1.12E-1	-3.11E+2
311	583.12	1.06E-1	-3.15E+2
312	585.00	1.00E-1	-3.19E+2
313	586.87	9.42E-2	-3.22E+2
314	588.75	8.84E-2	-3.26E+2
315	590.62	8.25E-2	-3.29E+2

repeat from p.46

9/10/90

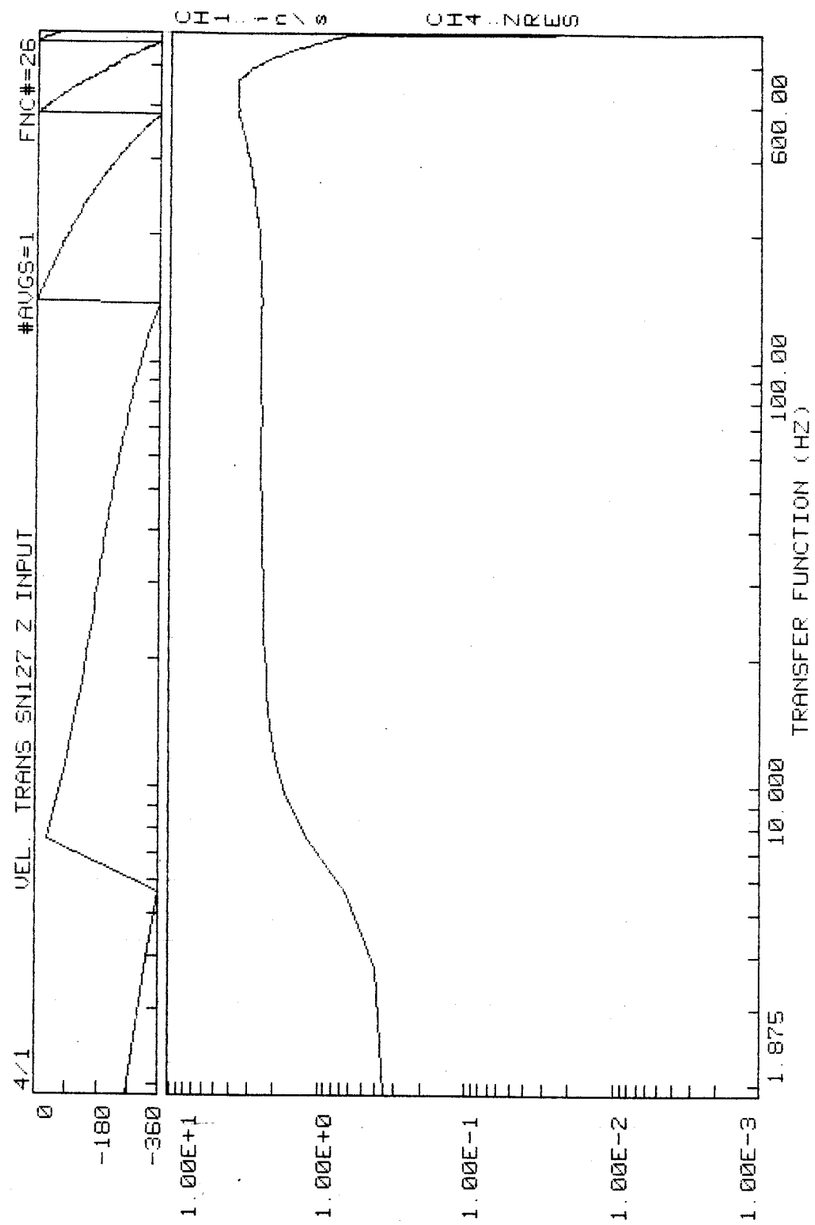
No Data

9/10/90

No Data

#127, Z drive, Z response

9/10/90



9/10/90

#127, Z drive, Z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
1	1.875	3.54E-1	-2.66E+2
2	3.750	4.08E-1	-3.19E+2
3	5.625	6.40E-1	-3.59E+2
4	7.500	1.15E+0	-3.34E+1
5	9.375	1.60E+0	-6.33E+1
6	11.250	1.87E+0	-8.65E+1
7	13.125	2.04E+0	-1.04E+2
8	15.000	2.14E+0	-1.18E+2
9	16.875	2.20E+0	-1.30E+2
10	18.750	2.25E+0	-1.40E+2
11	20.625	2.29E+0	-1.48E+2
12	22.500	2.31E+0	-1.56E+2
13	24.375	2.33E+0	-1.62E+2
14	26.250	2.34E+0	-1.68E+2
15	28.125	2.35E+0	-1.74E+2
16	30.000	2.36E+0	-1.79E+2
17	31.875	2.37E+0	-1.84E+2
18	33.750	2.37E+0	-1.88E+2
19	35.625	2.38E+0	-1.93E+2
20	37.500	2.38E+0	-1.97E+2
21	39.375	2.39E+0	-2.01E+2
22	41.250	2.39E+0	-2.05E+2
23	43.125	2.40E+0	-2.09E+2
24	45.000	2.40E+0	-2.13E+2
25	46.875	2.40E+0	-2.16E+2
26	48.750	2.41E+0	-2.20E+2
27	50.625	2.41E+0	-2.23E+2
28	52.500	2.42E+0	-2.27E+2
29	54.375	2.43E+0	-2.30E+2
30	56.250	2.43E+0	-2.34E+2
31	58.125	2.43E+0	-2.37E+2

9/10/90

#127, Z drive, Z response

cont from p.51

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
30	56.250	2.43E+0	-2.34E+2
31	58.125	2.43E+0	-2.37E+2
32	60.000	2.43E+0	-2.41E+2
33	61.875	2.43E+0	-2.44E+2
34	63.750	2.44E+0	-2.48E+2
35	65.625	2.44E+0	-2.51E+2
36	67.500	2.43E+0	-2.55E+2
37	69.375	2.42E+0	-2.58E+2
38	71.250	2.41E+0	-2.61E+2
39	73.125	2.39E+0	-2.64E+2
40	75.000	2.39E+0	-2.66E+2
41	76.875	2.39E+0	-2.69E+2
42	78.750	2.40E+0	-2.71E+2
43	80.625	2.42E+0	-2.74E+2
44	82.500	2.43E+0	-2.76E+2
45	84.375	2.44E+0	-2.79E+2
46	86.250	2.44E+0	-2.82E+2
47	88.125	2.45E+0	-2.85E+2
48	90.000	2.45E+0	-2.88E+2
49	91.875	2.46E+0	-2.91E+2
50	93.750	2.46E+0	-2.94E+2
51	95.625	2.46E+0	-2.96E+2
52	97.500	2.46E+0	-2.99E+2
53	99.375	2.45E+0	-3.02E+2
54	101.25	2.45E+0	-3.05E+2
55	103.12	2.44E+0	-3.08E+2
56	105.00	2.43E+0	-3.10E+2
57	106.87	2.43E+0	-3.13E+2
58	108.75	2.42E+0	-3.15E+2
59	110.62	2.43E+0	-3.18E+2
60	112.50	2.43E+0	-3.21E+2
61	114.37	2.44E+0	-3.23E+2

9/10/90

#127, Z drive, Z response

cont from p.52

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
60	112.50	2.43E+0	-3.21E+2
61	114.37	2.44E+0	-3.23E+2
62	116.25	2.44E+0	-3.26E+2
63	118.12	2.45E+0	-3.29E+2
64	120.00	2.45E+0	-3.32E+2
65	121.87	2.45E+0	-3.34E+2
66	123.75	2.46E+0	-3.37E+2
67	125.62	2.46E+0	-3.40E+2
68	127.50	2.47E+0	-3.43E+2
69	129.37	2.47E+0	-3.46E+2
70	131.25	2.46E+0	-3.50E+2
71	133.12	2.44E+0	-3.53E+2
72	135.00	2.42E+0	-3.56E+2
73	136.87	2.40E+0	-3.58E+2
74	138.75	2.40E+0	0.00E+0
75	140.62	2.41E+0	-2.71E+0
76	142.50	2.41E+0	-5.30E+0
77	144.37	2.42E+0	-8.07E+0
78	146.25	2.43E+0	-1.10E+1
79	148.12	2.43E+0	-1.40E+1
80	150.00	2.44E+0	-1.72E+1
81	151.87	2.44E+0	-2.05E+1
82	153.75	2.45E+0	-2.37E+1
83	155.62	2.45E+0	-2.67E+1
84	157.50	2.46E+0	-2.96E+1
85	159.37	2.46E+0	-3.24E+1
86	161.25	2.47E+0	-3.52E+1
87	163.12	2.47E+0	-3.79E+1
88	165.00	2.47E+0	-4.06E+1
89	166.87	2.48E+0	-4.33E+1
90	168.75	2.48E+0	-4.60E+1
91	170.62	2.48E+0	-4.86E+1

9/10/90

#127, Z Drive, Z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
90	168.75	2.48E+0	-4.60E+1
91	170.62	2.48E+0	-4.86E+1
92	172.50	2.49E+0	-5.12E+1
93	174.37	2.49E+0	-5.38E+1
94	176.25	2.50E+0	-5.65E+1
95	178.12	2.50E+0	-5.92E+1
96	180.00	2.50E+0	-6.19E+1
97	181.87	2.51E+0	-6.45E+1
98	183.75	2.52E+0	-6.71E+1
99	185.62	2.52E+0	-6.96E+1
100	187.50	2.52E+0	-7.22E+1
101	189.37	2.53E+0	-7.49E+1
102	191.25	2.53E+0	-7.76E+1
103	193.12	2.53E+0	-8.02E+1
104	195.00	2.54E+0	-8.27E+1
105	196.87	2.54E+0	-8.52E+1
106	198.75	2.55E+0	-8.77E+1
107	200.62	2.55E+0	-9.03E+1
108	202.50	2.56E+0	-9.30E+1
109	204.37	2.56E+0	-9.58E+1
110	206.25	2.57E+0	-9.86E+1
111	208.12	2.58E+0	-1.01E+2
112	210.00	2.58E+0	-1.04E+2
113	211.87	2.59E+0	-1.07E+2
114	213.75	2.60E+0	-1.09E+2
115	215.62	2.60E+0	-1.12E+2
116	217.50	2.61E+0	-1.15E+2
117	219.37	2.61E+0	-1.18E+2
118	221.25	2.62E+0	-1.20E+2
119	223.12	2.64E+0	-1.23E+2
120	225.00	2.65E+0	-1.26E+2
121	226.87	2.66E+0	-1.28E+2

repeat for ~~[illegible]~~ p.53

9/10/90

#127, Z Drive, Z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
120	225.00	2.65E+0	-1.26E+2
121	226.87	2.66E+0	-1.28E+2
122	228.75	2.67E+0	-1.30E+2
123	230.62	2.69E+0	-1.32E+2
124	232.50	2.70E+0	-1.35E+2
125	234.37	2.71E+0	-1.37E+2
126	236.25	2.72E+0	-1.40E+2
127	238.12	2.73E+0	-1.43E+2
128	240.00	2.73E+0	-1.45E+2
129	241.87	2.74E+0	-1.48E+2
130	243.75	2.74E+0	-1.51E+2
131	245.62	2.75E+0	-1.54E+2
132	247.50	2.75E+0	-1.56E+2
133	249.37	2.76E+0	-1.59E+2
134	251.25	2.76E+0	-1.62E+2
135	253.12	2.77E+0	-1.64E+2
136	255.00	2.77E+0	-1.67E+2
137	256.87	2.78E+0	-1.70E+2
138	258.75	2.78E+0	-1.73E+2
139	260.62	2.79E+0	-1.75E+2
140	262.50	2.80E+0	-1.78E+2
141	264.37	2.81E+0	-1.81E+2
142	266.25	2.82E+0	-1.84E+2
143	268.12	2.83E+0	-1.86E+2
144	270.00	2.83E+0	-1.89E+2
145	271.87	2.84E+0	-1.92E+2
146	273.75	2.85E+0	-1.94E+2
147	275.62	2.86E+0	-1.97E+2
148	277.50	2.87E+0	-1.99E+2
149	279.37	2.88E+0	-2.02E+2
150	281.25	2.88E+0	-2.04E+2
151	283.12	2.89E+0	-2.07E+2

repeat for p.54

9/10/90

#127 z drive, z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
150	281.25	2.88E+0	-2.04E+2
151	283.12	2.89E+0	-2.07E+2
152	285.00	2.90E+0	-2.10E+2
153	286.87	2.91E+0	-2.12E+2
154	288.75	2.92E+0	-2.15E+2
155	290.62	2.93E+0	-2.18E+2
156	292.50	2.94E+0	-2.20E+2
157	294.37	2.95E+0	-2.23E+2
158	296.25	2.96E+0	-2.26E+2
159	298.12	2.97E+0	-2.29E+2
160	300.00	2.98E+0	-2.31E+2
161	301.87	2.99E+0	-2.34E+2
162	303.75	3.00E+0	-2.37E+2
163	305.62	3.02E+0	-2.40E+2
164	307.50	3.03E+0	-2.42E+2
165	309.37	3.04E+0	-2.45E+2
166	311.25	3.05E+0	-2.48E+2
167	313.12	3.06E+0	-2.51E+2
168	315.00	3.08E+0	-2.53E+2
169	316.87	3.09E+0	-2.56E+2
170	318.75	3.10E+0	-2.59E+2
171	320.62	3.10E+0	-2.62E+2
172	322.50	3.10E+0	-2.64E+2
173	324.37	3.10E+0	-2.67E+2
174	326.25	3.12E+0	-2.70E+2
175	328.12	3.13E+0	-2.72E+2
176	330.00	3.15E+0	-2.75E+2
177	331.87	3.17E+0	-2.78E+2
178	333.75	3.19E+0	-2.81E+2
179	335.62	3.21E+0	-2.84E+2
180	337.50	3.22E+0	-2.86E+2
181	339.37	3.24E+0	-2.89E+2

repeat from p.55

9/10/90

#127, z drive, z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
180	337.50	3.22E+0	-2.86E+2
181	339.37	3.24E+0	-2.89E+2
182	341.25	3.25E+0	-2.92E+2
183	343.12	3.26E+0	-2.95E+2
184	345.00	3.27E+0	-2.98E+2
185	346.87	3.27E+0	-3.01E+2
186	348.75	3.28E+0	-3.03E+2
187	350.62	3.29E+0	-3.06E+2
188	352.50	3.31E+0	-3.09E+2
189	354.37	3.32E+0	-3.12E+2
190	356.25	3.33E+0	-3.15E+2
191	358.12	3.35E+0	-3.18E+2
192	360.00	3.36E+0	-3.21E+2
193	361.87	3.37E+0	-3.24E+2
194	363.75	3.39E+0	-3.27E+2
195	365.62	3.40E+0	-3.30E+2
196	367.50	3.41E+0	-3.33E+2
197	369.37	3.43E+0	-3.36E+2
198	371.25	3.44E+0	-3.39E+2
199	373.12	3.45E+0	-3.42E+2
200	375.00	3.46E+0	-3.45E+2
201	376.87	3.47E+0	-3.48E+2
202	378.75	3.49E+0	-3.51E+2
203	380.62	3.51E+0	-3.54E+2
204	382.50	3.52E+0	-3.57E+2
205	384.37	3.54E+0	-8.22E-1
206	386.25	3.53E+0	-4.56E+0
207	388.12	3.52E+0	-8.37E+0
208	390.00	3.49E+0	-1.20E+1
209	391.87	3.48E+0	-1.51E+1
210	393.75	3.48E+0	-1.80E+1
211	395.62	3.48E+0	-2.09E+1

repeat from p.56

9/10/90

#127 z drive, z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
210	393.75	3.48E+0	-1.80E+1
211	395.62	3.48E+0	-2.09E+1
212	397.50	3.48E+0	-2.38E+1
213	399.37	3.48E+0	-2.67E+1
214	401.25	3.49E+0	-2.96E+1
215	403.12	3.49E+0	-3.26E+1
216	405.00	3.50E+0	-3.57E+1
217	406.87	3.50E+0	-3.88E+1
218	408.75	3.51E+0	-4.19E+1
219	410.62	3.51E+0	-4.50E+1
220	412.50	3.52E+0	-4.82E+1
221	414.37	3.53E+0	-5.15E+1
222	416.25	3.53E+0	-5.47E+1
223	418.12	3.54E+0	-5.80E+1
224	420.00	3.55E+0	-6.12E+1
225	421.87	3.56E+0	-6.45E+1
226	423.75	3.56E+0	-6.79E+1
227	425.62	3.57E+0	-7.13E+1
228	427.50	3.57E+0	-7.46E+1
229	429.37	3.57E+0	-7.80E+1
230	431.25	3.58E+0	-8.13E+1
231	433.12	3.58E+0	-8.48E+1
232	435.00	3.58E+0	-8.82E+1
233	436.87	3.57E+0	-9.16E+1
234	438.75	3.57E+0	-9.51E+1
235	440.62	3.57E+0	-9.86E+1
236	442.50	3.57E+0	-1.02E+2
237	444.37	3.57E+0	-1.06E+2
238	446.25	3.57E+0	-1.09E+2
239	448.12	3.57E+0	-1.13E+2
240	450.00	3.57E+0	-1.17E+2

repeat from p.57

9/10/90

#127 z drive, z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
239	448.12	3.57E+0	-1.13E+2
240	450.00	3.57E+0	-1.17E+2
241	451.87	3.57E+0	-1.21E+2
242	453.75	3.58E+0	-1.25E+2
243	455.62	3.58E+0	-1.29E+2
244	457.50	3.58E+0	-1.33E+2
245	459.37	3.57E+0	-1.37E+2
246	461.25	3.56E+0	-1.41E+2
247	463.12	3.54E+0	-1.45E+2
248	465.00	3.52E+0	-1.50E+2
249	466.87	3.47E+0	-1.55E+2
250	468.75	3.40E+0	-1.60E+2
251	470.62	3.34E+0	-1.64E+2
252	472.50	3.29E+0	-1.68E+2
253	474.37	3.25E+0	-1.71E+2
254	476.25	3.22E+0	-1.74E+2
255	478.12	3.19E+0	-1.77E+2
256	480.00	3.15E+0	-1.81E+2
257	481.87	3.11E+0	-1.85E+2
258	483.75	3.08E+0	-1.89E+2
259	485.62	3.04E+0	-1.93E+2
260	487.50	3.00E+0	-1.96E+2
261	489.37	2.96E+0	-2.00E+2
262	491.25	2.92E+0	-2.04E+2
263	493.12	2.88E+0	-2.07E+2
264	495.00	2.83E+0	-2.10E+2
265	496.87	2.78E+0	-2.13E+2
266	498.75	2.74E+0	-2.17E+2
267	500.62	2.69E+0	-2.20E+2
268	502.50	2.64E+0	-2.23E+2
269	504.37	2.59E+0	-2.27E+2
270	506.25	2.53E+0	-2.30E+2

repeat from p.58

9/10/90

#127, Z drive, Z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
269	504.37	2.59E+0	-2.27E+2
270	506.25	2.53E+0	-2.30E+2
271	508.12	2.48E+0	-2.33E+2
272	510.00	2.44E+0	-2.35E+2
273	511.87	2.39E+0	-2.37E+2
274	513.75	2.34E+0	-2.39E+2
275	515.62	2.29E+0	-2.41E+2
276	517.50	2.25E+0	-2.45E+2
277	519.37	2.20E+0	-2.48E+2
278	521.25	2.15E+0	-2.52E+2
279	523.12	2.10E+0	-2.57E+2
280	525.00	2.05E+0	-2.61E+2
281	526.87	2.00E+0	-2.65E+2
282	528.75	1.95E+0	-2.70E+2
283	530.62	1.90E+0	-2.74E+2
284	532.50	1.85E+0	-2.79E+2
285	534.37	1.80E+0	-2.84E+2
286	536.25	1.75E+0	-2.88E+2
287	538.12	1.71E+0	-2.92E+2
288	540.00	1.66E+0	-2.96E+2
289	541.87	1.61E+0	-3.00E+2
290	543.75	1.56E+0	-3.04E+2
291	545.62	1.52E+0	-3.08E+2
292	547.50	1.47E+0	-3.11E+2
293	549.37	1.43E+0	-3.15E+2
294	551.25	1.38E+0	-3.19E+2
295	553.12	1.34E+0	-3.23E+2
296	555.00	1.30E+0	-3.27E+2
297	556.87	1.26E+0	-3.31E+2
298	558.75	1.22E+0	-3.35E+2
299	560.62	1.18E+0	-3.38E+2
300	562.50	1.14E+0	-3.42E+2

9/10/90

#127, Z drive, Z response

SAMPLE RATE: 1.920KHZ

BIN	FREQUENCY	F1(N)	F2(N)
299	560.62	1.18E+0	-3.38E+2
300	562.50	1.14E+0	-3.42E+2
301	564.37	1.11E+0	-3.46E+2
302	566.25	1.07E+0	-3.49E+2
303	568.12	1.04E+0	-3.53E+2
304	570.00	1.00E+0	-3.56E+2
305	571.87	9.71E-1	0.00E+0
306	573.75	9.38E-1	-4.22E+0
307	575.62	9.07E-1	-8.31E+0
308	577.50	8.76E-1	-1.25E+1
309	579.37	8.47E-1	-1.67E+1
310	581.25	8.19E-1	-2.09E+1
311	583.12	7.91E-1	-2.52E+1
312	585.00	7.64E-1	-2.96E+1
313	586.87	7.38E-1	-3.41E+1
314	588.75	7.13E-1	-3.87E+1
315	590.62	6.88E-1	-4.34E+1

9/21/90

No Data

DWright

9/21/90

No Data

DWright

#128 9/21/90

RERUN OF SN 128 AFTER REWORK

SWEEP 2 to 500 Hz
15 minutes
0.1 in/sec input

2 to 100 Hz
15 minutes
0.5 in/sec input

TEST WITH
Y- ~~#~~ INPUT RUNS 1A & 2A
X- INPUT RUNS 3A & 4A
Z- INPUT RUNS 5A & 6A

already copied

ZONIC
CHANNEL
1 CONSTANT AMPLITUDE SINE WAVE ⇒ VELOCITY INPUT
2 X-AXIS VOLTAGE OF TRANSDUCER
3 Y-AXIS VOLTAGE OF TRANSDUCER
4 Z-AXIS VOLTAGE OF TRANSDUCER
5 ACCELERATION INPUT (PCB ACCEL)

SN 128

X- AXIS ACCEPTABLE
Y- AXIS PROBLEMS IN HIGH FREQ RANGE
Z- AXIS ACCEPTABLE

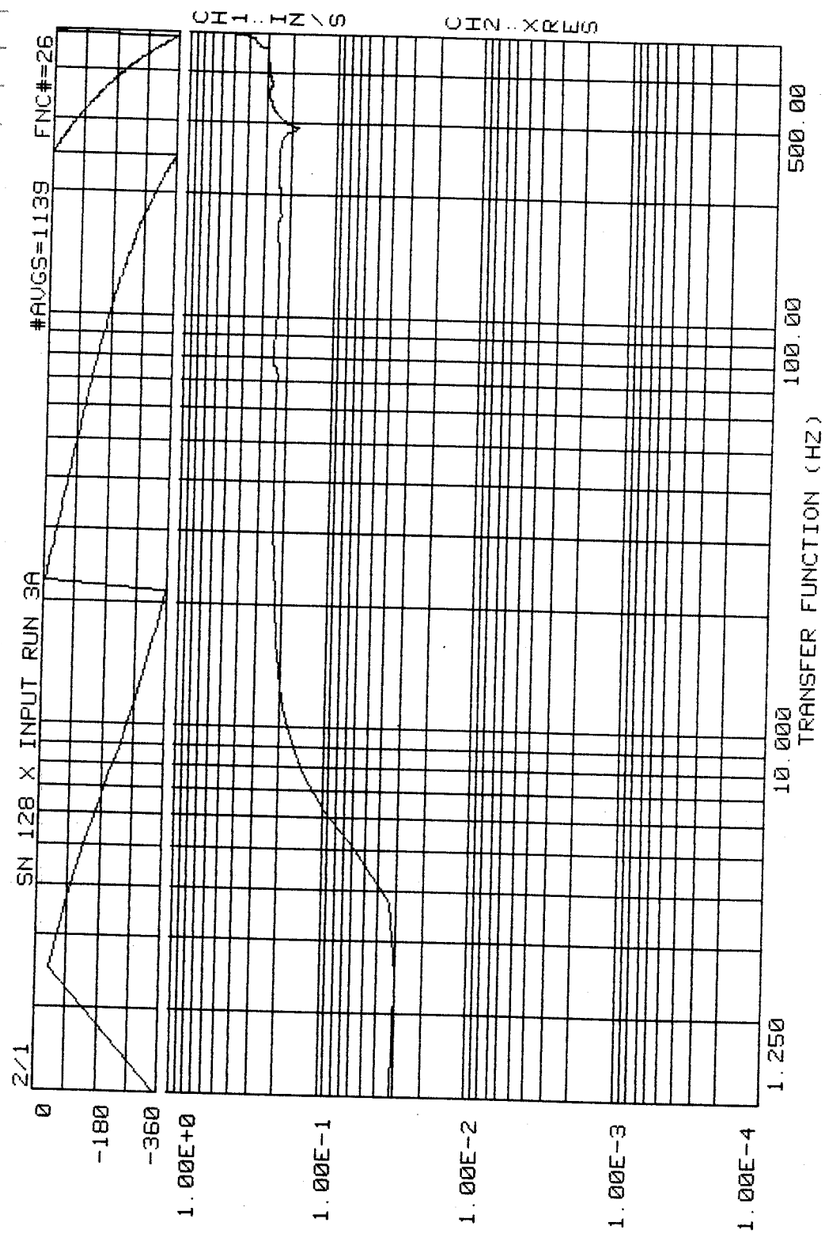
PROBLEMS WERE LATER DETERMINED TO BE ASSOCIATED WITH ~~MOUT~~ MOUNTING FIXTURE

Sine wave relationship

Freq Hz	Disp Inches	Vel In/sec	Accel g's
2	1.592E-02	0.10	3.260E-03
10	3.183E-03	0.10	1.630E-02
20	1.592E-03	0.10	3.260E-02
50	6.366E-04	0.10	8.150E-02
60	5.305E-04	0.10	9.780E-02
100	3.183E-04	0.10	1.630E-01
200	1.592E-04	0.10	3.260E-01
500	6.366E-05	0.10	8.150E-01
2	7.958E-02	0.50	1.630E-02
10	1.592E-02	0.50	8.150E-02
20	7.958E-03	0.50	1.630E-01
50	3.183E-03	0.50	4.075E-01
60	2.653E-03	0.50	4.890E-01
100	1.592E-03	0.50	8.150E-01
2	1.592E-01	1.00	3.260E-02
10	3.183E-02	1.00	1.630E-01
20	1.592E-02	1.00	3.260E-01
50	6.366E-03	1.00	8.150E-01
60	5.305E-03	1.00	9.780E-01
100	3.183E-03	1.00	1.630E+00
200	1.592E-03	1.00	3.260E+00
500	6.366E-04	1.00	8.150E+00
600	5.305E-04	1.00	9.780E+00

#128, X drive, X response

9/21/90



9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
1	1.250	3.17E-2	-3.49E+2
2	2.500	3.06E-2	-3.82E+1
3	3.750	3.32E-2	-8.79E+1
4	5.000	5.72E-2	-1.33E+2
5	6.250	9.55E-2	-1.71E+2
6	7.500	1.29E-1	-2.03E+2
7	8.750	1.55E-1	-2.30E+2
8	10.000	1.73E-1	-2.51E+2
9	11.250	1.87E-1	-2.69E+2
10	12.500	1.96E-1	-2.85E+2
11	13.750	2.04E-1	-2.98E+2
12	15.000	2.10E-1	-3.10E+2
13	16.250	2.14E-1	-3.21E+2
14	17.500	2.17E-1	-3.30E+2
15	18.750	2.20E-1	-3.39E+2
16	20.000	2.22E-1	-3.47E+2
17	21.250	2.24E-1	-3.54E+2
18	22.500	2.26E-1	-8.78E-1
19	23.750	2.27E-1	-7.56E+0
20	25.000	2.27E-1	-1.39E+1
21	26.250	2.28E-1	-1.98E+1
22	27.500	2.29E-1	-2.50E+1
23	28.750	2.30E-1	-2.95E+1
24	30.000	2.30E-1	-3.34E+1
25	31.250	2.30E-1	-3.73E+1
26	32.500	2.31E-1	-4.14E+1
27	33.750	2.31E-1	-4.56E+1
28	35.000	2.31E-1	-4.96E+1

9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
29	36.250	2.31E-1	-5.36E+1
30	37.500	2.32E-1	-5.74E+1
31	38.750	2.32E-1	-6.10E+1
32	40.000	2.32E-1	-6.44E+1
33	41.250	2.32E-1	-6.76E+1
34	42.500	2.33E-1	-7.07E+1
35	43.750	2.33E-1	-7.38E+1
36	45.000	2.33E-1	-7.68E+1
37	46.250	2.33E-1	-7.95E+1
38	47.500	2.33E-1	-8.22E+1
39	48.750	2.33E-1	-8.49E+1
40	50.000	2.33E-1	-8.76E+1
41	51.250	2.33E-1	-9.03E+1
42	52.500	2.33E-1	-9.30E+1
43	53.750	2.33E-1	-9.57E+1
44	55.000	2.33E-1	-9.83E+1
45	56.250	2.33E-1	-1.01E+2
46	57.500	2.34E-1	-1.03E+2
47	58.750	2.34E-1	-1.06E+2
48	60.000	2.34E-1	-1.08E+2
49	61.250	2.33E-1	-1.11E+2
50	62.500	2.32E-1	-1.13E+2
51	63.750	2.32E-1	-1.15E+2
52	65.000	2.32E-1	-1.18E+2
53	66.250	2.32E-1	-1.20E+2
54	67.500	2.31E-1	-1.22E+2
55	68.750	2.31E-1	-1.24E+2
56	70.000	2.30E-1	-1.27E+2

9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
57	71.250	2.29E-1	-1.29E+2
58	72.500	2.28E-1	-1.31E+2
59	73.750	2.31E-1	-1.33E+2
60	75.000	2.37E-1	-1.35E+2
61	76.250	2.43E-1	-1.37E+2
62	77.500	2.48E-1	-1.39E+2
63	78.750	2.48E-1	-1.41E+2
64	80.000	2.48E-1	-1.43E+2
65	81.250	2.46E-1	-1.45E+2
66	82.500	2.45E-1	-1.47E+2
67	83.750	2.44E-1	-1.49E+2
68	85.000	2.43E-1	-1.51E+2
69	86.250	2.42E-1	-1.53E+2
70	87.500	2.41E-1	-1.55E+2
71	88.750	2.41E-1	-1.57E+2
72	90.000	2.40E-1	-1.58E+2
73	91.250	2.40E-1	-1.60E+2
74	92.500	2.40E-1	-1.62E+2
75	93.750	2.39E-1	-1.64E+2
76	95.000	2.39E-1	-1.66E+2
77	96.250	2.39E-1	-1.67E+2
78	97.500	2.39E-1	-1.69E+2
79	98.750	2.38E-1	-1.71E+2
80	100.00	2.37E-1	-1.73E+2
81	101.25	2.35E-1	-1.75E+2
82	102.50	2.34E-1	-1.76E+2
83	103.75	2.34E-1	-1.78E+2
84	105.00	2.35E-1	-1.80E+2

9/21/90

#128, X Drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
85	106.25	2.35E-1	-1.82E+2
86	107.50	2.35E-1	-1.83E+2
87	108.75	2.35E-1	-1.85E+2
88	110.00	2.36E-1	-1.87E+2
89	111.25	2.36E-1	-1.88E+2
90	112.50	2.36E-1	-1.90E+2
91	113.75	2.36E-1	-1.92E+2
92	115.00	2.36E-1	-1.94E+2
93	116.25	2.35E-1	-1.95E+2
94	117.50	2.35E-1	-1.97E+2
95	118.75	2.35E-1	-1.99E+2
96	120.00	2.36E-1	-2.00E+2
97	121.25	2.36E-1	-2.02E+2
98	122.50	2.36E-1	-2.04E+2
99	123.75	2.36E-1	-2.05E+2
100	125.00	2.36E-1	-2.07E+2
101	126.25	2.35E-1	-2.09E+2
102	127.50	2.35E-1	-2.10E+2
103	128.75	2.35E-1	-2.12E+2
104	130.00	2.35E-1	-2.14E+2
105	131.25	2.35E-1	-2.15E+2
106	132.50	2.35E-1	-2.17E+2
107	133.75	2.35E-1	-2.18E+2
108	135.00	2.35E-1	-2.20E+2
109	136.25	2.35E-1	-2.22E+2
110	137.50	2.35E-1	-2.23E+2
111	138.75	2.35E-1	-2.25E+2
112	140.00	2.36E-1	-2.27E+2

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#128, X Drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
113	141.25	2.36E-1	-2.28E+2
114	142.50	2.36E-1	-2.30E+2
115	143.75	2.36E-1	-2.32E+2
116	145.00	2.35E-1	-2.33E+2
117	146.25	2.35E-1	-2.35E+2
118	147.50	2.35E-1	-2.37E+2
119	148.75	2.35E-1	-2.38E+2
120	150.00	2.35E-1	-2.40E+2
121	151.25	2.35E-1	-2.42E+2
122	152.50	2.36E-1	-2.43E+2
123	153.75	2.38E-1	-2.44E+2
124	155.00	2.39E-1	-2.43E+2
125	156.25	2.38E-1	-2.43E+2
126	157.50	2.37E-1	-2.44E+2
127	158.75	2.38E-1	-2.46E+2
128	160.00	2.38E-1	-2.48E+2
129	161.25	2.38E-1	-2.50E+2
130	162.50	2.37E-1	-2.52E+2
131	163.75	2.37E-1	-2.54E+2
132	165.00	2.37E-1	-2.56E+2
133	166.25	2.38E-1	-2.57E+2
134	167.50	2.38E-1	-2.59E+2
135	168.75	2.39E-1	-2.61E+2
136	170.00	2.40E-1	-2.62E+2
137	171.25	2.39E-1	-2.63E+2
138	172.50	2.37E-1	-2.65E+2
139	173.75	2.34E-1	-2.67E+2
140	175.00	2.31E-1	-2.68E+2

9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
141	176.25	2.30E-1	-2.70E+2
142	177.50	2.29E-1	-2.72E+2
143	178.75	2.29E-1	-2.73E+2
144	180.00	2.30E-1	-2.75E+2
145	181.25	2.32E-1	-2.76E+2
146	182.50	2.34E-1	-2.78E+2
147	183.75	2.36E-1	-2.80E+2
148	185.00	2.36E-1	-2.81E+2
149	186.25	2.35E-1	-2.83E+2
150	187.50	2.34E-1	-2.85E+2
151	188.75	2.34E-1	-2.86E+2
152	190.00	2.34E-1	-2.88E+2
153	191.25	2.34E-1	-2.89E+2
154	192.50	2.34E-1	-2.91E+2
155	193.75	2.34E-1	-2.92E+2
156	195.00	2.34E-1	-2.94E+2
157	196.25	2.35E-1	-2.95E+2
158	197.50	2.35E-1	-2.97E+2
159	198.75	2.35E-1	-2.98E+2
160	200.00	2.35E-1	-3.00E+2
161	201.25	2.35E-1	-3.02E+2
162	202.50	2.36E-1	-3.03E+2
163	203.75	2.36E-1	-3.05E+2
164	205.00	2.36E-1	-3.06E+2
165	206.25	2.37E-1	-3.07E+2
166	207.50	2.37E-1	-3.09E+2
167	208.75	2.38E-1	-3.11E+2
168	210.00	2.38E-1	-3.12E+2

