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
1hrs	514.4-2	1	Transverse	1
1hrs	514.4-1	1	Vertical	1
1hrs	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 : NV322GDM
Serial Number : 8052700036

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.

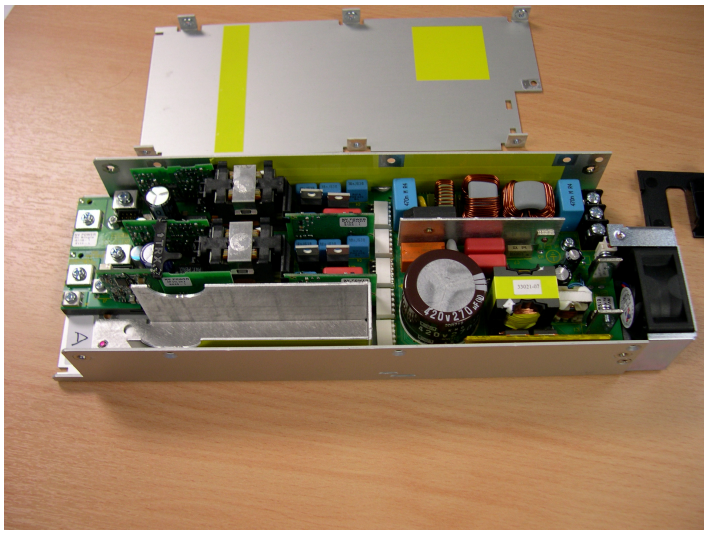
TEST RESULT -PASS

Appendix A – Vibration Summary Report

Objective

To subject 5 off NV350 units to vibration testing to include a sweep test, resonance search and endurance at resonance.

TEST PROCEDURE



The unit tested was NV350 NV3222N5, pictured above, which contained the following issue pcbs and was fitted with converter 7000-1, 5V single module 7130-1, 12/12 twin module 7260-1.

Converter pcb	12641 issue 1
5V module pcbs	12481 issue 1
	12482 issue 1
	12487 issue 1
12/12 module pcbs	12483 issue 1
	12482 issue 1
	12487 issue 1
	12489 issue 1
	12490 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 M4 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 after endurance testing.

TEST RESULTS

Unit A,
serial number 8041830001
Resonant frequencies : Plane 1 – 85Hz, 115Hz
Plane 2 – 103Hz, 138Hz
Plane 3 – 101Hz, 153Hz

Electrical test after sweep test : **TEST RESULT -PASS**
Electrical test after endurance test : **TEST RESULT -PASS**

Unit B, serial number 8041820002

Resonant frequencies : Plane 1 – 95Hz, 111Hz
Plane 2 – 102Hz, 134Hz
Plane 3 – 99Hz, 153Hz

Electrical test after sweep test : **TEST RESULT -PASS**
Electrical test after endurance test : **TEST RESULT -PASS**

Unit C, serial number 8041820001

Resonant frequencies : Plane 1 – 99Hz, 115Hz
Plane 2 – 100Hz, 134Hz
Plane 3 – 101Hz, 136Hz

Electrical test after sweep test : **TEST RESULT -PASS**
Electrical test after endurance test : **TEST RESULT -PASS**

Unit D, serial number 8041830002

Resonant frequencies : Plane 1 – 99Hz, 115Hz
Plane 2 – 101Hz, 134Hz
Plane 3 – 102Hz, 140Hz

Electrical test after sweep test : **TEST RESULT -PASS**
Electrical test after endurance test : **TEST RESULT -PASS**

Unit E, serial number 8041840003

Resonant frequencies : Plane 1 – 99Hz, 112Hz
Plane 2 – 101Hz, 133Hz
Plane 3 – 100Hz, 137Hz

Electrical test after sweep test : **TEST RESULT -PASS**
Electrical test after endurance test : **TEST RESULT -PASS**

EXTENDEND ENDURANCE TESTING AT RESONANCE

This test was in addition to the above and was for Engineering investigation only. The above test conforms to the published vibration specification.

