Medium Weight Shock and Vibration Test Report on 1.5” x 1” x 6”Pump with 7.5 HP Motor for Sims Pump Valve Co., Inc. Hoboken, NJ

NU LABORATORIES, INC.

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30 May 2007

Prepared By	Checked By	Approved By
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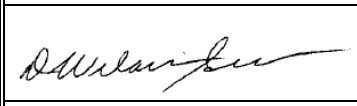	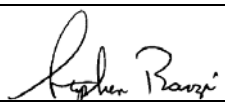	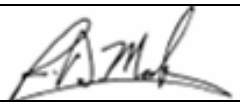
30 May 2007	30 May 2007	30 May 2007

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1. PURPOSE OF TEST

The purpose of this tests was to demonstrate that the 1.5" x 1" x 6" Pump with 7.5 HP Motor, hereinafter referred to as "the Pump", complied with the requirements of MIL-S-901D for a Grade A, Class I, nine (9) blow medium weight shock test and with the requirements of MIL-STD-167-1 when subjected to vibration testing through the frequency range of 4 Hz to 50 Hz in each of the three (3) major axes.

2. MANUFACTURER

Sims Pump Valve Co., Inc.
1314 Park Avenue
Hoboken, NJ 07030

3. MANUFACTURER'S TYPE OR MODEL NO.

1.5" x 1" x 6" Pump with 7.5 HP Motor
S/N: CR16696_1 (Pump)
S/N: K30744-7 (Motor)

4. SPECIFICATIONS

4.1 MILITARY

MIL-S-901D (NAVY) Military Specification, Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for, dated 17 March 1989

MIL-STD-167-1 (SHIPS) Military Standards Mechanical Vibrations of Shipboard Equipment, dated 1 May 1974

4.2 SIMS PUMP VALVE CO., INC.

Purchase Order No. 5762

5. NUMBER OF ITEMS TESTED

One (1)

6. SECURITY CLASSIFICATION OF ITEM

Unclassified

7. DATE TESTS COMPLETED

20 April 2007 – Shock
30 April 2007 – Vibration

8. TEST CONDUCTED BY

NU Laboratories, Inc.
312 Old Allerton Road
Annandale, NJ 08801
(NAVY Certified Shock Test Facility by NAVSEAINST 9491.1C)

9. TEST WITNESSES

Vladimir Spector, Sims Pump Valve Co., Inc. representative
John Franklin, Sims Pump Valve Co., Inc. representative

10. DISPOSITION OF TEST ITEM

The Pump was returned Sims Pump Valve Co., Inc.

11. ABSTRACT

The Pump was subjected to a total of nine (9) medium weight shock blows in accordance with the referenced test specifications. Visual inspections, performed after each shock blow, revealed no physical damage or discrepancies. Refer to Section 12 for additional information.

The Pump was subjected to vibration through the frequency range of 4 Hz through 50 Hz in each of the three (3) major axes in accordance with the referenced test specifications. Visual inspections, performed after each major axis, revealed no discrepancies. Refer to Section 13 for additional information.

12. SHOCK TEST DESCRIPTION

12.1 ACCEPTANCE CRITERIA

In accordance with MIL-STD-901D, the Pump is considered to have failed the shock test if any portion of the equipment comes adrift or otherwise becomes a hazard to personnel, or equipment is not able to perform its Grade A specified function due to performance degradation.

12.2 TEST SETUP

Upon receipt a visual inspection of the Pump revealed no obvious physical damage or discrepancy.

The Pump was weighed using a portable platform scale and the weight was recorded in the test log. The weight of the Pump was 375 pounds.

The Pump was bolted to a 48” x 48” x 1½” transition plate using four (4) ¾”-10 Grade 5 bolts torqued to 260 ft-lbs. Two (2) half-rails were attached to the transition plate and the entire assembly was secured to fixture Figure 13 of MIL-S-901D on the medium weight shock machine, oriented in the first major axis of test. The total weight on the anvil table was 1954.5 pounds. Refer to Table 1 for the medium weight shock test weights and Figure 1 for the photograph of the test setup.

Table 1: Medium Weight Shock Test Weights

Pump	**375 lbs**
48” x 48” x 1½” Transition Plate	**933 lbs**
Four (4) ¾”-10 Grade 5 Bolts	**4 lbs**
Suction Dummy Load	**20 lbs**
Discharge Dummy Load	**11.5 lbs**
Two (2) Half Rails	**166 lbs**
Eight (8) Half Rail Shoes	**32 lbs**
Six (6) T-Blocks with Hardware	**24 lbs**
Six (6) ½” Spacers	**9 lbs**
Fixture Figure 13 of MIL-S-901D	**380 lbs**
Fixture Figure 16 of MIL-S-901D	**1470 lbs**
Total Weight Fixture Figure 13	**1954.5 lbs**
Total Weight Fixture Figure 16	**3044.5 lbs**

12.3 TEST CONDITIONS

The Pump was energized with 460V, 3-phase, 60 Hz power throughout shock testing.

During Group I and Group III blows, identified as “**CONDITION A**”, the Pump was operational and pressurized to 63 psig.

During Group II blows, identified as “**CONDITION B**”, the Pump was non-operational and flooded.

12.4 BLOW #1 – CONDITION A

12.4.1 Conditions: Vertical Axis, 1’ hammer height, Group #I, 3” anvil table travel, fixture Figure 13 of the referenced specifications.
12.4.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.4.3 Action: The mounting bolts were retorqued and testing was continued.

12.5 BLOW #2 – CONDITION B

12.5.1 Conditions: Vertical Axis, 2’ hammer height, Group #II, 3” anvil table travel, fixture Figure 13 of the referenced specifications.
12.5.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.5.3 Action: Testing was continued.

12.6 BLOW #3 – CONDITION A

12.6.1 Conditions: Vertical Axis, 2’ hammer height, Group #III, 1.5” anvil table travel, fixture Figure 13 of the referenced specifications.
12.6.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.6.3 Action: Testing was continued.

The entire assembly was removed from fixture Figure 13 of MIL-S-901D and attached to fixture Figure 16 of MIL-S-901D, oriented with the side of the Pump down. The total weight on the anvil table was 3044.5 pounds. Refer to Table 1 for the test weights and Figure 1 for the photograph of the test setup.

12.7 BLOW #4 – CONDITION A

12.7.1 Conditions: 30° Side Down, 1.5’ hammer height, Group #I, 3” anvil table travel, fixture Figure 16 of the referenced specifications.
12.7.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.7.3 Action: Testing was continued.

