

**Category 1 – Basic Transportation**

*i Objective*

To ensure product can withstand typical vibrations experienced in common transportation processes and road conditions from manufacturer to storage installation. This procedure is not intended to test for field transportation.

*ii Test Conditions*

Conditions are defined from figures 514.4-1 through 514.4-3, representing 1000 miles of US road transportation.

Test Duration (per axis)	Level in g's / Freq	Number of Cycles	Axis	Samples used
1hr	514.4-2	1	Transverse	1
1hr	514.4-1	1	Vertical	1
1hr	514.4-3	1	Longitudinal	1

Records of pre test conditions, both functional and visual inspection to be recorded. Sample to be inspected and functionally tested after all vibration tests are conducted. The unit should not fail during the vibration tests. Refer to I-4.10,11,12.

***Results***

Test conditions are covered by Single Axis Vibration Test Procedure 69314. Results are given in appendix A.

**TEST RESULT -PASS**

## Category 9 – Shipboard Vibration

### iii Objective

Designed to simulate the conditions experienced in shipboard applications, where vibration is experienced through the ship superstructure.

### iv Test Conditions

Guide lines for test conditions are in accordance to Fig 514.4-15 Random Vibration, non operational.

Test Duration (per axis)	Level in g's / Freq	Number of Cycles	Axis	Samples used
2 hrs	514.4-15	1	Transverse	1
2 hrs	514.4-15	1	Vertical	1
2 hrs	514.4-15	1	Longitudinal	1

Records of pre test conditions, both functional and visual inspection to be recorded. Sample to be inspected and functionally tested after all vibration tests are conducted. The unit should not fail LUK quality inspection standards nor post vibration functional test.

### **Results**

Product Code : NV1-350FF-N3-C  
Serial Number : 8051670013

The unit was ATE functional tested after Vibration test and Passed.  
The unit was inspected for any internal mechanical damage. No non-conforming issues were found.

Results are shown in Appendix B.

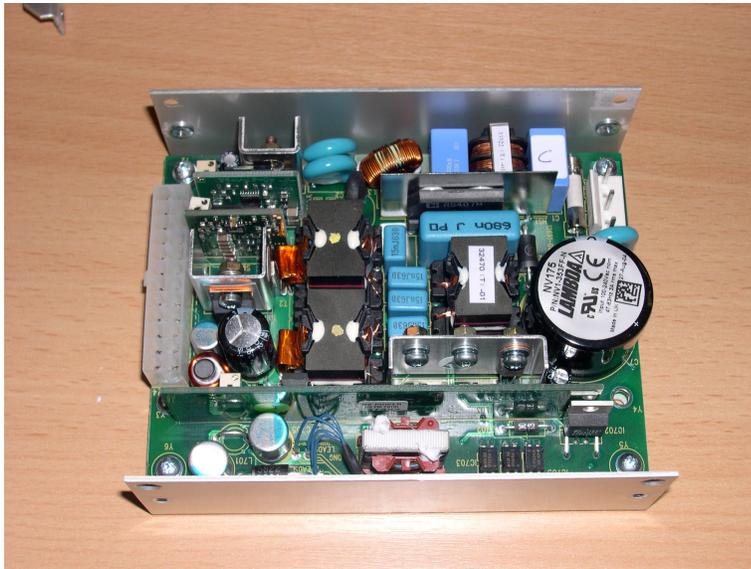
**TEST RESULT -PASS**

## Appendix A – Vibration Summary Report

### OBJECTIVE

To subject 5 off NV175 units to vibration testing to include a sweep test, resonance search and endurance at resonance.

