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SHOCK AND VIBRATION TESTING OF LCD MONITORS

ATS JOB # D132779

Prepared for

HOPE INDUSTRIAL SYSTEMS, INC.
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Subject

Shock and Vibration testing of LCD monitors

Materials

Three (3) monitors: ML 15", ML 17", ML 19"

Objective and Background

Applied Technical Services, Inc. was requested by Hope Industrial Systems, Inc. to perform a shock and vibration test on the supplied monitors per the document "HIS Monitor Testing, version 0.92," used as a guide. The testing was conducted according the following sections of the document:

- Test 6: Mechanical Shock (operating)
- Test 7: Free-Fall (non-operating)
- Test 10: Random vibration (non-operating)
- Test 11: Sinusoidal vibration (operating)

Procedure

Test 6: Mechanical Shock (operating)
Figures 1 and 2 show the setup used for this test.
A video signal was applied to the monitors during the exposure.
A total of 200 shocks per axis were applied. Each shock had an amplitude of 15g, a duration of 6ms and a ½-sine time waveform. Figures 5 and 6 show representative shocks for this test (positive and negative direction).

Test 7: Free-Fall (non-operating)
The displays were tested in a packaged configuration.
Each package was dropped onto a concrete floor from a height of 80cm on various faces, edges and corners.

Test 10: Random vibration (non-operating)
The displays were tested in a packaged configuration.
The packages were placed into a fixture to simulate a shipping environment (see Figures 3 and 4).
A random vibration was applied for a duration of 30 minutes per axis over three mutually perpendicular axes. Figure 7 shows the random vibration profile used (PSD vs. frequency).



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Test 11: Sinusoidal vibration (operating)

The setup was identical to the setup used for Test 6 (mechanical shock).

A sinusoidal sweep (shown in Figure 8) was applied to the displays along three mutually perpendicular axes.

A total of 10 sweeps per axis was performed.

Equipment used

Thermotron shaker table: ATS-1343 (02/12/2009), Model DS-642-919-H/V

Unholtz-Dickie shaker table: ATS-2259 (02/12/2009), Model R16C

Accelerometers: PCB J320C03, S/N: 7178 (06/24/2009)

PCB J320C03, S/N: 5668 (07/08/2009)

Conclusion

The displays provided by Hope Industrial Systems, Inc. were subjected to the shock and vibration tests described in "HIS Monitor Testing, version 0.92," for Tests 6, 7, 10 and 11.

The samples were returned to HIS for a functional evaluation.



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Figure 1: View of the test setup for Test 6 (mechanical shock) and Test 11 (sinusoidal vibration)
Vertical Axis