12.8 BLOW #5 – CONDITION B

12.8.1 Conditions: 30° Side Down, 2.5’ hammer height, Group #II, 3” anvil table travel, fixture Figure 16 of the referenced specifications.
12.8.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.8.3 Action: Testing was continued.

12.9 BLOW #6 – CONDITION A

12.9.1 Conditions: 30° Side Down, 2.5’ hammer height, Group #III, 1.5” anvil table travel, fixture Figure 16 of the referenced specifications.
12.9.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.9.3 Action: Testing was continued.

The entire assembly was removed from fixture Figure 16, rotated 90°, and reattached to fixture Figure 16 of MIL-S-901D with the front of the Pump facing down. The total weight on the anvil table remained 3044.5 pounds. Refer to Figure 1 for the photograph of the test setup.

12.10 BLOW #7 – CONDITION A

12.10.1 Conditions: 30° Front Down, 1.5’ hammer height, Group #I, 3” anvil table travel, fixture Figure 16 of the referenced specifications.
12.10.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.10.3 Action: Testing was continued.

12.11 BLOW #8 – CONDITION B

12.11.1 Conditions: 30° Front Down, 2.5' hammer height, Group #II, 3" anvil table travel, fixture Figure 16 of the referenced specifications.
12.11.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.11.3 Action: Testing was continued.

12.12 BLOW #9 – CONDITION A

12.12.1 Conditions: 30° Front Down, 2.5' hammer height, Group #III, 1.5" anvil table travel, fixture Figure 16 of the referenced specifications.
12.12.2 Observations: A post-blow visual inspection revealed no obvious physical damage or discrepancies.
12.12.3 Action: Testing was completed.

Refer to the Factory Test Record, Figure 2, and the Shock Acceptance Form, Figure 3, for additional information.

13. VIBRATION TEST DESCRIPTION

Upon completion of shock testing, the Pump was removed from the medium weight shock machine and attached to the vibration machine oriented in the first major axis of test. Refer to Figure 4 for photographs of the test setups.

One (1) accelerometer was attached to the fixture plate and one (1) accelerometer was attached to the top of the Pump discharge port, oriented in the direction of vibration, to aid in the detection of response prominences.

The Pump was flooded with water, energized with 460 VAC, three (3) phase, 60 Hz power and operating with the discharge pressure adjusted to 63 psig throughout the vibration test

13.1 FIRST MAJOR AXIS OF VIBRATION (VERTICAL)

13.1.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 33 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) to determine response prominences and from 34 Hz through 50 Hz with a vibration input of 0.006 + 0.000/-0.002 (double amplitude) to determine response prominences. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for approximately 15 seconds. No response prominences were noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheet, Figure 5.

13.1.2 Variable Frequency Vibration

The Pump was vibrated from 4 Hz to 50 Hz with input amplitudes as shown in Table 2. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for a period of five (5) minutes. No obvious physical damage, leakage or loss in pressure was noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheet, Figure 5.

Table 2: Variable Frequency Test Amplitudes

FREQUENCY (Hz)	INPUT INCHES (DOUBLE AMPLITUDE)
4 – 15 Hz	0.060 ± 0.012
16 – 25 Hz	0.040 ± 0.008
26 – 33 Hz	0.020 ± 0.004
34 – 40 Hz	0.010 ± 0.002
41 – 50 Hz	0.006 + 0.000 -0.002

13.1.3 Endurance Vibration

The endurance vibration was performed at the frequency of 50 Hz for a period of two (2) hours. Upon the completion of the two (2) hour dwell, a visual inspection revealed no obvious physical damage, leakage or loss in pressure.

13.2 SECOND MAJOR AXIS OF VIBRATION (END TO END)

13.2.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 33 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) to determine response prominences and from 34 Hz through 50 Hz with a vibration input of 0.006 + 0.000/-0.002 (double amplitude) to determine response prominences. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for approximately 15 seconds. No response prominences were noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheet, Figure 6.

13.2.2 Variable Frequency Vibration

The Pump was vibrated from 4 Hz to 50 Hz with input amplitudes as shown in Table 2. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for a period of five (5) minutes. No obvious physical damage, leakage or loss in pressure was noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheet, Figure 6

13.2.3 Endurance Vibration

The endurance vibration was performed at the frequency of 50 Hz for a period of two (2) hours. Upon the completion of the two (2) hour dwell, a visual inspection revealed no obvious physical damage, leakage or loss in pressure.

13.3 THIRD MAJOR AXIS OF VIBRATION (SIDE TO SIDE)

13.3.1 Exploratory Vibration

The Pump was vibrated from 4 Hz through 33 Hz with a vibration input of 0.020 ± 0.004 inches (double amplitude) to determine response prominences and from 34 Hz through 50 Hz with a vibration input of 0.006 + 0.000/-0.002 (double amplitude) to determine response prominences. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for approximately 15 seconds. No response prominences were noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheet, Figure 7.

13.3.2 Variable Frequency Vibration

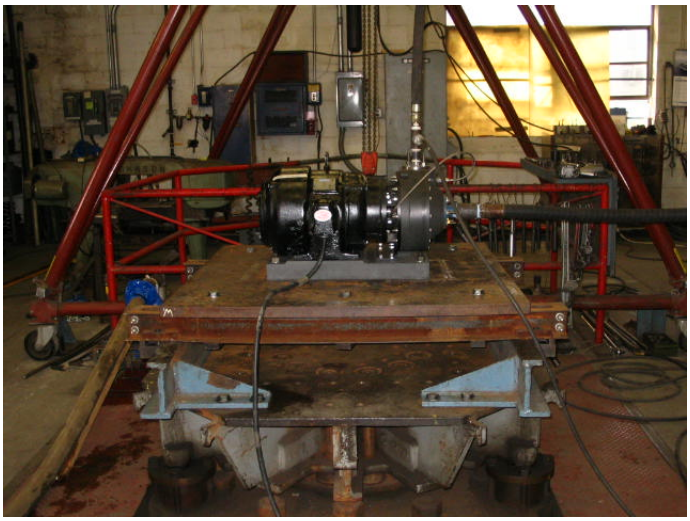
The Pump was vibrated from 4 Hz to 50 Hz with input amplitudes as shown in Table 2. The change in frequency was made in discrete intervals of 1 Hz and the vibration was maintained at each frequency for a period of five (5) minutes. No obvious physical damage, leakage or loss in pressure was noted.

The table input vibration levels and the accelerometer output vibration levels at each frequency were recorded on the Vibration Test Data Sheet, Figure 7.