The test was for two hours at each of the resonant frequencies above i.e two in each of the three planes.

Following this test, the unit was mechanically inspected and electrically tested. There were no further observations to those reported above and the unit passed the electrical test.

Appendix B – Random Vibration Summary

Sample Content

1 off NV350 PSU SN 8052700036

Equipment Used

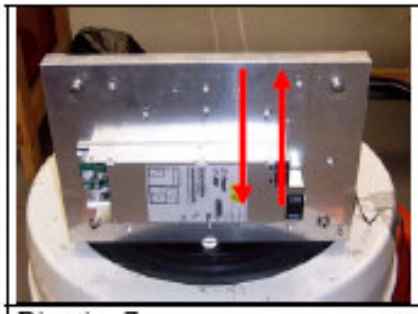
Equipment used	*ID No*	*Calibration due*
Shaker System	178 + 179	Monitored using calibrated equipment
DVC 48 Vibration controller	15	22/10/05
Accelerometer	215	22/08/06
Accelerometer	24	20/10/05
Digital Camera	N/A	N/A

Test Schedule

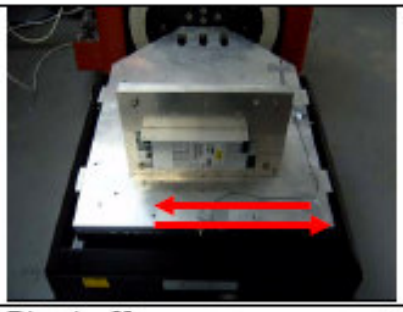
A Random vibration test was conducted generally in accordance with MIL810 E method 514.4. The following profile was used:-

2 – 50 Hz @ 0.001g2/Hz PSD

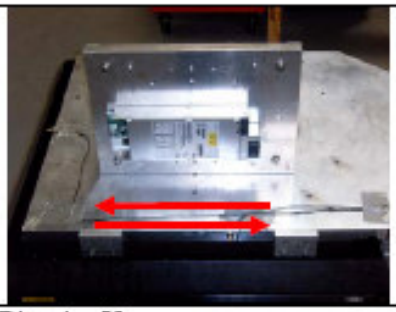
The sample was then fixed to the shaker and tested in the axis shown below.