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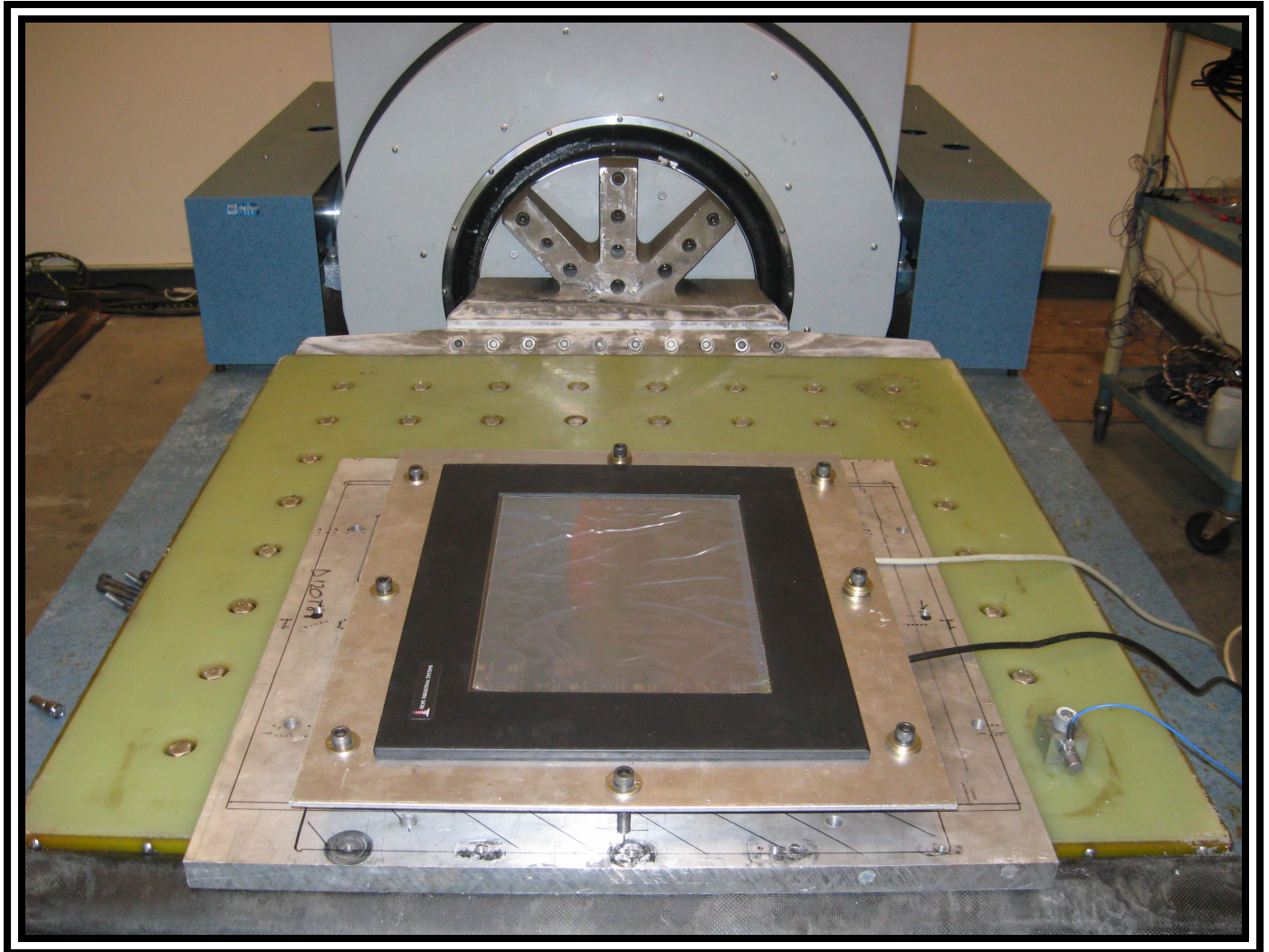


Figure 2: View of the test setup for Test 6 (mechanical shock) and Test 11 (sinusoidal vibration)
Horizontal Axes