9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
169	211.25	2.38E-1	-3.14E+2
170	212.50	2.39E-1	-3.15E+2
171	213.75	2.39E-1	-3.17E+2
172	215.00	2.39E-1	-3.18E+2
173	216.25	2.39E-1	-3.20E+2
174	217.50	2.39E-1	-3.21E+2
175	218.75	2.40E-1	-3.23E+2
176	220.00	2.40E-1	-3.25E+2
177	221.25	2.40E-1	-3.26E+2
178	222.50	2.40E-1	-3.28E+2
179	223.75	2.39E-1	-3.29E+2
180	225.00	2.39E-1	-3.31E+2
181	226.25	2.39E-1	-3.33E+2
182	227.50	2.39E-1	-3.35E+2
183	228.75	2.39E-1	-3.36E+2
184	230.00	2.39E-1	-3.38E+2
185	231.25	2.39E-1	-3.39E+2
186	232.50	2.39E-1	-3.41E+2
187	233.75	2.39E-1	-3.42E+2
188	235.00	2.39E-1	-3.44E+2
189	236.25	2.39E-1	-3.46E+2
190	237.50	2.39E-1	-3.47E+2
191	238.75	2.39E-1	-3.49E+2
192	240.00	2.39E-1	-3.50E+2
193	241.25	2.39E-1	-3.52E+2
194	242.50	2.39E-1	-3.53E+2
195	243.75	2.39E-1	-3.55E+2
196	245.00	2.39E-1	-3.56E+2

9/21/90

#128, X-hive, X-response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
197	246.25	2.39E-1	-3.58E+2
198	247.50	2.39E-1	0.00E+0
199	248.75	2.39E-1	-1.24E+0
200	250.00	2.39E-1	-2.93E+0
201	251.25	2.39E-1	-4.49E+0
202	252.50	2.39E-1	-6.09E+0
203	253.75	2.40E-1	-7.83E+0
204	255.00	2.39E-1	-9.57E+0
205	256.25	2.38E-1	-1.11E+1
206	257.50	2.38E-1	-1.25E+1
207	258.75	2.37E-1	-1.41E+1
208	260.00	2.37E-1	-1.57E+1
209	261.25	2.37E-1	-1.73E+1
210	262.50	2.37E-1	-1.88E+1
211	263.75	2.36E-1	-2.04E+1
212	265.00	2.35E-1	-2.20E+1
213	266.25	2.35E-1	-2.37E+1
214	267.50	2.35E-1	-2.53E+1
215	268.75	2.34E-1	-2.71E+1
216	270.00	2.33E-1	-2.88E+1
217	271.25	2.32E-1	-3.03E+1
218	272.50	2.30E-1	-3.19E+1
219	273.75	2.29E-1	-3.34E+1
220	275.00	2.28E-1	-3.50E+1
221	276.25	2.26E-1	-3.66E+1
222	277.50	2.24E-1	-3.80E+1
223	278.75	2.22E-1	-3.94E+1
224	280.00	2.20E-1	-4.10E+1

9/21/90

#128, X-hive, X-response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
225	281.25	2.17E-1	-4.27E+1
226	282.50	2.13E-1	-4.44E+1
227	283.75	2.08E-1	-4.61E+1
228	285.00	2.02E-1	-4.77E+1
229	286.25	1.96E-1	-4.93E+1
230	287.50	1.90E-1	-5.10E+1
231	288.75	1.84E-1	-5.24E+1
232	290.00	1.80E-1	-5.39E+1
233	291.25	1.80E-1	-5.55E+1
234	292.50	1.84E-1	-5.73E+1
235	293.75	1.90E-1	-5.92E+1
236	295.00	1.96E-1	-6.10E+1
237	296.25	2.02E-1	-6.24E+1
238	297.50	2.09E-1	-6.37E+1
239	298.75	2.14E-1	-6.53E+1
240	300.00	2.18E-1	-6.70E+1
241	301.25	2.22E-1	-6.88E+1
242	302.50	2.25E-1	-7.04E+1
243	303.75	2.28E-1	-7.20E+1
244	305.00	2.31E-1	-7.37E+1
245	306.25	2.34E-1	-7.54E+1
246	307.50	2.37E-1	-7.70E+1
247	308.75	2.38E-1	-7.86E+1
248	310.00	2.40E-1	-8.01E+1
249	311.25	2.43E-1	-8.16E+1
250	312.50	2.46E-1	-8.32E+1
251	313.75	2.49E-1	-8.50E+1
252	315.00	2.52E-1	-8.68E+1

9/21/90

#128, x drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
253	316.25	2.54E-1	-8.89E+1
254	317.50	2.57E-1	-9.08E+1
255	318.75	2.59E-1	-9.26E+1
256	320.00	2.61E-1	-9.45E+1
257	321.25	2.61E-1	-9.63E+1
258	322.50	2.62E-1	-9.80E+1
259	323.75	2.63E-1	-9.97E+1
260	325.00	2.66E-1	-1.01E+2
261	326.25	2.68E-1	-1.03E+2
262	327.50	2.70E-1	-1.04E+2
263	328.75	2.72E-1	-1.06E+2
264	330.00	2.73E-1	-1.08E+2
265	331.25	2.74E-1	-1.10E+2
266	332.50	2.75E-1	-1.11E+2
267	333.75	2.76E-1	-1.13E+2
268	335.00	2.76E-1	-1.15E+2
269	336.25	2.77E-1	-1.17E+2
270	337.50	2.78E-1	-1.19E+2
271	338.75	2.78E-1	-1.21E+2
272	340.00	2.78E-1	-1.23E+2
273	341.25	2.78E-1	-1.24E+2
274	342.50	2.79E-1	-1.26E+2
275	343.75	2.81E-1	-1.27E+2
276	345.00	2.83E-1	-1.29E+2
277	346.25	2.84E-1	-1.30E+2
278	347.50	2.86E-1	-1.32E+2
279	348.75	2.87E-1	-1.34E+2
280	350.00	2.87E-1	-1.35E+2

BWagat

9/21/90

#128, x drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
281	351.25	2.88E-1	-1.37E+2
282	352.50	2.88E-1	-1.39E+2
283	353.75	2.88E-1	-1.41E+2
284	355.00	2.88E-1	-1.42E+2
285	356.25	2.87E-1	-1.44E+2
286	357.50	2.87E-1	-1.46E+2
287	358.75	2.86E-1	-1.48E+2
288	360.00	2.84E-1	-1.50E+2
289	361.25	2.83E-1	-1.51E+2
290	362.50	2.82E-1	-1.53E+2
291	363.75	2.81E-1	-1.55E+2
292	365.00	2.81E-1	-1.57E+2
293	366.25	2.80E-1	-1.59E+2
294	367.50	2.80E-1	-1.60E+2
295	368.75	2.79E-1	-1.62E+2
296	370.00	2.78E-1	-1.64E+2
297	371.25	2.78E-1	-1.66E+2
298	372.50	2.78E-1	-1.67E+2
299	373.75	2.77E-1	-1.69E+2
300	375.00	2.77E-1	-1.71E+2
301	376.25	2.77E-1	-1.73E+2
302	377.50	2.78E-1	-1.75E+2
303	378.75	2.78E-1	-1.76E+2
304	380.00	2.78E-1	-1.78E+2
305	381.25	2.78E-1	-1.80E+2
306	382.50	2.78E-1	-1.82E+2
307	383.75	2.79E-1	-1.84E+2
308	385.00	2.79E-1	-1.86E+2

BWagat

9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
309	386.25	2.79E-1	-1.88E+2
310	387.50	2.80E-1	-1.89E+2
311	388.75	2.81E-1	-1.91E+2
312	390.00	2.81E-1	-1.93E+2
313	391.25	2.82E-1	-1.95E+2
314	392.50	2.82E-1	-1.97E+2
315	393.75	2.83E-1	-1.99E+2
316	395.00	2.84E-1	-2.00E+2
317	396.25	2.84E-1	-2.02E+2
318	397.50	2.84E-1	-2.04E+2
319	398.75	2.85E-1	-2.06E+2
320	400.00	2.85E-1	-2.08E+2
321	401.25	2.86E-1	-2.10E+2
322	402.50	2.86E-1	-2.12E+2
323	403.75	2.86E-1	-2.13E+2
324	405.00	2.87E-1	-2.15E+2
325	406.25	2.86E-1	-2.17E+2
326	407.50	2.87E-1	-2.19E+2
327	408.75	2.87E-1	-2.21E+2
328	410.00	2.87E-1	-2.23E+2
329	411.25	2.87E-1	-2.25E+2
330	412.50	2.87E-1	-2.27E+2
331	413.75	2.87E-1	-2.29E+2
332	415.00	2.88E-1	-2.31E+2
333	416.25	2.88E-1	-2.33E+2
334	417.50	2.88E-1	-2.35E+2
335	418.75	2.87E-1	-2.37E+2
336	420.00	2.88E-1	-2.39E+2

Dwright

9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
337	421.25	2.90E-1	-2.41E+2
338	422.50	2.91E-1	-2.43E+2
339	423.75	2.92E-1	-2.45E+2
340	425.00	2.93E-1	-2.47E+2
341	426.25	2.93E-1	-2.49E+2
342	427.50	2.93E-1	-2.51E+2
343	428.75	2.94E-1	-2.53E+2
344	430.00	2.94E-1	-2.55E+2
345	431.25	2.94E-1	-2.57E+2
346	432.50	2.95E-1	-2.59E+2
347	433.75	2.95E-1	-2.61E+2
348	435.00	2.95E-1	-2.63E+2
349	436.25	2.95E-1	-2.66E+2
350	437.50	2.95E-1	-2.67E+2
351	438.75	2.95E-1	-2.70E+2
352	440.00	2.95E-1	-2.72E+2
353	441.25	2.95E-1	-2.74E+2
354	442.50	2.95E-1	-2.76E+2
355	443.75	2.96E-1	-2.78E+2
356	445.00	2.96E-1	-2.80E+2
357	446.25	2.97E-1	-2.82E+2
358	447.50	2.98E-1	-2.85E+2
359	448.75	2.98E-1	-2.86E+2
360	450.00	2.98E-1	-2.89E+2
361	451.25	2.98E-1	-2.91E+2
362	452.50	2.98E-1	-2.93E+2
363	453.75	2.98E-1	-2.95E+2
364	455.00	2.98E-1	-2.98E+2

Dwright

9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
365	456.25	2.97E-1	-3.00E+2
366	457.50	2.97E-1	-3.02E+2
367	458.75	2.97E-1	-3.04E+2
368	460.00	2.98E-1	-3.06E+2
369	461.25	3.05E-1	-3.09E+2
370	462.50	3.12E-1	-3.11E+2
371	463.75	3.23E-1	-3.13E+2
372	465.00	3.28E-1	-3.15E+2
373	466.25	3.34E-1	-3.18E+2
374	467.50	3.36E-1	-3.20E+2
375	468.75	3.40E-1	-3.22E+2
376	470.00	3.42E-1	-3.24E+2
377	471.25	3.45E-1	-3.26E+2
378	472.50	3.48E-1	-3.28E+2
379	473.75	3.50E-1	-3.30E+2
380	475.00	3.52E-1	-3.32E+2
381	476.25	3.54E-1	-3.35E+2
382	477.50	3.56E-1	-3.37E+2
383	478.75	3.58E-1	-3.39E+2
384	480.00	3.60E-1	-3.42E+2
385	481.25	3.62E-1	-3.44E+2
386	482.50	3.65E-1	-3.47E+2
387	483.75	3.68E-1	-3.49E+2
388	485.00	3.72E-1	-3.51E+2
389	486.25	3.75E-1	-3.53E+2
390	487.50	3.81E-1	-3.56E+2
391	488.75	3.84E-1	-3.58E+2
392	490.00	3.92E-1	-1.10E+0

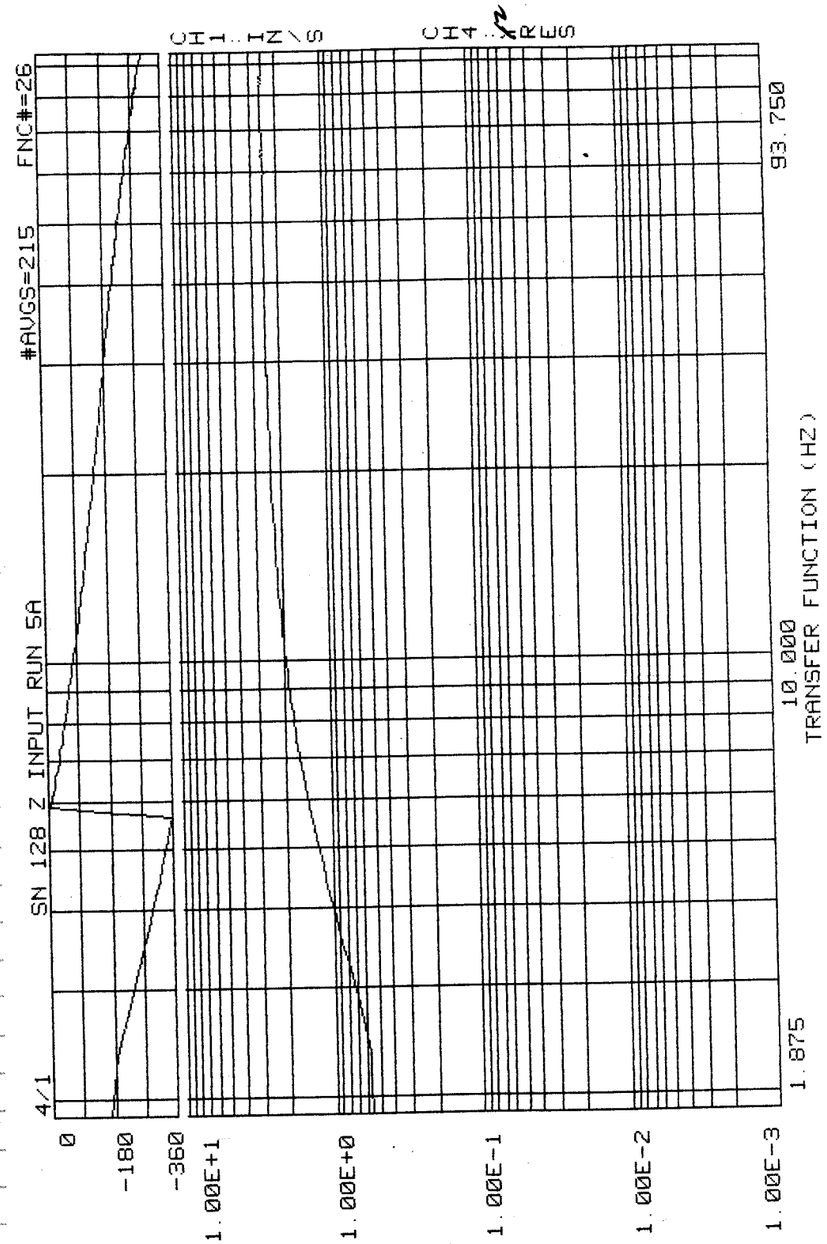
9/21/90

#128, X drive, X response

SAMPLE RATE: 1.280KHZ

BIN	FREQUENCY	F1(N)	F2(N)
393	491.25	3.96E-1	-3.20E+0
394	492.50	4.05E-1	-6.19E+0
395	493.75	4.15E-1	-8.48E+0
396	495.00	4.33E-1	-1.27E+1
397	496.25	4.41E-1	-1.60E+1
398	497.50	4.60E-1	-2.08E+1
399	498.75	4.73E-1	-2.41E+1
400	500.00	5.18E-1	-2.82E+1

#128 Z, drive, Z response 9/21/90



9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
8	1.875	5.70E-1	-1.67E+2
9	2.109	5.78E-1	-1.76E+2
10	2.344	5.88E-1	-1.88E+2
11	2.578	6.26E-1	-2.05E+2
12	2.813	6.85E-1	-2.23E+2
13	3.047	7.48E-1	-2.40E+2
14	3.281	8.11E-1	-2.56E+2
15	3.516	8.75E-1	-2.70E+2
16	3.750	9.38E-1	-2.83E+2
17	3.984	9.99E-1	-2.95E+2
18	4.219	1.06E+0	-3.06E+2
19	4.453	1.12E+0	-3.16E+2
20	4.688	1.17E+0	-3.25E+2
21	4.922	1.23E+0	-3.34E+2
22	5.156	1.28E+0	-3.42E+2
23	5.391	1.33E+0	-3.49E+2
24	5.625	1.37E+0	-3.57E+2
25	5.859	1.42E+0	-3.14E+0
26	6.094	1.46E+0	-9.34E+0
27	6.328	1.50E+0	-1.51E+1
28	6.563	1.54E+0	-2.06E+1
29	6.797	1.58E+0	-2.58E+1
30	7.031	1.62E+0	-3.08E+1
31	7.266	1.65E+0	-3.54E+1
32	7.500	1.68E+0	-3.98E+1
33	7.734	1.71E+0	-4.41E+1
34	7.969	1.74E+0	-4.81E+1
35	8.203	1.77E+0	-5.20E+1

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
36	8.438	1.80E+0	-5.57E+1
37	8.672	1.82E+0	-5.92E+1
38	8.906	1.85E+0	-6.25E+1
39	9.141	1.87E+0	-6.58E+1
40	9.375	1.89E+0	-6.89E+1
41	9.609	1.92E+0	-7.19E+1
42	9.844	1.94E+0	-7.48E+1
43	10.078	1.96E+0	-7.76E+1
44	10.312	1.97E+0	-8.03E+1
45	10.547	1.99E+0	-8.28E+1
46	10.781	2.01E+0	-8.54E+1
47	11.016	2.03E+0	-8.78E+1
48	11.250	2.04E+0	-9.01E+1
49	11.484	2.06E+0	-9.24E+1
50	11.719	2.07E+0	-9.46E+1
51	11.953	2.08E+0	-9.67E+1
52	12.187	2.10E+0	-9.88E+1
53	12.422	2.11E+0	-1.01E+2
54	12.656	2.12E+0	-1.03E+2
55	12.891	2.13E+0	-1.05E+2
56	13.125	2.14E+0	-1.07E+2
57	13.359	2.15E+0	-1.08E+2
58	13.594	2.17E+0	-1.10E+2
59	13.828	2.18E+0	-1.12E+2
60	14.062	2.18E+0	-1.14E+2
61	14.297	2.19E+0	-1.15E+2
62	14.531	2.20E+0	-1.17E+2
63	14.766	2.21E+0	-1.18E+2

DuVaynt

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
64	15.000	2.22E+0	-1.20E+2
65	15.234	2.23E+0	-1.21E+2
66	15.469	2.23E+0	-1.23E+2
67	15.703	2.24E+0	-1.24E+2
68	15.937	2.25E+0	-1.26E+2
69	16.172	2.25E+0	-1.27E+2
70	16.406	2.26E+0	-1.28E+2
71	16.641	2.27E+0	-1.30E+2
72	16.875	2.27E+0	-1.31E+2
73	17.109	2.28E+0	-1.32E+2
74	17.344	2.28E+0	-1.34E+2
75	17.578	2.29E+0	-1.35E+2
76	17.812	2.29E+0	-1.36E+2
77	18.047	2.30E+0	-1.37E+2
78	18.281	2.30E+0	-1.38E+2
79	18.516	2.31E+0	-1.40E+2
80	18.750	2.31E+0	-1.41E+2
81	18.984	2.32E+0	-1.42E+2
82	19.219	2.32E+0	-1.43E+2
83	19.453	2.32E+0	-1.44E+2
84	19.687	2.33E+0	-1.45E+2
85	19.922	2.33E+0	-1.46E+2
86	20.156	2.33E+0	-1.47E+2
87	20.391	2.34E+0	-1.48E+2
88	20.625	2.34E+0	-1.49E+2
89	20.859	2.34E+0	-1.50E+2
90	21.094	2.35E+0	-1.51E+2
91	21.328	2.35E+0	-1.52E+2

DuVaynt

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
92	21.562	2.35E+0	-1.53E+2
93	21.797	2.36E+0	-1.54E+2
94	22.031	2.36E+0	-1.55E+2
95	22.266	2.36E+0	-1.56E+2
96	22.500	2.36E+0	-1.57E+2
97	22.734	2.37E+0	-1.57E+2
98	22.969	2.37E+0	-1.58E+2
99	23.203	2.37E+0	-1.59E+2
100	23.437	2.38E+0	-1.60E+2
101	23.672	2.38E+0	-1.61E+2
102	23.906	2.38E+0	-1.62E+2
103	24.141	2.38E+0	-1.63E+2
104	24.375	2.38E+0	-1.63E+2
105	24.609	2.38E+0	-1.64E+2
106	24.844	2.39E+0	-1.65E+2
107	25.078	2.39E+0	-1.66E+2
108	25.312	2.39E+0	-1.67E+2
109	25.547	2.39E+0	-1.67E+2
110	25.781	2.39E+0	-1.68E+2
111	26.016	2.39E+0	-1.69E+2
112	26.250	2.40E+0	-1.70E+2
113	26.484	2.40E+0	-1.70E+2
114	26.719	2.40E+0	-1.71E+2
115	26.953	2.40E+0	-1.72E+2
116	27.187	2.40E+0	-1.73E+2
117	27.422	2.40E+0	-1.73E+2
118	27.656	2.41E+0	-1.74E+2
119	27.891	2.41E+0	-1.75E+2

BWVaugt

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
120	28.125	2.41E+0	-1.76E+2
121	28.359	2.41E+0	-1.76E+2
122	28.594	2.41E+0	-1.77E+2
123	28.828	2.41E+0	-1.78E+2
124	29.062	2.41E+0	-1.78E+2
125	29.297	2.42E+0	-1.79E+2
126	29.531	2.42E+0	-1.80E+2
127	29.766	2.42E+0	-1.80E+2
128	30.000	2.42E+0	-1.81E+2
129	30.234	2.42E+0	-1.82E+2
130	30.469	2.42E+0	-1.82E+2
131	30.703	2.42E+0	-1.83E+2
132	30.937	2.42E+0	-1.84E+2
133	31.172	2.42E+0	-1.84E+2
134	31.406	2.43E+0	-1.85E+2
135	31.641	2.42E+0	-1.85E+2
136	31.875	2.43E+0	-1.86E+2
137	32.109	2.43E+0	-1.87E+2
138	32.344	2.43E+0	-1.87E+2
139	32.578	2.43E+0	-1.88E+2
140	32.812	2.43E+0	-1.89E+2
141	33.047	2.43E+0	-1.89E+2
142	33.281	2.43E+0	-1.90E+2
143	33.516	2.43E+0	-1.90E+2
144	33.750	2.43E+0	-1.91E+2
145	33.984	2.43E+0	-1.92E+2
146	34.219	2.43E+0	-1.92E+2
147	34.453	2.43E+0	-1.93E+2

BWVaugt

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
148	34.687	2.43E+0	-1.93E+2
149	34.922	2.43E+0	-1.94E+2
150	35.156	2.44E+0	-1.95E+2
151	35.391	2.43E+0	-1.95E+2
152	35.625	2.44E+0	-1.96E+2
153	35.859	2.44E+0	-1.96E+2
154	36.094	2.44E+0	-1.97E+2
155	36.328	2.44E+0	-1.97E+2
156	36.562	2.44E+0	-1.98E+2
157	36.797	2.44E+0	-1.99E+2
158	37.031	2.44E+0	-1.99E+2
159	37.266	2.44E+0	-2.00E+2
160	37.500	2.44E+0	-2.00E+2
161	37.734	2.44E+0	-2.01E+2
162	37.969	2.44E+0	-2.01E+2
163	38.203	2.44E+0	-2.02E+2
164	38.437	2.44E+0	-2.02E+2
165	38.672	2.44E+0	-2.03E+2
166	38.906	2.44E+0	-2.04E+2
167	39.141	2.44E+0	-2.04E+2
168	39.375	2.44E+0	-2.05E+2
169	39.609	2.45E+0	-2.06E+2
170	39.844	2.44E+0	-2.06E+2
171	40.078	2.45E+0	-2.06E+2
172	40.312	2.45E+0	-2.07E+2
173	40.547	2.45E+0	-2.07E+2
174	40.781	2.45E+0	-2.08E+2
175	41.016	2.45E+0	-2.09E+2

DWright

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
176	41.250	2.45E+0	-2.09E+2
177	41.484	2.45E+0	-2.09E+2
178	41.719	2.45E+0	-2.10E+2
179	41.953	2.45E+0	-2.11E+2
180	42.187	2.44E+0	-2.11E+2
181	42.422	2.45E+0	-2.12E+2
182	42.656	2.45E+0	-2.12E+2
183	42.891	2.44E+0	-2.12E+2
184	43.125	2.44E+0	-2.13E+2
185	43.359	2.45E+0	-2.14E+2
186	43.594	2.44E+0	-2.14E+2
187	43.828	2.44E+0	-2.15E+2
188	44.062	2.44E+0	-2.16E+2
189	44.297	2.44E+0	-2.16E+2
190	44.531	2.44E+0	-2.16E+2
191	44.766	2.44E+0	-2.17E+2
192	45.000	2.44E+0	-2.18E+2
193	45.234	2.44E+0	-2.18E+2
194	45.469	2.44E+0	-2.18E+2
195	45.703	2.44E+0	-2.19E+2
196	45.937	2.44E+0	-2.19E+2
197	46.172	2.43E+0	-2.19E+2
198	46.406	2.43E+0	-2.20E+2
199	46.641	2.44E+0	-2.21E+2
200	46.875	2.43E+0	-2.21E+2
201	47.109	2.43E+0	-2.21E+2
202	47.344	2.43E+0	-2.22E+2
203	47.578	2.44E+0	-2.23E+2

DWright

9/21/90

#128, z drive, z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
204	47.812	2.43E+0	-2.23E+2
205	48.047	2.43E+0	-2.23E+2
206	48.281	2.44E+0	-2.24E+2
207	48.516	2.44E+0	-2.24E+2
208	48.750	2.43E+0	-2.24E+2
209	48.984	2.43E+0	-2.25E+2
210	49.219	2.43E+0	-2.26E+2
211	49.453	2.43E+0	-2.26E+2
212	49.687	2.43E+0	-2.26E+2
213	49.922	2.43E+0	-2.27E+2
214	50.156	2.43E+0	-2.28E+2
215	50.391	2.43E+0	-2.28E+2
216	50.625	2.42E+0	-2.28E+2
217	50.859	2.42E+0	-2.28E+2
218	51.094	2.43E+0	-2.29E+2
219	51.328	2.43E+0	-2.30E+2
220	51.562	2.42E+0	-2.30E+2
221	51.797	2.42E+0	-2.30E+2
222	52.031	2.43E+0	-2.31E+2
223	52.266	2.42E+0	-2.31E+2
224	52.500	2.42E+0	-2.31E+2
225	52.734	2.42E+0	-2.32E+2
226	52.969	2.43E+0	-2.33E+2
227	53.203	2.43E+0	-2.33E+2
228	53.437	2.42E+0	-2.33E+2
229	53.672	2.42E+0	-2.34E+2
230	53.906	2.43E+0	-2.35E+2
231	54.141	2.43E+0	-2.35E+2

DeWayne

9/21/90

#128, z drive, z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
232	54.375	2.42E+0	-2.35E+2
233	54.609	2.42E+0	-2.35E+2
234	54.844	2.43E+0	-2.36E+2
235	55.078	2.43E+0	-2.37E+2
236	55.312	2.42E+0	-2.37E+2
237	55.547	2.42E+0	-2.37E+2
238	55.781	2.42E+0	-2.38E+2
239	56.016	2.43E+0	-2.39E+2
240	56.250	2.42E+0	-2.39E+2
241	56.484	2.42E+0	-2.39E+2
242	56.719	2.42E+0	-2.39E+2
243	56.953	2.43E+0	-2.41E+2
244	57.187	2.43E+0	-2.41E+2
245	57.422	2.42E+0	-2.41E+2
246	57.656	2.42E+0	-2.41E+2
247	57.891	2.42E+0	-2.42E+2
248	58.125	2.43E+0	-2.43E+2
249	58.359	2.43E+0	-2.43E+2
250	58.594	2.43E+0	-2.43E+2
251	58.828	2.43E+0	-2.43E+2
252	59.062	2.45E+0	-2.45E+2
253	59.297	2.44E+0	-2.45E+2
254	59.531	2.43E+0	-2.46E+2
255	59.766	2.40E+0	-2.46E+2
256	60.000	2.41E+0	-2.47E+2
257	60.234	2.47E+0	-2.48E+2
258	60.469	2.47E+0	-2.47E+2
259	60.703	2.45E+0	-2.47E+2

DeWayne

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
260	60.937	2.46E+0	-2.47E+2
261	61.172	2.47E+0	-2.48E+2
262	61.406	2.47E+0	-2.49E+2
263	61.641	2.46E+0	-2.49E+2
264	61.875	2.46E+0	-2.49E+2
265	62.109	2.45E+0	-2.49E+2
266	62.344	2.47E+0	-2.51E+2
267	62.578	2.49E+0	-2.52E+2
268	62.812	2.48E+0	-2.52E+2
269	63.047	2.48E+0	-2.52E+2
270	63.281	2.47E+0	-2.52E+2
271	63.516	2.49E+0	-2.53E+2
272	63.750	2.50E+0	-2.54E+2
273	63.984	2.49E+0	-2.54E+2
274	64.219	2.48E+0	-2.54E+2
275	64.453	2.48E+0	-2.54E+2
276	64.687	2.49E+0	-2.55E+2
277	64.922	2.50E+0	-2.56E+2
278	65.156	2.49E+0	-2.56E+2
279	65.391	2.49E+0	-2.56E+2
280	65.625	2.48E+0	-2.56E+2
281	65.859	2.49E+0	-2.58E+2
282	66.094	2.49E+0	-2.59E+2
283	66.328	2.48E+0	-2.59E+2
284	66.562	2.48E+0	-2.59E+2
285	66.797	2.47E+0	-2.59E+2
286	67.031	2.46E+0	-2.60E+2
287	67.266	2.46E+0	-2.61E+2

Sur Ayat

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
288	67.500	2.46E+0	-2.61E+2
289	67.734	2.45E+0	-2.61E+2
290	67.969	2.45E+0	-2.61E+2
291	68.203	2.44E+0	-2.61E+2
292	68.437	2.46E+0	-2.63E+2
293	68.672	2.47E+0	-2.63E+2
294	68.906	2.47E+0	-2.63E+2
295	69.141	2.46E+0	-2.64E+2
296	69.375	2.46E+0	-2.64E+2
297	69.609	2.49E+0	-2.65E+2
298	69.844	2.52E+0	-2.66E+2
299	70.078	2.52E+0	-2.66E+2
300	70.312	2.51E+0	-2.66E+2
301	70.547	2.50E+0	-2.66E+2
302	70.781	2.51E+0	-2.66E+2
303	71.016	2.53E+0	-2.68E+2
304	71.250	2.53E+0	-2.68E+2
305	71.484	2.53E+0	-2.68E+2
306	71.719	2.52E+0	-2.68E+2
307	71.953	2.52E+0	-2.68E+2
308	72.187	2.53E+0	-2.69E+2
309	72.422	2.54E+0	-2.70E+2
310	72.656	2.54E+0	-2.70E+2
311	72.891	2.53E+0	-2.70E+2
312	73.125	2.53E+0	-2.70E+2
313	73.359	2.53E+0	-2.71E+2
314	73.594	2.54E+0	-2.72E+2
315	73.828	2.54E+0	-2.73E+2

Sur Ayat

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
316	74.062	2.54E+0	-2.73E+2
317	74.297	2.53E+0	-2.73E+2
318	74.531	2.52E+0	-2.73E+2
319	74.766	2.52E+0	-2.73E+2
320	75.000	2.53E+0	-2.74E+2
321	75.234	2.53E+0	-2.75E+2
322	75.469	2.53E+0	-2.75E+2
323	75.703	2.52E+0	-2.75E+2
324	75.937	2.52E+0	-2.75E+2
325	76.172	2.52E+0	-2.75E+2
326	76.406	2.53E+0	-2.76E+2
327	76.641	2.53E+0	-2.77E+2
328	76.875	2.52E+0	-2.77E+2
329	77.109	2.52E+0	-2.77E+2
330	77.344	2.51E+0	-2.77E+2
331	77.578	2.51E+0	-2.77E+2
332	77.812	2.52E+0	-2.78E+2
333	78.047	2.52E+0	-2.79E+2
334	78.281	2.52E+0	-2.79E+2
335	78.516	2.51E+0	-2.79E+2
336	78.750	2.51E+0	-2.79E+2
337	78.984	2.50E+0	-2.79E+2
338	79.219	2.51E+0	-2.80E+2
339	79.453	2.51E+0	-2.81E+2
340	79.687	2.51E+0	-2.81E+2
341	79.922	2.50E+0	-2.81E+2
342	80.156	2.50E+0	-2.81E+2
343	80.391	2.50E+0	-2.81E+2

DWVaught

9/21/90

#128, Z drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
344	80.625	2.50E+0	-2.82E+2
345	80.859	2.51E+0	-2.83E+2
346	81.094	2.50E+0	-2.83E+2
347	81.328	2.50E+0	-2.83E+2
348	81.562	2.49E+0	-2.83E+2
349	81.797	2.49E+0	-2.83E+2
350	82.031	2.49E+0	-2.83E+2
351	82.266	2.50E+0	-2.85E+2
352	82.500	2.50E+0	-2.85E+2
353	82.734	2.50E+0	-2.85E+2
354	82.969	2.49E+0	-2.85E+2
355	83.203	2.48E+0	-2.85E+2
356	83.437	2.48E+0	-2.85E+2
357	83.672	2.49E+0	-2.86E+2
358	83.906	2.49E+0	-2.87E+2
359	84.141	2.49E+0	-2.87E+2
360	84.375	2.49E+0	-2.87E+2
361	84.609	2.48E+0	-2.87E+2
362	84.844	2.48E+0	-2.87E+2
363	85.078	2.47E+0	-2.88E+2
364	85.312	2.49E+0	-2.89E+2
365	85.547	2.49E+0	-2.90E+2
366	85.781	2.49E+0	-2.90E+2
367	86.016	2.48E+0	-2.90E+2
368	86.250	2.47E+0	-2.90E+2
369	86.484	2.47E+0	-2.90E+2
370	86.719	2.47E+0	-2.91E+2
371	86.953	2.49E+0	-2.92E+2

DWVaught

9/21/90

#128, Z Drive, Z response

SAMPLE RATE: 240.00HZ

BIN	FREQUENCY	F1(N)	F2(N)
372	87.187	2.48E+0	-2.93E+2
373	87.422	2.48E+0	-2.93E+2
374	87.656	2.47E+0	-2.93E+2
375	87.891	2.46E+0	-2.93E+2
376	88.125	2.46E+0	-2.93E+2
377	88.359	2.46E+0	-2.94E+2
378	88.594	2.48E+0	-2.95E+2
379	88.828	2.48E+0	-2.95E+2
380	89.062	2.47E+0	-2.95E+2
381	89.297	2.46E+0	-2.95E+2
382	89.531	2.46E+0	-2.95E+2
383	89.766	2.46E+0	-2.96E+2
384	90.000	2.46E+0	-2.96E+2
385	90.234	2.47E+0	-2.98E+2
386	90.469	2.47E+0	-2.98E+2
387	90.703	2.47E+0	-2.98E+2
388	90.937	2.46E+0	-2.98E+2
389	91.172	2.45E+0	-2.98E+2
390	91.406	2.45E+0	-2.98E+2
391	91.641	2.45E+0	-2.99E+2
392	91.875	2.47E+0	-3.00E+2
393	92.109	2.47E+0	-3.01E+2
394	92.344	2.47E+0	-3.01E+2
395	92.578	2.46E+0	-3.01E+2
396	92.812	2.45E+0	-3.01E+2
397	93.047	2.45E+0	-3.01E+2
398	93.281	2.45E+0	-3.01E+2
399	93.516	2.44E+0	-3.03E+2
400	93.750	2.43E+0	-3.03E+2

Bill Wright

RERUN OF Y-AXIS FOR SN 128

MODIFY TEST FIXTURE TO CLAMP ~~ONE~~ V-BLOCKS TO PLATE WITH BOLTS. IT WAS DETERMINED THAT HIGH FREQUENCY RESPONSE WAS A RESULT OF ROCKING OF ~~THE~~ V-BLOCKS ON PLATE.