Direction Z

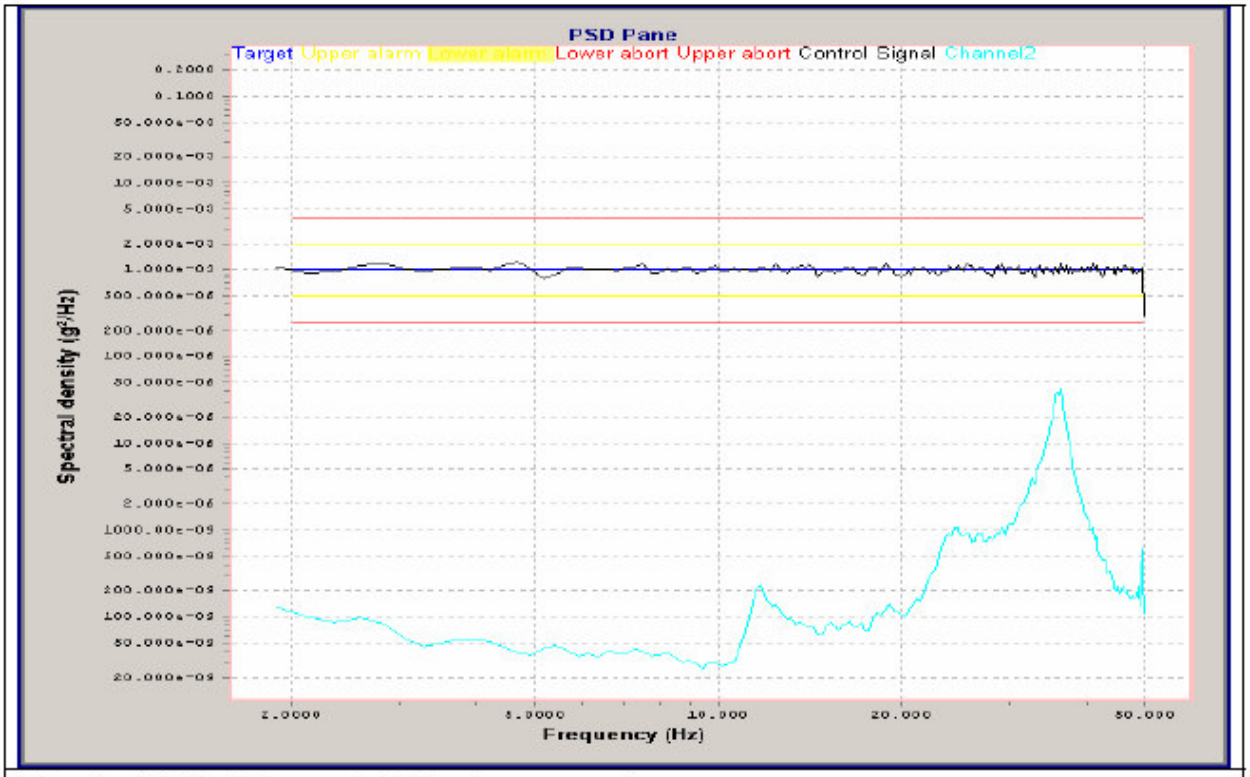


Direction X



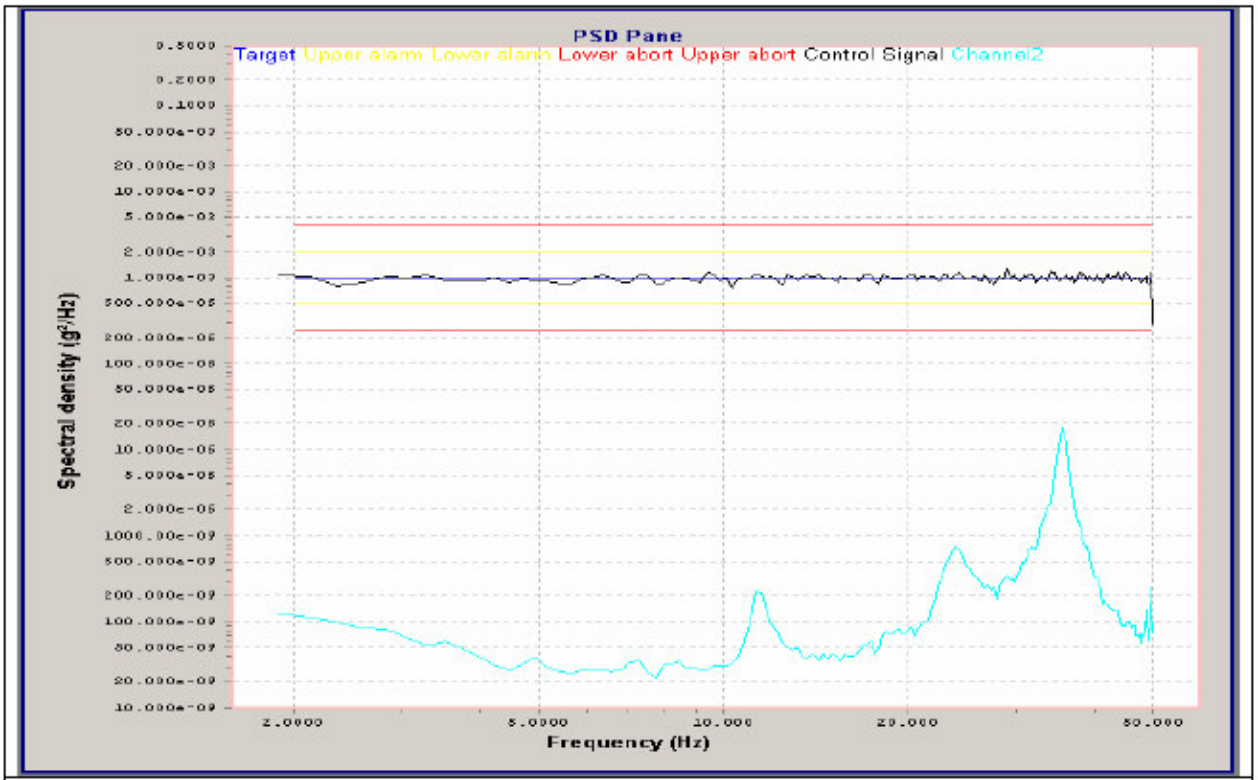
Direction Y

Typical Power Spectral Density plots for each test axis can be seen overleaf.

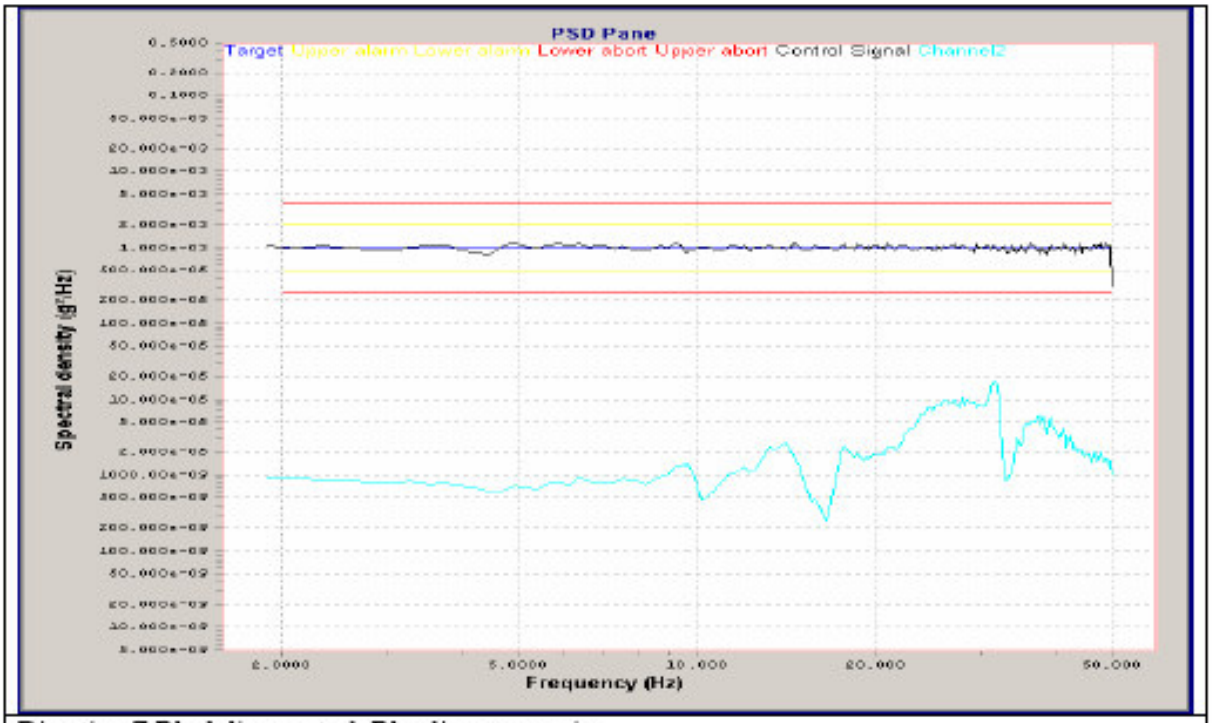


Direction Y Black line control, Blue line cross axis

Any opinions or interpretations expressed within this report, together with tests marked 'Non UKAS' are not included in the UKAS Accreditation Schedule for this Laboratory.



Direction X 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