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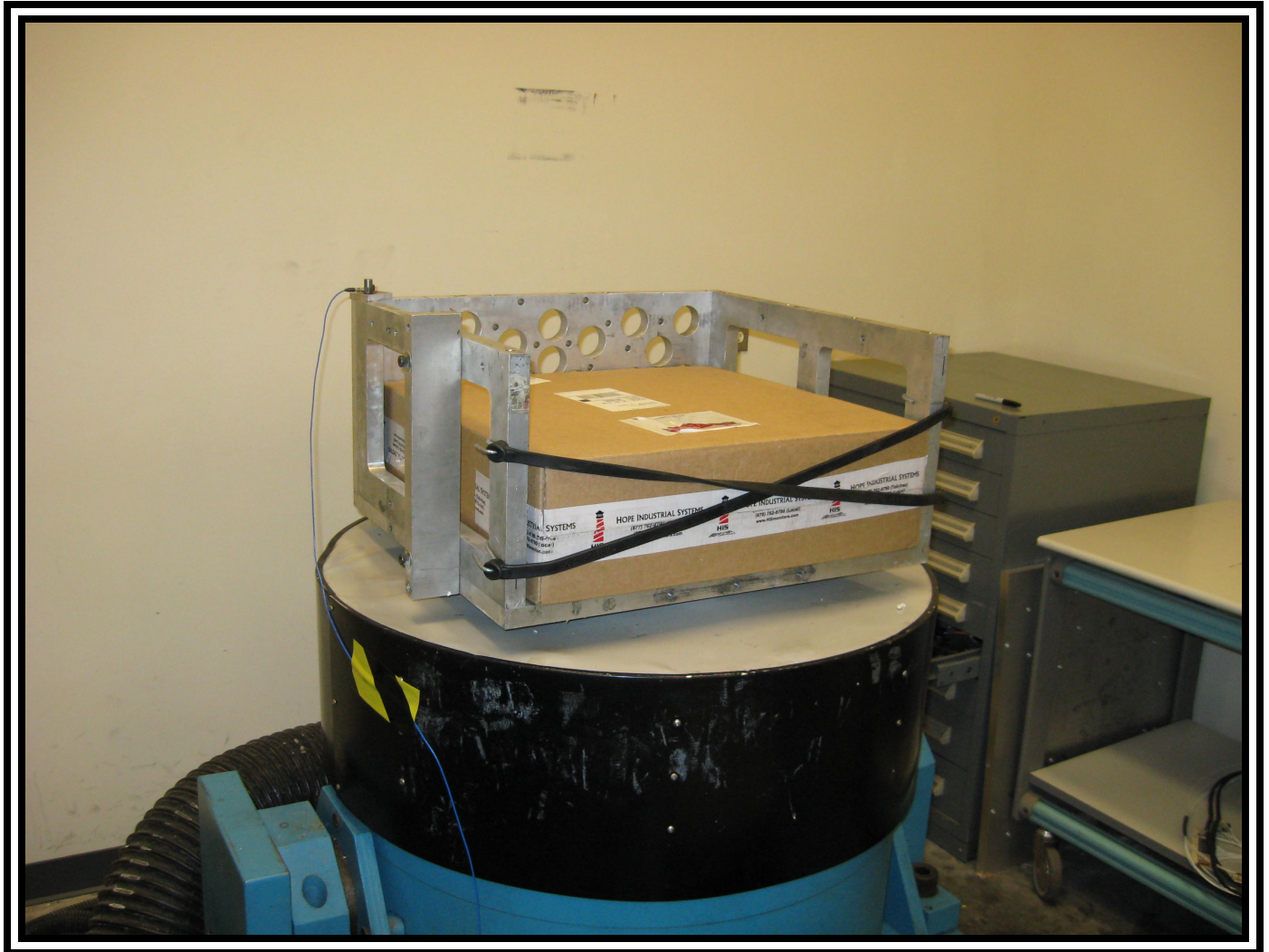


Figure 3: View of the test setup for Test 10 (random vibration)
Vertical Axis



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Figure 4: View of the test setup for Test 10 (random vibration)
Horizontal Axes



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Figure 5: Time history of a representative shock pulse (15g, 6ms, ½-sine) Positive Direction