SWEEP 2 to 500 Hz
15 minutes
0.1 in/sec

TEST Y-INPUT ONLY

Sine wave relationship

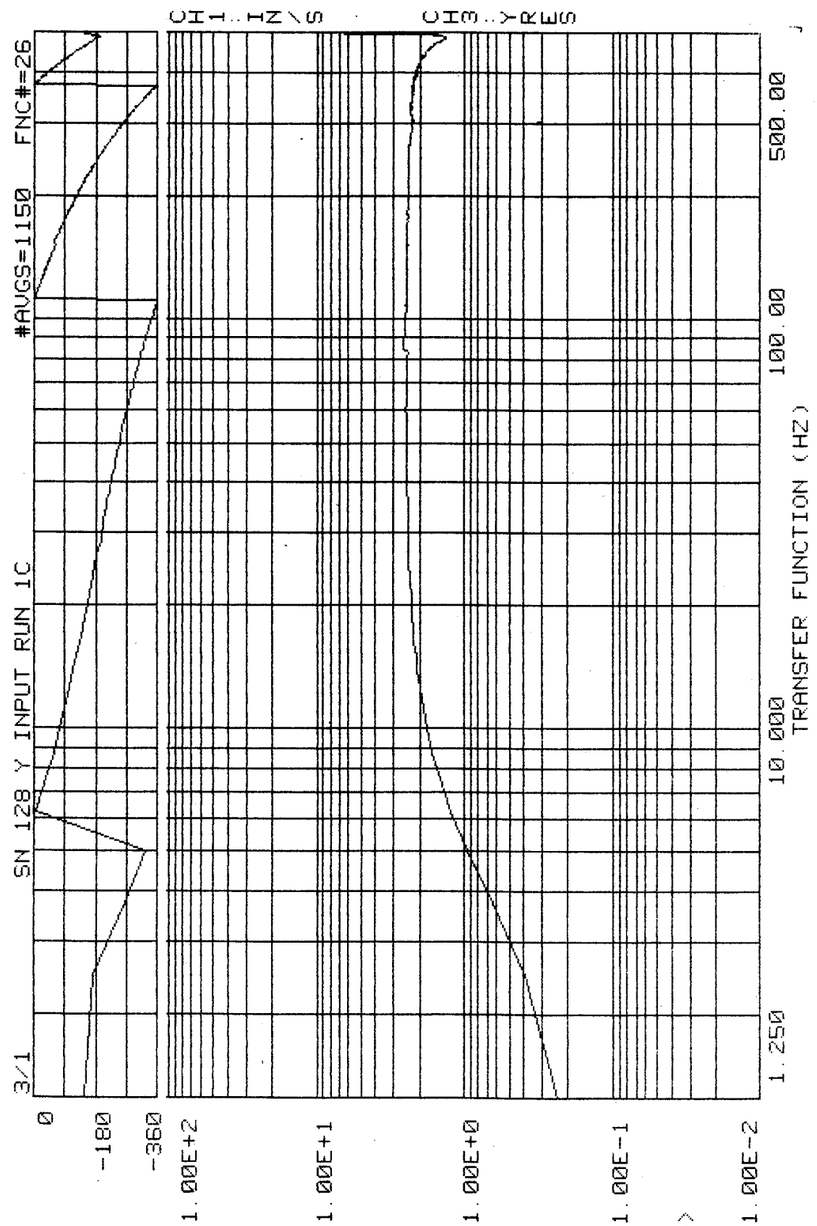
SN 128

Y-AXIS ACCEPTABLE

Freq Hz	Disp Inches	Vel In/sec	Accel g's
2	1.592E-02	0.10	3.260E-03
10	3.183E-03	0.10	1.630E-02
20	1.592E-03	0.10	3.260E-02
50	6.366E-04	0.10	8.150E-02
60	5.305E-04	0.10	9.780E-02
100	3.183E-04	0.10	1.630E-01
200	1.592E-04	0.10	3.260E-01
500	6.366E-05	0.10	8.150E-01
2	7.958E-02	0.50	1.630E-02
10	1.592E-02	0.50	8.150E-02
20	7.958E-03	0.50	1.630E-01
50	3.183E-03	0.50	4.075E-01
60	2.653E-03	0.50	4.890E-01
100	1.592E-03	0.50	8.150E-01
2	1.592E-01	1.00	3.260E-02
10	3.183E-02	1.00	1.630E-01
20	1.592E-02	1.00	3.260E-01
50	6.366E-03	1.00	8.150E-01
60	5.305E-03	1.00	9.780E-01
100	3.183E-03	1.00	1.630E+00
200	1.592E-03	1.00	3.260E+00
500	6.366E-04	1.00	8.150E+00
600	5.305E-04	1.00	9.780E+00

Bill Wright

9/25/90



9/25/90

#128, Y time, Y response

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE   ? 2,36
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY       F1(N)        F2(N)
1          1.250       2.39E-1     -1.47E+2
2          2.500       3.84E-1     -1.71E+2
3          3.750       6.49E-1     -2.64E+2
4          5.000       9.56E-1     -3.24E+2
5          6.250       1.23E+0     -4.58E+0
6          7.500       1.46E+0     -3.38E+1
7          8.750       1.65E+0     -5.63E+1
8         10.000       1.78E+0     -7.48E+1
9         11.250       1.90E+0     -8.95E+1
10        12.500       1.97E+0     -1.02E+2
11        13.750       2.06E+0     -1.14E+2
12        15.000       2.12E+0     -1.23E+2
13        16.250       2.16E+0     -1.32E+2
14        17.500       2.20E+0     -1.40E+2
15        18.750       2.24E+0     -1.47E+2
16        20.000       2.27E+0     -1.53E+2
17        21.250       2.29E+0     -1.59E+2
18        22.500       2.31E+0     -1.65E+2
19        23.750       2.32E+0     -1.71E+2
20        25.000       2.34E+0     -1.77E+2
21        26.250       2.35E+0     -1.82E+2
22        27.500       2.36E+0     -1.88E+2
23        28.750       2.37E+0     -1.92E+2
24        30.000       2.38E+0     -1.95E+2
25        31.250       2.39E+0     -1.98E+2
26        32.500       2.39E+0     -2.02E+2
27        33.750       2.40E+0     -2.05E+2
28        35.000       2.40E+0     -2.09E+2
+>
```

DW August

9/25/90

#128, y drive, y response

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE  ? 36#7 71
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY       F1(N)          F2(N)
29        36.250       2.40E+0       -2.13E+2
30        37.500       2.41E+0       -2.17E+2
31        38.750       2.42E+0       -2.20E+2
32        40.000       2.42E+0       -2.24E+2
33        41.250       2.42E+0       -2.27E+2
34        42.500       2.42E+0       -2.30E+2
35        43.750       2.43E+0       -2.33E+2
36        45.000       2.44E+0       -2.36E+2
37        46.250       2.44E+0       -2.39E+2
38        47.500       2.43E+0       -2.41E+2
39        48.750       2.44E+0       -2.44E+2
40        50.000       2.44E+0       -2.47E+2
41        51.250       2.43E+0       -2.49E+2
42        52.500       2.44E+0       -2.52E+2
43        53.750       2.44E+0       -2.55E+2
44        55.000       2.45E+0       -2.57E+2
45        56.250       2.45E+0       -2.60E+2
46        57.500       2.45E+0       -2.63E+2
47        58.750       2.45E+0       -2.66E+2
48        60.000       2.55E+0       -2.71E+2
49        61.250       2.44E+0       -2.71E+2
50        62.500       2.44E+0       -2.73E+2
51        63.750       2.45E+0       -2.76E+2
52        65.000       2.44E+0       -2.78E+2
53        66.250       2.44E+0       -2.81E+2
54        67.500       2.45E+0       -2.83E+2
55        68.750       2.44E+0       -2.86E+2
56        70.000       2.44E+0       -2.88E+2
+>
```


9/25/90

#128, y drive, y response

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE  ? 72 106
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY       F1(N)          F2(N)
57        71.250       2.44E+0       -2.91E+2
58        72.500       2.44E+0       -2.93E+2
59        73.750       2.44E+0       -2.95E+2
60        75.000       2.43E+0       -2.97E+2
61        76.250       2.43E+0       -3.00E+2
62        77.500       2.43E+0       -3.02E+2
63        78.750       2.43E+0       -3.04E+2
64        80.000       2.42E+0       -3.07E+2
65        81.250       2.41E+0       -3.09E+2
66        82.500       2.40E+0       -3.11E+2
67        83.750       2.50E+0       -3.14E+2
68        85.000       2.54E+0       -3.16E+2
69        86.250       2.55E+0       -3.18E+2
70        87.500       2.55E+0       -3.20E+2
71        88.750       2.54E+0       -3.22E+2
72        90.000       2.54E+0       -3.24E+2
73        91.250       2.53E+0       -3.27E+2
74        92.500       2.52E+0       -3.29E+2
75        93.750       2.52E+0       -3.31E+2
76        95.000       2.51E+0       -3.33E+2
77        96.250       2.51E+0       -3.35E+2
78        97.500       2.50E+0       -3.37E+2
79        98.750       2.49E+0       -3.39E+2
80        100.00       2.49E+0       -3.41E+2
81        101.25       2.49E+0       -3.43E+2
82        102.50       2.49E+0       -3.45E+2
83        103.75       2.49E+0       -3.47E+2
84        105.00       2.48E+0       -3.49E+2
+>
```

9/25/90

#128, 1/drive, 1/response

```
-> PF
ENTER FUNCTION #: 26
FREQ RANGE  ? 107 141
SAMPLE RATE:  1.280KHZ
BIN     FREQUENCY       F1(N)        F2(N)
85        106.25       2.48E+0     -3.51E+2
86        107.50       2.49E+0     -3.53E+2
87        108.75       2.50E+0     -3.55E+2
88        110.00       2.48E+0     -3.57E+2
89        111.25       2.44E+0     -3.59E+2
90        112.50       2.45E+0     -8.18E-1
91        113.75       2.45E+0     -2.76E+0
92        115.00       2.45E+0     -4.68E+0
93        116.25       2.45E+0     -6.61E+0
94        117.50       2.45E+0     -8.42E+0
95        118.75       2.45E+0     -1.04E+1
96        120.00       2.44E+0     -1.20E+1
97        121.25       2.44E+0     -1.41E+1
98        122.50       2.44E+0     -1.60E+1
99        123.75       2.44E+0     -1.80E+1
100       125.00       2.43E+0     -1.98E+1
101       126.25       2.45E+0     -2.18E+1
102       127.50       2.45E+0     -2.37E+1
103       128.75       2.44E+0     -2.55E+1
104       130.00       2.44E+0     -2.74E+1
105       131.25       2.44E+0     -2.93E+1
106       132.50       2.44E+0     -3.12E+1
107       133.75       2.44E+0     -3.31E+1
108       135.00       2.44E+0     -3.51E+1
109       136.25       2.44E+0     -3.68E+1
110       137.50       2.44E+0     -3.88E+1
111       138.75       2.43E+0     -4.07E+1
112       140.00       2.43E+0     -4.26E+1
->
```

DWright

9/25/90

#128, 1/drive, 1/response

```
+> PF
ENTER FUNCTION #: 26
FREQ RANGE  ? 142 176
SAMPLE RATE:  1.280KHZ
BIN     FREQUENCY       F1(N)        F2(N)
113       141.25       2.43E+0     -4.45E+1
114       142.50       2.43E+0     -4.65E+1
115       143.75       2.43E+0     -4.83E+1
116       145.00       2.42E+0     -5.03E+1
117       146.25       2.42E+0     -5.24E+1
118       147.50       2.42E+0     -5.44E+1
119       148.75       2.41E+0     -5.66E+1
120       150.00       2.41E+0     -5.84E+1
121       151.25       2.41E+0     -6.03E+1
122       152.50       2.41E+0     -6.06E+1
123       153.75       2.43E+0     -5.94E+1
124       155.00       2.44E+0     -5.89E+1
125       156.25       2.44E+0     -5.98E+1
126       157.50       2.43E+0     -6.15E+1
127       158.75       2.43E+0     -6.33E+1
128       160.00       2.43E+0     -6.55E+1
129       161.25       2.43E+0     -6.76E+1
130       162.50       2.42E+0     -6.97E+1
131       163.75       2.42E+0     -7.18E+1
132       165.00       2.41E+0     -7.38E+1
133       166.25       2.41E+0     -7.57E+1
134       167.50       2.42E+0     -7.76E+1
135       168.75       2.42E+0     -7.95E+1
136       170.00       2.42E+0     -8.11E+1
137       171.25       2.42E+0     -8.26E+1
138       172.50       2.41E+0     -8.41E+1
139       173.75       2.41E+0     -8.56E+1
140       175.00       2.41E+0     -8.72E+1
+>
```

DWright

9/25/90

#128, Y drive, Y response – No Data

9/25/90

#128, Y drive, Y response

```
+>  PF
ENTER FUNCTION #: 26
FREQ RANGE  ? 212 246
SAMPLE RATE:   1.280KHZ
```

BIN	FREQUENCY	F1(N)	F2(N)
169	211.25	2.39E+0	-1.37E+2
170	212.50	2.38E+0	-1.39E+2
171	213.75	2.38E+0	-1.41E+2
172	215.00	2.38E+0	-1.42E+2
173	216.25	2.38E+0	-1.44E+2
174	217.50	2.38E+0	-1.46E+2
175	218.75	2.38E+0	-1.47E+2
176	220.00	2.38E+0	-1.49E+2
177	221.25	2.38E+0	-1.51E+2
178	222.50	2.38E+0	-1.53E+2
179	223.75	2.37E+0	-1.54E+2
180	225.00	2.37E+0	-1.56E+2
181	226.25	2.37E+0	-1.58E+2
182	227.50	2.37E+0	-1.59E+2
183	228.75	2.37E+0	-1.61E+2
184	230.00	2.37E+0	-1.63E+2
185	231.25	2.37E+0	-1.64E+2
186	232.50	2.37E+0	-1.66E+2
187	233.75	2.37E+0	-1.68E+2
188	235.00	2.37E+0	-1.70E+2
189	236.25	2.36E+0	-1.71E+2
190	237.50	2.36E+0	-1.73E+2
191	238.75	2.36E+0	-1.75E+2
192	240.00	2.35E+0	-1.76E+2
193	241.25	2.35E+0	-1.78E+2
194	242.50	2.35E+0	-1.79E+2
195	243.75	2.35E+0	-1.81E+2
196	245.00	2.35E+0	-1.83E+2

```
+>
```

9/25/90

#128, y drive, y response

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE  ? 247 281
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY        F1(N)          F2(N)
197      246.25         2.35E+0       -1.84E+2
198      247.50         2.35E+0       -1.86E+2
199      248.75         2.35E+0       -1.87E+2
200      250.00         2.35E+0       -1.89E+2
201      251.25         2.35E+0       -1.91E+2
202      252.50         2.35E+0       -1.93E+2
203      253.75         2.35E+0       -1.94E+2
204      255.00         2.35E+0       -1.96E+2
205      256.25         2.35E+0       -1.98E+2
206      257.50         2.35E+0       -2.00E+2
207      258.75         2.34E+0       -2.02E+2
208      260.00         2.34E+0       -2.03E+2
209      261.25         2.34E+0       -2.05E+2
210      262.50         2.34E+0       -2.06E+2
211      263.75         2.34E+0       -2.08E+2
212      265.00         2.33E+0       -2.10E+2
213      266.25         2.33E+0       -2.11E+2
214      267.50         2.33E+0       -2.13E+2
215      268.75         2.33E+0       -2.15E+2
216      270.00         2.33E+0       -2.16E+2
217      271.25         2.33E+0       -2.18E+2
218      272.50         2.32E+0       -2.19E+2
219      273.75         2.31E+0       -2.21E+2
220      275.00         2.32E+0       -2.22E+2
221      276.25         2.32E+0       -2.24E+2
222      277.50         2.32E+0       -2.26E+2
223      278.75         2.32E+0       -2.28E+2
224      280.00         2.32E+0       -2.30E+2
+>
```

DWright

9/25/90

#128, y drive, y response

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE  ? 282 316
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY        F1(N)          F2(N)
225      281.25         2.32E+0       -2.32E+2
226      282.50         2.32E+0       -2.33E+2
227      283.75         2.32E+0       -2.35E+2
228      285.00         2.30E+0       -2.36E+2
229      286.25         2.29E+0       -2.38E+2
230      287.50         2.29E+0       -2.39E+2
231      288.75         2.29E+0       -2.41E+2
232      290.00         2.28E+0       -2.43E+2
233      291.25         2.28E+0       -2.45E+2
234      292.50         2.28E+0       -2.47E+2
235      293.75         2.28E+0       -2.49E+2
236      295.00         2.27E+0       -2.50E+2
237      296.25         2.25E+0       -2.51E+2
238      297.50         2.25E+0       -2.53E+2
239      298.75         2.24E+0       -2.55E+2
240      300.00         2.23E+0       -2.59E+2
241      301.25         2.23E+0       -2.59E+2
242      302.50         2.23E+0       -2.61E+2
243      303.75         2.22E+0       -2.62E+2
244      305.00         2.21E+0       -2.63E+2
245      306.25         2.22E+0       -2.64E+2
246      307.50         2.23E+0       -2.67E+2
247      308.75         2.26E+0       -2.69E+2
248      310.00         2.29E+0       -2.71E+2
249      311.25         2.28E+0       -2.72E+2
250      312.50         2.27E+0       -2.73E+2
251      313.75         2.29E+0       -2.75E+2
252      315.00         2.30E+0       -2.77E+2
+>
```

DWright

9/25/90

#128, y drive, y response

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE   ? 317 351
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY       F1(N)        F2(N)
253      316.25       2.31E+0     -2.79E+2
254      317.50       2.32E+0     -2.81E+2
255      318.75       2.30E+0     -2.82E+2
256      320.00       2.30E+0     -2.84E+2
257      321.25       2.31E+0     -2.86E+2
258      322.50       2.33E+0     -2.88E+2
259      323.75       2.32E+0     -2.90E+2
260      325.00       2.29E+0     -2.91E+2
261      326.25       2.29E+0     -2.93E+2
262      327.50       2.31E+0     -2.95E+2
263      328.75       2.32E+0     -2.97E+2
264      330.00       2.30E+0     -2.98E+2
265      331.25       2.29E+0     -3.00E+2
266      332.50       2.31E+0     -3.02E+2
267      333.75       2.32E+0     -3.04E+2
268      335.00       2.30E+0     -3.06E+2
269      336.25       2.28E+0     -3.07E+2
270      337.50       2.28E+0     -3.10E+2
271      338.75       2.29E+0     -3.12E+2
272      340.00       2.28E+0     -3.13E+2
273      341.25       2.26E+0     -3.14E+2
274      342.50       2.26E+0     -3.16E+2
275      343.75       2.28E+0     -3.18E+2
276      345.00       2.26E+0     -3.20E+2
277      346.25       2.24E+0     -3.21E+2
278      347.50       2.25E+0     -3.23E+2
279      348.75       2.27E+0     -3.25E+2
280      350.00       2.24E+0     -3.27E+2
+>
```


9/25/90

#128, y drive, y response

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE   ? 352 386
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY       F1(N)        F2(N)
281      351.25       2.22E+0     -3.28E+2
282      352.50       2.24E+0     -3.30E+2
283      353.75       2.25E+0     -3.32E+2
284      355.00       2.21E+0     -3.33E+2
285      356.25       2.22E+0     -3.35E+2
286      357.50       2.24E+0     -3.38E+2
287      358.75       2.24E+0     -3.39E+2
288      360.00       2.21E+0     -3.41E+2
289      361.25       2.24E+0     -3.43E+2
290      362.50       2.25E+0     -3.45E+2
291      363.75       2.21E+0     -3.46E+2
292      365.00       2.23E+0     -3.48E+2
293      366.25       2.25E+0     -3.50E+2
294      367.50       2.21E+0     -3.51E+2
295      368.75       2.21E+0     -3.53E+2
296      370.00       2.23E+0     -3.56E+2
297      371.25       2.22E+0     -3.57E+2
298      372.50       2.19E+0     -3.59E+2
299      373.75       2.21E+0     -1.34E+0
300      375.00       2.21E+0     -3.17E+0
301      376.25       2.17E+0     -4.49E+0
302      377.50       2.19E+0     -6.87E+0
303      378.75       2.20E+0     -9.00E+0
304      380.00       2.16E+0     -1.01E+1
305      381.25       2.17E+0     -1.25E+1
306      382.50       2.19E+0     -1.47E+1
307      383.75       2.14E+0     -1.60E+1
308      385.00       2.16E+0     -1.83E+1
+>
```

9/25/90

#128, yshim, yresponse

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE  ? 387 421
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY        F1(N)        F2(N)
309      386.25        2.17E+0     -2.03E+1
310      387.50        2.13E+0     -2.16E+1
311      388.75        2.15E+0     -2.39E+1
312      390.00        2.15E+0     -2.58E+1
313      391.25        2.12E+0     -2.71E+1
314      392.50        2.14E+0     -2.94E+1
315      393.75        2.13E+0     -3.12E+1
316      395.00        2.12E+0     -3.28E+1
317      396.25        2.15E+0     -3.52E+1
318      397.50        2.11E+0     -3.65E+1
319      398.75        2.12E+0     -3.87E+1
320      400.00        2.15E+0     -4.10E+1
321      401.25        2.08E+0     -4.22E+1
322      402.50        2.11E+0     -4.46E+1
323      403.75        2.13E+0     -4.68E+1
324      405.00        2.06E+0     -4.82E+1
325      406.25        2.09E+0     -5.06E+1
326      407.50        2.08E+0     -5.23E+1
327      408.75        2.06E+0     -5.42E+1
328      410.00        2.07E+0     -5.66E+1
329      411.25        2.03E+0     -5.79E+1
330      412.50        2.04E+0     -6.04E+1
331      413.75        2.05E+0     -6.28E+1
332      415.00        2.01E+0     -6.39E+1
333      416.25        2.03E+0     -6.65E+1
334      417.50        2.01E+0     -6.83E+1
335      418.75        2.00E+0     -7.03E+1
336      420.00        2.03E+0     -7.29E+1
+>
```


9/25/90

#128, yshim, yresponse

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE  ? 422 456
SAMPLE RATE:   1.280KHZ
BIN     FREQUENCY        F1(N)        F2(N)
337      421.25        1.98E+0     -7.42E+1
338      422.50        2.00E+0     -7.68E+1
339      423.75        1.99E+0     -7.86E+1
340      425.00        1.97E+0     -8.04E+1
341      426.25        1.99E+0     -8.28E+1
342      427.50        1.94E+0     -8.45E+1
343      428.75        1.96E+0     -8.70E+1
344      430.00        1.95E+0     -8.90E+1
345      431.25        1.92E+0     -9.08E+1
346      432.50        1.95E+0     -9.32E+1
347      433.75        1.89E+0     -9.47E+1
348      435.00        1.92E+0     -9.74E+1
349      436.25        1.87E+0     -9.89E+1
350      437.50        1.88E+0     -1.01E+2
351      438.75        1.91E+0     -1.04E+2
352      440.00        1.85E+0     -1.05E+2
353      441.25        1.88E+0     -1.08E+2
354      442.50        1.82E+0     -1.09E+2
355      443.75        1.84E+0     -1.12E+2
356      445.00        1.83E+0     -1.14E+2
357      446.25        1.81E+0     -1.16E+2
358      447.50        1.83E+0     -1.18E+2
359      448.75        1.77E+0     -1.20E+2
360      450.00        1.80E+0     -1.23E+2
361      451.25        1.73E+0     -1.24E+2
362      452.50        1.76E+0     -1.27E+2
363      453.75        1.73E+0     -1.29E+2
364      455.00        1.73E+0     -1.31E+2
+>
```

#128, Y-Wire, Y-response 9/28/90