13.3.3 Endurance Vibration

The endurance vibration was performed at the frequency of 50 Hz for a period of two (2) hours. Upon the completion of the two (2) hour dwell an inspection was performed which revealed no obvious physical damage, leakage or loss in pressure.

Refer to the Vibration Test Data Sheets, Figures 5 through 7, and the Vibration Plots, Figures 8 through 10, for additional information.



Vertical Axis

30° Side Down

30° Front Down

Shock Test Setups
Figure 1

FACTORY TEST RECORD: CLASS HI SHOCK			DATE 25 April 2007	TEST # 10678.1
1. ITEM NAME OF EQUIPMENT SHOCK-TESTED 1.5" x 1" x 6" Pump with 7.5 HP Motor		2. RATING (KW, VOLTS, GPM, CFM, ETC.)		
3. MAJOR PARTS				
PUMP, ETC.	TESTED FOR Sims Pump Valve Co., Inc.	ADDRESS 1314 Park Avenue Hoboken, NJ 07030	GOV DWG NO	IDENTIFYING #
MOTOR, ETC.	MANUFACTURER	ADDRESS	GOV DWG NO	IDENTIFYING #
STARTER, ETC.	MANUFACTURER	ADDRESS	GOV DWG NO	IDENTIFYING #
4. CONTRACT NO.	CONTRACTOR	ADDRESS		
5. TYPE OF SHOCK TEST ☒ ASSEMBLY ☐ SUB-ASSEMBLY ☐ PART				
6. TOTAL WEIGHT OF ASSEMBLY TESTED 375 lbs.	WEIGHT OF INDIVIDUAL MAJOR PARTS LBS.	MOTOR LBS.	STARTER LBS.	
7. WEIGHT CLASSIFICATION OF ITEM ☐ LIGHT ☒ MEDIUM	8. APPLICABLE MOUNTING FIGURE IN SPECIFICATION MIL-S-901 ☐ FIX 4A, FIG 5 ☐ FIX 4C, FIG 8 ☒ FIG 13 ☒ FIG 16 ☐ FIG 10-2 ☐ OTHER			

9. FOR LIGHTWEIGHT ITEMS

FIRST CONDITION				SECOND CONDITION			
BLOW	DROP	AXIS	DAMAGE INCURRED	BLOW	DROP	AXIS	DAMAGE INCURRED

ITEMS SUBJECT TO ABOVE TWO CONDITIONS WERE SAME ☐ DIFFERENT ☐	REMARKS

10. FOR MEDIUM-WEIGHT ITEMS

Fig. 13 Fig. 16,				Fig. 16,			
BLOWS	GRP #	HAMMER DROP	DAMAGE INCURRED	BLOWS	GRP #	HAMMER DROP	DAMAGE INCURRED
1	I	1.0'	No damage noted	7	I	1.5'	No damage noted
2	II	2.0'	No damage noted	8	II	2.5'	No damage noted
3	III	2.0'	No damage noted	9	III	2.5'	No damage noted
4	I	1.5'	No damage noted				
5	II	2.5'	No damage noted				
6	III	2.5'	No damage noted				

TOTAL WEIGHT ON ANVIL TABLE Figure 13 – 1954.5 lbs./Figure 16 – 3044.5 lbs.	REMARKS	
TEST LABORATORY NU Laboratories, Inc.	ADDRESS 312 Old Allerton Road, Annandale, NJ 08801	TEST ENGINEER [signature]

Factory Test Record
Figure 2

MIL-S-901D: SHOCK ACCEPTANCE FORM

1. The item identified below has met the requirements of Military Specification MIL-S-901, based upon:

   ☒ Shock testing of the item identified below

   ❑ Previous shock testing of an item similar to the item identified below (shock test extension)

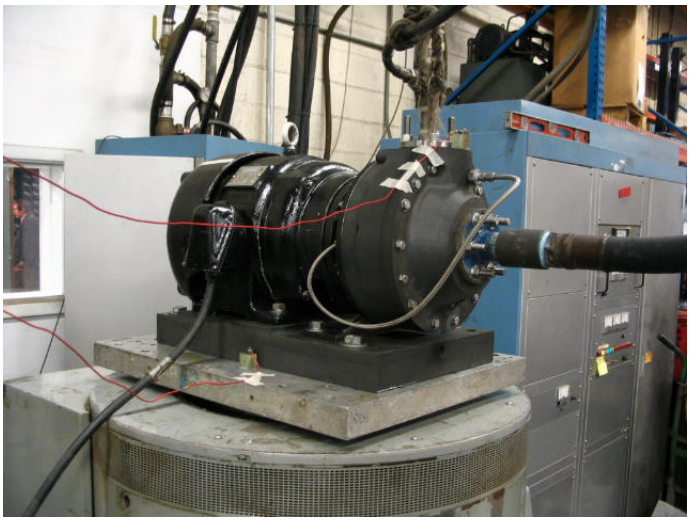
   ❑ Previous shock testing of an item identical to the item identified below (shock test extension)

2. Item (Nomenclature) Pump
3. Item (Description) 1.5" x 1" x 6" Pump with 7.5 HP Motor
4. Tested For Sims Pump Valve Co., Inc.
5. M/N: _____ 6. S/N: CR16696 1 (Pump); K30744-7 (Motor)
7. Dwg. Number _____ 8. Revision and Date _____
9. Military Specification MIL-S-901D
10. Ship _____ 11. Service _____
12. Contract No. _____
13. Shock Test Facility NU Laboratories, Inc.
14. Report No. 10678.1
15. Previous Shock test approval reference (if this form conveys shock test Extension approval) _____

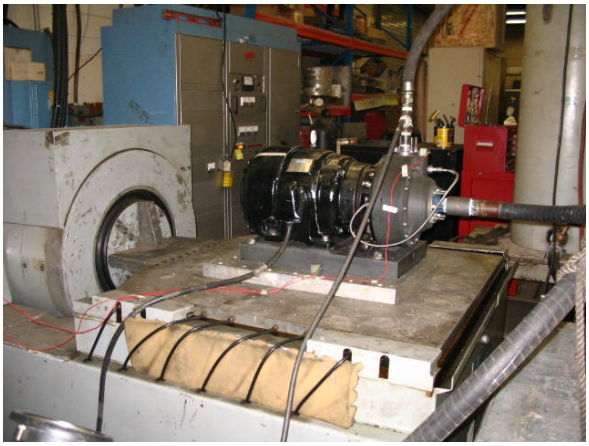
16. Test Category ☐ Lightweight ☒ Medium weight ☐ Heavyweight
17. Shock Grade ☒ A ☐ B
18. Equipment Class ☒ I ☐ II ☐ III
19. Shock Test Type ☒ A ☐ B ☐ C
20. Mounting Location ☒ Deck ☐ Hull ☐ Shell ☐ Wetted-Surface
21. Shipboard mounting plane represented during shock test:
    ☒ Base ☐ Front or Face ❑ Back
    ☐ Top ☐ Combination ☐ Other _____
22. Mounting orientation of item relative to ship's fore-and-aft axis (for medium weight and heavyweight test items only): Unrestricted
23. Approval Limitations: _____
24. Approved. _____