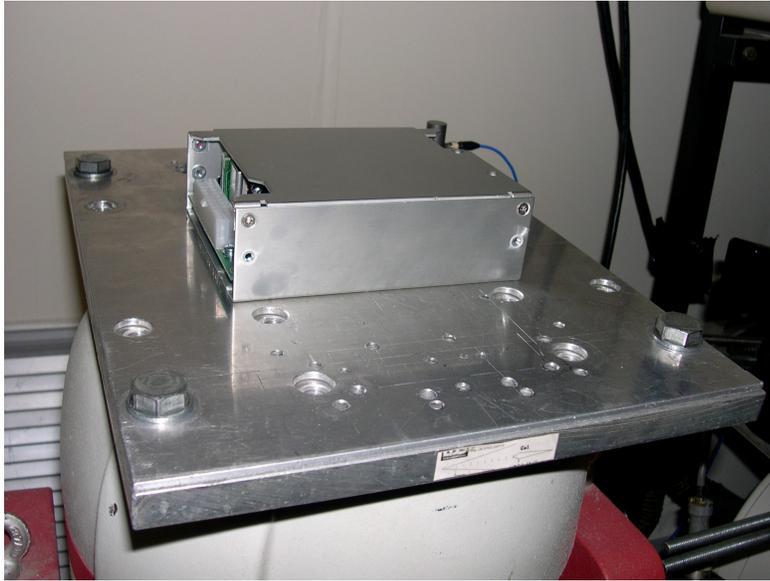
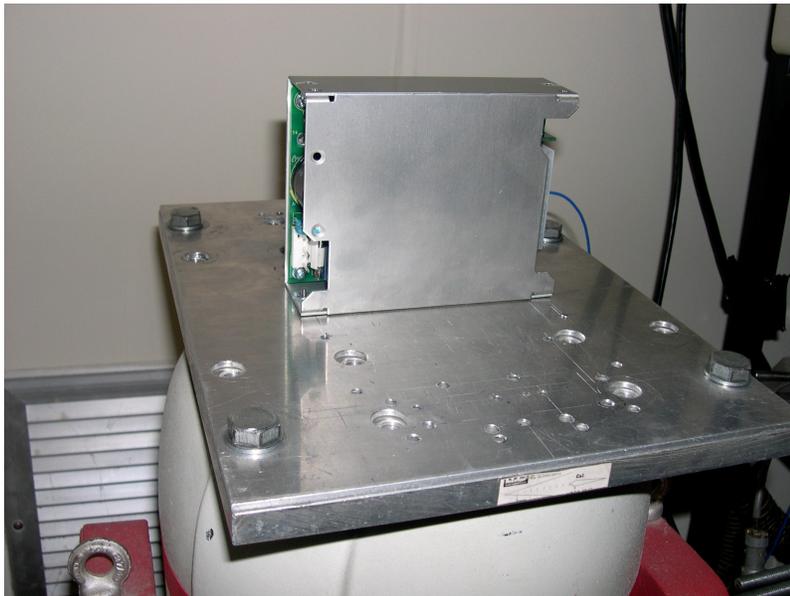
### TEST PROCEDURE



The unit tested was NV175 NV1-453-FF-N pictured above, which contained the following issue pcbs and was fitted with assembly 87381.

Converter pcb	12691 issue 1
Control pcb	12705 issue 1
Output pcbs	12707 issue 1
	12708 issue 1

The unit was subjected to the following test with the unit mounted in each of the three planes as indicated below .

**Plane 1 :****Plane 2 :**

**Plane 3 :**

The unit was mounted onto a 3mm flat or right angle aluminium plate using the M3 customer fixings. The plate was in turn mounted to the vibration table. Mechanical inspection and Electrical testing was performed before the test. The following tests were performed :

Sweep test from 10Hz to 500Hz to 10Hz for 10 cycles.

Resonance search at 2.2g between 10Hz and 500Hz .

Endurance testing at 2.2g for 1 hour at each of two selected frequencies .

The resonance search was performed with a stroboscope. The frequencies selected were observed worst case and the test was conducted on each of the three planes indicated in Fig. 1 .

Mechanical inspection and Electrical testing was performed following the sweep test and endurance testing.

**TEST RESULTS**

**Unit C**, serial number 8042310005

Resonant frequencies :      Plane 1 – 130Hz, 205Hz  
   Plane 2 – 127Hz, 223Hz  
   Plane 3 – 155Hz, 215Hz

Electrical test after vibration : **TEST RESULT -PASS**

**Unit D**, serial number 8042300076

Resonant frequencies :      Plane 1 – 127Hz, 217Hz  
   Plane 2 – 130Hz, 202Hz  
   Plane 3 – 155Hz, 234Hz

Electrical test after vibration : **TEST RESULT -PASS**

**Unit E**, serial number 8042300071

Resonant frequencies :      Plane 1 – 130Hz, 212Hz  
   Plane 2 – 130Hz, 210Hz  
   Plane 3 – 145Hz, 189Hz

Electrical test after vibration : **TEST RESULT -PASS****Unit F**, serial number 8042300077

Resonant frequencies :      Plane 1 – 128Hz, 209Hz  
   Plane 2 – 130Hz, 209Hz  
   Plane 3 – 146Hz, 195Hz

Electrical test after vibration : **TEST RESULT -PASS****Unit G**, serial number 8042300069

Resonant frequencies :      Plane 1 – 129Hz, 217Hz  
   Plane 2 – 130Hz, 217Hz  
   Plane 3 – 149Hz, 193Hz