```
+>  PF
ENTER FUNCTION #:  26
FREQ RANGE  ? 457 492
SAMPLE RATE:   1.280KHZ
```

BIN	FREQUENCY	F1(N)	F2(N)
365	456.25	1.73E+0	-1.34E+2
366	457.50	1.69E+0	-1.35E+2
367	458.75	1.71E+0	-1.38E+2
368	460.00	1.66E+0	-1.40E+2
369	461.25	1.68E+0	-1.42E+2
370	462.50	1.63E+0	-1.44E+2
371	463.75	1.64E+0	-1.47E+2
372	465.00	1.60E+0	-1.48E+2
373	466.25	1.60E+0	-1.51E+2
374	467.50	1.59E+0	-1.53E+2
375	468.75	1.56E+0	-1.55E+2
376	470.00	1.57E+0	-1.58E+2
377	471.25	1.52E+0	-1.59E+2
378	472.50	1.54E+0	-1.62E+2
379	473.75	1.48E+0	-1.64E+2
380	475.00	1.48E+0	-1.67E+2
381	476.25	1.43E+0	-1.67E+2
382	477.50	1.43E+0	-1.70E+2
383	478.75	1.40E+0	-1.72E+2
384	480.00	1.39E+0	-1.75E+2
385	481.25	1.36E+0	-1.77E+2
386	482.50	1.34E+0	-1.80E+2
387	483.75	1.34E+0	-1.81E+2
388	485.00	1.33E+0	-1.84E+2
389	486.25	1.37E+0	-1.86E+2
390	487.50	1.36E+0	-1.89E+2
391	488.75	1.39E+0	-1.89E+2
392	490.00	1.42E+0	-1.85E+2
393	491.25	1.61E+0	-1.74E+2
394	492.50	1.50E+0	-1.65E+2
395	493.75	1.57E+0	-1.61E+2
396	495.00	1.84E+0	-1.62E+2
397	496.25	2.99E+0	-1.55E+2
398	497.50	3.24E+0	-1.50E+2
399	498.75	3.94E+0	-1.49E+2
400	500.00	1.11E+1	-1.50E+2

DWLaight

10/9/90

Calibration of Geokon 4500H Vibrating Wire Pressure Xducers

Gulf Coast Calibrations supplied personnel (Bob King) and equipment (Ashcroft Dead Weight Tester, S/N ~~GCC 118~~ GCC 118, calibration due 3/1/91 – capability 5 psi – 10,000 psi) with weights (S/N 1 Na-35688) of 100, 200, 500, 400, 500 psi capability when used with the DWT. The square of the frequencies divided by 10^3 were monitored on the Geokon GK401 Readout Box (S/N 0600)

Results of applied pressure versus the frequency squared are given in tabular form on the following page for Geokon 4500H-500 Vibrating Wire Transducers S/N 12783, 12784, 12785 and 12786, Regression Analyses give information from which calibration plots for the data may be constructed.

Witnessed CW Wolf QA Chief

DWLaight

10/9/90

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

Customer SOUTHWEST RESEARCH INSTITUTE Date 10/9/1990
6220 CULEBRA SAN ANTONIO, TX Expires N/A
Customer P.O.
Type and Size of Gauge Transducer
Serial No. 12783

Test Reading Charts

Applied Pressure	Reading ($f^2 x 10^{-3}$)
0	9492
100	8710
200	7917
300	7119
400	6315
500	5509
100	8706
200	7913
300	7115
400	6313
500	5503
400	6313
300	7114
200	7911
100	8705
0	9489

I CERTIFY, AT THE TIME OF CALIBRATION, THE READINGS INDICATED WERE THOSE FOUND AT THE APPLIED PRESSURE POINTS AS RECORDED.

Our Test Equipment used for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY and maintained in accordance with conditions as noted under MIL. STD. 45662A.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY No. 40093

Test Equipment GCC118
Date Cal. 3-1-1990
Expires 3-1-1991

Technician Robert D. Kings

Witnessed CANADA Corrid

10/9/90

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

Customer SOUTHWEST RESEARCH INSTITUTE Date 10-9-1990
6220 CULEBRA SAN ANTONIO, TX Expires N/A
Customer P.O.
Type and Size of Gauge Transducer
Serial No. 12784

Test Reading Charts

Applied Pressure	Reading ($f^2 x 10^{-3}$)
0	8471
100	7662
200	6857
300	6044
400	5223
500	4402
400	5219
300	6040
200	6852
100	7659
0	8452
100	7660
200	6853
300	6041
400	5220
500	4395
400	5213
300	6034
200	6848
100	7656
0	8449

I CERTIFY, AT THE TIME OF CALIBRATION THE READINGS INDICATED WERE THOSE FOUND AT THE APPLIED PRESSURE POINTS AS RECORDED.

Our Test Equipment used for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY and maintained in accordance with conditions as noted under MIL. STD. 45662A.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY No. 40093

Test Equipment GCC118
Date of Cal. 3-1-1990
Expires 3-1-1991

Technician Robert D. Kings

Witnessed CANADA Corrid

10/9/90

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

Customer SOUTHWEST RESEARCH INSTITUTE Date 10-9-1990

6220 CULEBRA SAN ANTONIO, TX Expires N/A

Customer P.O.

Type and Size of Gauge Transducer

Serial No. 12785

Test Reading Charts

Applied Pressure	Reading ($f^2 \times 10^{-3}$)
0	9468
100	8669
200	7835
300	7013
400	6189
500	5336
400	6174
300	7000
200	7820
100	8635
0	9437
100	8637
200	7823
300	7002
400	6177
500	5337
400	6175
300	6999
200	7820
100	8636
0	9439

I CERTIFY, AT THE TIME OF CALIBRATION, THE READINGS INDICATED WERE THOSE FOUND AT THE APPLIED PRESSURE POINTS AS RECORDED.

Our Test Equipment used for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY and maintained in accordance with conditions as noted under MIL. STD. 45662A.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY No. 40093

Test Equipment GCC118
Date of cal. 3-1-1990
Expires 3-1-1991

Technician Robert D. Kingsl

Witnessed CWWR QA Rhuck

10/9/90

GULF COAST CALIBRATION

7999 Hansen, Suite 321
Houston, TX 77061
(713) 944-3139

Certificate Of Calibration

Customer SOUTHWEST RESEARCH INSTITUTE Date 10-9-1990

6220 CULEBRA SAN ANTONIO, TX Expires N/A

Customer P.O.

Type and Size of Gauge Transducer

Serial No. 12786

Test Reading Charts

Applied Pressure	Reading ($f^2 \times 10^{-3}$)
0	9845
100	9068
200	8290
300	7506
400	6718
500	5922
400	6714
300	7499
200	8280
100	9059
0	9824
100	9058
200	8281
300	7499
400	6713
500	5919
400	6711
300	7498
200	8279
100	9058
0	9822

I CERTIFY, AT THE TIME OF CALIBRATION, THE READINGS INDICATED WERE THOSE FOUND AT THE APPLIED PRESSURE POINTS AS RECORDED.

Our Test Equipment used for calibration is traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY and maintained in accordance with conditions as noted under MIL. STD. 45662A.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY No. 40093

Test Equipment GCC118
Date of Cal. 3-1-1990
Expires 3-1-1991

Technician Robert D. Kingsl

Witnessed CWWR QA Rhuck

10/9/90

Transducer Serial No. 12783 Test Reading Chart

Applied Pressure	Readings
0	9492
100	8710
200	7917
300	7119
400	6315
500	5509
100	8706
200	7913
300	7115
400	6313
500	5503
400	6313
300	7114
200	7911
100	8705
0	9489

Regression Output:

Constant	1191.864
Std Err of Y Est	0.921727
R Squared	0.999970
No. of Observations	16
Degrees of Freedom	14
X Coefficient(s)	-0.12543
Std Err of Coef.	0.000182

Transducer Serial No. 12784 Test Reading Chart

Applied Pressure	Readings
0	8471
100	7662
200	6857
300	6044
400	5223
500	4402
400	5219
300	6040
200	6852
100	7659
0	8452
100	7660
200	6853
300	6041
400	5220
500	4395
400	5213
300	6034
200	6848
100	7656
0	8449

Regression Output:

Constant	1043.077
Std Err of Y Est	1.112513
R Squared	0.999953
No. of Observations	21
Degrees of Freedom	19
X Coefficient(s)	-0.12316
Std Err of Coef.	0.000191

10/9/90

Transducer Serial No. 12785 Test Reading Chart

Applied Pressure	Readings
0	9468
100	8669
200	7835
300	7013
400	6189
500	5336
400	6174
300	7000
200	7820
100	8635
0	9437
100	8637
200	7823
300	7002
400	6177
500	5337
400	6175
300	6999
200	7820
100	8636
0	9439

Regression Output:

Constant	1151.872
Std Err of Y Est	1.635372
R Squared	0.999900
No. of Observations	21
Degrees of Freedom	19
X Coefficient(s)	-0.12174
Std Err of Coef.	0.000278

10/9/90

Transducer Serial No. 12786 Test Reading Chart

Applied Pressure	Readings
0	9845
100	9068
200	8290
300	7506
400	6718
500	5922
400	6714
300	7499
200	8280
100	9059
0	9824
100	9058
200	8281
300	7499
400	6713
500	5919
400	6711
300	7498
200	8279
100	9058
0	9822

Regression Output:

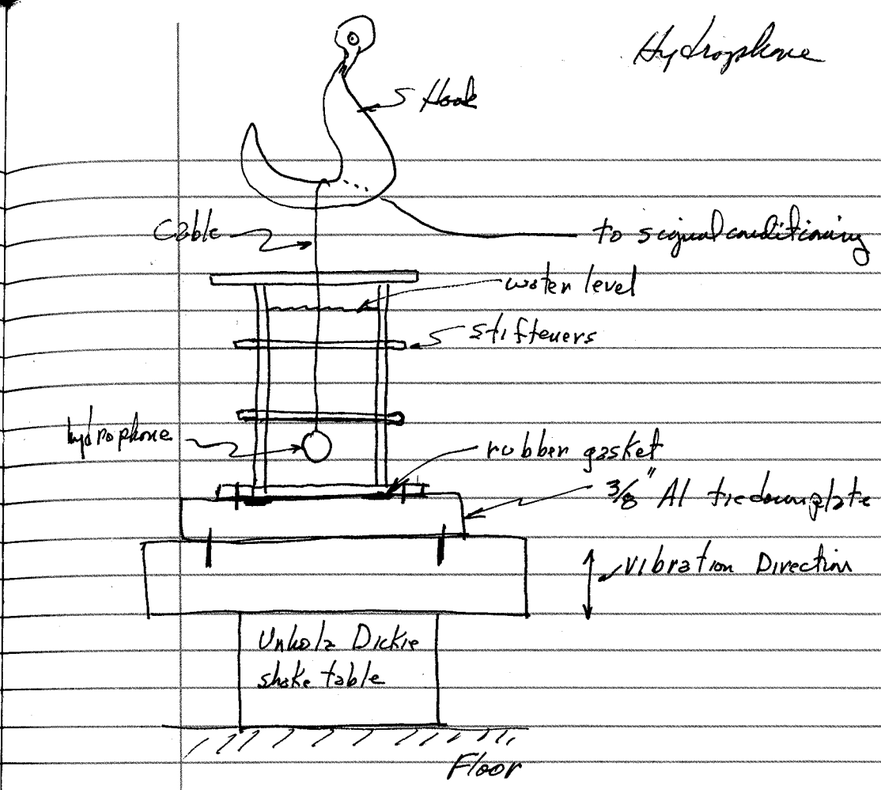
Constant	1259.003
Std Err of Y Est	1.079799
R Squared	0.999956
No. of Observations	21
Degrees of Freedom	19
X Coefficient(s)	-0.12794
Std Err of Coef.	0.000193

Hydrophone 11/26/90

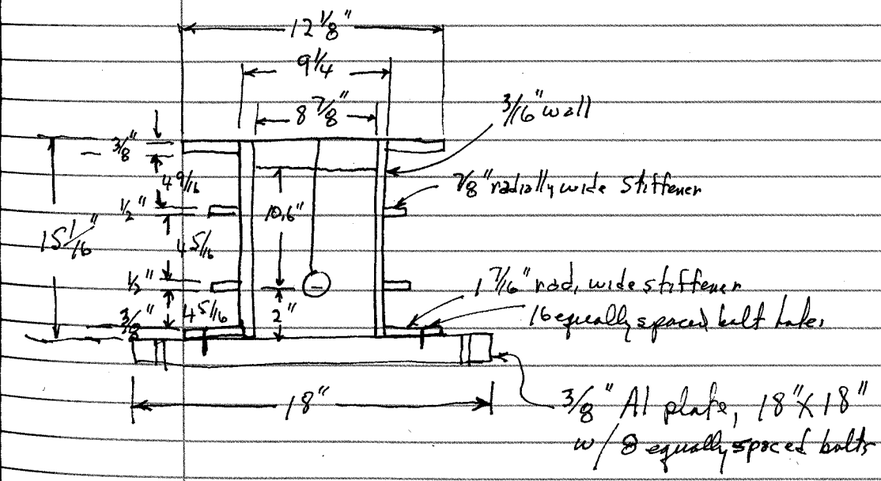
Calibration of Wilcoxon Hydrophone, Model #505, S/N 1208

Factory quoted sensitivity was -177.1 dB referenced to 1v/μPa. The transducer is to be used to detect "time of arrival" of seismic waves at the installation point in the Lucky Friday Mine. A plexiglas cylindrical tank was bolted to an aluminum plate, which was in turn bolted to the Unholtz Dickie [UD] 6000 shaker table. The hydrophone cable was suspended from an exterior support (hook) not attached to the shaker so that the transducer would be "free standing" at an immersion depth of 10.6 in. under the water surface in the plexiglas cylinder. Schematics of the test arrangement, dimensional characteristics and the instrument chain layout are drawn on pages 123 & 124

Hydrophone 11/26/90

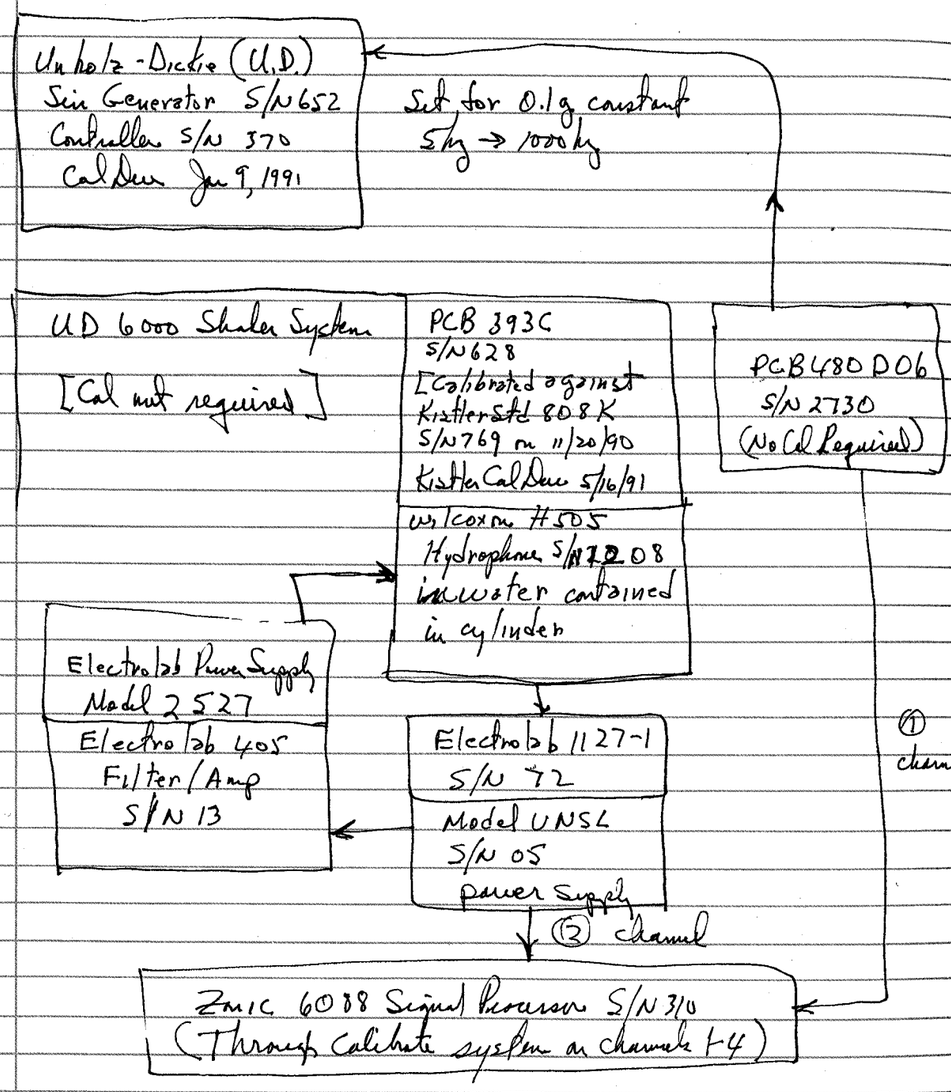


SCHEMATIC OF TEST ARRANGEMENT



Dimensional Schematic

Hydrophone 4/27/90



Instrumentation Schematic

RWright

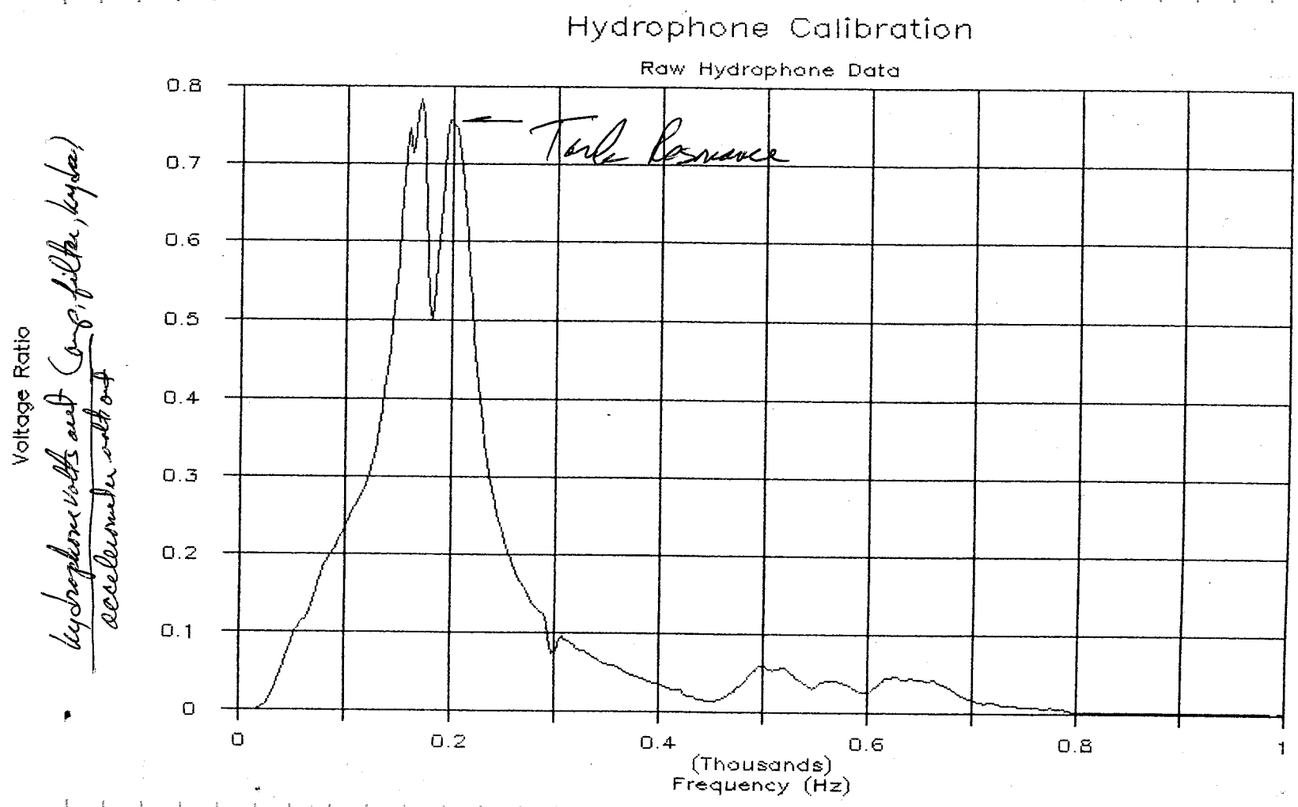
The hydrophone ~~was~~ assembly as shown in the schematics was vibrated at a constant 0.1g over a frequency range of 5-1000hz. Filter response with voltage out/voltage in through the amplifier only showed a flat response from 200-700hz (p.126) [It was noted that the gains for the Electrolab Amp were 5, 50, 5000, 5000 instead of 1, 10, 100, 1000.] The raw voltage data shows the resonance of the plexiglas tank (p.127). This raw response was corrected for filter characteristics by dividing ②/① (Sup.124). The results are given on p.128. A flat response for the system is valid at approximately 50-100 hz. A plot of volts per psi is shown on p.129 using voltage from p.128 and psi as computed from:

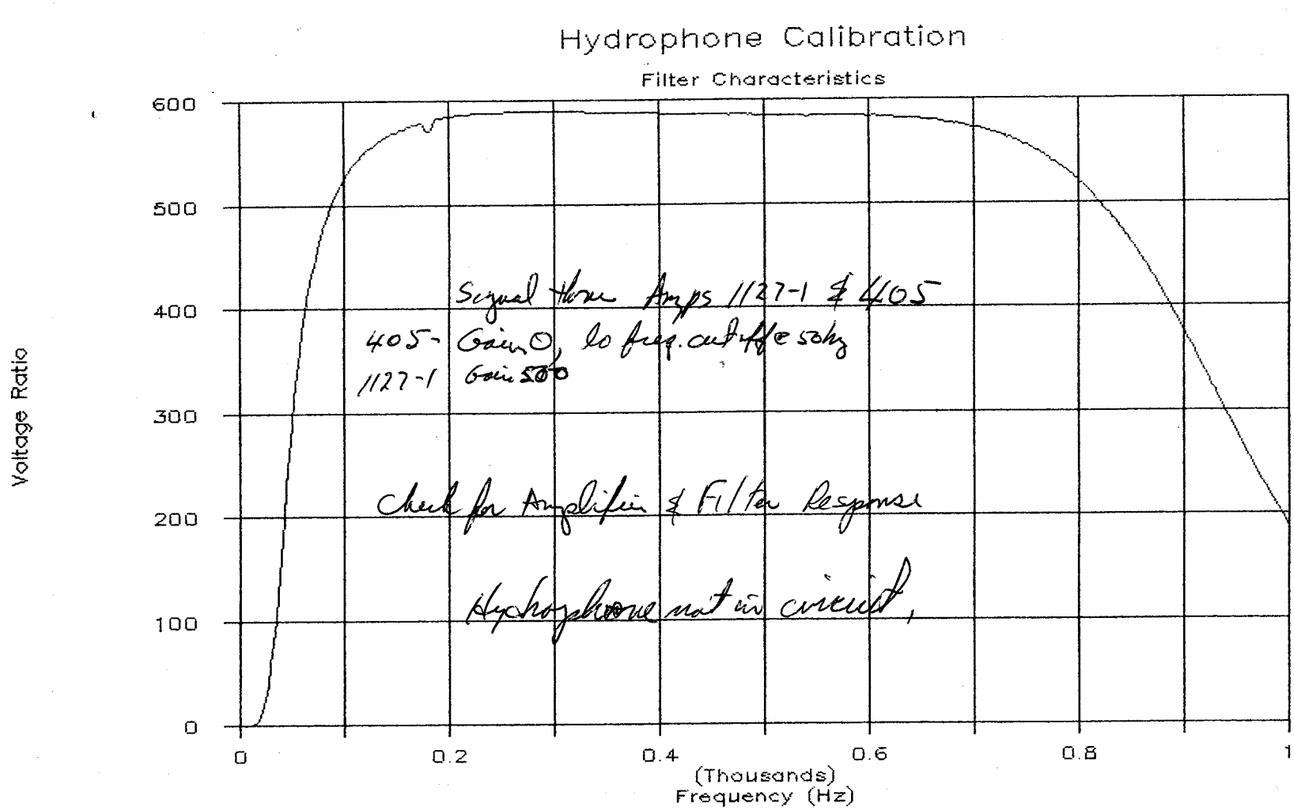
$$p_0 = \rho \ddot{x}_0 \left(\frac{g}{\omega^2} + h \right)$$

where:

p_o	=	Pressure amplitude (lbs/in^2)
ρ	=	Density of water (9.3552 x 10^{-5} lb sec^2/in^4)
$\ddot{x}_o$	=	Dynamic acceleration (in/sec^2)
g	=	Acceleration of gravity (386 in/sec^2)
ω	=	Frequency of excitation (radians/sec)
h	=	Depth of the hydrophone (inches)

RWright


Hydrophone Calibration
Raw Hydrophone Data
Voltage Ratio
hydrophone volts out (amp, filter, keyder)
accelerometer volts out
Tank Resonance
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.2
0.4
0.6
0.8
1
(Thousands)
Frequency (Hz)


Hydrophone Calibration
Filter Characteristics
Voltage Ratio
Signal Horn Amps 1127-1 & 405
405 - Gain 0, lo freq. cut off 5 khz
1127-1 Gain 500
Check for Amplifier & Filter Response
Hydrophone not in circuit,
600
500
400
300
200
100
0
0
0.2
0.4
0.6
0.8
1
(Thousands)
Frequency (Hz)

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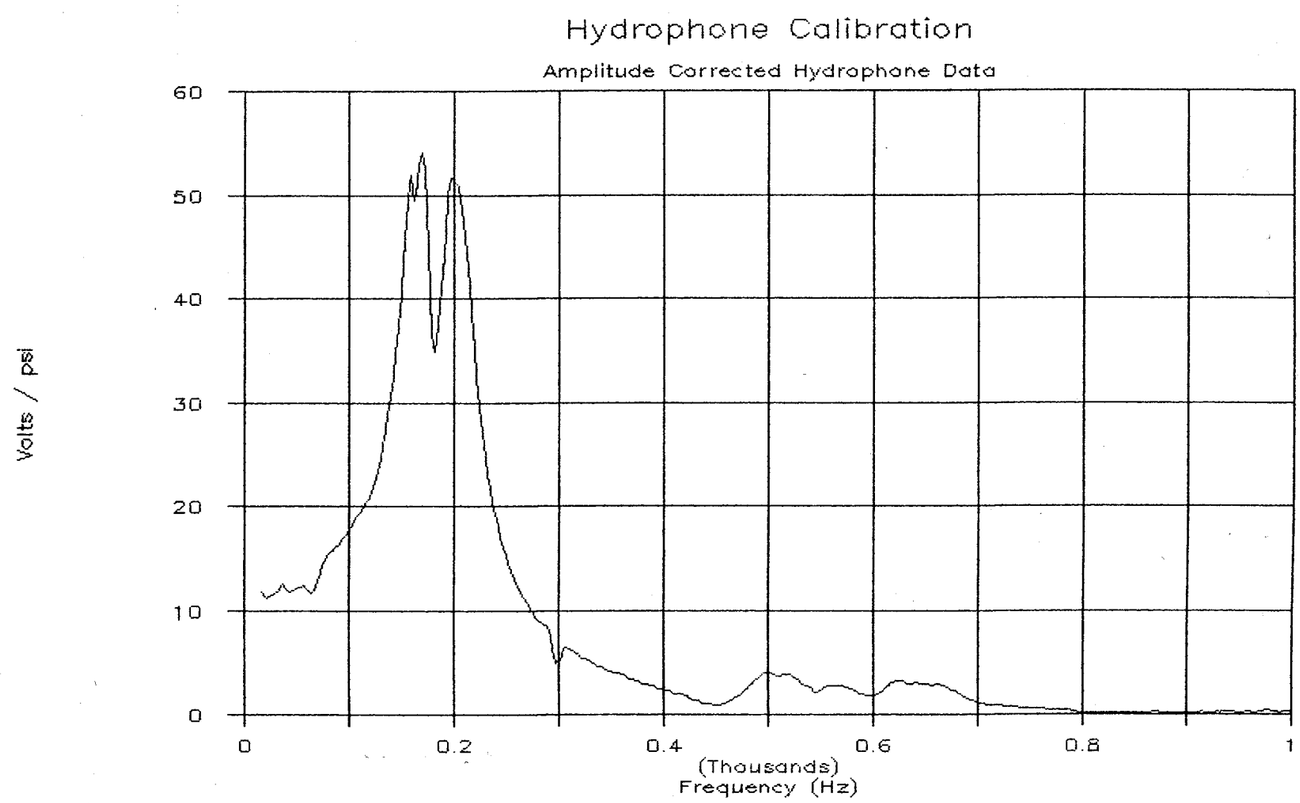

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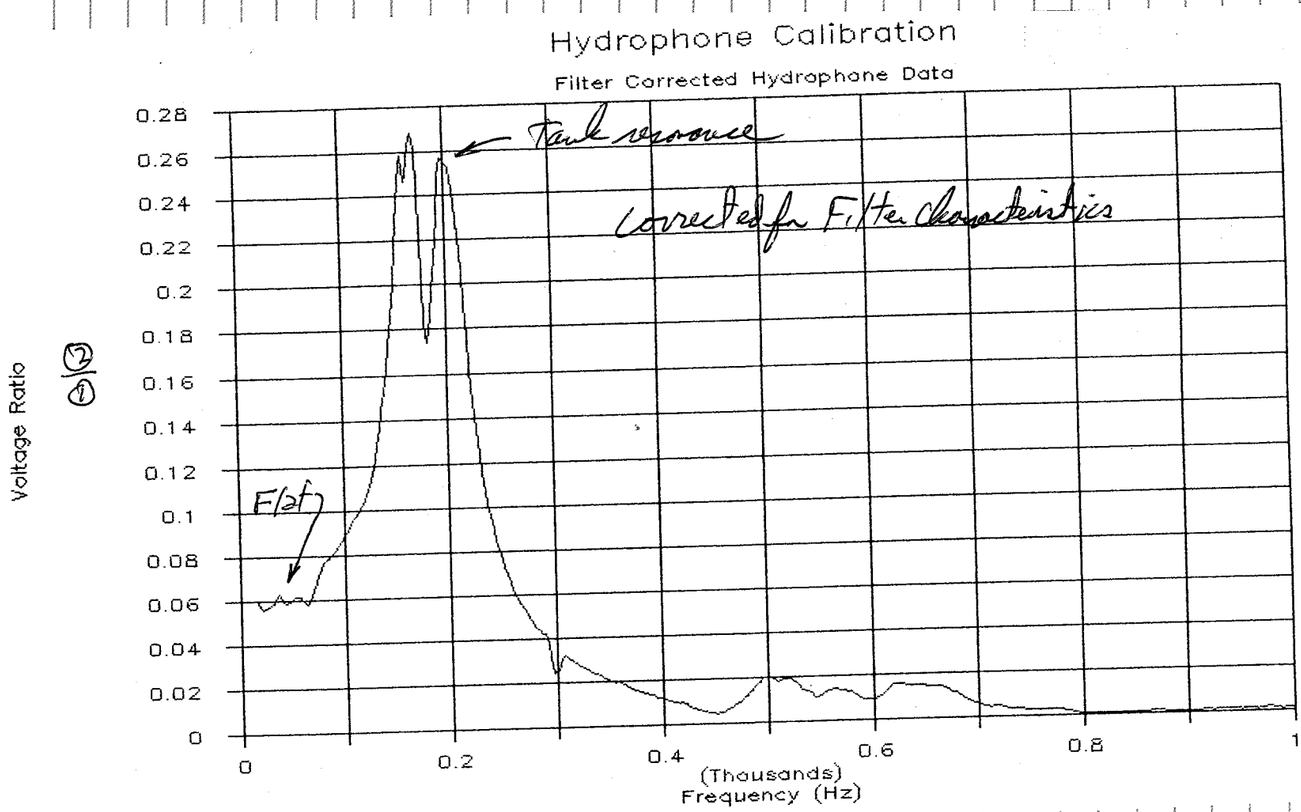

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A spread sheet was used for the calculations. A flat response for the system can be observed in the vicinity of 50 hz with a sensitivity of ≈ 12-13 v/psi. The quoted sensitivity of -177. dB gives 12.8 v/psi for 32 vdc. Hydrophone response may be used to measure time of arrival, but it may be questionable to use it for pressure measurements. Numerical values for the curve on p129 are given on pp 131-139.

Calculation: $-122.1\ dB = 20 \log \frac{E_1}{E_2}$

$-8.855 = \log \frac{E_1}{E_2}$

$(1.39637)10^{-9} = \frac{E_1}{E_2}$