Authorized Signature	Approval Activity	Date
		25 April 2007

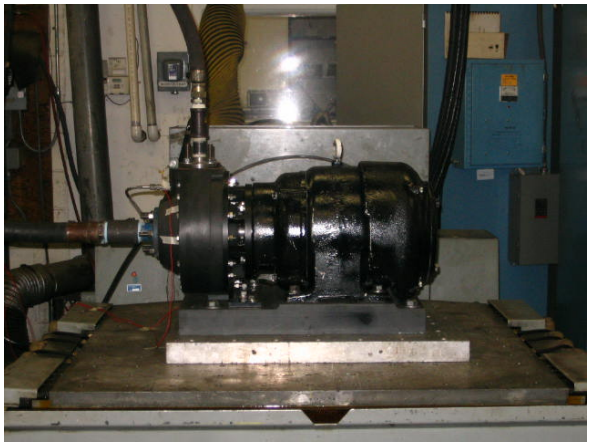
Shock Acceptance Form
Figure 3



Vertical Axis

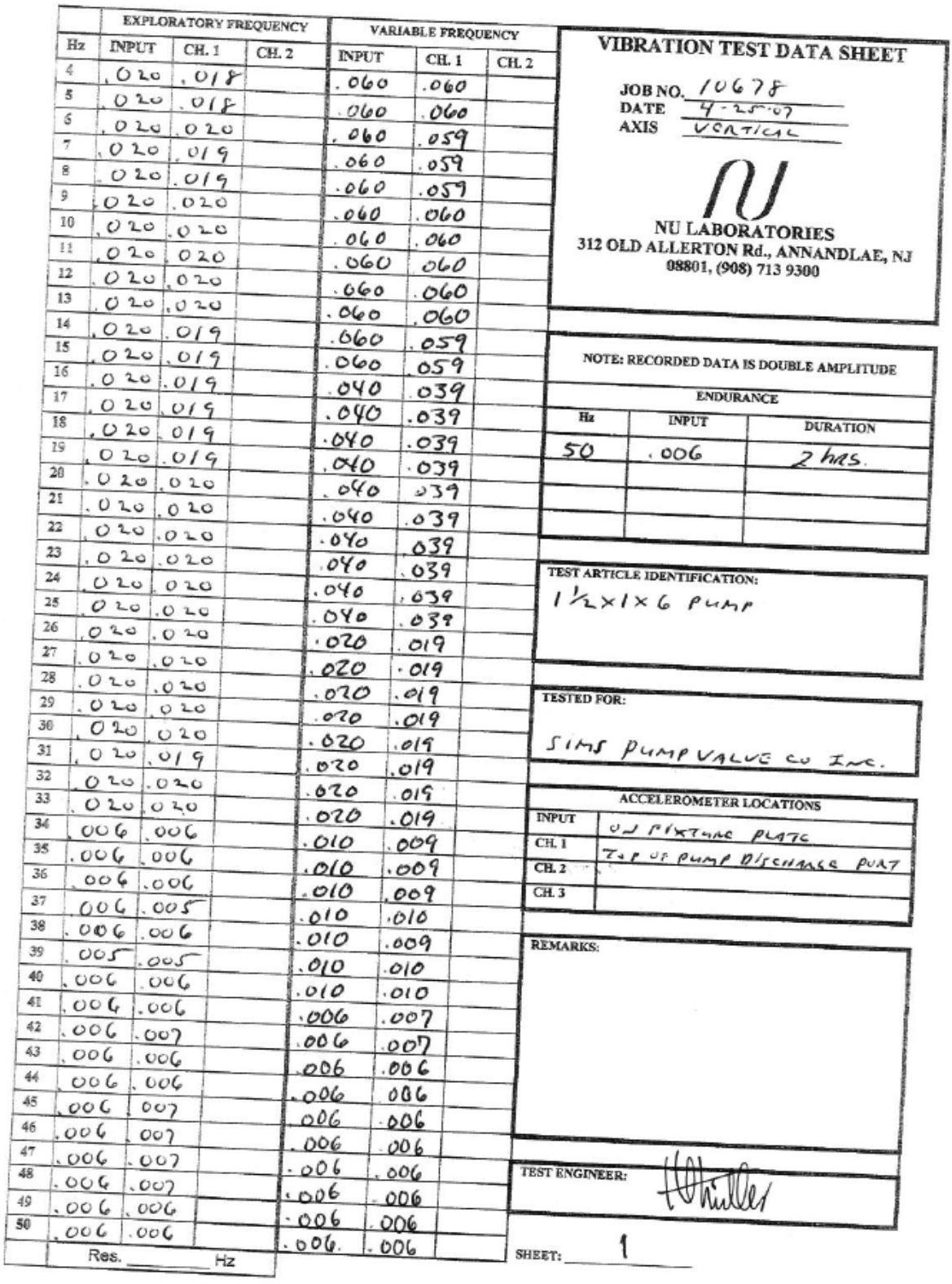


End to End



Side to Side

Vibration Test Setups
Figure 4



	EXPLORATORY FREQUENCY			VARIABLE FREQUENCY		
Hz	INPUT	CH. 1	CH. 2	INPUT	CH. 1	CH. 2
4	.020	.018		.060	.060	
5	.020	.018		.060	.060	
6	.020	.020		.060	.059	
7	.020	.019		.060	.059	
8	.020	.019		.060	.059	
9	.020	.020		.060	.060	
10	.020	.020		.060	.060	
11	.020	.020		.060	.060	
12	.020	.020		.060	.060	
13	.020	.020		.060	.060	
14	.020	.019		.060	.059	
15	.020	.019		.060	.059	
16	.020	.019		.040	.039	
17	.020	.019		.040	.039	
18	.020	.019		.040	.039	
19	.020	.019		.040	.039	
20	.020	.020		.040	.039	
21	.020	.020		.040	.039	
22	.020	.020		.040	.039	
23	.020	.020		.040	.039	
24	.020	.020		.040	.039	
25	.020	.020		.040	.039	
26	.020	.020		.020	.019	
27	.020	.020		.020	.019	
28	.020	.020		.020	.019	
29	.020	.020		.020	.019	
30	.020	.020		.020	.019	
31	.020	.019		.020	.019	
32	.020	.020		.020	.019	
33	.020	.020		.020	.019	
34	.006	.006		.010	.009	
35	.006	.006		.010	.009	
36	.006	.006		.010	.009	
37	.006	.005		.010	.010	
38	.006	.006		.010	.009	
39	.005	.005		.010	.010	
40	.006	.006		.010	.010	
41	.006	.006		.006	.007	
42	.006	.007		.006	.007	
43	.006	.006		.006	.006	
44	.006	.006		.006	.006	
45	.006	.007		.006	.006	
46	.006	.007		.006	.006	
47	.006	.007		.006	.006	
48	.006	.007		.006	.006	
49	.006	.006		.006	.006	
50	.006	.006		.006	.006	

Res. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10678
DATE 4-25-07
AXIS VERTICAL

NU LABORATORIES
312 OLD ALLERTON Rd., ANNANDLAE, NJ
08801, (908) 713 9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE

ENDURANCE

Hz	INPUT	DURATION
50	.006	2 hrs.

TEST ARTICLE IDENTIFICATION:
1½×1×6 PUMP

TESTED FOR:
SIMS PUMP VALVE CO INC.

ACCELEROMETER LOCATIONS