Electrical test after vibration : **TEST RESULT -PASS**

**Appendix B – Random Vibration Summary**

**Sample Content**

1 off NV-175 PSU S/N 8051670013

**Equipment Used**

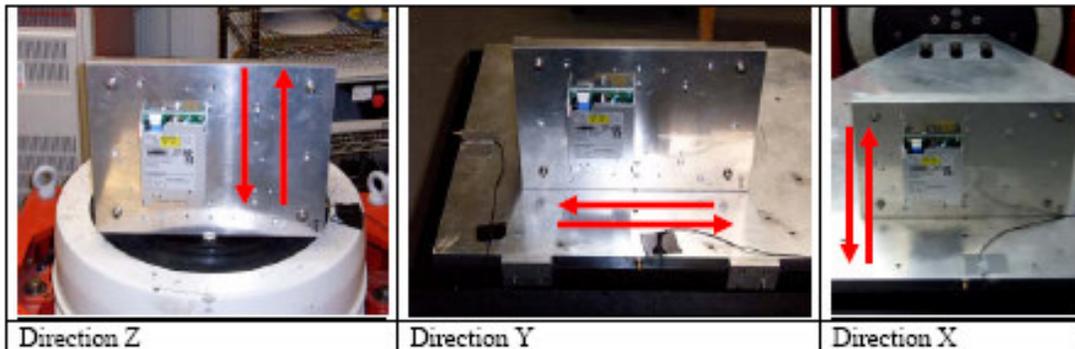
<i>Equipment used</i>	<i>ID No</i>	<i>Calibration due</i>
Shaker System	178 + 179	N/A
DVC 48 Vibration controller	15	22/10/05
Accelerometer	215	22/08/06
Accelerometer	238	22/04/06
Digital Camera	N/A	N/A

**Test Schedule**

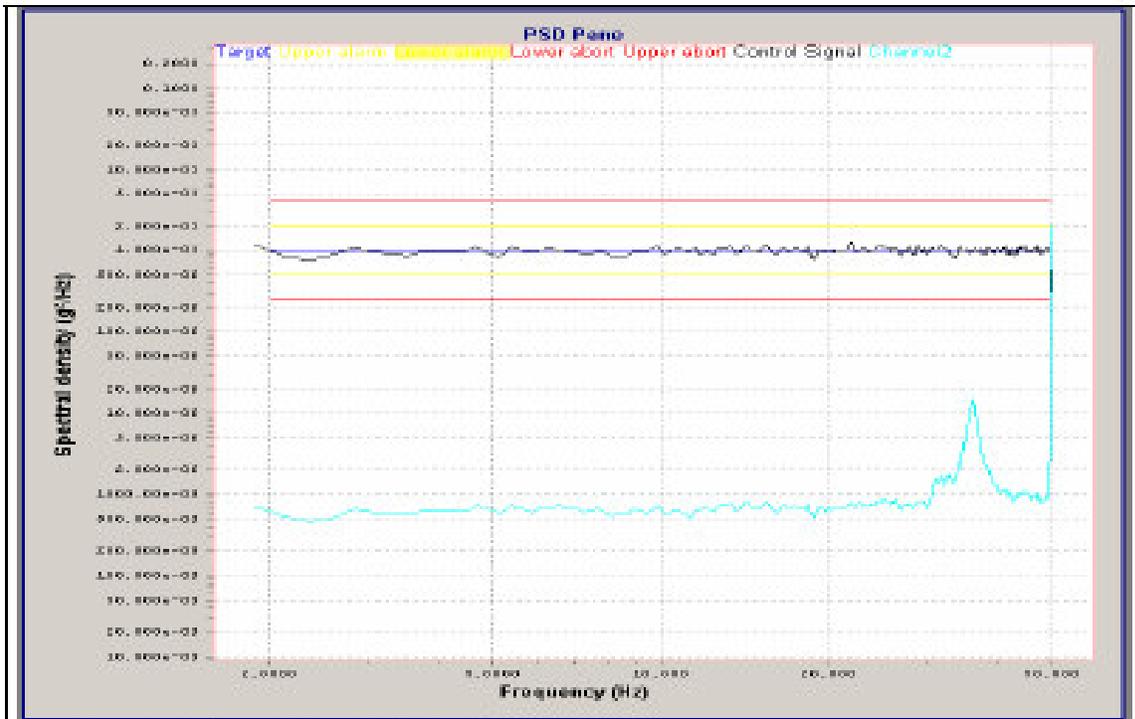
A Random vibration test was conducted generally in accordance with MIL810 E method 514.4. The following profile was used:-