$E_2 = 1 \frac{v}{\mu Pa}$

~~$E_1 = 1.39637(1.45)(10^{-4})(10^{-6})$~~ 3/4/91

1 psi = 6894 Pa

$1.45 \times 10^{-4} = 1$ Pa

$10^{-6}(1.45 \times 10^{-4})$ psi = 1 μPa

$E_2\ 1.45 \times 10^{-10}$ psi = 1 μPa

$E_1 = \left[(1.4)10^{-9}\right]\left[\frac{1v}{(1.45)10^{-10}\ psi}\right]$

$E_1 = (.9655)10 = 9.655 \frac{v}{psi}$

Factory cal @ 24 for RI cal @ 32

$E_1 = \left(\frac{32}{24}\right) 9.655 = 12.8 \frac{v}{psi}$ or $.776 \frac{psi}{volt}$

11/28/90

Hydrophone Calibaration Data
Filter Looks at Characteristics of 1127 and 405 Amp Filters
1127-1 Low Freq at 50 Hz and Gain of Approximatly 500
405 Gain Set at 0 and Filter at 06 (ie 1.6 kHz)

p129

Freq	Filter FAmp	Phase	Gain Corr	1/FAmp	Hydrophone HAmp	Phase	Voltage Corr	Filter Corr	V/psi	Gain Corr
	0.940 @ 100 Hz		524.06		0.233 @ 100 Hz		0.356		2.611	524.06
0.0	2.03E+00	-90	1.13E+03	4.92E-01	2.08E-01	-90	7.42E-02	3.65E-02	1.40E-02	7.32E+00
2.5	1.66E-04	88	9.22E-02	6.04E+03	7.14E-04	175	2.54E-04	1.54E+00	5.88E-01	3.08E+02
5.0	1.00E-04	41	5.57E-02	1.00E+04	6.81E-05	-127	2.42E-05	2.42E-01	9.29E-02	4.87E+01
7.5	1.62E-04	0	9.04E-02	6.17E+03	1.36E-04	-53	4.85E-05	2.99E-01	1.14E-01	6.00E+01
10.0	3.87E-04	-23	2.16E-01	2.58E+03	1.80E-04	-45	6.40E-05	1.65E-01	6.33E-02	3.32E+01
12.5	9.86E-04	-45	5.49E-01	1.01E+03	2.98E-04	-35	1.06E-04	1.08E-01	4.12E-02	2.16E+01
15.0	2.63E-03	-67	1.47E+00	3.80E+02	5.70E-04	-52	2.03E-04	7.71E-02	2.95E-02	1.55E+01
17.5	6.31E-03	-89	3.52E+00	1.59E+02	1.05E-03	-83	3.72E-04	5.90E-02	2.26E-02	1.18E+01
20.0	1.33E-02	-112	7.44E+00	7.50E+01	2.11E-03	-112	7.52E-04	5.64E-02	2.16E-02	1.13E+01
22.5	2.53E-02	-134	1.41E+01	3.95E+01	3.98E-03	-135	1.42E-03	5.59E-02	2.14E-02	1.12E+01
25.0	4.39E-02	-156	2.44E+01	2.28E+01	6.95E-03	-157	2.47E-03	5.64E-02	2.16E-02	1.13E+01
27.5	7.02E-02	-178	3.91E+01	1.42E+01	1.13E-02	-178	4.03E-03	5.74E-02	2.20E-02	1.15E+01
30.0	1.05E-01	161	5.86E+01	9.51E+00	1.70E-02	161	6.06E-03	5.77E-02	2.21E-02	1.16E+01
32.5	1.44E-01	144	8.02E+01	6.95E+00	2.38E-02	141	8.46E-03	5.88E-02	2.25E-02	1.18E+01
35.0	1.82E-01	129	1.02E+02	5.48E+00	3.14E-02	122	1.12E-02	6.12E-02	2.34E-02	1.23E+01
37.5	2.26E-01	111	1.26E+02	4.42E+00	3.98E-02	103	1.42E-02	6.26E-02	2.40E-02	1.26E+01
40.0	2.88E-01	90	1.61E+02	3.47E+00	4.89E-02	86	1.74E-02	6.04E-02	2.31E-02	1.21E+01
42.5	3.54E-01	71	1.98E+02	2.82E+00	5.84E-02	71	2.08E-02	5.87E-02	2.25E-02	1.18E+01
45.0	4.14E-01	55	2.31E+02	2.42E+00	6.82E-02	57	2.43E-02	5.86E-02	2.25E-02	1.18E+01
47.5	4.68E-01	41	2.61E+02	2.14E+00	7.81E-02	43	2.78E-02	5.94E-02	2.27E-02	1.19E+01
50.0	5.17E-01	28	2.88E+02	1.93E+00	8.80E-02	29	3.13E-02	6.06E-02	2.32E-02	1.22E+01
52.5	5.63E-01	15	3.14E+02	1.78E+00	9.70E-02	16	3.45E-02	6.13E-02	2.35E-02	1.23E+01
55.0	6.05E-01	4	3.37E+02	1.65E+00	1.04E-01	3	3.72E-02	6.15E-02	2.36E-02	1.23E+01
57.5	6.45E-01	-7	3.59E+02	1.55E+00	1.12E-01	-9	3.97E-02	6.16E-02	2.36E-02	1.24E+01
60.0	6.79E-01	-16	3.78E+02	1.47E+00	1.15E-01	-17	4.09E-02	6.03E-02	2.31E-02	1.21E+01
62.5	7.10E-01	-26	3.95E+02	1.41E+00	1.17E-01	-24	4.16E-02	5.87E-02	2.25E-02	1.18E+01
65.0	7.36E-01	-35	4.10E+02	1.36E+00	1.19E-01	-29	4.25E-02	5.78E-02	2.21E-02	1.16E+01
67.5	7.61E-01	-43	4.24E+02	1.31E+00	1.28E-01	-35	4.55E-02	5.98E-02	2.29E-02	1.20E+01
70.0	7.83E-01	-51	4.37E+02	1.28E+00	1.41E-01	-42	5.01E-02	6.40E-02	2.45E-02	1.28E+01
72.5	8.04E-01	-58	4.48E+02	1.24E+00	1.53E-01	-50	5.46E-02	6.79E-02	2.60E-02	1.36E+01
75.0	8.23E-01	-65	4.59E+02	1.22E+00	1.64E-01	-58	5.84E-02	7.10E-02	2.72E-02	1.43E+01
77.5	8.40E-01	-71	4.68E+02	1.19E+00	1.74E-01	-65	6.21E-02	7.40E-02	2.83E-02	1.48E+01
80.0	8.55E-01	-77	4.77E+02	1.17E+00	1.83E-01	-72	6.53E-02	7.64E-02	2.93E-02	1.53E+01
82.5	8.69E-01	-83	4.84E+02	1.15E+00	1.90E-01	-79	6.77E-02	7.79E-02	2.98E-02	1.56E+01

119 v/psi

Factory 12.8

Hydrophone Cal

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85.0	8.82E-01	-89	4.92E+02	1.13E+00	1.95E-01	-86	6.95E-02	7.88E-02	3.02E-02	1.58E+01
87.5	8.94E-01	-94	4.98E+02	1.12E+00	2.00E-01	-91	7.13E-02	7.98E-02	3.05E-02	1.60E+01
90.0	9.05E-01	-99	5.04E+02	1.11E+00	2.06E-01	-97	7.34E-02	8.12E-02	3.11E-02	1.63E+01
92.5	9.14E-01	-104	5.10E+02	1.09E+00	2.13E-01	-102	7.58E-02	8.29E-02	3.17E-02	1.66E+01
95.0	9.24E-01	-109	5.15E+02	1.08E+00	2.19E-01	-107	7.81E-02	8.45E-02	3.24E-02	1.70E+01
97.5	9.32E-01	-114	5.20E+02	1.07E+00	2.26E-01	-112	8.04E-02	8.63E-02	3.30E-02	1.73E+01
100.0	9.40E-01	-118	5.24E+02	1.06E+00	2.33E-01	-117	8.29E-02	8.82E-02	3.38E-02	1.77E+01
102.5	9.47E-01	-122	5.28E+02	1.06E+00	2.40E-01	-122	8.55E-02	9.02E-02	3.46E-02	1.81E+01
105.0	9.54E-01	-127	5.32E+02	1.05E+00	2.47E-01	-126	8.80E-02	9.22E-02	3.53E-02	1.85E+01
107.5	9.61E-01	-131	5.35E+02	1.04E+00	2.54E-01	-130	9.05E-02	9.42E-02	3.61E-02	1.89E+01
110.0	9.67E-01	-134	5.39E+02	1.03E+00	2.61E-01	-135	9.30E-02	9.62E-02	3.68E-02	1.93E+01
112.5	9.72E-01	-138	5.42E+02	1.03E+00	2.67E-01	-139	9.52E-02	9.79E-02	3.75E-02	1.96E+01
115.0	9.78E-01	-142	5.45E+02	1.02E+00	2.76E-01	-143	9.82E-02	1.00E-01	3.85E-02	2.02E+01
117.5	9.83E-01	-146	5.48E+02	1.02E+00	2.81E-01	-146	1.00E-01	1.02E-01	3.89E-02	2.04E+01
120.0	9.87E-01	-149	5.50E+02	1.01E+00	2.88E-01	-149	1.02E-01	1.04E-01	3.98E-02	2.08E+01
122.5	9.90E-01	-152	5.52E+02	1.01E+00	2.97E-01	-152	1.06E-01	1.07E-01	4.09E-02	2.14E+01
125.0	9.94E-01	-156	5.54E+02	1.01E+00	3.10E-01	-155	1.11E-01	1.11E-01	4.26E-02	2.23E+01
127.5	9.98E-01	-159	5.56E+02	1.00E+00	3.27E-01	-159	1.16E-01	1.17E-01	4.47E-02	2.34E+01
130.0	1.00E+00	-162	5.59E+02	9.98E-01	3.45E-01	-162	1.23E-01	1.23E-01	4.69E-02	2.46E+01
132.5	1.00E+00	-165	5.60E+02	9.95E-01	3.65E-01	-166	1.30E-01	1.29E-01	4.95E-02	2.59E+01
135.0	1.01E+00	-169	5.62E+02	9.92E-01	3.86E-01	-170	1.37E-01	1.36E-01	5.22E-02	2.74E+01
137.5	1.01E+00	-172	5.64E+02	9.88E-01	4.09E-01	-173	1.46E-01	1.44E-01	5.51E-02	2.89E+01
140.0	1.01E+00	-175	5.65E+02	9.86E-01	4.34E-01	-177	1.54E-01	1.52E-01	5.83E-02	3.06E+01
142.5	1.02E+00	-177	5.67E+02	9.83E-01	4.63E-01	179	1.65E-01	1.62E-01	6.20E-02	3.25E+01
145.0	1.02E+00	-180	5.68E+02	9.81E-01	4.95E-01	176	1.76E-01	1.73E-01	6.63E-02	3.47E+01
147.5	1.02E+00	178	5.69E+02	9.79E-01	5.33E-01	172	1.90E-01	1.86E-01	7.12E-02	3.73E+01
150.0	1.02E+00	175	5.70E+02	9.78E-01	5.76E-01	167	2.05E-01	2.01E-01	7.68E-02	4.02E+01
152.5	1.02E+00	172	5.71E+02	9.76E-01	6.27E-01	163	2.23E-01	2.18E-01	8.35E-02	4.37E+01
155.0	1.03E+00	170	5.72E+02	9.74E-01	6.84E-01	157	2.44E-01	2.37E-01	9.09E-02	4.76E+01
157.5	1.03E+00	167	5.74E+02	9.72E-01	7.37E-01	150	2.62E-01	2.55E-01	9.76E-02	5.12E+01
160.0	1.03E+00	165	5.74E+02	9.71E-01	7.48E-01	139	2.66E-01	2.58E-01	9.90E-02	5.19E+01
162.5	1.03E+00	162	5.75E+02	9.69E-01	7.14E-01	121	2.54E-01	2.46E-01	9.44E-02	4.95E+01
165.0	1.03E+00	160	5.76E+02	9.67E-01	7.24E-01	101	2.58E-01	2.49E-01	9.54E-02	5.00E+01
167.5	1.03E+00	157	5.77E+02	9.66E-01	7.66E-01	85	2.73E-01	2.64E-01	1.01E-01	5.29E+01
170.0	1.04E+00	155	5.78E+02	9.64E-01	7.84E-01	75	2.79E-01	2.69E-01	1.03E-01	5.40E+01
172.5	1.04E+00	152	5.79E+02	9.62E-01	7.64E-01	68	2.72E-01	2.62E-01	1.00E-01	5.25E+01
175.0	1.04E+00	150	5.79E+02	9.63E-01	7.07E-01	62	2.52E-01	2.43E-01	9.29E-02	4.87E+01
177.5	1.03E+00	148	5.74E+02	9.71E-01	5.85E-01	58	2.08E-01	2.02E-01	7.75E-02	4.06E+01
180.0	1.02E+00	145	5.71E+02	9.76E-01	5.24E-01	60	1.86E-01	1.82E-01	6.97E-02	3.65E+01
182.5	1.02E+00	143	5.71E+02	9.76E-01	5.00E-01	63	1.78E-01	1.74E-01	6.65E-02	3.49E+01
185.0	1.03E+00	141	5.76E+02	9.67E-01	5.40E-01	65	1.92E-01	1.86E-01	7.12E-02	3.73E+01
187.5	1.04E+00	139	5.81E+02	9.59E-01	5.79E-01	65	2.06E-01	1.97E-01	7.56E-02	3.96E+01
190.0	1.05E+00	136	5.83E+02	9.56E-01	6.21E-01	64	2.21E-01	2.11E-01	8.10E-02	4.24E+01
192.5	1.05E+00	134	5.84E+02	9.55E-01	6.78E-01	61	2.41E-01	2.31E-01	8.83E-02	4.63E+01
195.0	1.05E+00	132	5.84E+02	9.55E-01	7.33E-01	55	2.61E-01	2.49E-01	9.55E-02	5.01E+01
197.5	1.05E+00	130	5.84E+02	9.54E-01	7.57E-01	45	2.70E-01	2.57E-01	9.85E-02	5.16E+01

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Hydrophone Cal

200.0	1.05E+00	128	5.85E+02	9.53E-01	7.55E-01	30	2.69E-01	2.56E-01	9.81E-02	5.14E+01
202.5	1.05E+00	126	5.85E+02	9.53E-01	7.51E-01	14	2.67E-01	2.55E-01	9.76E-02	5.11E+01
205.0	1.05E+00	124	5.85E+02	9.52E-01	7.47E-01	0	2.66E-01	2.53E-01	9.69E-02	5.08E+01
207.5	1.05E+00	122	5.86E+02	9.51E-01	7.30E-01	-10	2.60E-01	2.47E-01	9.47E-02	4.96E+01
210.0	1.05E+00	120	5.86E+02	9.51E-01	6.98E-01	-17	2.49E-01	2.37E-01	9.06E-02	4.75E+01
212.5	1.05E+00	118	5.86E+02	9.51E-01	6.55E-01	-22	2.33E-01	2.22E-01	8.49E-02	4.45E+01
215.0	1.05E+00	115	5.86E+02	9.51E-01	6.09E-01	-28	2.17E-01	2.06E-01	7.90E-02	4.14E+01
217.5	1.05E+00	113	5.86E+02	9.51E-01	5.66E-01	-35	2.01E-01	1.91E-01	7.33E-02	3.84E+01
220.0	1.05E+00	111	5.87E+02	9.50E-01	5.23E-01	-40	1.86E-01	1.77E-01	6.77E-02	3.55E+01
222.5	1.05E+00	109	5.87E+02	9.49E-01	4.79E-01	-45	1.70E-01	1.62E-01	6.19E-02	3.25E+01
225.0	1.05E+00	108	5.87E+02	9.49E-01	4.36E-01	-49	1.55E-01	1.47E-01	5.65E-02	2.96E+01
227.5	1.05E+00	106	5.87E+02	9.49E-01	4.00E-01	-53	1.42E-01	1.35E-01	5.17E-02	2.71E+01
230.0	1.05E+00	104	5.87E+02	9.49E-01	3.68E-01	-56	1.31E-01	1.24E-01	4.76E-02	2.50E+01
232.5	1.05E+00	102	5.88E+02	9.48E-01	3.42E-01	-59	1.22E-01	1.15E-01	4.42E-02	2.32E+01
235.0	1.05E+00	100	5.88E+02	9.48E-01	3.19E-01	-61	1.14E-01	1.08E-01	4.13E-02	2.16E+01
237.5	1.05E+00	98	5.88E+02	9.48E-01	3.01E-01	-64	1.07E-01	1.02E-01	3.90E-02	2.04E+01
240.0	1.05E+00	96	5.88E+02	9.48E-01	2.84E-01	-67	1.01E-01	9.59E-02	3.67E-02	1.92E+01
242.5	1.05E+00	94	5.88E+02	9.48E-01	2.68E-01	-69	9.54E-02	9.04E-02	3.46E-02	1.82E+01
245.0	1.06E+00	92	5.89E+02	9.47E-01	2.52E-01	-72	8.97E-02	8.50E-02	3.25E-02	1.71E+01
247.5	1.06E+00	90	5.89E+02	9.47E-01	2.38E-01	-74	8.48E-02	8.03E-02	3.08E-02	1.61E+01
250.0	1.06E+00	88	5.89E+02	9.47E-01	2.27E-01	-76	8.06E-02	7.64E-02	2.92E-02	1.53E+01
252.5	1.06E+00	87	5.89E+02	9.47E-01	2.15E-01	-78	7.67E-02	7.26E-02	2.78E-02	1.46E+01
255.0	1.06E+00	85	5.89E+02	9.46E-01	2.05E-01	-81	7.29E-02	6.90E-02	2.64E-02	1.39E+01
257.5	1.06E+00	83	5.89E+02	9.46E-01	1.96E-01	-83	6.96E-02	6.59E-02	2.52E-02	1.32E+01
260.0	1.06E+00	81	5.89E+02	9.46E-01	1.87E-01	-85	6.65E-02	6.29E-02	2.41E-02	1.26E+01
262.5	1.06E+00	79	5.89E+02	9.46E-01	1.79E-01	-86	6.36E-02	6.02E-02	2.30E-02	1.21E+01
265.0	1.06E+00	77	5.89E+02	9.46E-01	1.71E-01	-88	6.10E-02	5.77E-02	2.21E-02	1.16E+01
267.5	1.06E+00	76	5.89E+02	9.46E-01	1.65E-01	-90	5.87E-02	5.55E-02	2.13E-02	1.11E+01
270.0	1.06E+00	74	5.89E+02	9.46E-01	1.59E-01	-92	5.66E-02	5.35E-02	2.05E-02	1.07E+01
272.5	1.06E+00	72	5.89E+02	9.46E-01	1.53E-01	-94	5.44E-02	5.15E-02	1.97E-02	1.03E+01
275.0	1.06E+00	70	5.89E+02	9.46E-01	1.47E-01	-96	5.23E-02	4.94E-02	1.89E-02	9.92E+00
277.5	1.06E+00	68	5.89E+02	9.46E-01	1.41E-01	-98	5.02E-02	4.75E-02	1.82E-02	9.54E+00
280.0	1.06E+00	67	5.90E+02	9.45E-01	1.36E-01	-100	4.85E-02	4.58E-02	1.75E-02	9.19E+00
282.5	1.06E+00	65	5.89E+02	9.46E-01	1.32E-01	-102	4.70E-02	4.45E-02	1.70E-02	8.92E+00
285.0	1.06E+00	63	5.89E+02	9.46E-01	1.29E-01	-103	4.59E-02	4.34E-02	1.66E-02	8.72E+00