INPUT	ON FIXTURE PLATE
CH. 1	TOP OF PUMP DISCHARGE PORT
CH. 2	
CH. 3	

REMARKS:

TEST ENGINEER:

SHEET: 1

Vibration Test Data Sheet
Figure 5

	EXPLORATORY FREQUENCY			VARIABLE FREQUENCY		
Hz	INPUT	CH. 1	CH. 2	INPUT	CH. 1	CH. 2
4	.020	.019		.060	.057	
5	.020	.018		.060	.057	
6	.020	.018		.060	.057	
7	.020	.018		.060	.059	
8	.020	.019		.060	.058	
9	.020	.019		.060	.058	
10	.020	.019		.060	.059	
11	.020	.019		.060	.059	
12	.020	.019		.060	.059	
13	.020	.019		.060	.059	
14	.020	.019		.060	.059	
15	.020	.019		.060	.060	
16	.020	.020		.040	.039	
17	.020	.019		.040	.039	
18	.020	.019		.040	.040	
19	.020	.019		.040	.040	
20	.020	.020		.040	.040	
21	.020	.020		.040	.040	
22	.020	.020		.040	.040	
23	.020	.020		.040	.040	
24	.020	.020		.040	.040	
25	.020	.020		.040	.040	
26	.020	.020		.020	.020	
27	.020	.020		.020	.020	
28	.020	.020		.020	.020	
29	.020	.020		.020	.020	
30	.020	.020		.020	.020	
31	.020	.020		.020	.020	
32	.020	.020		.020	.020	
33	.020	.020		.020	.020	
34	.006	.006		.010	.010	
35	.006	.006		.010	.010	
36	.006	.006		.010	.010	
37	.006	.006		.010	.010	
38	.006	.006		.010	.010	
39	.006	.006		.010	.010	
40	.006	.006		.010	.010	
41	.006	.006		.006	.006	
42	.006	.006		.006	.006	
43	.006	.006		.006	.006	
44	.006	.006		.006	.006	
45	.006	.006		.006	.006	
46	.006	.007		.006	.006	
47	.006	.007		.006	.006	
48	.006	.006		.006	.006	
49	.006	.006		.006	.006	
50	.006	.007		.006	.006	

Res. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10678
DATE 4/27/07
AXIS End to End.

NU LABORATORIES
312 OLD ALLERTON Rd., ANNANDLAE, NJ
08801, (908) 713 9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE

ENDURANCE

Hz	INPUT	DURATION
50	.006	2 HRS

TEST ARTICLE IDENTIFICATION:
1½ x 1 x 6 Pump

TESTED FOR:
Sims pump valve CO. Inc.

ACCELEROMETER LOCATIONS

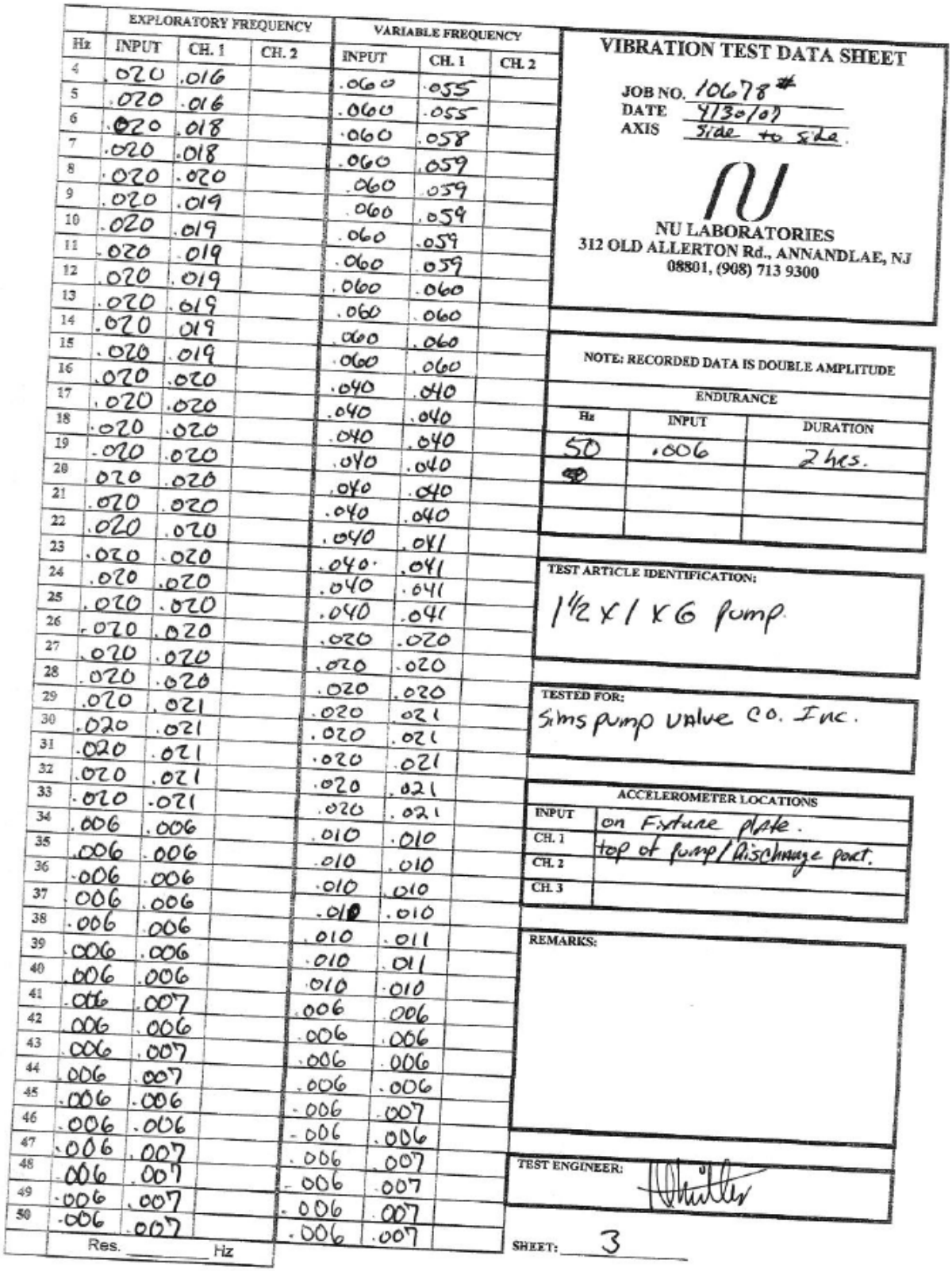
INPUT	on fixture plate.
CH. 1	top of pump Discharge port.
CH. 2	
CH. 3	