2 – 50 Hz @ 0.001g<sup>2</sup>/Hz PSD

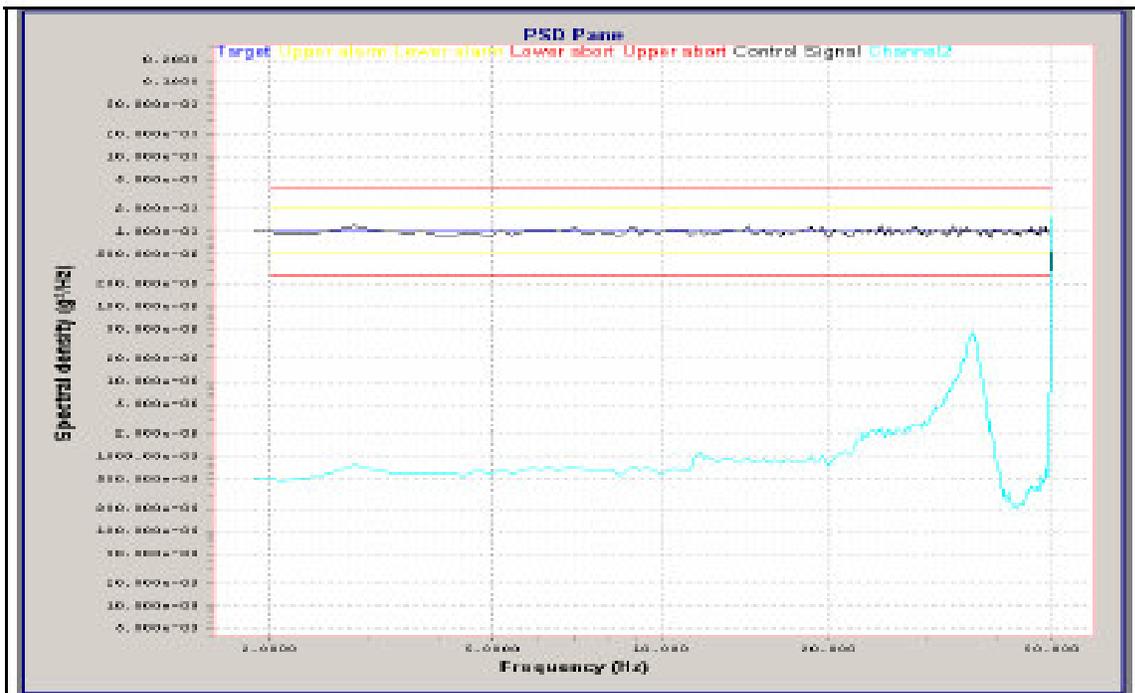
The sample was then fixed to the shaker and tested in the axis shown below.



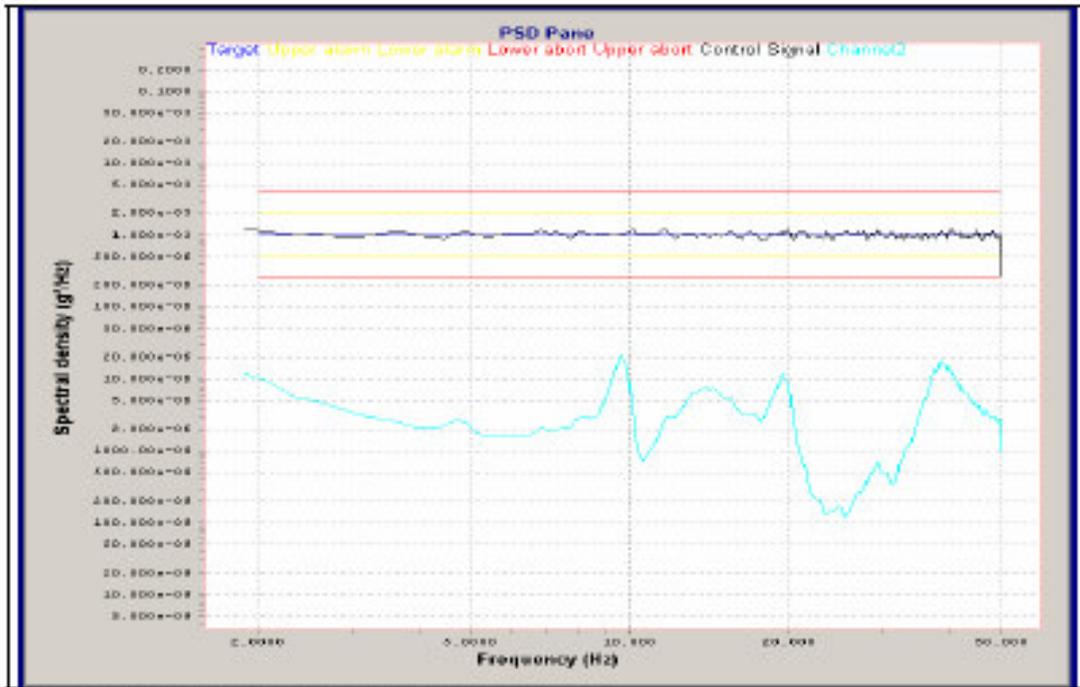
Typical PSD response for each axis of the test can be seen overleaf.



Direction X Black line control, Blue line cross axis



Direction Y Black line control, Blue line cross axis



Direction Z Black line control, Blue line cross axis

**Report Conclusion**

All testing was successfully completed and no observations made.

END OF REPORT