287.5	1.06E+00	61	5.89E+02	9.46E-01	1.27E-01	-104	4.50E-02	4.26E-02	1.63E-02	8.55E+00
290.0	1.06E+00	60	5.89E+02	9.46E-01	1.26E-01	-104	4.47E-02	4.23E-02	1.62E-02	8.49E+00
292.5	1.06E+00	58	5.90E+02	9.45E-01	1.12E-01	-112	3.99E-02	3.77E-02	1.44E-02	7.57E+00
295.0	1.06E+00	56	5.90E+02	9.45E-01	9.40E-02	-112	3.35E-02	3.16E-02	1.21E-02	6.35E+00
297.5	1.06E+00	54	5.89E+02	9.46E-01	7.28E-02	-112	2.59E-02	2.45E-02	9.40E-03	4.92E+00

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300.0	1.06E+00	52	5.89E+02	9.47E-01	7.66E-02	-114	2.73E-02	2.58E-02	9.89E-03	5.19E+00
302.5	1.06E+00	51	5.90E+02	9.45E-01	7.77E-02	-115	2.77E-02	2.61E-02	1.00E-02	5.25E+00
305.0	1.06E+00	49	5.90E+02	9.45E-01	9.25E-02	-118	3.29E-02	3.11E-02	1.19E-02	6.25E+00
307.5	1.06E+00	47	5.89E+02	9.46E-01	9.61E-02	-120	3.42E-02	3.24E-02	1.24E-02	6.50E+00
310.0	1.06E+00	46	5.89E+02	9.46E-01	9.32E-02	-121	3.32E-02	3.14E-02	1.20E-02	6.30E+00
312.5	1.06E+00	44	5.89E+02	9.46E-01	9.04E-02	-123	3.22E-02	3.04E-02	1.17E-02	6.11E+00
315.0	1.06E+00	42	5.89E+02	9.46E-01	8.82E-02	-125	3.14E-02	2.97E-02	1.14E-02	5.96E+00
317.5	1.06E+00	41	5.89E+02	9.46E-01	8.59E-02	-126	3.06E-02	2.89E-02	1.11E-02	5.81E+00
320.0	1.06E+00	39	5.89E+02	9.46E-01	8.32E-02	-128	2.96E-02	2.80E-02	1.07E-02	5.63E+00
322.5	1.06E+00	37	5.89E+02	9.46E-01	8.06E-02	-130	2.87E-02	2.72E-02	1.04E-02	5.45E+00
325.0	1.06E+00	36	5.89E+02	9.46E-01	7.88E-02	-132	2.81E-02	2.65E-02	1.02E-02	5.33E+00
327.5	1.06E+00	34	5.89E+02	9.46E-01	7.74E-02	-134	2.76E-02	2.61E-02	9.99E-03	5.23E+00
330.0	1.06E+00	32	5.89E+02	9.47E-01	7.54E-02	-135	2.68E-02	2.54E-02	9.74E-03	5.10E+00
332.5	1.06E+00	31	5.89E+02	9.47E-01	7.30E-02	-137	2.60E-02	2.46E-02	9.43E-03	4.94E+00
335.0	1.06E+00	29	5.89E+02	9.47E-01	7.10E-02	-139	2.53E-02	2.39E-02	9.17E-03	4.81E+00
337.5	1.06E+00	27	5.89E+02	9.47E-01	6.93E-02	-141	2.47E-02	2.34E-02	8.94E-03	4.69E+00
340.0	1.06E+00	26	5.89E+02	9.47E-01	6.77E-02	-142	2.41E-02	2.28E-02	8.75E-03	4.58E+00
342.5	1.06E+00	24	5.89E+02	9.47E-01	6.59E-02	-143	2.34E-02	2.22E-02	8.50E-03	4.46E+00
345.0	1.06E+00	22	5.89E+02	9.47E-01	6.43E-02	-145	2.29E-02	2.17E-02	8.30E-03	4.35E+00
347.5	1.06E+00	21	5.89E+02	9.47E-01	6.27E-02	-147	2.23E-02	2.11E-02	8.09E-03	4.24E+00
350.0	1.06E+00	19	5.89E+02	9.47E-01	6.06E-02	-149	2.16E-02	2.04E-02	7.82E-03	4.10E+00
352.5	1.06E+00	17	5.89E+02	9.47E-01	5.88E-02	-151	2.09E-02	1.98E-02	7.59E-03	3.98E+00
355.0	1.05E+00	16	5.88E+02	9.48E-01	5.87E-02	-153	2.09E-02	1.98E-02	7.58E-03	3.97E+00
357.5	1.05E+00	14	5.88E+02	9.48E-01	5.88E-02	-156	2.09E-02	1.99E-02	7.60E-03	3.98E+00
360.0	1.05E+00	12	5.88E+02	9.48E-01	5.74E-02	-157	2.04E-02	1.94E-02	7.42E-03	3.89E+00
362.5	1.05E+00	11	5.88E+02	9.48E-01	5.60E-02	-159	1.99E-02	1.89E-02	7.24E-03	3.79E+00
365.0	1.05E+00	9	5.88E+02	9.48E-01	5.35E-02	-159	1.90E-02	1.80E-02	6.91E-03	3.62E+00
367.5	1.05E+00	7	5.88E+02	9.48E-01	5.11E-02	-160	1.82E-02	1.72E-02	6.61E-03	3.46E+00
370.0	1.05E+00	6	5.88E+02	9.48E-01	4.95E-02	-162	1.76E-02	1.67E-02	6.40E-03	3.36E+00
372.5	1.05E+00	4	5.87E+02	9.49E-01	4.82E-02	-164	1.72E-02	1.63E-02	6.24E-03	3.27E+00
375.0	1.05E+00	2	5.88E+02	9.48E-01	4.69E-02	-166	1.67E-02	1.58E-02	6.06E-03	3.17E+00
377.5	1.05E+00	1	5.87E+02	9.49E-01	4.55E-02	-167	1.62E-02	1.54E-02	5.89E-03	3.08E+00
380.0	1.05E+00	-1	5.87E+02	9.49E-01	4.45E-02	-168	1.59E-02	1.50E-02	5.76E-03	3.02E+00
382.5	1.05E+00	-2	5.87E+02	9.49E-01	4.37E-02	-169	1.55E-02	1.48E-02	5.65E-03	2.96E+00
385.0	1.05E+00	-4	5.87E+02	9.49E-01	4.28E-02	-171	1.52E-02	1.45E-02	5.54E-03	2.90E+00
387.5	1.05E+00	-6	5.87E+02	9.49E-01	4.17E-02	-173	1.48E-02	1.41E-02	5.39E-03	2.83E+00
390.0	1.05E+00	-7	5.87E+02	9.49E-01	4.01E-02	-174	1.43E-02	1.35E-02	5.18E-03	2.72E+00
392.5	1.05E+00	-9	5.87E+02	9.49E-01	3.83E-02	-177	1.36E-02	1.29E-02	4.96E-03	2.60E+00
395.0	1.05E+00	-11	5.87E+02	9.49E-01	3.70E-02	-179	1.32E-02	1.25E-02	4.79E-03	2.51E+00
397.5	1.05E+00	-12	5.87E+02	9.49E-01	3.63E-02	180	1.29E-02	1.23E-02	4.69E-03	2.46E+00
400.0	1.05E+00	-14	5.87E+02	9.50E-01	3.54E-02	178	1.26E-02	1.20E-02	4.59E-03	2.40E+00
402.5	1.05E+00	-16	5.87E+02	9.50E-01	3.43E-02	177	1.22E-02	1.16E-02	4.44E-03	2.33E+00
405.0	1.05E+00	-17	5.87E+02	9.50E-01	3.32E-02	176	1.18E-02	1.12E-02	4.30E-03	2.25E+00

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407.5	1.05E+00	-19	5.87E+02	9.50E-01	3.20E-02	175	1.14E-02	1.08E-02	4.14E-03	2.17E+00
410.0	1.05E+00	-20	5.87E+02	9.50E-01	3.08E-02	175	1.10E-02	1.04E-02	3.99E-03	2.09E+00
412.5	1.05E+00	-22	5.87E+02	9.50E-01	2.97E-02	174	1.06E-02	1.00E-02	3.85E-03	2.02E+00
415.0	1.05E+00	-24	5.86E+02	9.51E-01	2.88E-02	171	1.03E-02	9.75E-03	3.73E-03	1.96E+00
417.5	1.05E+00	-25	5.86E+02	9.51E-01	2.92E-02	164	1.04E-02	9.88E-03	3.78E-03	1.98E+00
420.0	1.05E+00	-27	5.86E+02	9.51E-01	2.85E-02	163	1.01E-02	9.63E-03	3.69E-03	1.93E+00
422.5	1.05E+00	-28	5.86E+02	9.51E-01	2.70E-02	164	9.60E-03	9.13E-03	3.50E-03	1.83E+00
425.0	1.05E+00	-30	5.87E+02	9.50E-01	2.37E-02	169	8.44E-03	8.01E-03	3.07E-03	1.61E+00
427.5	1.05E+00	-32	5.86E+02	9.51E-01	2.17E-02	171	7.73E-03	7.34E-03	2.81E-03	1.47E+00
430.0	1.05E+00	-33	5.86E+02	9.51E-01	2.09E-02	171	7.43E-03	7.06E-03	2.70E-03	1.42E+00
432.5	1.05E+00	-35	5.86E+02	9.51E-01	2.00E-02	170	7.12E-03	6.77E-03	2.59E-03	1.36E+00
435.0	1.05E+00	-37	5.86E+02	9.51E-01	1.86E-02	171	6.64E-03	6.31E-03	2.42E-03	1.27E+00
437.5	1.05E+00	-38	5.86E+02	9.51E-01	1.73E-02	173	6.15E-03	5.85E-03	2.24E-03	1.17E+00
440.0	1.05E+00	-40	5.86E+02	9.51E-01	1.68E-02	175	5.98E-03	5.69E-03	2.18E-03	1.14E+00
442.5	1.05E+00	-41	5.86E+02	9.51E-01	1.64E-02	176	5.83E-03	5.54E-03	2.12E-03	1.11E+00
445.0	1.05E+00	-43	5.86E+02	9.51E-01	1.56E-02	179	5.55E-03	5.28E-03	2.02E-03	1.06E+00
447.5	1.05E+00	-45	5.86E+02	9.51E-01	1.45E-02	-175	5.17E-03	4.92E-03	1.88E-03	9.87E-01
450.0	1.05E+00	-46	5.86E+02	9.51E-01	1.38E-02	-169	4.92E-03	4.68E-03	1.79E-03	9.40E-01
452.5	1.05E+00	-48	5.86E+02	9.51E-01	1.39E-02	-163	4.96E-03	4.72E-03	1.81E-03	9.47E-01
455.0	1.05E+00	-49	5.86E+02	9.51E-01	1.48E-02	-158	5.28E-03	5.02E-03	1.92E-03	1.01E+00
457.5	1.05E+00	-51	5.86E+02	9.51E-01	1.61E-02	-152	5.72E-03	5.45E-03	2.09E-03	1.09E+00
460.0	1.05E+00	-53	5.86E+02	9.51E-01	1.76E-02	-147	6.27E-03	5.96E-03	2.28E-03	1.20E+00
462.5	1.05E+00	-54	5.86E+02	9.51E-01	1.89E-02	-143	6.73E-03	6.40E-03	2.45E-03	1.28E+00
465.0	1.05E+00	-56	5.86E+02	9.51E-01	2.07E-02	-142	7.36E-03	7.00E-03	2.68E-03	1.41E+00
467.5	1.05E+00	-57	5.85E+02	9.52E-01	2.29E-02	-141	8.15E-03	7.76E-03	2.97E-03	1.56E+00
470.0	1.05E+00	-59	5.86E+02	9.51E-01	2.51E-02	-140	8.94E-03	8.51E-03	3.26E-03	1.71E+00
472.5	1.05E+00	-61	5.86E+02	9.51E-01	2.73E-02	-141	9.74E-03	9.26E-03	3.55E-03	1.86E+00
475.0	1.05E+00	-62	5.86E+02	9.51E-01	3.04E-02	-143	1.08E-02	1.03E-02	3.95E-03	2.07E+00
477.5	1.05E+00	-64	5.86E+02	9.51E-01	3.38E-02	-145	1.20E-02	1.15E-02	4.39E-03	2.30E+00
480.0	1.05E+00	-66	5.86E+02	9.51E-01	3.69E-02	-147	1.31E-02	1.25E-02	4.79E-03	2.51E+00
482.5	1.05E+00	-67	5.86E+02	9.51E-01	4.00E-02	-150	1.42E-02	1.36E-02	5.19E-03	2.72E+00
485.0	1.05E+00	-69	5.85E+02	9.52E-01	4.33E-02	-154	1.54E-02	1.47E-02	5.62E-03	2.94E+00
487.5	1.05E+00	-70	5.86E+02	9.51E-01	4.70E-02	-159	1.67E-02	1.59E-02	6.09E-03	3.19E+00
490.0	1.05E+00	-72	5.85E+02	9.52E-01	5.08E-02	-163	1.81E-02	1.72E-02	6.60E-03	3.46E+00
492.5	1.05E+00	-74	5.85E+02	9.52E-01	5.41E-02	-168	1.93E-02	1.83E-02	7.03E-03	3.68E+00
495.0	1.05E+00	-75	5.85E+02	9.52E-01	5.71E-02	-173	2.03E-02	1.94E-02	7.41E-03	3.88E+00
497.5	1.05E+00	-77	5.85E+02	9.52E-01	5.87E-02	-178	2.09E-02	1.99E-02	7.63E-03	4.00E+00
500.0	1.05E+00	-79	5.85E+02	9.52E-01	5.93E-02	178	2.11E-02	2.01E-02	7.70E-03	4.03E+00
502.5	1.05E+00	-80	5.85E+02	9.52E-01	5.85E-02	174	2.08E-02	1.98E-02	7.60E-03	3.98E+00
505.0	1.05E+00	-82	5.85E+02	9.52E-01	5.65E-02	169	2.01E-02	1.91E-02	7.33E-03	3.84E+00
507.5	1.05E+00	-83	5.85E+02	9.52E-01	5.44E-02	162	1.94E-02	1.85E-02	7.07E-03	3.70E+00
510.0	1.05E+00	-85	5.85E+02	9.52E-01	5.38E-02	154	1.91E-02	1.82E-02	6.99E-03	3.66E+00
512.5	1.05E+00	-87	5.85E+02	9.52E-01	5.51E-02	148	1.96E-02	1.87E-02	7.15E-03	3.75E+00
515.0	1.05E+00	-88	5.85E+02	9.52E-01	5.63E-02	144	2.00E-02	1.91E-02	7.31E-03	3.83E+00
517.5	1.05E+00	-90	5.85E+02	9.52E-01	5.72E-02	140	2.04E-02	1.94E-02	7.43E-03	3.89E+00
520.0	1.05E+00	-92	5.85E+02	9.52E-01	5.67E-02	138	2.02E-02	1.92E-02	7.37E-03	3.86E+00
522.5	1.05E+00	-93	5.85E+02	9.52E-01	5.51E-02	136	1.96E-02	1.87E-02	7.15E-03	3.75E+00
525.0	1.05E+00	-95	5.85E+02	9.52E-01	5.27E-02	133	1.88E-02	1.79E-02	6.84E-03	3.59E+00
527.5	1.05E+00	-96	5.85E+02	9.52E-01	5.02E-02	131	1.79E-02	1.70E-02	6.52E-03	3.42E+00
530.0	1.05E+00	-98	5.85E+02	9.52E-01	4.69E-02	128	1.67E-02	1.59E-02	6.09E-03	3.19E+00

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532.5	1.05E+00	-100	5.85E+02	9.52E-01	4.32E-02	125	1.54E-02	1.47E-02	5.62E-03	2.94E+00
535.0	1.05E+00	-101	5.85E+02	9.52E-01	4.08E-02	120	1.45E-02	1.38E-02	5.30E-03	2.78E+00
537.5	1.05E+00	-103	5.84E+02	9.54E-01	4.03E-02	113	1.43E-02	1.37E-02	5.24E-03	2.75E+00
540.0	1.05E+00	-105	5.84E+02	9.55E-01	3.79E-02	110	1.35E-02	1.29E-02	4.94E-03	2.59E+00
542.5	1.05E+00	-106	5.84E+02	9.55E-01	3.60E-02	109	1.28E-02	1.22E-02	4.68E-03	2.45E+00
545.0	1.05E+00	-108	5.84E+02	9.54E-01	3.26E-02	111	1.16E-02	1.11E-02	4.24E-03	2.22E+00
547.5	1.05E+00	-110	5.85E+02	9.53E-01	3.16E-02	111	1.13E-02	1.07E-02	4.11E-03	2.15E+00
550.0	1.05E+00	-111	5.85E+02	9.53E-01	3.35E-02	108	1.19E-02	1.14E-02	4.36E-03	2.28E+00
552.5	1.05E+00	-113	5.85E+02	9.53E-01	3.59E-02	104	1.28E-02	1.22E-02	4.67E-03	2.45E+00
555.0	1.05E+00	-115	5.85E+02	9.53E-01	3.83E-02	102	1.36E-02	1.30E-02	4.97E-03	2.61E+00
557.5	1.05E+00	-116	5.85E+02	9.53E-01	3.98E-02	100	1.42E-02	1.35E-02	5.17E-03	2.71E+00
560.0	1.05E+00	-118	5.85E+02	9.53E-01	4.08E-02	96	1.45E-02	1.39E-02	5.31E-03	2.78E+00
562.5	1.05E+00	-120	5.85E+02	9.53E-01	4.20E-02	92	1.49E-02	1.43E-02	5.46E-03	2.86E+00
565.0	1.05E+00	-121	5.85E+02	9.53E-01	4.21E-02	90	1.50E-02	1.43E-02	5.47E-03	2.87E+00
567.5	1.05E+00	-123	5.85E+02	9.53E-01	4.15E-02	87	1.48E-02	1.41E-02	5.39E-03	2.82E+00
570.0	1.05E+00	-125	5.85E+02	9.53E-01	4.06E-02	85	1.45E-02	1.38E-02	5.28E-03	2.77E+00
572.5	1.05E+00	-126	5.85E+02	9.53E-01	3.96E-02	82	1.41E-02	1.34E-02	5.15E-03	2.70E+00
575.0	1.05E+00	-128	5.85E+02	9.53E-01	3.87E-02	79	1.38E-02	1.31E-02	5.03E-03	2.64E+00
577.5	1.05E+00	-130	5.85E+02	9.53E-01	3.77E-02	78	1.34E-02	1.28E-02	4.91E-03	2.57E+00
580.0	1.05E+00	-131	5.85E+02	9.53E-01	3.69E-02	77	1.31E-02	1.25E-02	4.79E-03	2.51E+00
582.5	1.05E+00	-133	5.84E+02	9.54E-01	3.51E-02	76	1.25E-02	1.19E-02	4.56E-03	2.39E+00
585.0	1.05E+00	-135	5.84E+02	9.54E-01	3.24E-02	75	1.16E-02	1.10E-02	4.22E-03	2.21E+00
587.5	1.05E+00	-136	5.84E+02	9.54E-01	3.04E-02	74	1.08E-02	1.03E-02	3.95E-03	2.07E+00
590.0	1.05E+00	-138	5.84E+02	9.54E-01	2.87E-02	75	1.02E-02	9.74E-03	3.73E-03	1.96E+00
592.5	1.05E+00	-140	5.84E+02	9.54E-01	2.78E-02	78	9.89E-03	9.44E-03	3.62E-03	1.89E+00
595.0	1.05E+00	-141	5.84E+02	9.54E-01	2.70E-02	79	9.63E-03	9.19E-03	3.52E-03	1.84E+00