REMARKS:

TEST ENGINEER:

SHEET: 2

Vibration Test Data Sheet
Figure 6



	EXPLORATORY FREQUENCY			VARIABLE FREQUENCY		
Hz	INPUT	CH. 1	CH. 2	INPUT	CH. 1	CH. 2
4	.020	.016		.060	.055	
5	.020	.016		.060	.055	
6	.020	.018		.060	.058	
7	.020	.018		.060	.059	
8	.020	.020		.060	.059	
9	.020	.019		.060	.059	
10	.020	.019		.060	.059	
11	.020	.019		.060	.059	
12	.020	.019		.060	.060	
13	.020	.019		.060	.060	
14	.020	.019		.060	.060	
15	.020	.019		.060	.060	
16	.020	.020		.040	.040	
17	.020	.020		.040	.040	
18	.020	.020		.040	.040	
19	.020	.020		.040	.040	
20	.020	.020		.040	.040	
21	.020	.020		.040	.040	
22	.020	.020		.040	.041	
23	.020	.020		.040	.041	
24	.020	.020		.040	.041	
25	.020	.020		.040	.041	
26	.020	.020		.020	.020	
27	.020	.020		.020	.020	
28	.020	.020		.020	.020	
29	.020	.021		.020	.021	
30	.020	.021		.020	.021	
31	.020	.021		.020	.021	
32	.020	.021		.020	.021	
33	.020	.021		.020	.021	
34	.006	.006		.010	.010	
35	.006	.006		.010	.010	
36	.006	.006		.010	.010	
37	.006	.006		.010	.010	
38	.006	.006		.010	.011	
39	.006	.006		.010	.011	
40	.006	.006		.010	.010	
41	.006	.007		.006	.006	
42	.006	.006		.006	.006	
43	.006	.007		.006	.006	
44	.006	.007		.006	.006	
45	.006	.006		.006	.007	
46	.006	.006		.006	.006	
47	.006	.007		.006	.007	
48	.006	.007		.006	.007	
49	.006	.007		.006	.007	
50	.006	.007		.006	.007	

Res. _____ Hz

VIBRATION TEST DATA SHEET

JOB NO. 10678 #
DATE 4/30/07
AXIS Side to side

NU LABORATORIES
312 OLD ALLERTON Rd., ANNANDLAE, NJ
08801, (908) 713 9300

NOTE: RECORDED DATA IS DOUBLE AMPLITUDE

ENDURANCE

Hz	INPUT	DURATION
50	.006	2 hrs.

TEST ARTICLE IDENTIFICATION:
1½ x 1 x 6 pump

TESTED FOR:
Sims pump valve Co. Inc.

ACCELEROMETER LOCATIONS

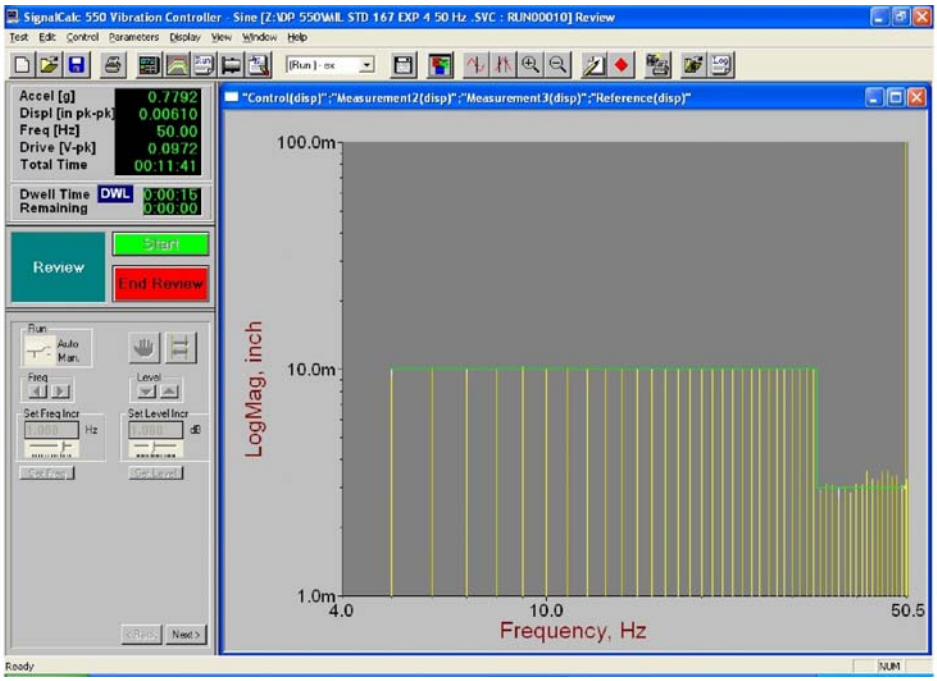
INPUT	on Fixture plate.
CH. 1	top of pump/discharge port.
CH. 2	
CH. 3	