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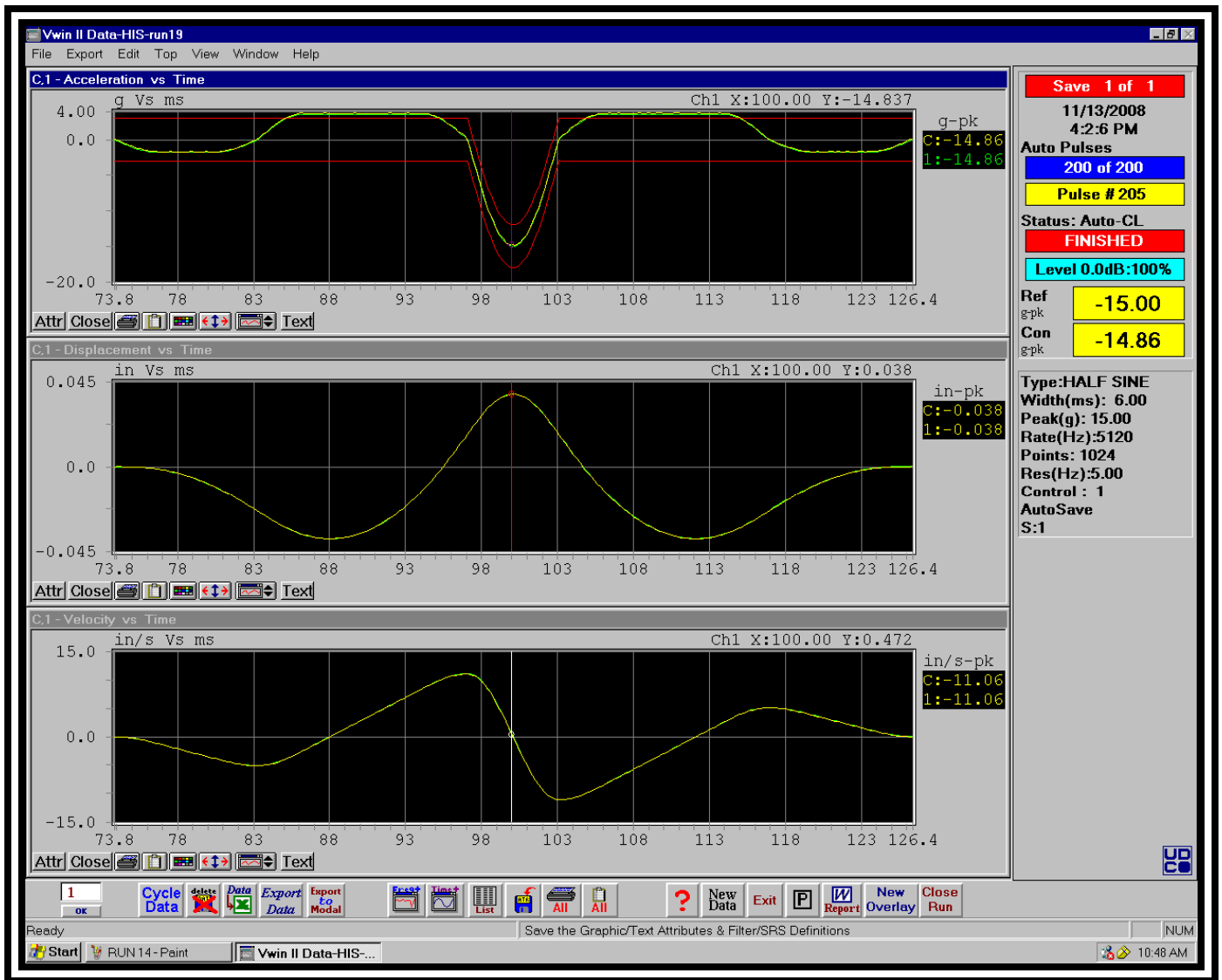


Figure 6: Time history of a representative shock pulse (15g, 6ms, ½-sine) Negative Direction



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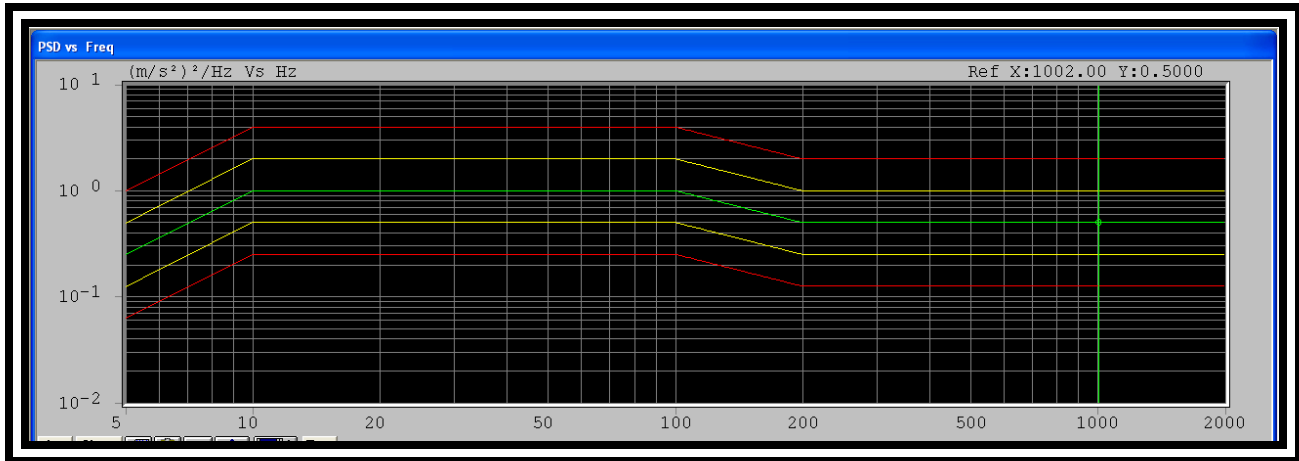