597.5	1.05E+00	-143	5.84E+02	9.55E-01	2.68E-02	79	9.54E-03	9.11E-03	3.49E-03	1.83E+00
600.0	1.05E+00	-145	5.84E+02	9.55E-01	2.68E-02	76	9.53E-03	9.10E-03	3.48E-03	1.83E+00
602.5	1.05E+00	-147	5.84E+02	9.55E-01	2.81E-02	71	1.00E-02	9.55E-03	3.66E-03	1.92E+00
605.0	1.05E+00	-148	5.84E+02	9.54E-01	3.00E-02	65	1.07E-02	1.02E-02	3.90E-03	2.04E+00
607.5	1.05E+00	-150	5.84E+02	9.55E-01	3.24E-02	57	1.15E-02	1.10E-02	4.22E-03	2.21E+00
610.0	1.05E+00	-152	5.84E+02	9.55E-01	3.53E-02	49	1.26E-02	1.20E-02	4.59E-03	2.41E+00
612.5	1.05E+00	-153	5.84E+02	9.55E-01	3.86E-02	43	1.37E-02	1.31E-02	5.03E-03	2.64E+00
615.0	1.05E+00	-155	5.84E+02	9.55E-01	4.17E-02	38	1.49E-02	1.42E-02	5.44E-03	2.85E+00
617.5	1.05E+00	-157	5.84E+02	9.55E-01	4.45E-02	34	1.58E-02	1.51E-02	5.80E-03	3.04E+00
620.0	1.05E+00	-159	5.83E+02	9.56E-01	4.60E-02	30	1.64E-02	1.56E-02	5.99E-03	3.14E+00
622.5	1.05E+00	-160	5.83E+02	9.56E-01	4.64E-02	25	1.65E-02	1.58E-02	6.05E-03	3.17E+00
625.0	1.04E+00	-162	5.82E+02	9.57E-01	4.69E-02	21	1.67E-02	1.60E-02	6.12E-03	3.20E+00
627.5	1.04E+00	-164	5.82E+02	9.57E-01	4.68E-02	16	1.67E-02	1.60E-02	6.11E-03	3.20E+00
630.0	1.04E+00	-166	5.82E+02	9.57E-01	4.54E-02	13	1.62E-02	1.55E-02	5.92E-03	3.10E+00
632.5	1.04E+00	-167	5.82E+02	9.57E-01	4.42E-02	9	1.57E-02	1.51E-02	5.77E-03	3.02E+00
635.0	1.04E+00	-169	5.82E+02	9.57E-01	4.39E-02	7	1.56E-02	1.49E-02	5.72E-03	3.00E+00
637.5	1.04E+00	-171	5.82E+02	9.58E-01	4.42E-02	5	1.57E-02	1.51E-02	5.77E-03	3.03E+00
640.0	1.04E+00	-172	5.82E+02	9.58E-01	4.45E-02	2	1.58E-02	1.52E-02	5.81E-03	3.05E+00
642.5	1.04E+00	-174	5.82E+02	9.58E-01	4.46E-02	-1	1.59E-02	1.52E-02	5.83E-03	3.05E+00
645.0	1.04E+00	-176	5.81E+02	9.59E-01	4.41E-02	-5	1.57E-02	1.51E-02	5.77E-03	3.02E+00
647.5	1.04E+00	-178	5.81E+02	9.59E-01	4.34E-02	-9	1.55E-02	1.48E-02	5.68E-03	2.97E+00
650.0	1.04E+00	-180	5.81E+02	9.60E-01	4.26E-02	-13	1.52E-02	1.45E-02	5.57E-03	2.92E+00

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652.5	1.04E+00	179	5.81E+02	9.60E-01	4.22E-02	-17	1.50E-02	1.44E-02	5.52E-03	2.90E+00
655.0	1.04E+00	177	5.80E+02	9.61E-01	4.18E-02	-22	1.49E-02	1.43E-02	5.47E-03	2.87E+00
657.5	1.04E+00	175	5.80E+02	9.62E-01	4.14E-02	-26	1.47E-02	1.42E-02	5.43E-03	2.84E+00
660.0	1.04E+00	173	5.81E+02	9.60E-01	4.21E-02	-29	1.50E-02	1.44E-02	5.51E-03	2.89E+00
662.5	1.04E+00	172	5.80E+02	9.62E-01	4.23E-02	-34	1.50E-02	1.45E-02	5.54E-03	2.90E+00
665.0	1.04E+00	170	5.80E+02	9.61E-01	4.15E-02	-38	1.48E-02	1.42E-02	5.43E-03	2.85E+00
667.5	1.04E+00	168	5.79E+02	9.63E-01	4.00E-02	-43	1.42E-02	1.37E-02	5.25E-03	2.75E+00
670.0	1.04E+00	166	5.79E+02	9.62E-01	3.81E-02	-48	1.36E-02	1.31E-02	5.00E-03	2.62E+00
672.5	1.04E+00	164	5.78E+02	9.64E-01	3.64E-02	-53	1.30E-02	1.25E-02	4.79E-03	2.51E+00
675.0	1.04E+00	163	5.78E+02	9.64E-01	3.49E-02	-57	1.24E-02	1.20E-02	4.59E-03	2.40E+00
677.5	1.03E+00	161	5.77E+02	9.66E-01	3.30E-02	-62	1.18E-02	1.14E-02	4.35E-03	2.28E+00
680.0	1.04E+00	159	5.77E+02	9.65E-01	3.11E-02	-68	1.11E-02	1.07E-02	4.09E-03	2.14E+00
682.5	1.03E+00	157	5.76E+02	9.67E-01	2.94E-02	-74	1.05E-02	1.01E-02	3.87E-03	2.03E+00
685.0	1.03E+00	155	5.77E+02	9.66E-01	2.69E-02	-78	9.56E-03	9.24E-03	3.54E-03	1.85E+00
687.5	1.03E+00	153	5.76E+02	9.68E-01	2.46E-02	-80	8.75E-03	8.47E-03	3.25E-03	1.70E+00
690.0	1.03E+00	152	5.76E+02	9.68E-01	2.30E-02	-82	8.19E-03	7.93E-03	3.04E-03	1.59E+00
692.5	1.03E+00	150	5.75E+02	9.70E-01	2.13E-02	-84	7.59E-03	7.36E-03	2.82E-03	1.48E+00
695.0	1.03E+00	148	5.75E+02	9.70E-01	1.98E-02	-86	7.05E-03	6.84E-03	2.62E-03	1.37E+00
697.5	1.03E+00	146	5.74E+02	9.72E-01	1.84E-02	-87	6.55E-03	6.37E-03	2.44E-03	1.28E+00
700.0	1.03E+00	144	5.74E+02	9.72E-01	1.75E-02	-87	6.22E-03	6.04E-03	2.31E-03	1.21E+00
702.5	1.03E+00	142	5.72E+02	9.74E-01	1.64E-02	-89	5.85E-03	5.70E-03	2.18E-03	1.14E+00
705.0	1.03E+00	140	5.72E+02	9.74E-01	1.50E-02	-92	5.35E-03	5.21E-03	1.99E-03	1.05E+00
707.5	1.02E+00	139	5.71E+02	9.76E-01	1.41E-02	-94	5.01E-03	4.89E-03	1.87E-03	9.82E-01
710.0	1.02E+00	137	5.71E+02	9.76E-01	1.38E-02	-94	4.90E-03	4.78E-03	1.83E-03	9.59E-01
712.5	1.02E+00	135	5.70E+02	9.78E-01	1.36E-02	-93	4.83E-03	4.72E-03	1.81E-03	9.47E-01
715.0	1.02E+00	133	5.70E+02	9.78E-01	1.39E-02	-92	4.96E-03	4.86E-03	1.86E-03	9.75E-01
717.5	1.02E+00	131	5.68E+02	9.81E-01	1.43E-02	-96	5.11E-03	5.01E-03	1.92E-03	1.01E+00
720.0	1.02E+00	129	5.68E+02	9.81E-01	1.44E-02	-99	5.14E-03	5.04E-03	1.93E-03	1.01E+00
722.5	1.02E+00	127	5.66E+02	9.84E-01	1.38E-02	-101	4.90E-03	4.82E-03	1.85E-03	9.67E-01
725.0	1.02E+00	125	5.66E+02	9.84E-01	1.23E-02	-101	4.36E-03	4.30E-03	1.65E-03	8.62E-01
727.5	1.01E+00	123	5.65E+02	9.87E-01	1.14E-02	-104	4.07E-03	4.01E-03	1.54E-03	8.06E-01
730.0	1.01E+00	121	5.65E+02	9.87E-01	1.10E-02	-107	3.93E-03	3.88E-03	1.48E-03	7.78E-01
732.5	1.01E+00	119	5.62E+02	9.91E-01	1.06E-02	-107	3.77E-03	3.73E-03	1.43E-03	7.49E-01
735.0	1.01E+00	117	5.63E+02	9.90E-01	1.05E-02	-108	3.73E-03	3.70E-03	1.42E-03	7.42E-01
737.5	1.01E+00	116	5.61E+02	9.94E-01	1.05E-02	-111	3.73E-03	3.71E-03	1.42E-03	7.44E-01
740.0	1.01E+00	114	5.61E+02	9.94E-01	1.04E-02	-114	3.69E-03	3.67E-03	1.40E-03	7.36E-01
742.5	1.00E+00	112	5.59E+02	9.98E-01	9.98E-03	-117	3.55E-03	3.55E-03	1.36E-03	7.12E-01
745.0	1.00E+00	110	5.59E+02	9.98E-01	9.57E-03	-115	3.41E-03	3.40E-03	1.30E-03	6.82E-01
747.5	9.98E-01	108	5.56E+02	1.00E+00	9.28E-03	-115	3.30E-03	3.31E-03	1.27E-03	6.64E-01
750.0	9.98E-01	106	5.56E+02	1.00E+00	8.87E-03	-118	3.16E-03	3.16E-03	1.21E-03	6.35E-01
752.5	9.94E-01	104	5.54E+02	1.01E+00	8.67E-03	-121	3.09E-03	3.11E-03	1.19E-03	6.23E-01
755.0	9.92E-01	102	5.53E+02	1.01E+00	8.63E-03	-122	3.07E-03	3.10E-03	1.19E-03	6.22E-01
757.5	9.90E-01	100	5.52E+02	1.01E+00	8.59E-03	-123	3.06E-03	3.09E-03	1.18E-03	6.20E-01
760.0	9.87E-01	98	5.50E+02	1.01E+00	8.40E-03	-124	2.99E-03	3.03E-03	1.16E-03	6.08E-01
762.5	9.86E-01	96	5.49E+02	1.01E+00	7.98E-03	-130	2.84E-03	2.88E-03	1.10E-03	5.78E-01
765.0	9.81E-01	94	5.47E+02	1.02E+00	7.64E-03	-133	2.72E-03	2.77E-03	1.06E-03	5.56E-01

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767.5	9.80E-01	92	5.46E+02	1.02E+00	7.51E-03	-133	2.67E-03	2.73E-03	1.04E-03	5.47E-01
770.0	9.75E-01	90	5.43E+02	1.03E+00	7.38E-03	-132	2.63E-03	2.70E-03	1.03E-03	5.41E-01
772.5	9.74E-01	88	5.43E+02	1.03E+00	7.54E-03	-133	2.68E-03	2.75E-03	1.05E-03	5.53E-01
775.0	9.68E-01	86	5.40E+02	1.03E+00	7.69E-03	-141	2.74E-03	2.83E-03	1.08E-03	5.67E-01
777.5	9.67E-01	84	5.39E+02	1.03E+00	7.41E-03	-152	2.64E-03	2.73E-03	1.05E-03	5.48E-01
780.0	9.62E-01	81	5.36E+02	1.04E+00	7.25E-03	-158	2.58E-03	2.68E-03	1.03E-03	5.39E-01
782.5	9.60E-01	79	5.35E+02	1.04E+00	7.21E-03	-163	2.57E-03	2.68E-03	1.02E-03	5.37E-01
785.0	9.57E-01	77	5.33E+02	1.05E+00	6.79E-03	-165	2.42E-03	2.53E-03	9.68E-04	5.07E-01
787.5	9.53E-01	75	5.31E+02	1.05E+00	5.98E-03	-169	2.13E-03	2.24E-03	8.56E-04	4.49E-01
790.0	9.51E-01	73	5.30E+02	1.05E+00	4.96E-03	-174	1.77E-03	1.86E-03	7.11E-04	3.73E-01
792.5	9.45E-01	71	5.27E+02	1.06E+00	4.22E-03	-176	1.50E-03	1.59E-03	6.09E-04	3.19E-01
795.0	9.43E-01	69	5.26E+02	1.06E+00	3.41E-03	-170	1.21E-03	1.29E-03	4.93E-04	2.58E-01
797.5	9.36E-01	67	5.22E+02	1.07E+00	2.84E-03	-165	1.01E-03	1.08E-03	4.14E-04	2.17E-01
800.0	9.34E-01	65	5.21E+02	1.07E+00	2.26E-03	-161	8.05E-04	8.61E-04	3.30E-04	1.73E-01
802.5	9.29E-01	63	5.18E+02	1.08E+00	1.80E-03	-165	6.42E-04	6.91E-04	2.65E-04	1.39E-01
805.0	9.25E-01	61	5.16E+02	1.08E+00	1.70E-03	-154	6.06E-04	6.55E-04	2.51E-04	1.31E-01
807.5	9.21E-01	58	5.13E+02	1.09E+00	2.24E-03	-141	7.96E-04	8.64E-04	3.31E-04	1.73E-01
810.0	9.15E-01	56	5.10E+02	1.09E+00	2.43E-03	-140	8.63E-04	9.43E-04	3.61E-04	1.89E-01
812.5	9.13E-01	54	5.09E+02	1.10E+00	2.21E-03	-144	7.88E-04	8.63E-04	3.31E-04	1.73E-01
815.0	9.06E-01	52	5.05E+02	1.10E+00	2.27E-03	-151	8.09E-04	8.93E-04	3.42E-04	1.79E-01
817.5	9.03E-01	50	5.03E+02	1.11E+00	2.53E-03	-140	9.02E-04	9.99E-04	3.82E-04	2.00E-01
820.0	8.96E-01	48	5.00E+02	1.12E+00	2.97E-03	-132	1.06E-03	1.18E-03	4.52E-04	2.37E-01
822.5	8.92E-01	45	4.97E+02	1.12E+00	2.96E-03	-135	1.05E-03	1.18E-03	4.53E-04	2.37E-01
825.0	8.87E-01	43	4.94E+02	1.13E+00	2.96E-03	-139	1.05E-03	1.19E-03	4.54E-04	2.38E-01
827.5	8.80E-01	41	4.91E+02	1.14E+00	3.02E-03	-134	1.08E-03	1.22E-03	4.68E-04	2.45E-01
830.0	8.77E-01	39	4.89E+02	1.14E+00	2.83E-03	-131	1.01E-03	1.15E-03	4.40E-04	2.31E-01
832.5	8.69E-01	37	4.84E+02	1.15E+00	2.95E-03	-136	1.05E-03	1.21E-03	4.64E-04	2.43E-01
835.0	8.65E-01	35	4.82E+02	1.16E+00	3.09E-03	-137	1.10E-03	1.27E-03	4.87E-04	2.55E-01
837.5	8.58E-01	32	4.78E+02	1.17E+00	2.82E-03	-141	1.00E-03	1.17E-03	4.48E-04	2.35E-01
840.0	8.52E-01	30	4.75E+02	1.17E+00	2.47E-03	-151	8.81E-04	1.03E-03	3.96E-04	2.07E-01
842.5	8.47E-01	28	4.72E+02	1.18E+00	2.35E-03	-160	8.35E-04	9.86E-04	3.78E-04	1.98E-01
845.0	8.39E-01	26	4.68E+02	1.19E+00	2.59E-03	-162	9.23E-04	1.10E-03	4.22E-04	2.21E-01
847.5	8.35E-01	24	4.65E+02	1.20E+00	2.53E-03	-165	9.00E-04	1.08E-03	4.13E-04	2.17E-01
850.0	8.26E-01	21	4.60E+02	1.21E+00	2.48E-03	-171	8.82E-04	1.07E-03	4.09E-04	2.14E-01
852.5	8.21E-01	19	4.58E+02	1.22E+00	2.68E-03	-172	9.55E-04	1.16E-03	4.46E-04	2.34E-01
855.0	8.14E-01	17	4.54E+02	1.23E+00	2.76E-03	-170	9.81E-04	1.21E-03	4.62E-04	2.42E-01
857.5	8.06E-01	15	4.49E+02	1.24E+00	2.68E-03	-165	9.53E-04	1.18E-03	4.53E-04	2.37E-01
860.0	8.01E-01	12	4.46E+02	1.25E+00	2.59E-03	-169	9.22E-04	1.15E-03	4.41E-04	2.31E-01
862.5	7.91E-01	10	4.41E+02	1.26E+00	2.74E-03	-173	9.77E-04	1.23E-03	4.73E-04	2.48E-01
865.0	7.86E-01	8	4.38E+02	1.27E+00	2.89E-03	-173	1.03E-03	1.31E-03	5.02E-04	2.63E-01
867.5	7.78E-01	6	4.34E+02	1.28E+00	3.13E-03	-173	1.11E-03	1.43E-03	5.48E-04	2.87E-01
870.0	7.70E-01	4	4.29E+02	1.30E+00	3.18E-03	-179	1.13E-03	1.47E-03	5.63E-04	2.95E-01
872.5	7.64E-01	1	4.26E+02	1.31E+00	3.01E-03	178	1.07E-03	1.40E-03	5.37E-04	2.81E-01
875.0	7.55E-01	-1	4.21E+02	1.32E+00	2.86E-03	178	1.02E-03	1.35E-03	5.16E-04	2.70E-01
877.5	7.49E-01	-3	4.17E+02	1.34E+00	2.66E-03	175	9.48E-04	1.27E-03	4.85E-04	2.54E-01
880.0	7.40E-01	-5	4.12E+02	1.35E+00	2.62E-03	176	9.32E-04	1.26E-03	4.82E-04	2.53E-01
882.5	7.32E-01	-8	4.08E+02	1.37E+00	2.41E-03	-178	8.56E-04	1.17E-03	4.48E-04	2.35E-01

Hydrophone Cal 11/28/90

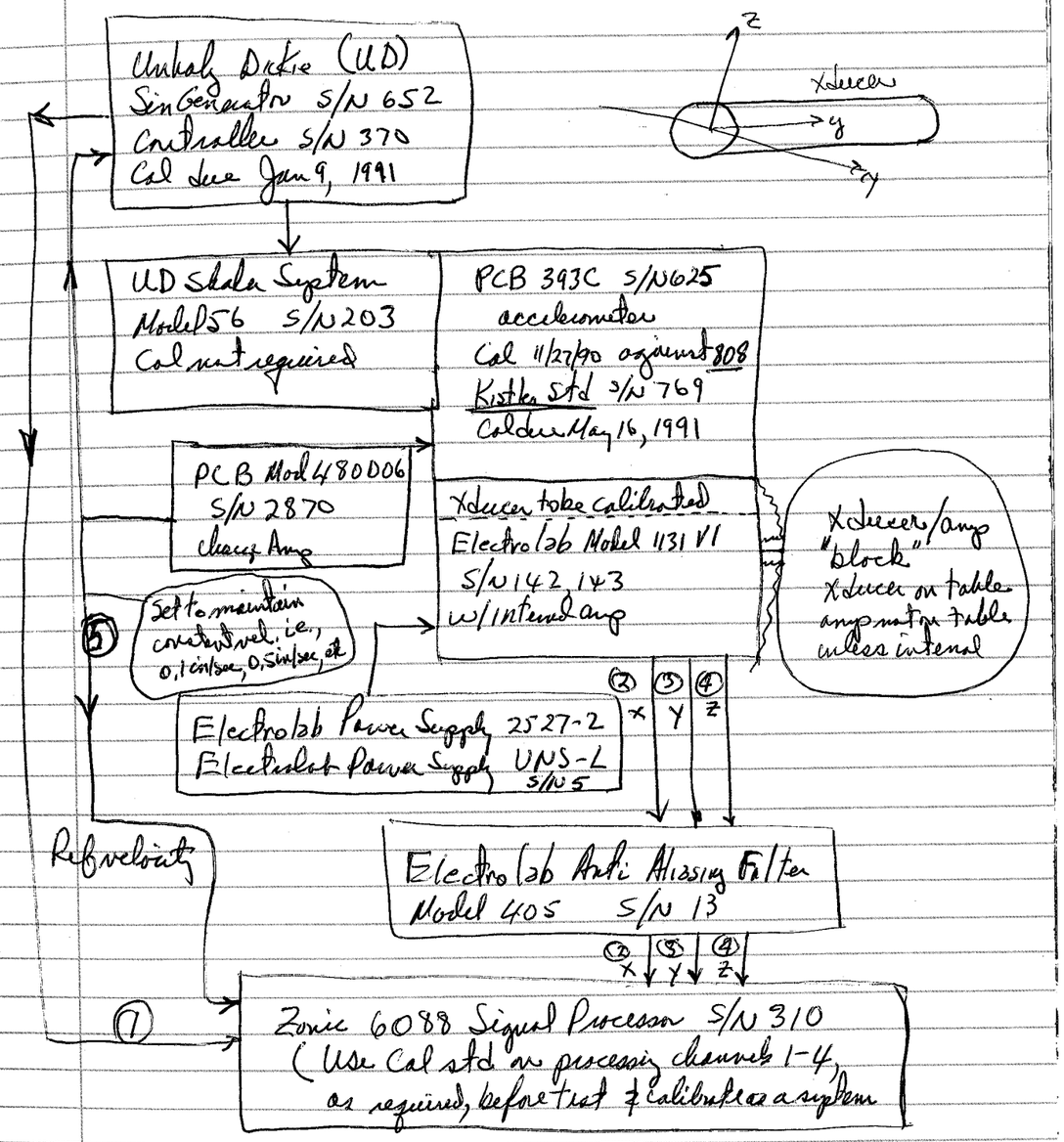
885.0	7.26E-01	-10	4.04E+02	1.38E+00	2.03E-03	-179	7.22E-04	9.96E-04	3.81E-04	2.00E-01
887.5	7.16E-01	-12	3.99E+02	1.40E+00	2.00E-03	168	7.11E-04	9.94E-04	3.81E-04	1.99E-01
890.0	7.09E-01	-14	3.95E+02	1.41E+00	2.03E-03	161	7.22E-04	1.02E-03	3.90E-04	2.04E-01
892.5	7.00E-01	-17	3.90E+02	1.43E+00	2.03E-03	160	7.23E-04	1.03E-03	3.96E-04	2.07E-01
895.0	6.91E-01	-19	3.85E+02	1.45E+00	1.97E-03	154	7.00E-04	1.01E-03	3.88E-04	2.03E-01
897.5	6.83E-01	-21	3.81E+02	1.46E+00	1.95E-03	115	6.93E-04	1.01E-03	3.88E-04	2.04E-01
900.0	6.74E-01	-23	3.76E+02	1.48E+00	2.18E-03	111	7.77E-04	1.15E-03	4.41E-04	2.31E-01
902.5	6.67E-01	-26	3.72E+02	1.50E+00	1.94E-03	117	6.92E-04	1.04E-03	3.97E-04	2.08E-01
905.0	6.59E-01	-28	3.67E+02	1.52E+00	1.86E-03	151	6.61E-04	1.00E-03	3.85E-04	2.02E-01
907.5	6.49E-01	-30	3.62E+02	1.54E+00	2.23E-03	162	7.95E-04	1.22E-03	4.69E-04	2.46E-01