REMARKS:

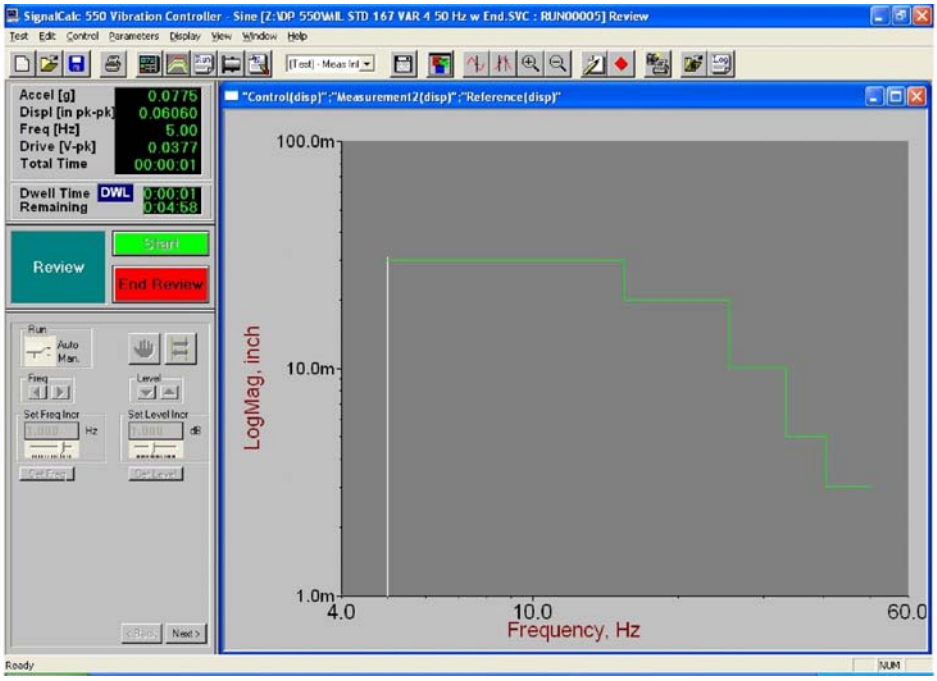
TEST ENGINEER:

SHEET: 3

Vibration Test Data Sheet
Figure 7

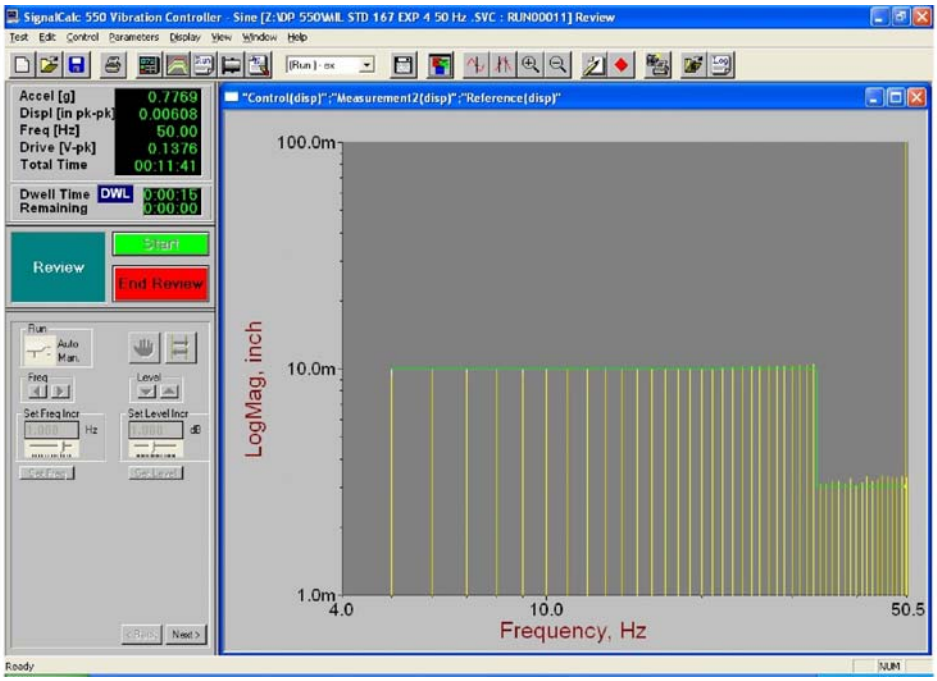


Exploratory

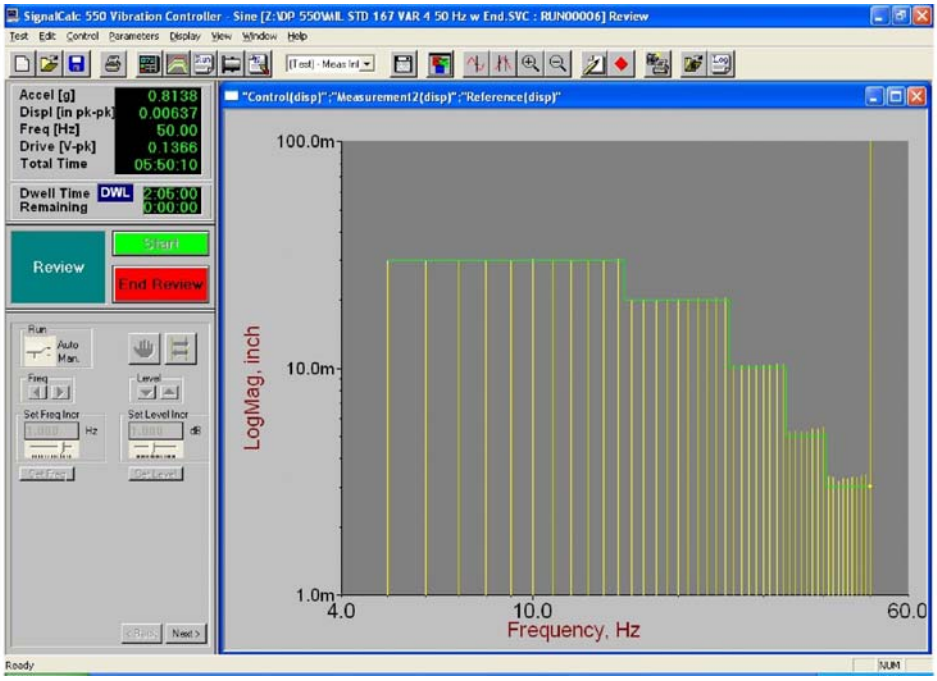


Variable and Endurance

Vibration Plots
Vertical Axis
Figure 8

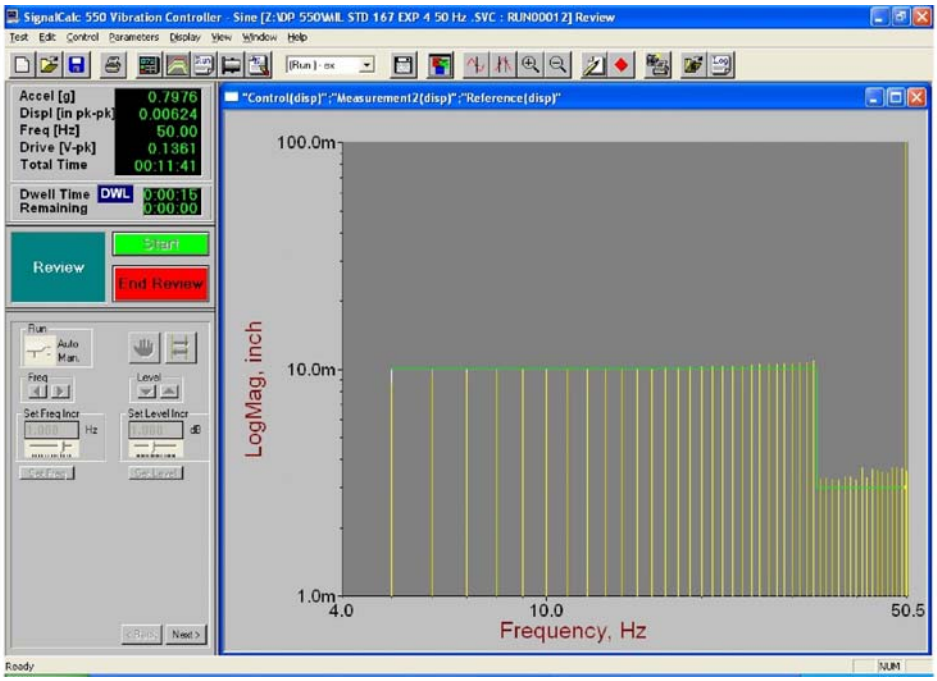


Exploratory

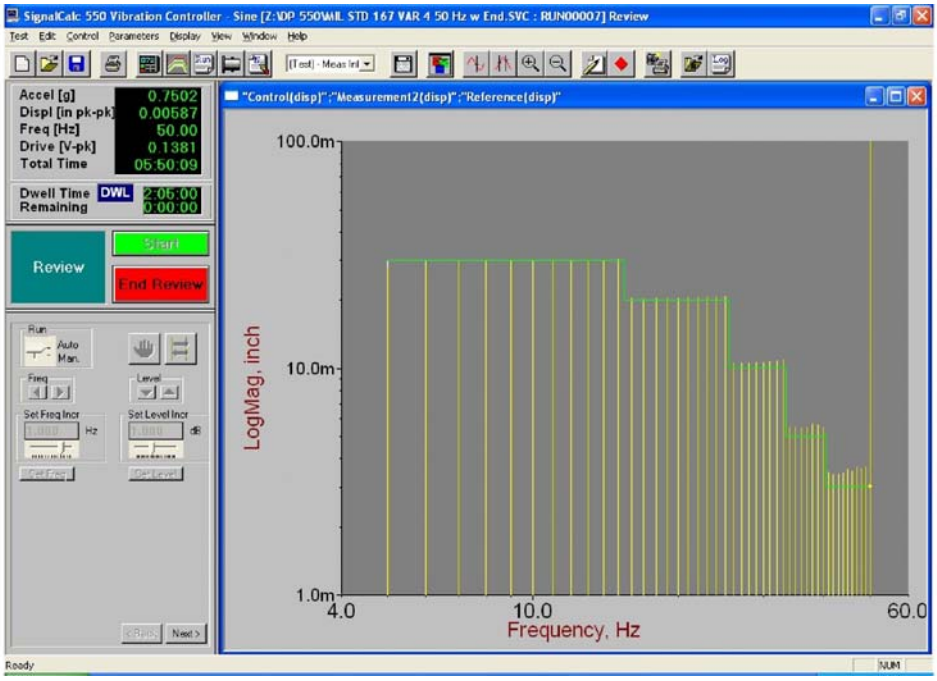


Variable and Endurance

Vibration Plots
End to End
Figure 9



Exploratory



Variable and Endurance

Vibration Plots
Side to Side
Figure 10

LIST OF APPARATUS

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL DATE	DUE DATE
Platform Scale	Fairbanks Morse	1124A	G-511379	09/19/06	09/19/07
Digital Scale	Industrial Sales	TI-500SSB-5K	5019011000018	09/19/06	09/19/07
Balance Scale	Ohaus	1225	EL-330	09/19/06	09/19/07
Torque Wrench	CDI	2503MFRMH	0499200127	03/22/07	03/22/08
Torque Wrench	Utica	TCI-150FRN	MD6973	09/11/06	09/11/07
Torque Wrench	CDI	752MFRMH	1002602828	01/24/07	01/24/08
0-100 Pressure Gauge	Weksler	GP2-16-3	1001	11/03/06	11/03/07
Medium Weight Shock Machine	New England Trawler	10-T-3351-C	N/A	Functional	
Vibration Machine	Unholtz	T1000.20	357	Functional	
Vibration Controller	Data Physics	DP550	3186	01/11/07	01/11/08
Power Supply	Endevco	4222	EL393	06/14/06	06/14/07
Charge Amplifier	Endevco	2721B	BR34	06/14/06	06/14/07
Charge Amplifier	Endevco	2721B	BR16	06/14/06	06/14/07
Accelerometer	Endevco	2221D	EY62	03/05/07	03/05/08
Accelerometer	Endevco	2221D	EY55	03/05/07	03/05/08

All calibrations are traceable to the National Institute of Standards and Technology. Procedures satisfy the requirements set forth in MIL-STD-45662 or ANSI/NCSL Z540-1.

Calibration records are on file at NU Laboratories, Inc.

All weights and scales are traceable to the State of NJ Office of Weights and Measures (NJSA 51:1-61; 75; NJAC 13:47E-1.2)