Figure 7: Random vibration profile used for Test 10



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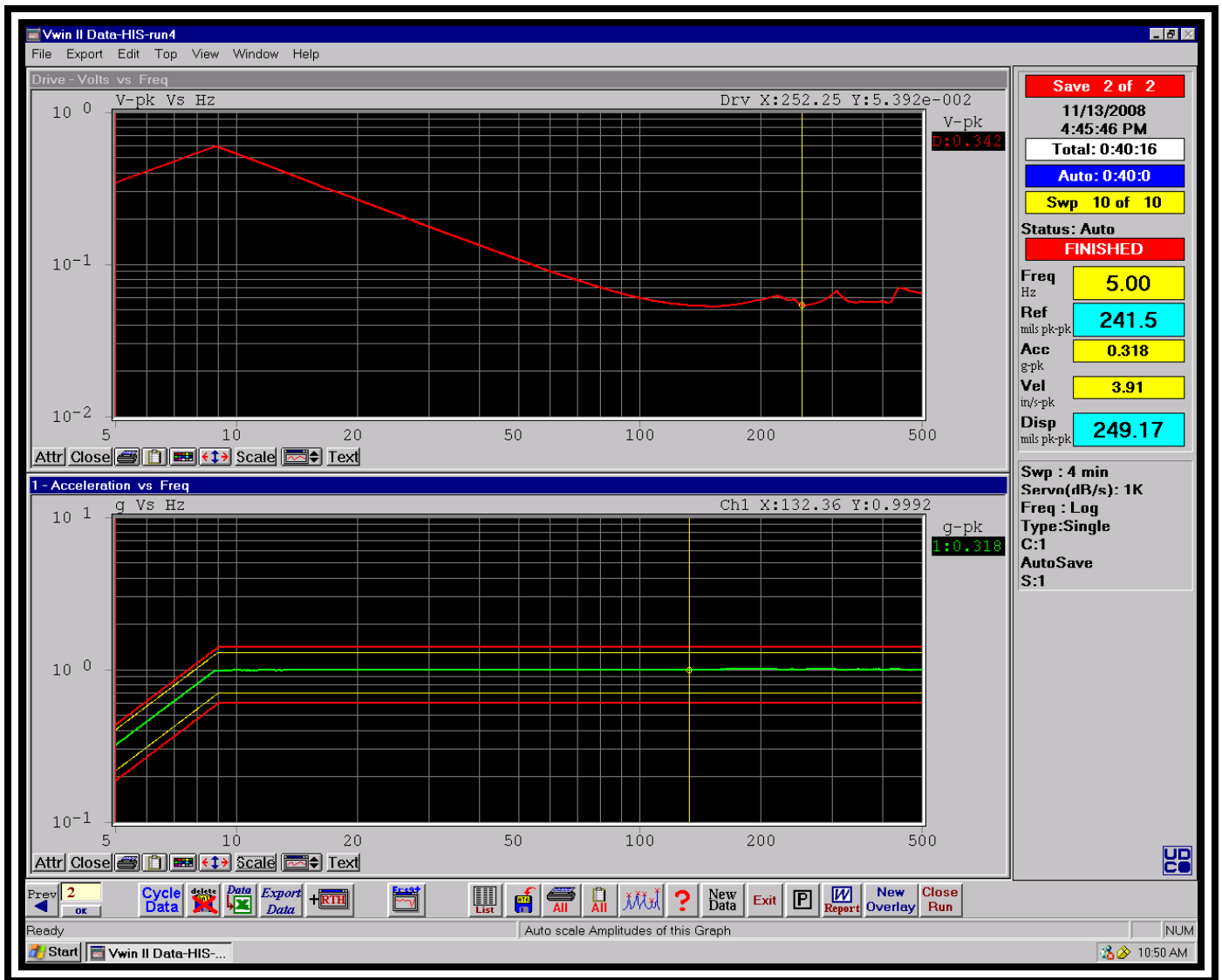


Figure 8: Sinusoidal sweep profile used for Test 11