910.0	6.42E-01	-32	3.58E+02	1.56E+00	2.28E-03	151	8.11E-04	1.26E-03	4.84E-04	2.54E-01
912.5	6.32E-01	-35	3.52E+02	1.58E+00	2.24E-03	138	7.97E-04	1.26E-03	4.84E-04	2.53E-01
915.0	6.23E-01	-37	3.47E+02	1.60E+00	2.47E-03	133	8.81E-04	1.41E-03	5.41E-04	2.84E-01
917.5	6.15E-01	-39	3.43E+02	1.63E+00	2.37E-03	142	8.46E-04	1.37E-03	5.27E-04	2.76E-01
920.0	6.06E-01	-41	3.38E+02	1.65E+00	2.29E-03	159	8.14E-04	1.34E-03	5.15E-04	2.70E-01
922.5	5.98E-01	-44	3.33E+02	1.67E+00	2.17E-03	162	7.73E-04	1.29E-03	4.96E-04	2.60E-01
925.0	5.88E-01	-46	3.28E+02	1.70E+00	2.07E-03	154	7.36E-04	1.25E-03	4.79E-04	2.51E-01
927.5	5.80E-01	-48	3.23E+02	1.73E+00	2.17E-03	153	7.72E-04	1.33E-03	5.10E-04	2.67E-01
930.0	5.72E-01	-50	3.19E+02	1.75E+00	2.32E-03	157	8.26E-04	1.45E-03	5.54E-04	2.90E-01
932.5	5.61E-01	-53	3.13E+02	1.78E+00	2.17E-03	155	7.74E-04	1.38E-03	5.28E-04	2.77E-01
935.0	5.54E-01	-55	3.09E+02	1.81E+00	2.43E-03	153	8.65E-04	1.56E-03	5.99E-04	3.14E-01
937.5	5.44E-01	-57	3.03E+02	1.84E+00	2.67E-03	152	9.52E-04	1.75E-03	6.70E-04	3.51E-01
940.0	5.35E-01	-59	2.98E+02	1.87E+00	2.64E-03	146	9.38E-04	1.75E-03	6.71E-04	3.52E-01
942.5	5.27E-01	-61	2.94E+02	1.90E+00	2.54E-03	147	9.04E-04	1.72E-03	6.57E-04	3.44E-01
945.0	5.17E-01	-64	2.88E+02	1.93E+00	2.38E-03	145	8.46E-04	1.64E-03	6.26E-04	3.28E-01
947.5	5.09E-01	-66	2.84E+02	1.96E+00	1.93E-03	148	6.87E-04	1.35E-03	5.16E-04	2.71E-01
950.0	5.01E-01	-68	2.79E+02	2.00E+00	1.78E-03	139	6.33E-04	1.26E-03	4.84E-04	2.54E-01
952.5	4.92E-01	-70	2.74E+02	2.03E+00	1.82E-03	131	6.49E-04	1.32E-03	5.05E-04	2.65E-01
955.0	4.84E-01	-72	2.70E+02	2.07E+00	1.82E-03	132	6.47E-04	1.34E-03	5.12E-04	2.69E-01
957.5	4.75E-01	-75	2.65E+02	2.11E+00	1.96E-03	135	6.96E-04	1.47E-03	5.62E-04	2.94E-01
960.0	4.66E-01	-77	2.60E+02	2.15E+00	1.93E-03	127	6.88E-04	1.48E-03	5.65E-04	2.96E-01
962.5	4.58E-01	-79	2.55E+02	2.18E+00	1.75E-03	128	6.21E-04	1.36E-03	5.19E-04	2.72E-01
965.0	4.49E-01	-81	2.50E+02	2.23E+00	1.55E-03	130	5.52E-04	1.23E-03	4.71E-04	2.47E-01
967.5	4.41E-01	-83	2.46E+02	2.27E+00	1.64E-03	123	5.84E-04	1.32E-03	5.07E-04	2.66E-01
970.0	4.33E-01	-85	2.42E+02	2.31E+00	1.95E-03	109	6.94E-04	1.60E-03	6.13E-04	3.22E-01
972.5	4.24E-01	-88	2.36E+02	2.36E+00	2.18E-03	112	7.75E-04	1.83E-03	7.01E-04	3.67E-01
975.0	4.17E-01	-89	2.32E+02	2.40E+00	2.51E-03	115	8.93E-04	2.14E-03	8.21E-04	4.30E-01
977.5	4.08E-01	-92	2.28E+02	2.45E+00	2.38E-03	117	8.46E-04	2.07E-03	7.93E-04	4.16E-01
980.0	3.99E-01	-94	2.23E+02	2.50E+00	2.11E-03	125	7.52E-04	1.88E-03	7.21E-04	3.78E-01
982.5	3.93E-01	-96	2.19E+02	2.55E+00	1.87E-03	124	6.65E-04	1.69E-03	6.49E-04	3.40E-01
985.0	3.85E-01	-98	2.14E+02	2.60E+00	1.56E-03	110	5.54E-04	1.44E-03	5.52E-04	2.89E-01
987.5	3.76E-01	-100	2.10E+02	2.66E+00	1.25E-03	94	4.45E-04	1.18E-03	4.53E-04	2.37E-01
990.0	3.70E-01	-102	2.06E+02	2.70E+00	1.29E-03	71	4.61E-04	1.25E-03	4.77E-04	2.50E-01
992.5	3.61E-01	-104	2.01E+02	2.77E+00	1.47E-03	77	5.23E-04	1.45E-03	5.55E-04	2.91E-01
995.0	3.54E-01	-106	1.97E+02	2.83E+00	1.73E-03	84	6.15E-04	1.74E-03	6.66E-04	3.49E-01
997.5	3.47E-01	-108	1.94E+02	2.88E+00	1.57E-03	90	5.59E-04	1.61E-03	6.17E-04	3.23E-01
1000.0	3.39E-01	-110	1.89E+02	2.95E+00	1.44E-03	72	5.12E-04	1.51E-03	5.79E-04	3.03E-01

Single Axis Velocimeter 11/28/90

Calibration of Single Axis velocity Xducers #142, #143

Two Electrolab Model 1131 VI Uniaxial Velocity Xducers w/ amplifier gain & low frequency cutoff S/N's 142, 143 were supplied by the U.S. Bureau of Mines to be used in conjunction w/ studies @ the Lucky Friday Mine. Each (uniaxial) Xducer was screwed directly into the shaker plate of an Unholtz-Dickie Model 56 S/N 203 shaker. The experimental arrangement is equivalent to that diagrammed on page 19. A schematic for the arrangement used to calibrate the velocimeters and accelerometer received from the Bureau of Mines is given on page 141. [The schematic (p141) shows the particular components used to calibrate the uniaxial Xducers.] For the uniaxial Xducers, only the z-direction of response was used (See schematic p 17.). The frequency sweep was from 0 - 500 hz @ 0.1 in/sec maximum velocity for each cycle.

Single Axis Velocimeter 11/28/90

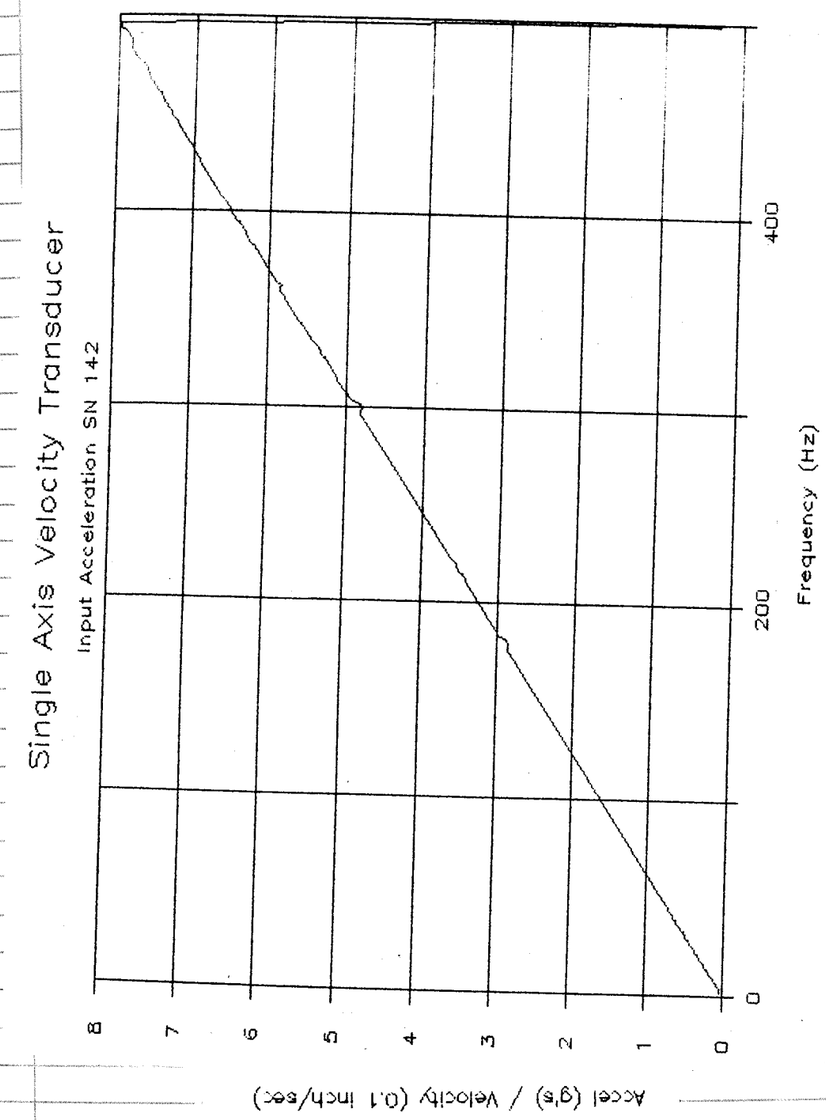


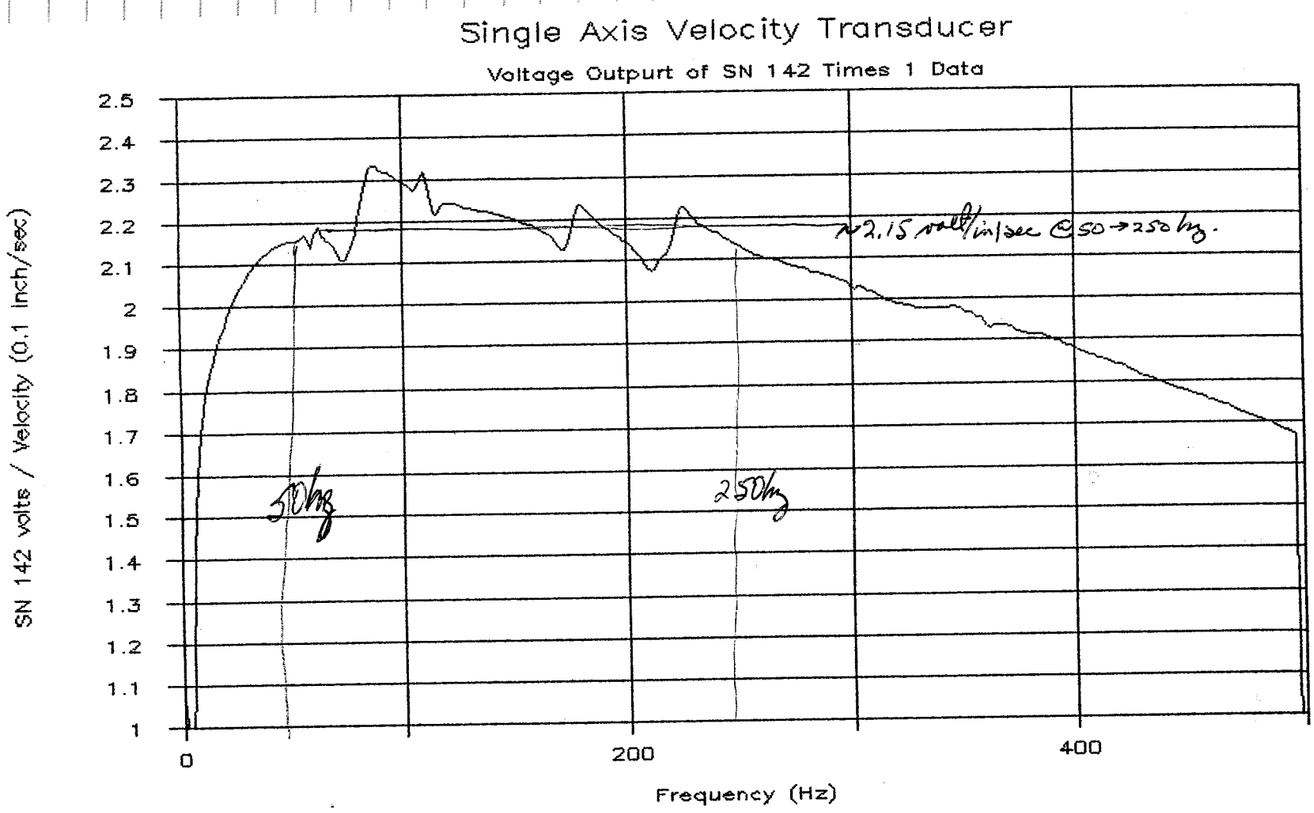
Uniaxial Velocimeters 11/28/90

There were two outputs for each of the uniaxial Transducers: ① normal, ② ×100 data output. The second output didnot directly reduce the normal output by 100, so data from that channel/output is suspect. The Transducers have a low-cut-off frequency of 50hz. For Xducer 142, the nominal value of response was 2.15 volts/in/sec over the range of 50-250hz, while for Xducer 143 it was 2.10 volts/in/sec over the same range.

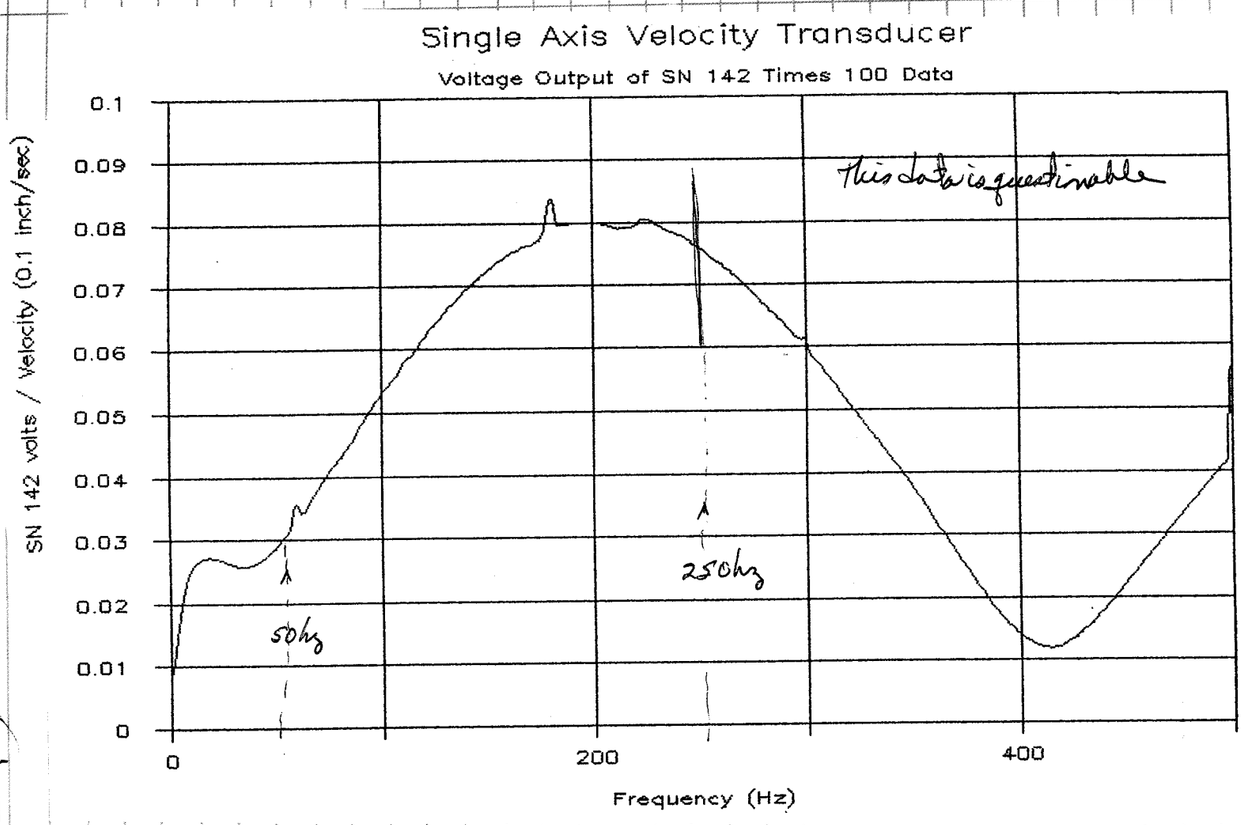
The graphs on pages 143 (for Xducer S/N 142) and page 146 (for Xducer S/N 143) were obtained to show that a linear plot of acceleration/input velocity of 0.1 in/sec vs input frequency was obtained; for a constant input peak velocity, the acceleration increases as the frequency increases. Numerical values for the six graphs related to Xducer 142, 143 may be obtained from the Calibration Data File Notebook; attachment to Scientific Notebook Control # 14 - Rock Mechanics Project.

11/28/90



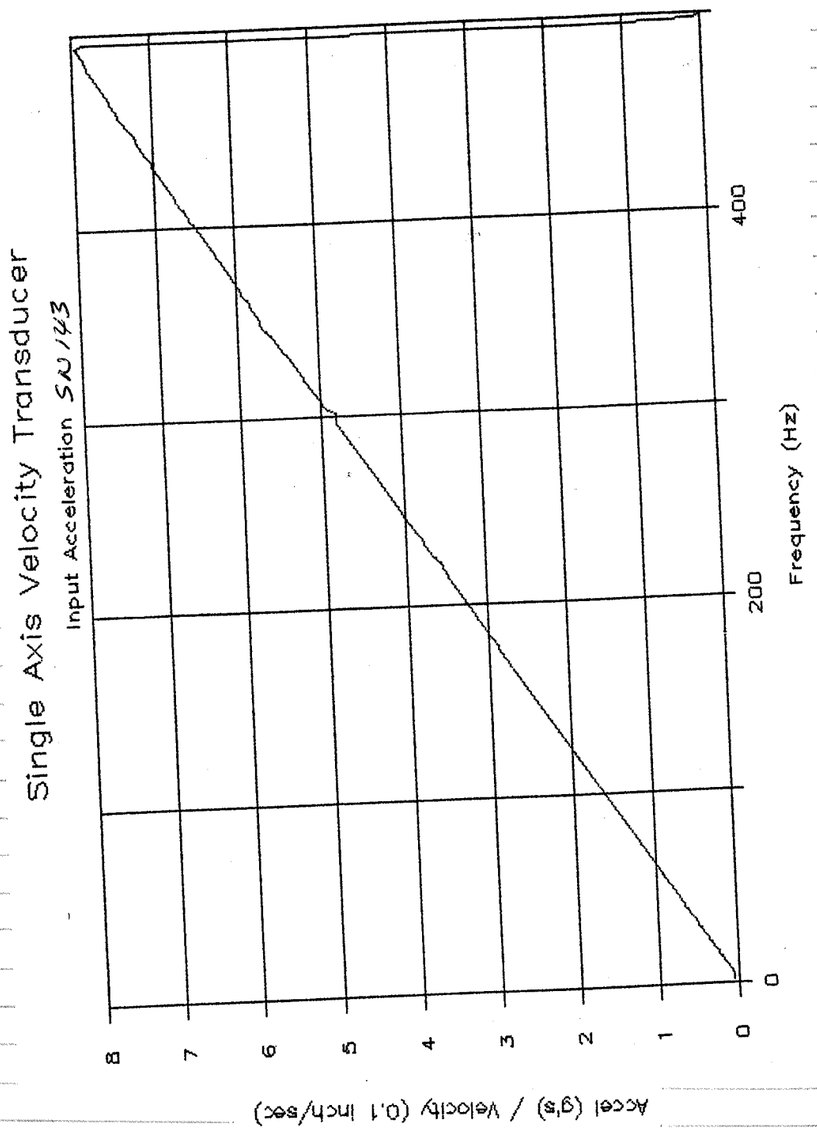


Unique Velocitrek 142 11/28/90

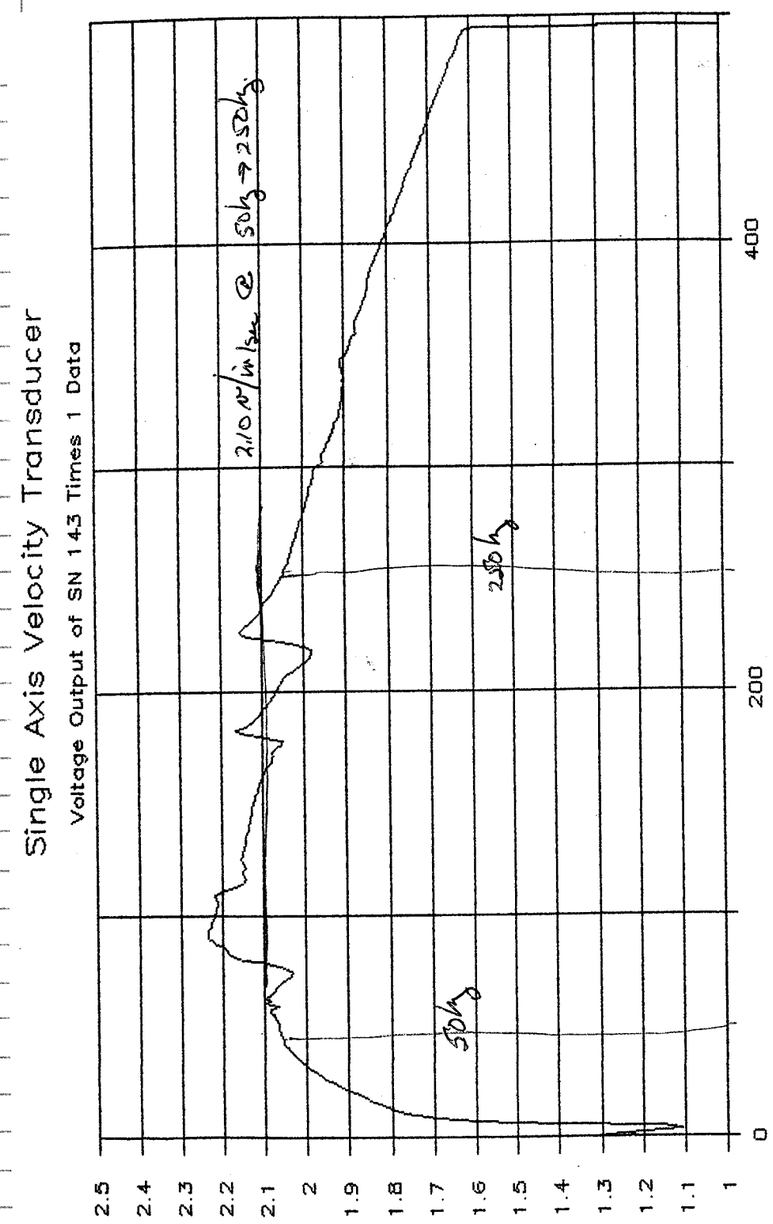


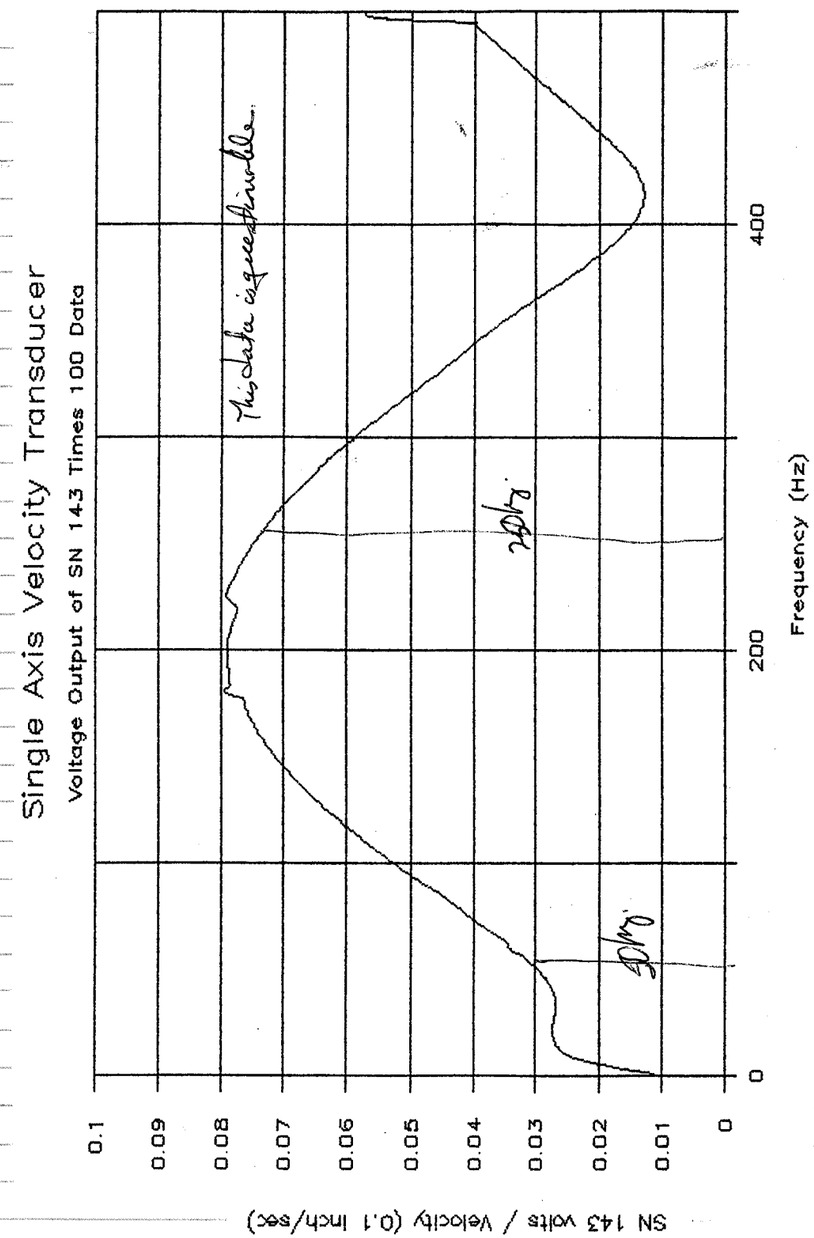
Unique Velocitrek 142 11/28/90

Unicapial velocimeter 143 11/28/90



Unicapial Velocimeter 143 11/28/90

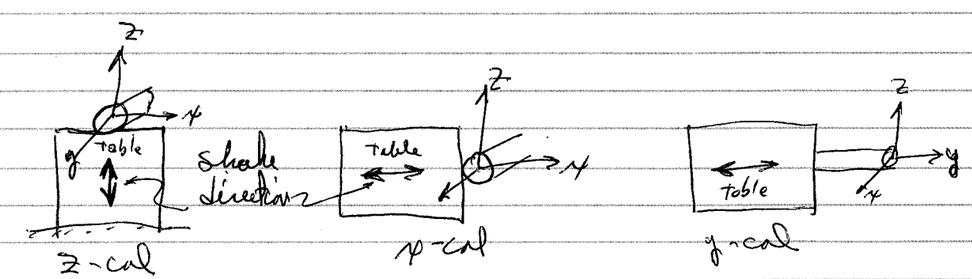




BWright

Calibration of Triaxial accelerometer S/N 73, Electrolot Model 1130GA

On Electrolot Model 1130GA, S/N 73 accelerometer with a paired Electrolot Model 1127 amplifier, S/N 73 was calibrated in the system delineated on page 141. This transducer is sensitive to orientation and the z-axis remained vertical during the calibration procedure. A slip table was not used on this transducer, as it was on the first series of triaxial xducers. The transducer was affixed directly to the UD Shaker System (p141) and oriented properly so that the direction of vibration was in the x, y or z direction while z was directed upwards. The shaker assembly vibrates upward or horizontally. All 3-axis xducers were affixed to the shake table as shown below:



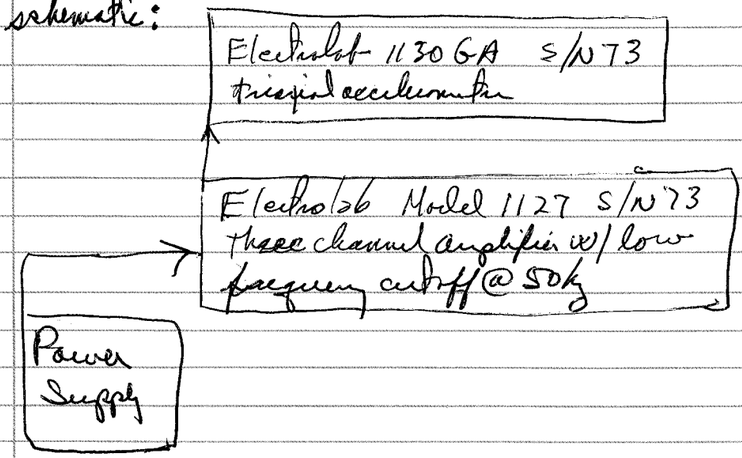
Note: this was not a new xducer.

BWright

Triaxial Accelerometer 12/6/90

all original data is incorporated into the Calibration Data File Notebook, attachment to Scientific Notebook Control #14 - Rock Mechanics Project. The shaker table was ranged from 0-500hz with a programmed max acceleration throughout this range of 0.1g. The schematic on p141 is modified at the (transducer/amp "block") as follows for frequent calibrations

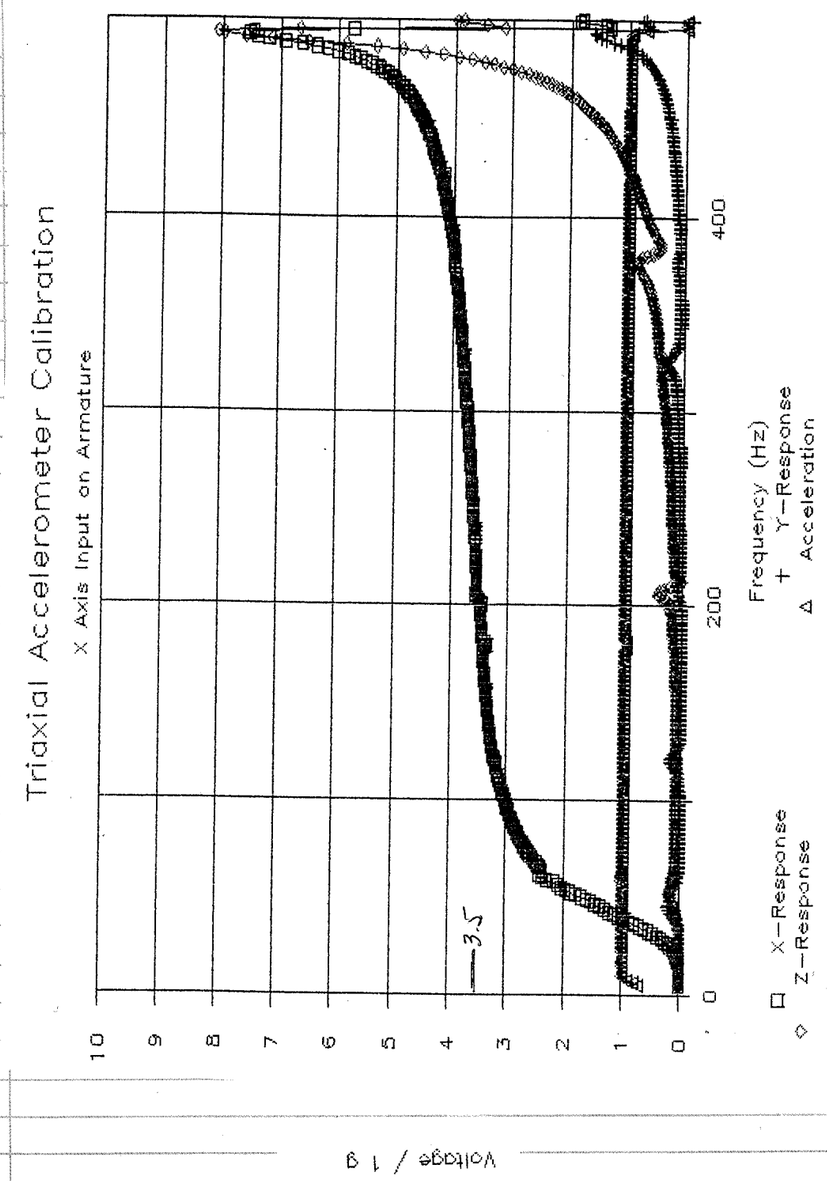
schematic:



The graphs pp 151, 152, 153 show accelerometer response in primary directions due to shaker table acceleration in that direction; $\left|\frac{x\ drive}{x\ response}\right|$ $\left|\frac{y\ drive}{y\ response}\right|$ $\left|\frac{z\ drive}{z\ response}\right|$

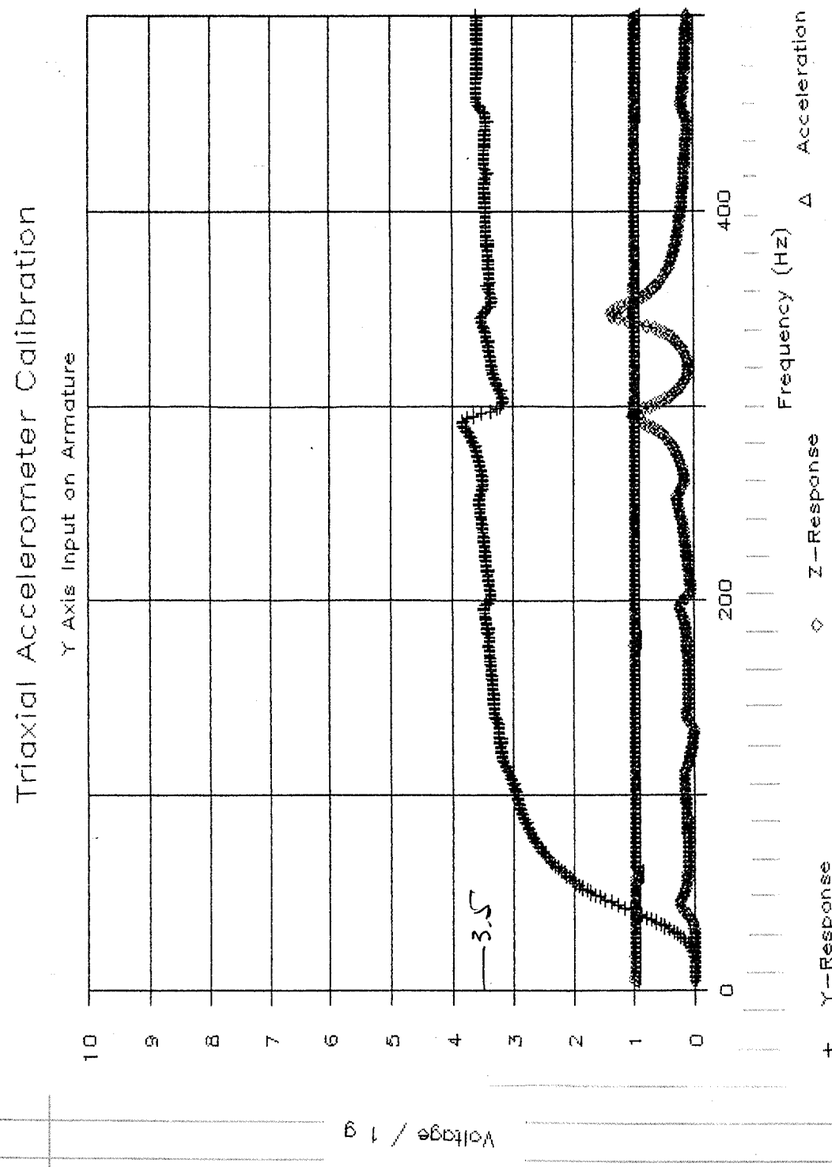
DM Wright

Triaxial Accelerometer 12/7/90



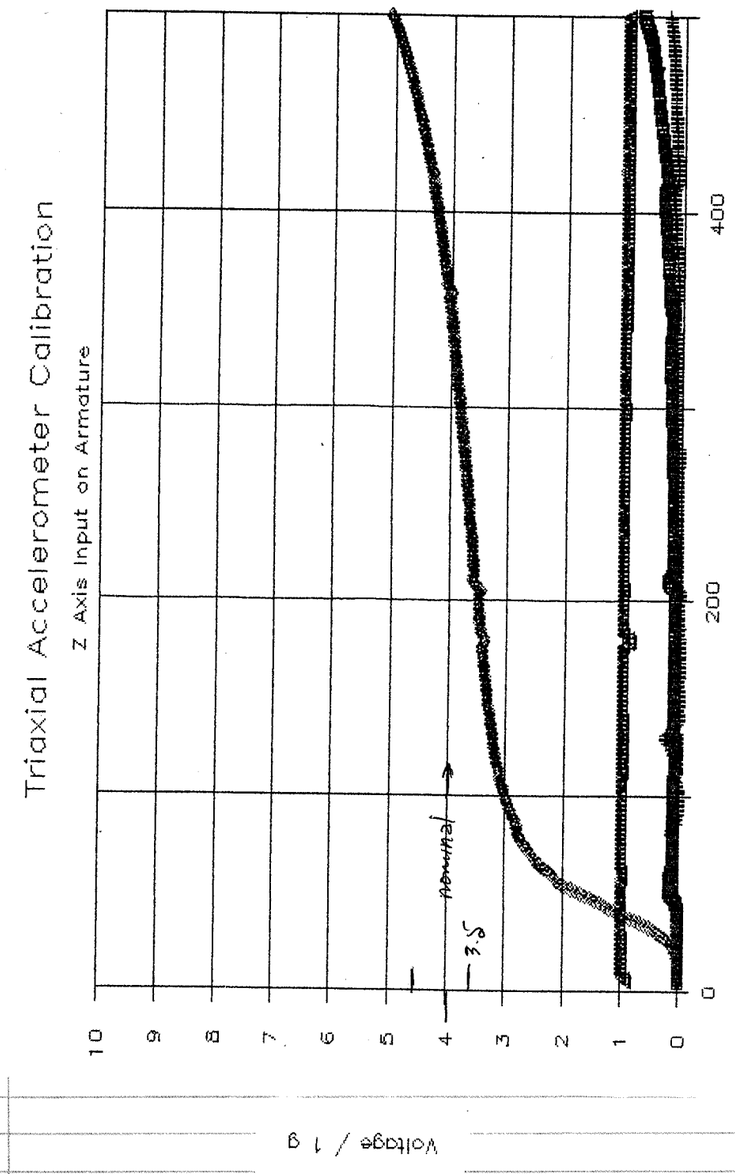
DM Wright

Triaxial accelerometer 12/7/90



3.5 m/g nominal

Triaxial Accelerometer 12/7/90



~4 m/g

Triaxis Velocimeters 12/9/90

Calibration of Five New Triaxial Velocimeters

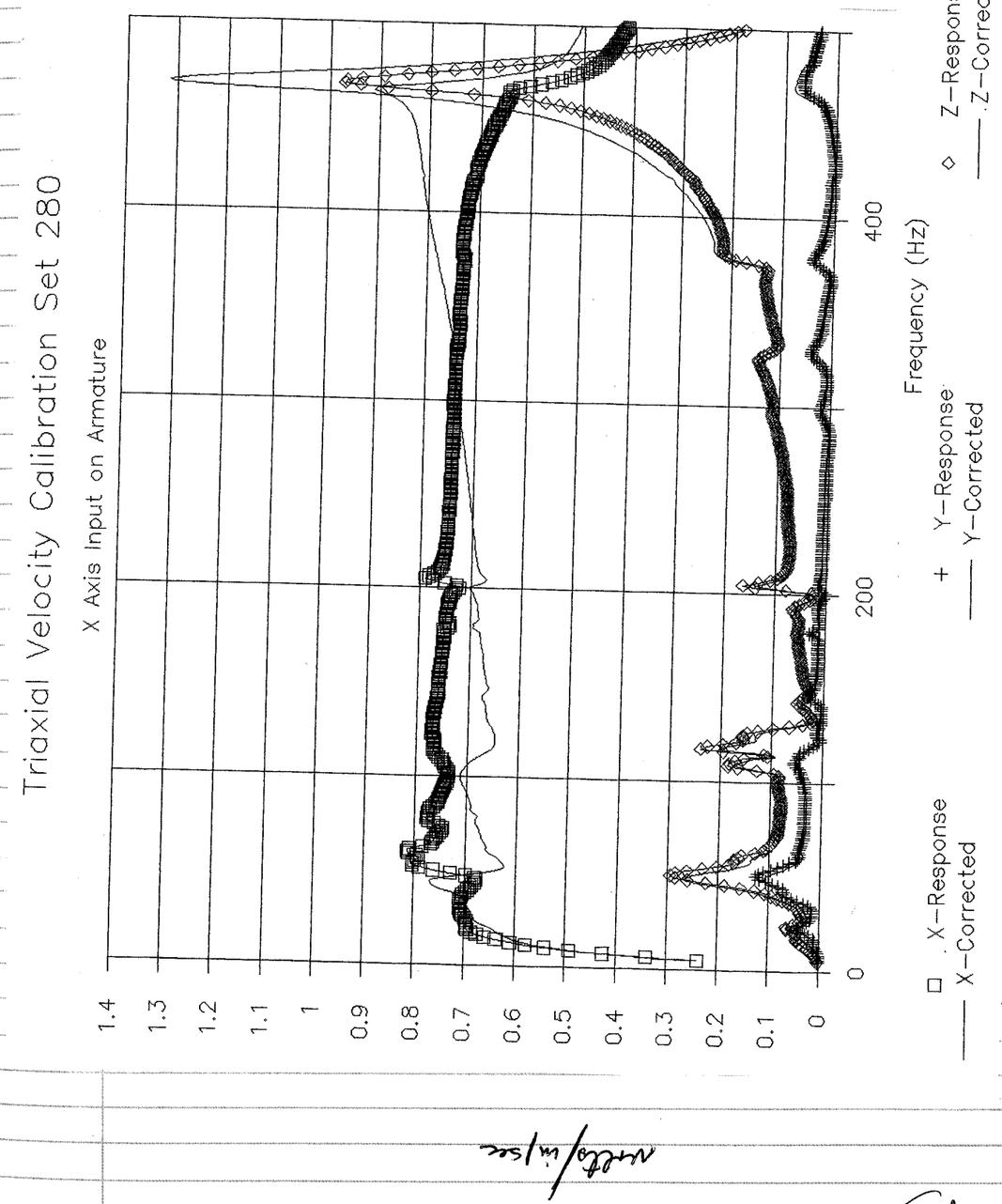
Electrofab Model 1130 S/N's 280, 281, 282, 510, 540
w/Electrolab Model 1127 Amplifiers, matching S/N's of
280, 281, 282, 510, 540

The calibration set-up used is represented by the schematic on p. 141. Each Xducer with its matching amplifier was affixed to the shaker table. The shaker table was then vibrated in the appropriate directions when the affixed Xducer was properly oriented: (X drive / X-axis in-line), (Y drive / Y axis in line), (Z drive / Z axis in-line)

The frequency was driven from 0-500 hz. with a constant maximum velocity input of 0.1 in/sec. Graphs of responses in the primary directions are inserted on page 155-169. For numerical data the Calibration Data File Notebook, attachment to Scientific Notebook Control #14, should be consulted. The graphs are plots of these data. These transducers were not new. The corrected data take into account the characteristics of the filters.

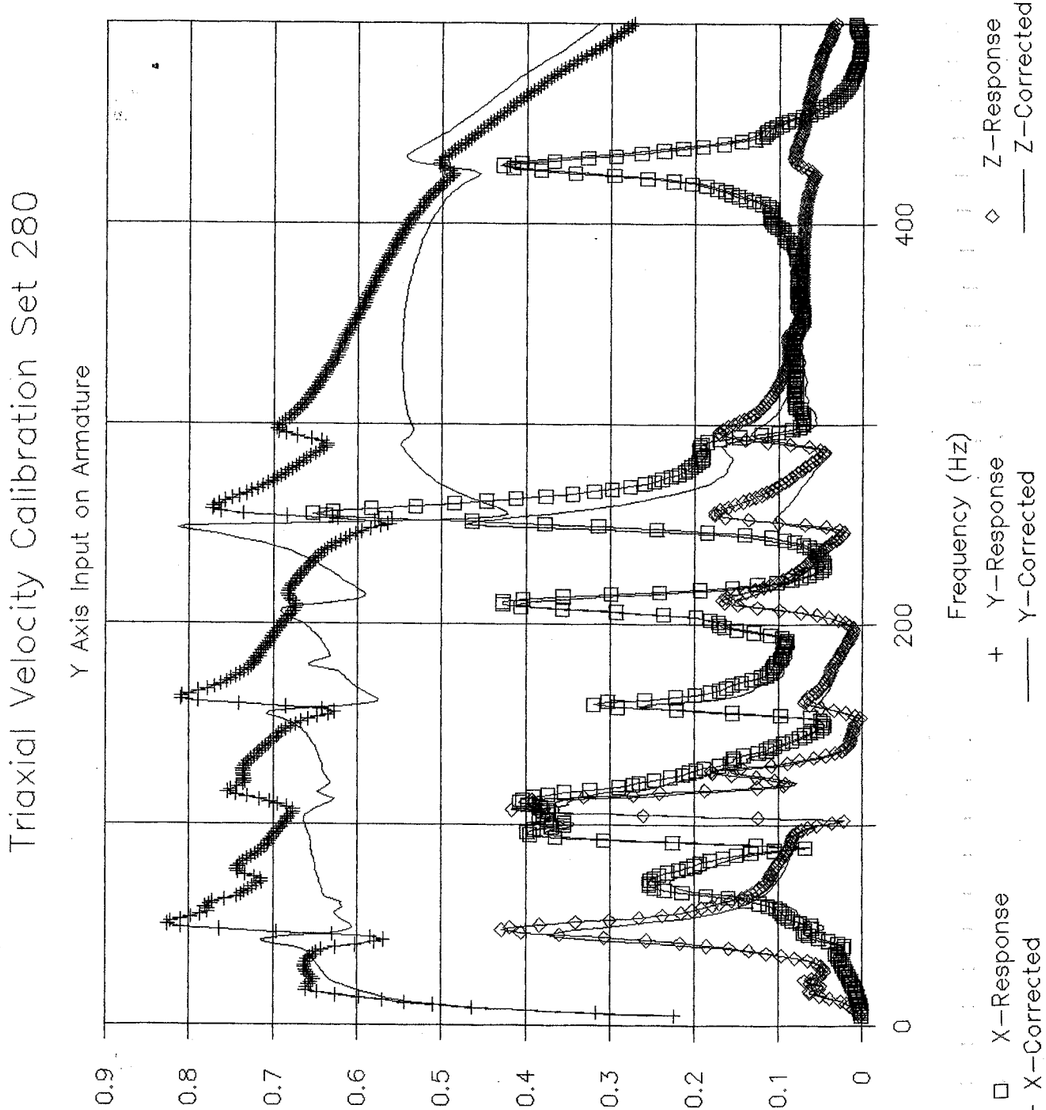
SWWright

Triaxial Velocimeter #280 12/10/90



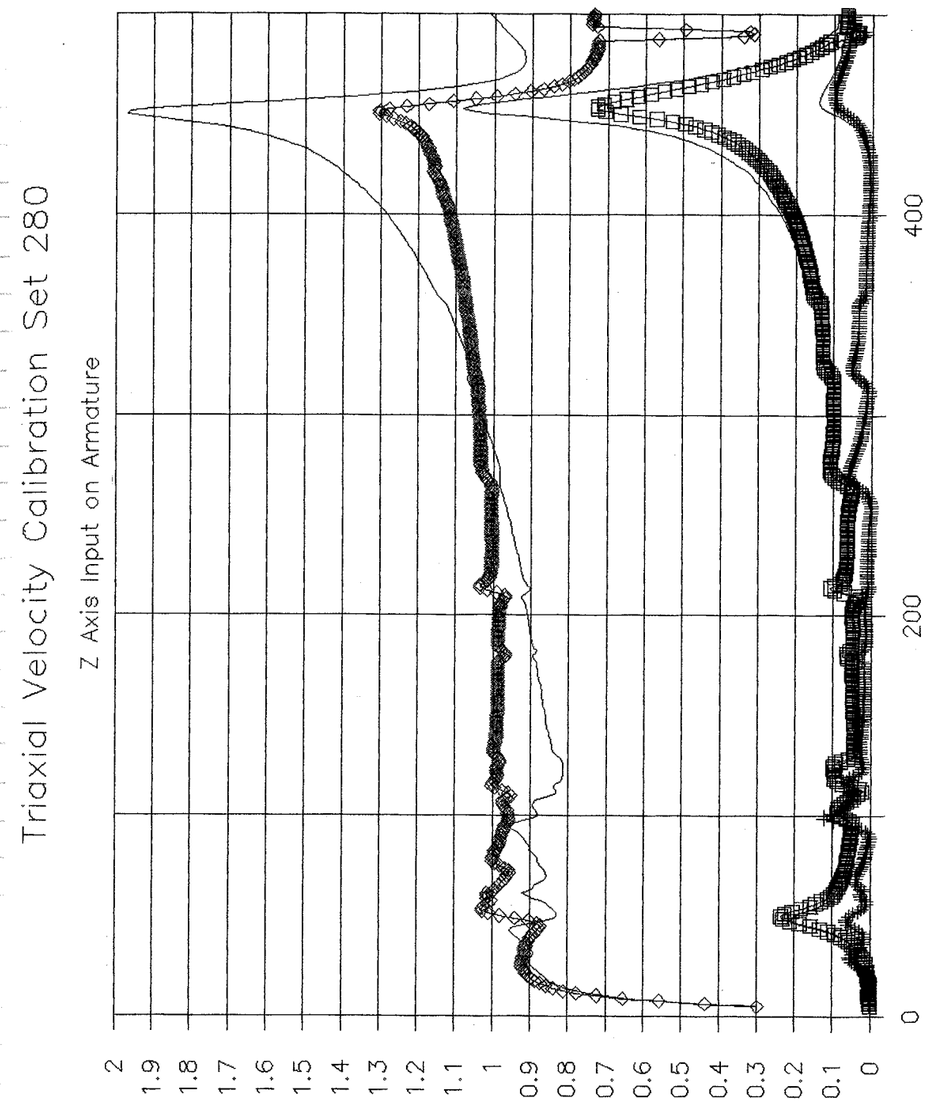
SWWright

Triaxial Velocimeter #280 12/10/90



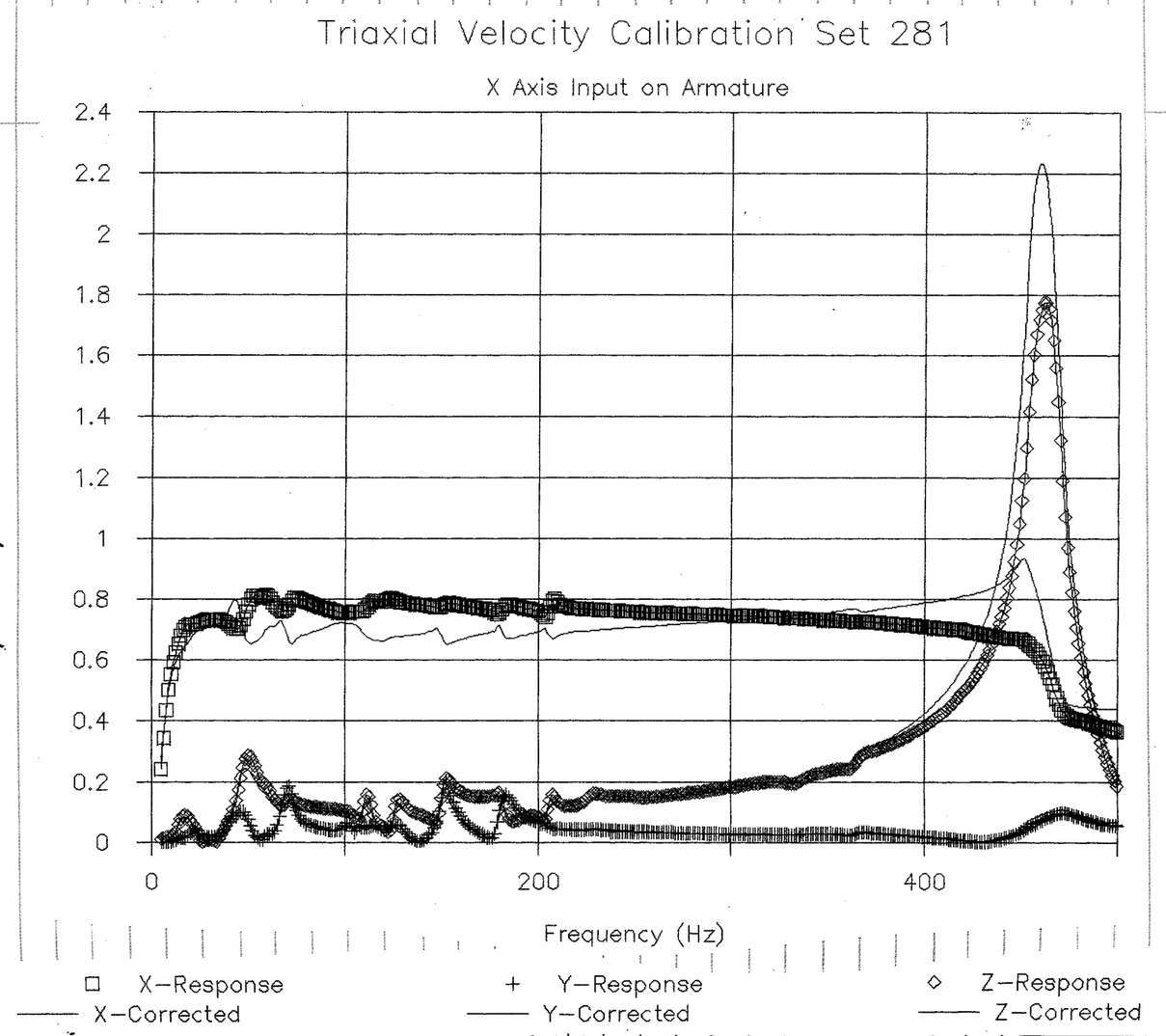
volts/in/sec

Triaxial Velocimeter #280 12/10/90



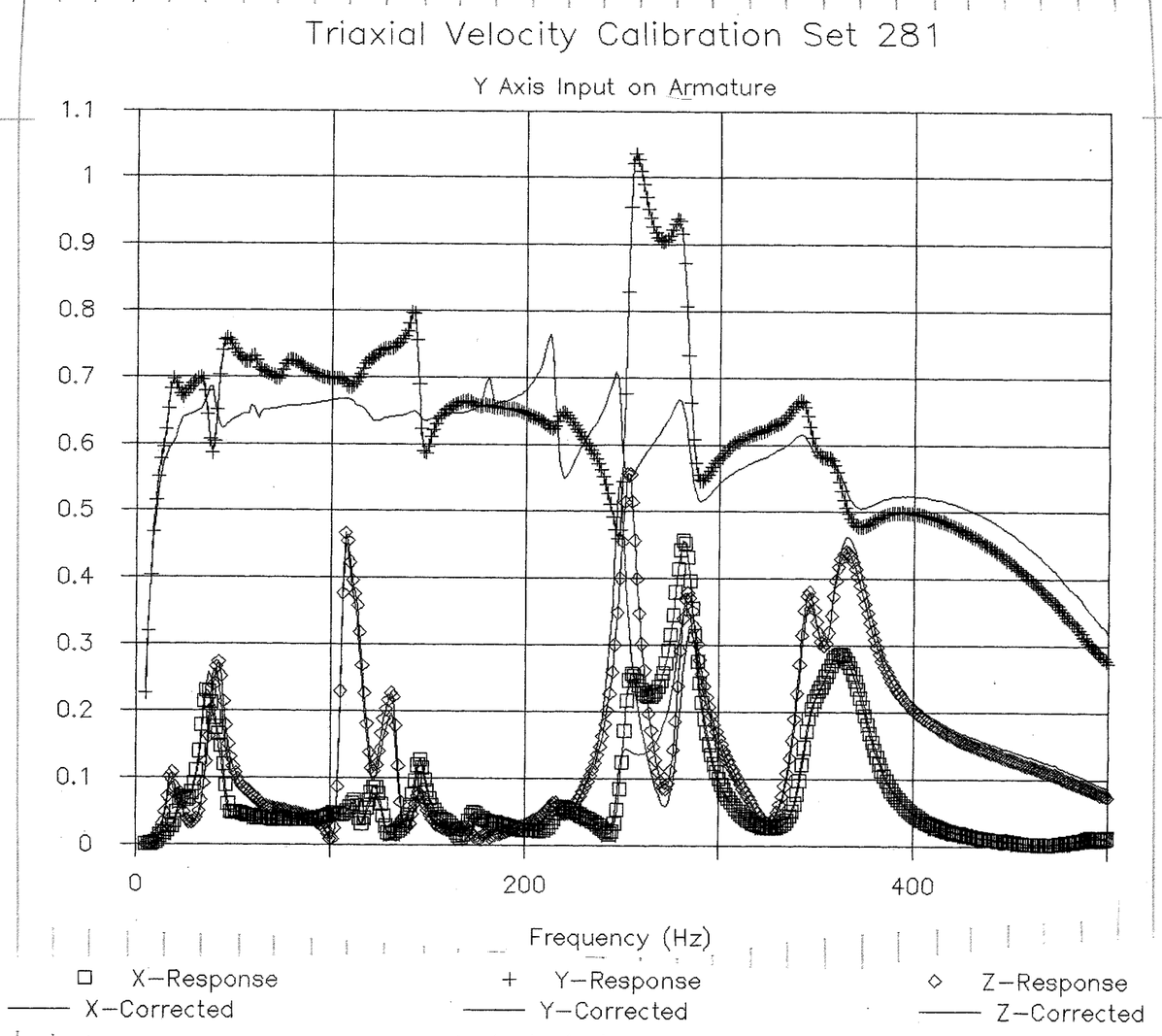
Triaxial Velocimeter #281

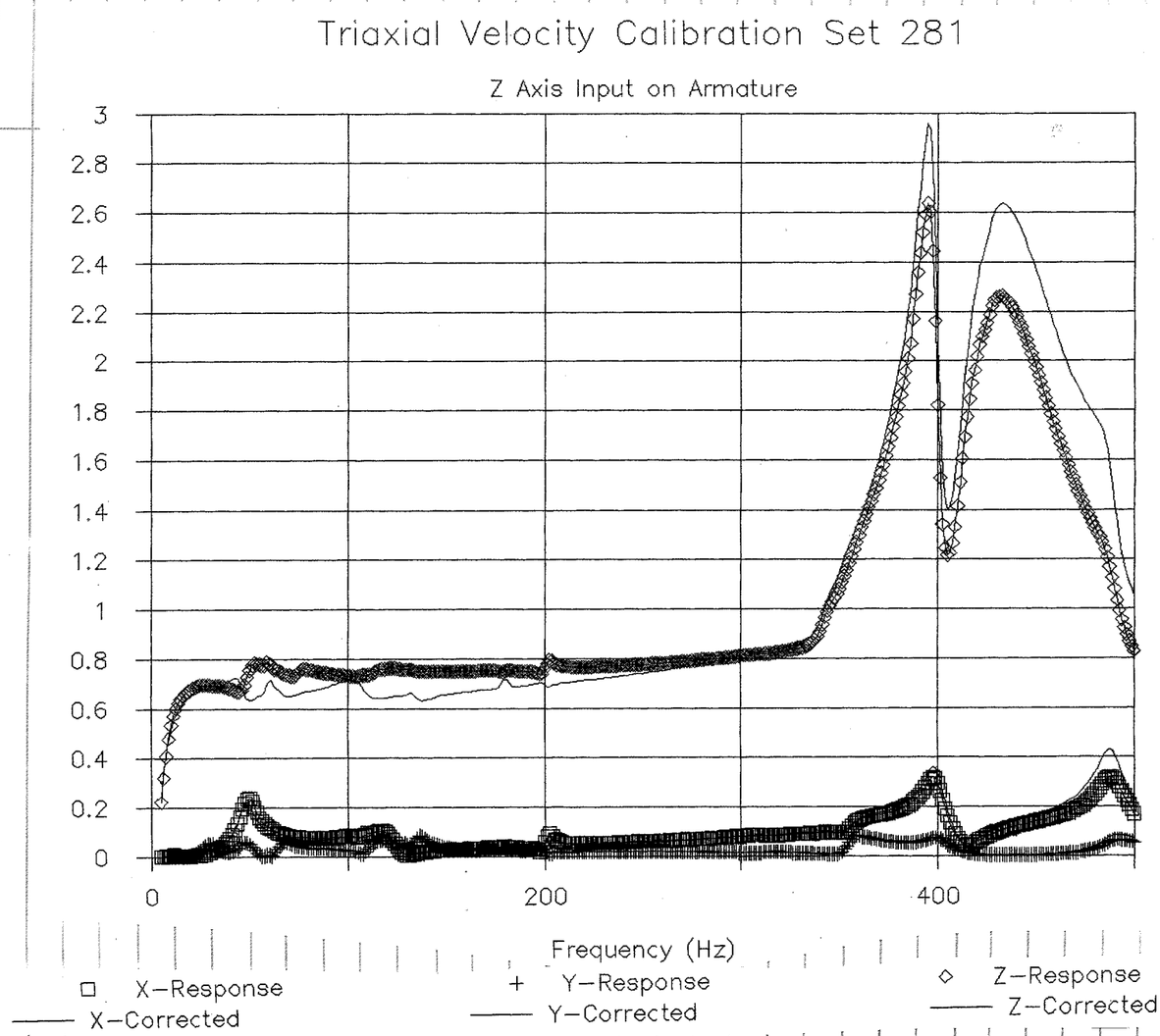
12/10/90



Triaxial Velocimeter #281

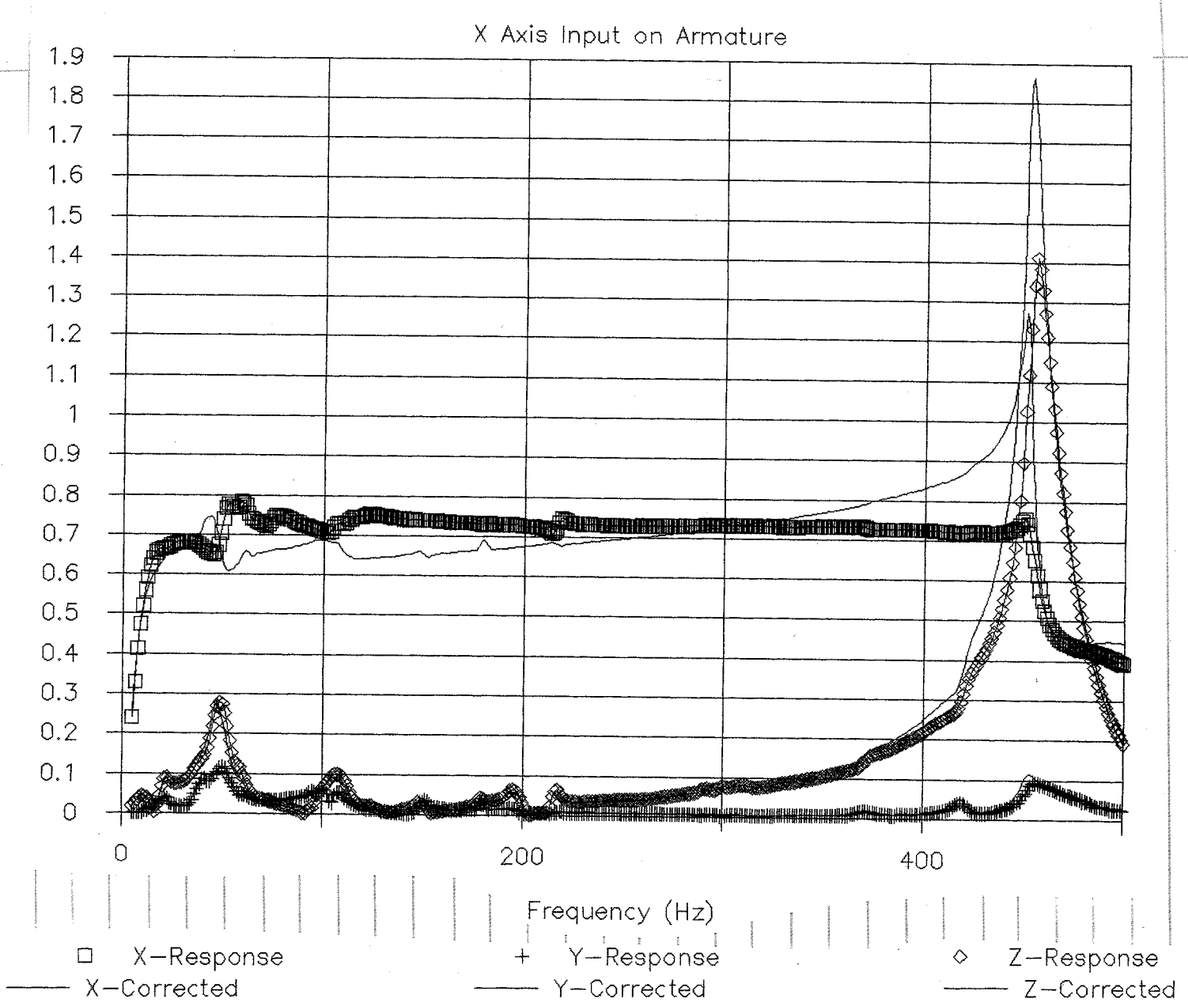
14/10/90





Triaxial Velocity #281

1/10/90

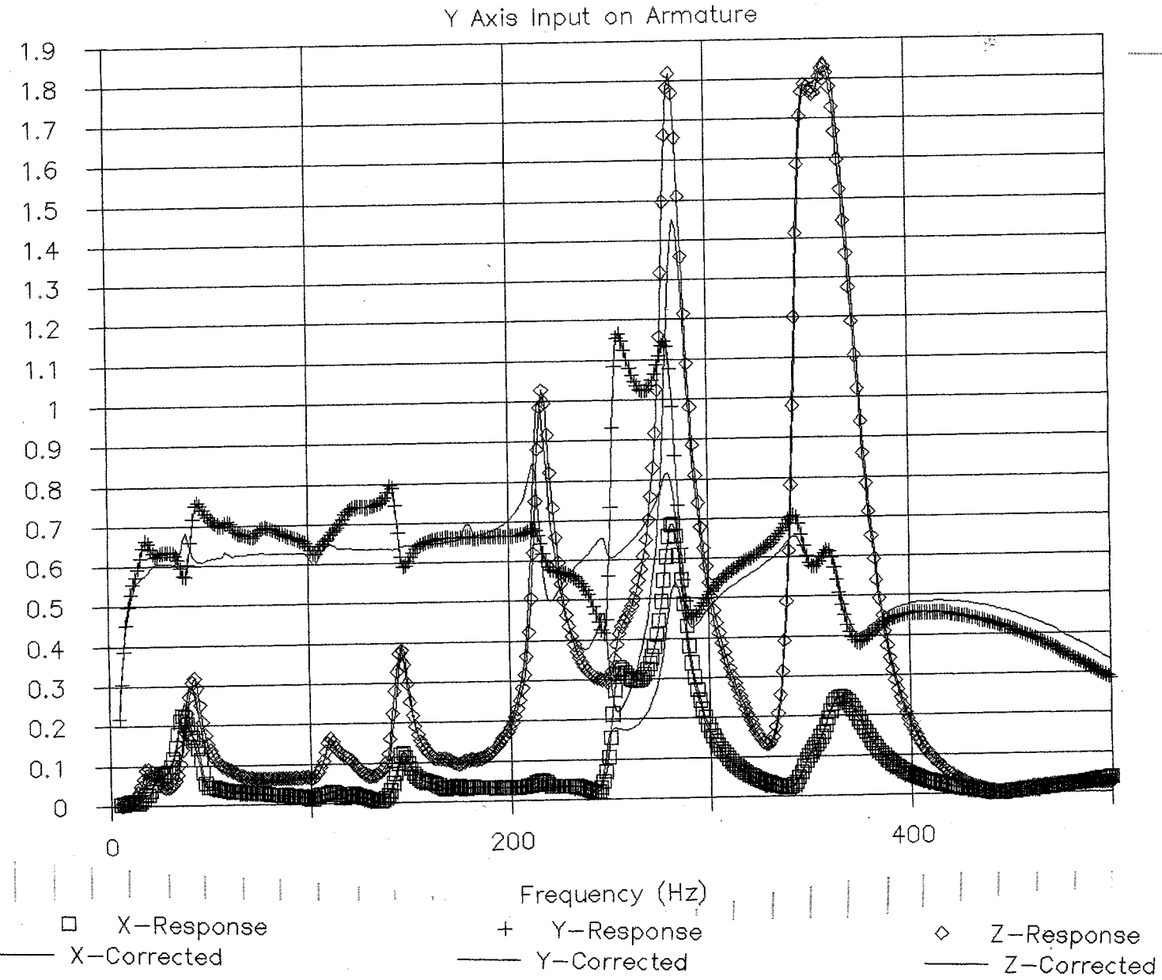


Triaxial Velocity #282

1/10/90

Triaxial Velocity Calibration Set 282

Y Axis Input on Armature

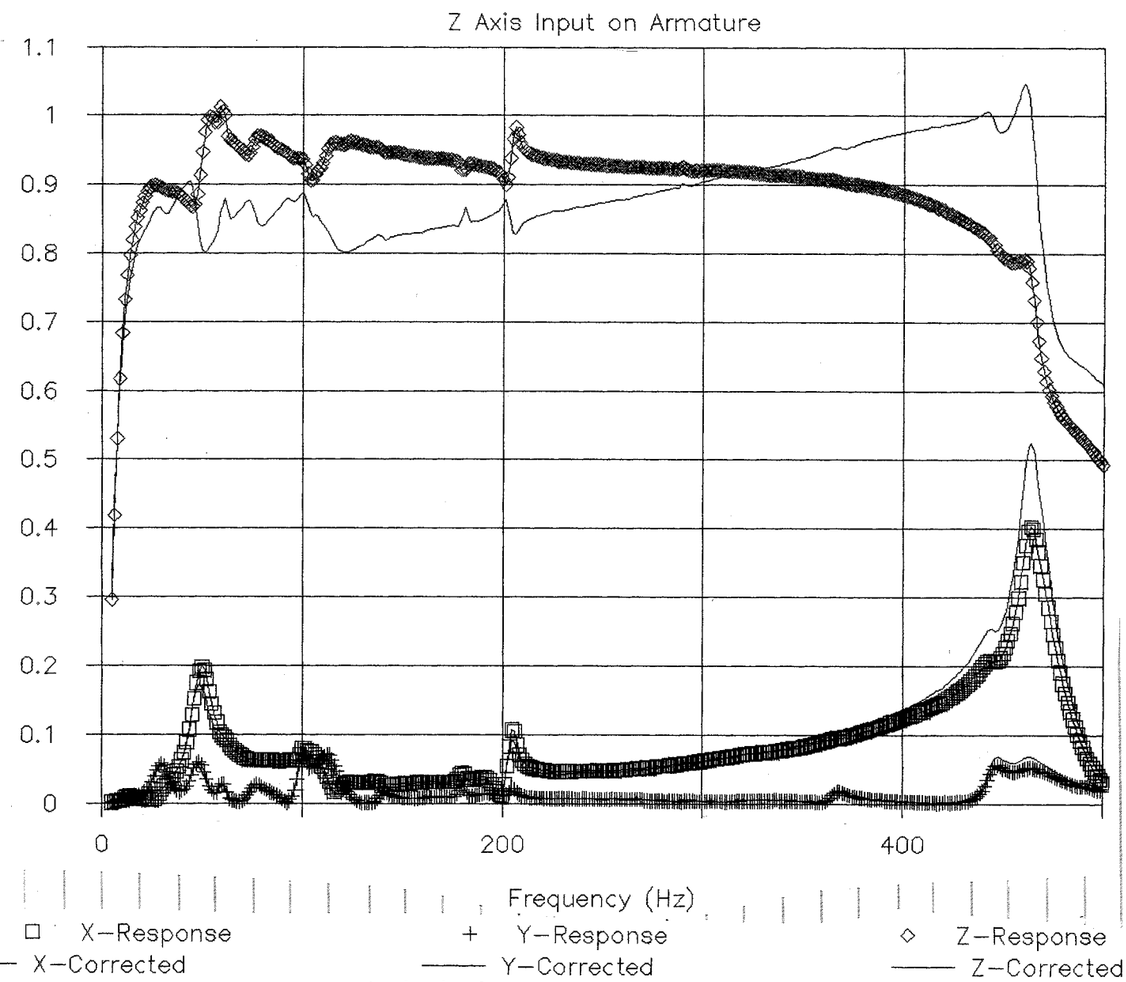


Triaxial Velocity Calibration #282

12/10/90

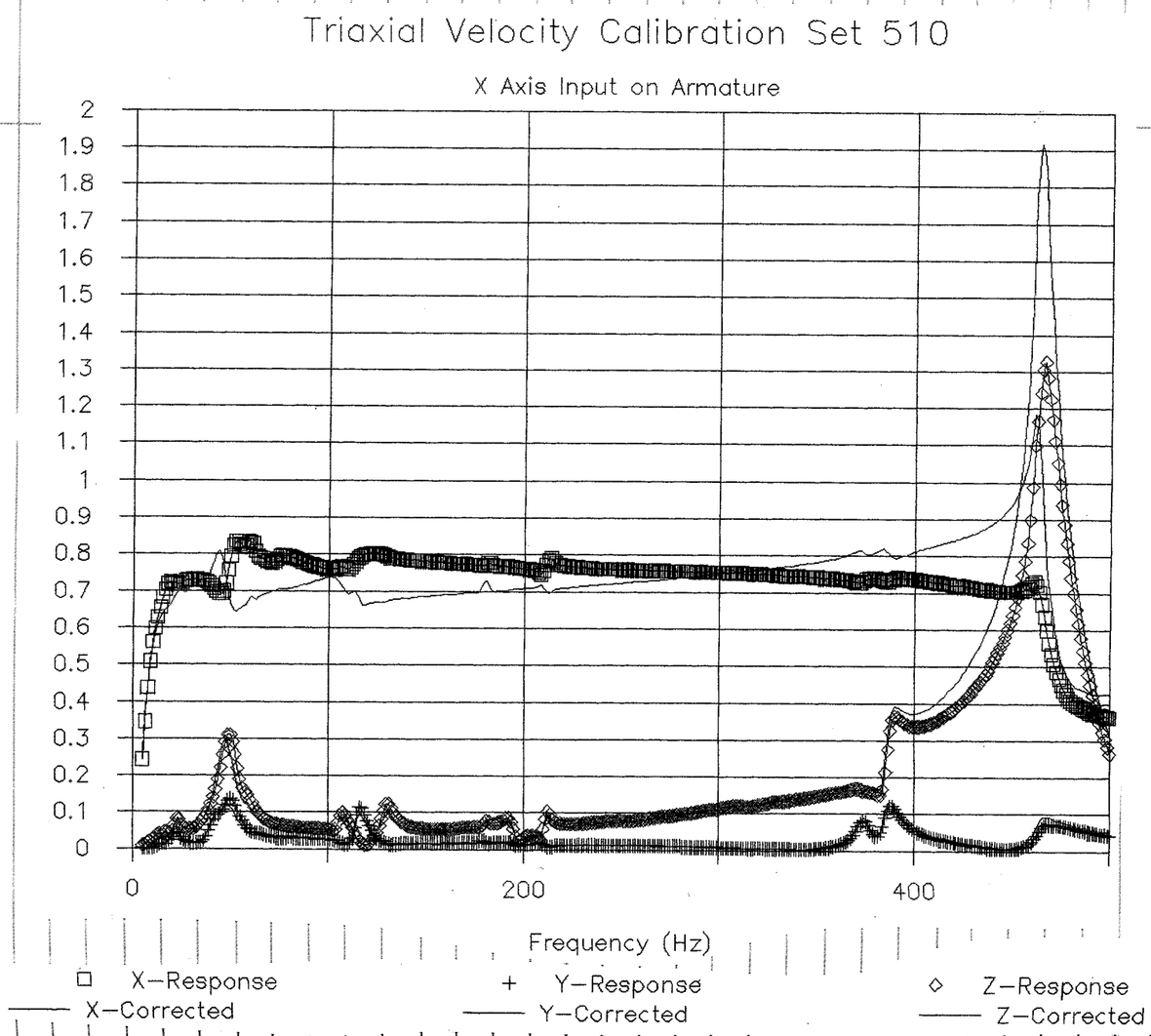
Triaxial Velocity Calibration Set 282

Z Axis Input on Armature



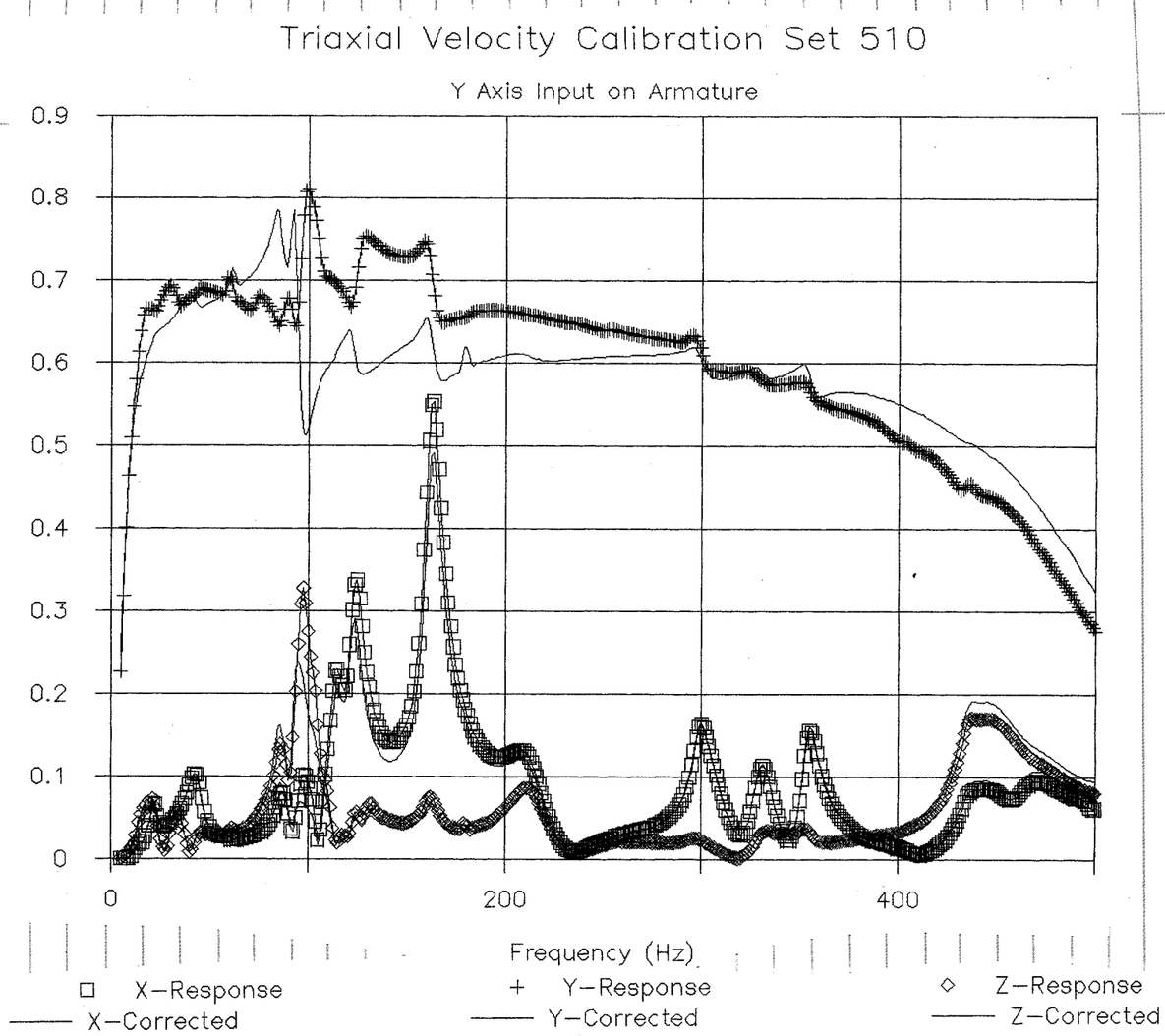
Triaxial Velocity Calibration #282

12/10/90



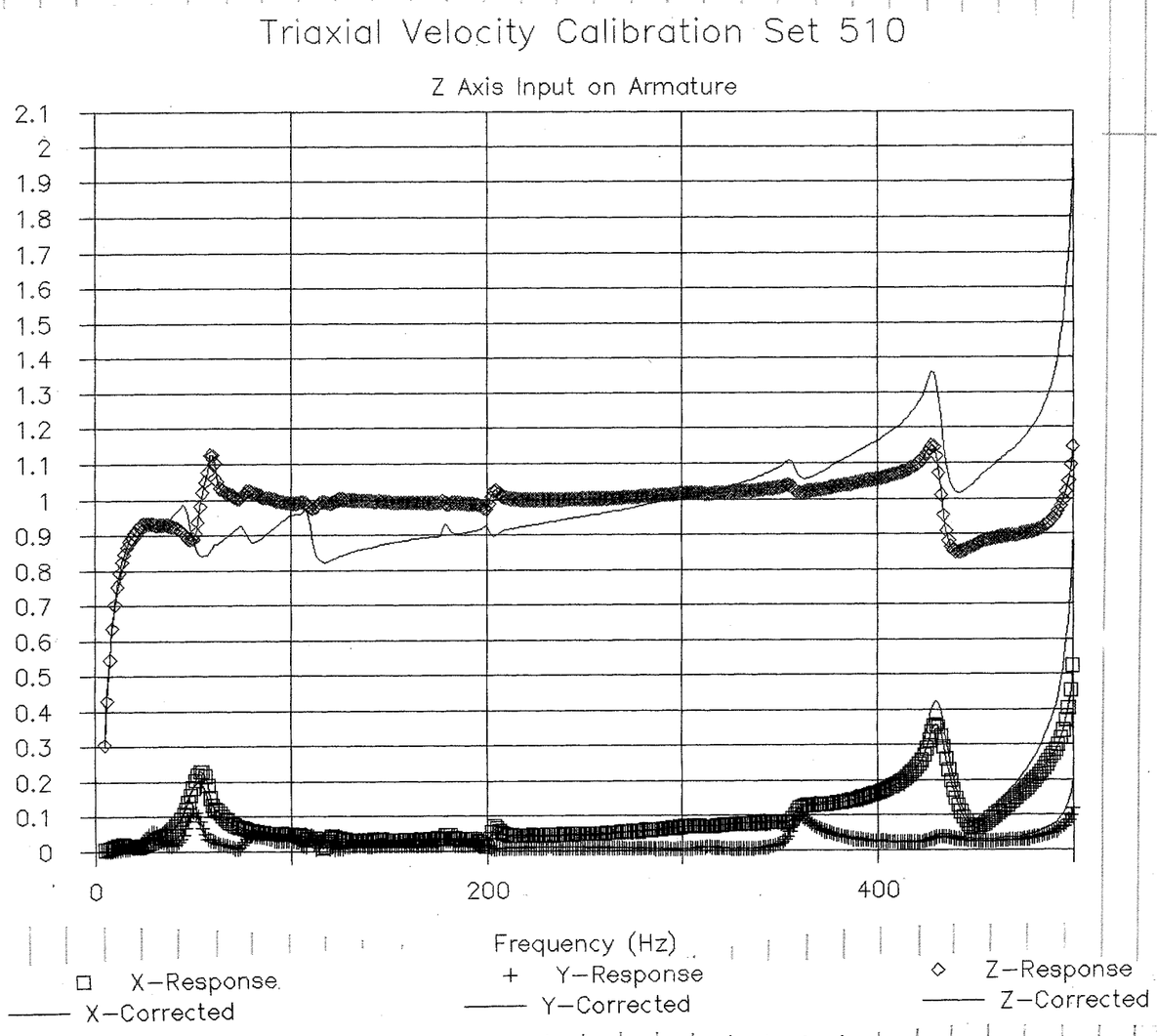
Triaxial Velocimeter # 510

12/10/90



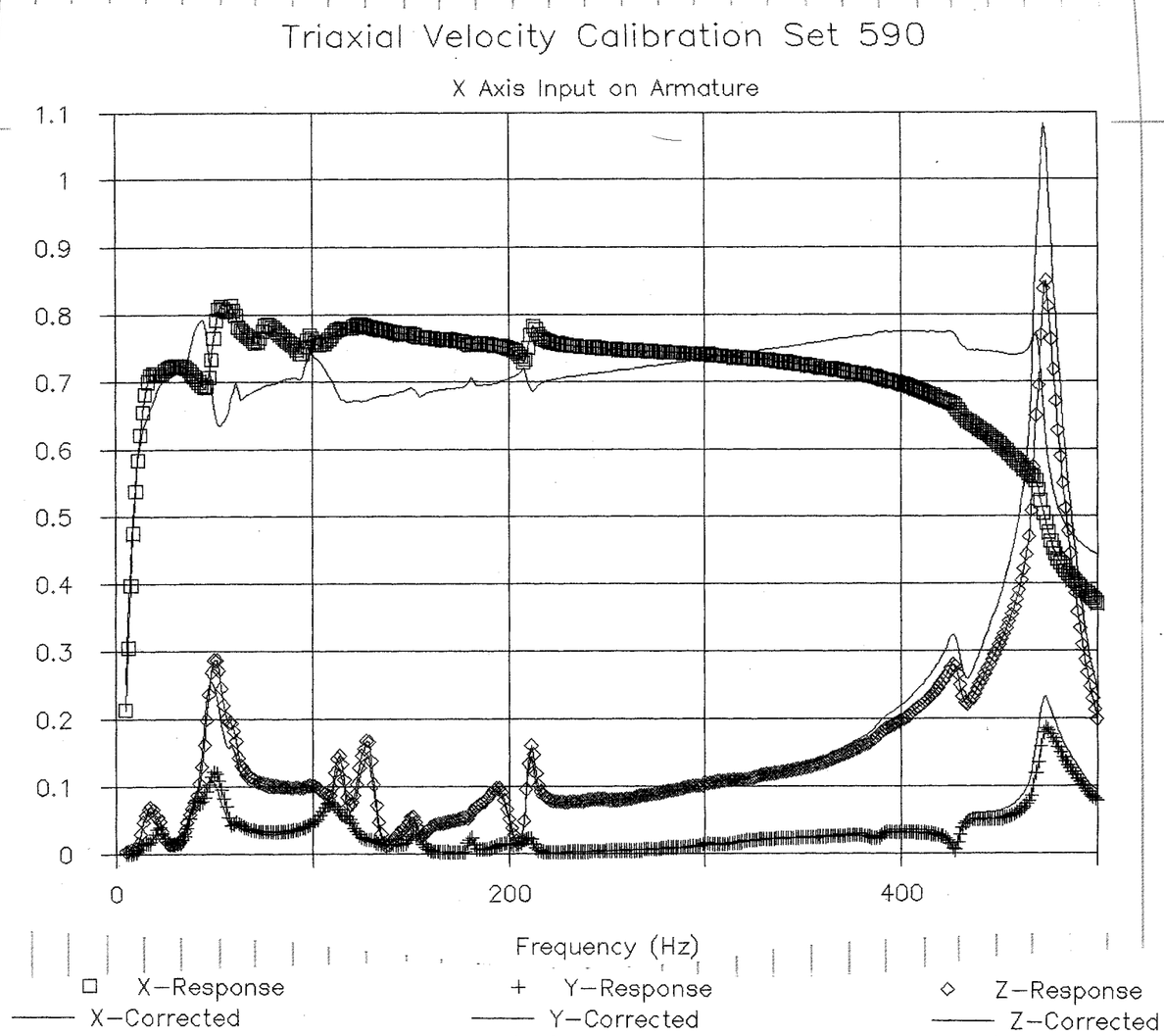
Triaxial Velocimeter #510

12/10/90



Triaxial Velocimeter #510

12/10/90

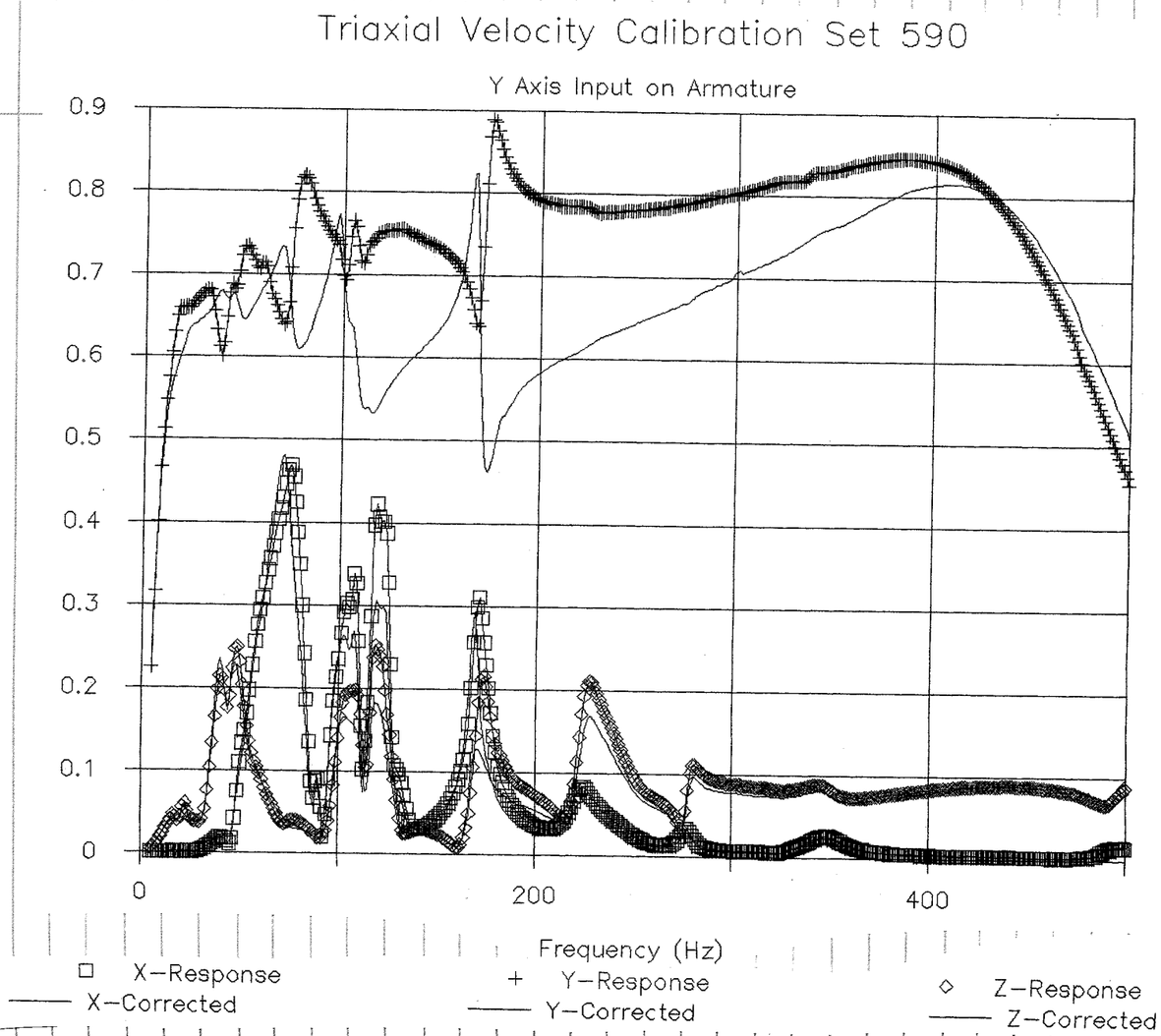


Triaxial Velocimeter #590

12/10/90

Triaxial Velocimeter #590

12/10/90



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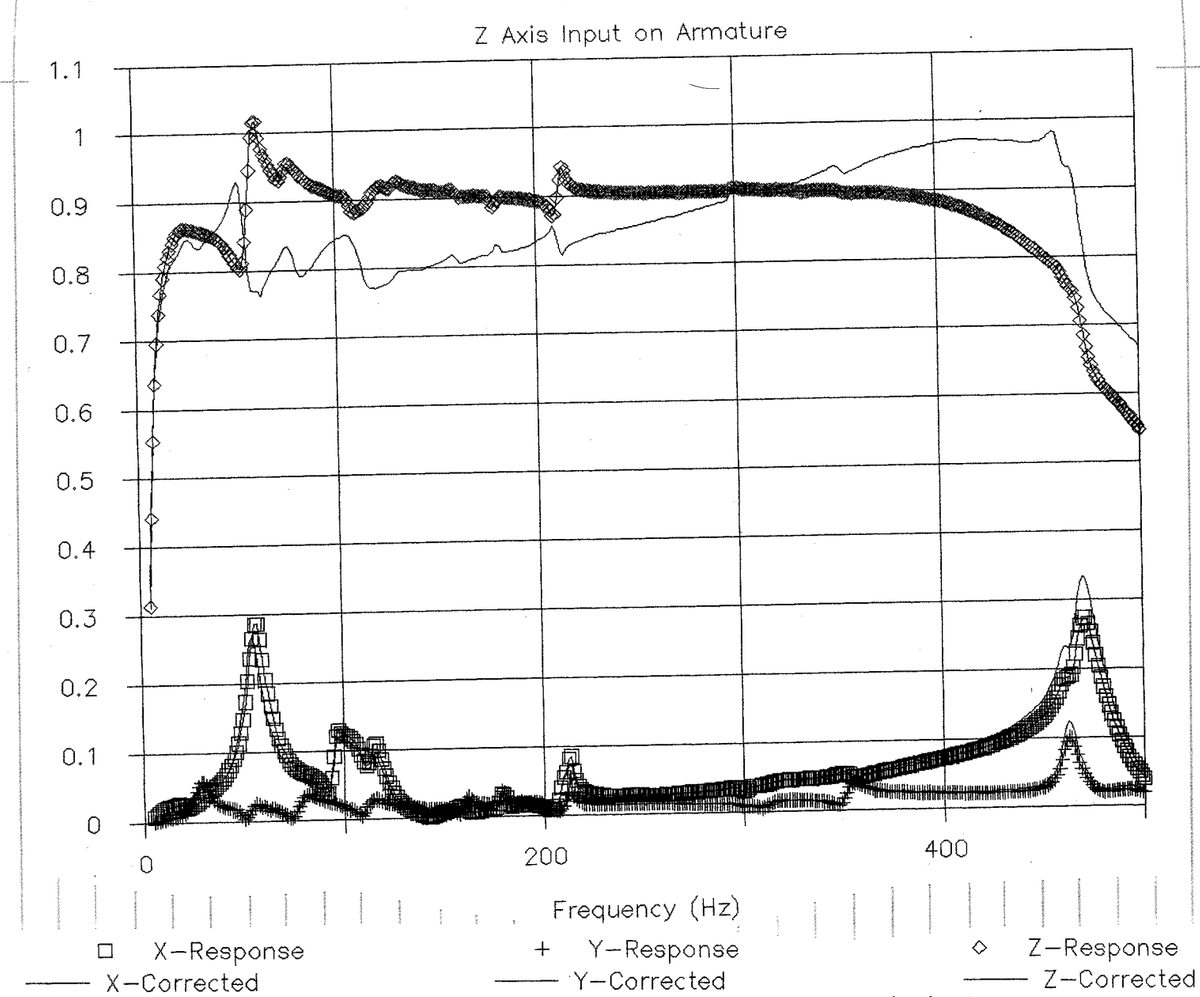
Triaxial Velocimeter #590

12/10/90



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Velocimeter Summary 12/14/90

X- AXIS INPUT
ALL SETS GIVE SIMILAR RESULTS
PRIMARY INTERACTION WITH Z- AXIS RESPONSE ≈ 450 Hz ON ALL TRANSDUCERS
SECONDARY INTERACTION WITH Z- AXIS RESPONSE ≈ 50 Hz ON ALL TRANSDUCERS
CROSS-AXIS ~~INPUT~~ RESPONSE IS NOT GREATER THAN AN ORDER OF MAGNITUDE LESS OVER A SIGNIFICANT PART OF FREQUENCY RANGE TO 500 Hz. Z- AXIS IS WORSE THAN Y-AXIS

SET 280	≈ 0.75	volts	/(in/sec)
281	≈ 0.75	"	"
282	≈ 0.70	"	"
510	≈ 0.75	"	"
590	≈ 0.75	"	"

Ron Graff

Velocimeter Summary 12/14/90

Y-AXIS INPUT
PRIMARY SENSITIVITY IS NOT VERY LINEAR
SIGNIFICANT INTERACTION WITH BOTH X and Y AXIS RESPONSE THROUGHOUT FREQUENCY RANGE
SETS 281 & 282 SHOW SIGNIFICANT INTERACTION 250 to 280 Hz
SETS 510 & 590 APPEAR TO BE THE BEST

SET 280	≈ 0.65	volts	/ (in/sec)
281	≈ 0.65	"	"
282	≈ 0.65	"	"
510	≈ 0.65	"	"
590	≈ 0.70	"	"

Z-AXIS INPUT
PRIMARY INTERACTION WITH X-AXIS RESPONSE ≈ 400 to 500 Hz DEPENDING ON TRANSDUCER
50 Hz RESPONSE INDICATED IN X-INPUT IS ~~ALSO~~ ALSO EVIDENT

SET 280	≈ 0.45	volts	/ (in/sec)
281	≈ 0.70	"	"
282	≈ 0.90	"	"
510	≈ 0.45	"	"
590	≈ 0.85	"	"

Ron Graff