Addendums (See separate document)

Addendum 1: DLT VS160e Engineering Test Report (230 VAC)

ENGINEERING TEST REPORT

NUMBER: 2L0341EEU1(Benchmark)

ON

Model No.(s):
DLT VS160e (Benchmark),
StorageWorks DLT-VS-160/320 External (HP),
DLT VS160 External Tape Drive (Tandberg)

IN ACCORDANCE WITH:
EN55022 FOR CLASS B
&
EN55024

TESTED FOR:
Benchmark Storage Innovations, Inc.
3122 Sterling Circle
Boulder, CO. 80301

TESTED BY:
NEMKO DALLAS, INC.
802 N. KEALY
LEWISVILLE, TEXAS 75057-3136

APPROVED BY: _____ DATE: 7/26/02

NVLAP®

NVLAP LAB CODE: 100426-0

Table of Contents

Section 1. Summary of Test Results

General:

All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with EN55022: 1998 for Class B Information Technology Equipment (CISPR 22: 1997) and EN55024: 1998 (EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, and EN61000-4-11) using the following test standards as test methodologies:

All tests were performed using measurement procedure CISPR 16. Radiated emissions were performed on an open area test site.

Abstract:

Emissions:

Name of Test	Basic Standard	Results
Conducted Emissions (Mains port)	EN 55022:1998 (CISPR 22:1997) Para. No. 5.1 (Table 2)	Complies
Radiated Emissions	EN 55022:1998 (CISPR 22:1997) Para. No. 6 (Table 6)	Complies
Harmonics	EN61000-3-2: 1995	Complies
Flicker	EN61000-3-3: 1994	Complies

Abstract: - Continued

Immunities:

Name of Test	Basic Standard	Test Specification	Performance	Results
Electrostatic Discharge	EN61000-4-2: 1995	4kV Contact Discharge 8 kV Air Discharge Additional ESD 12kV Air Discharge	B	Complies Complies Complies
Radiated Electro-magnetic Field	EN61000-4-3: 1996	80 to 1000 MHz 80% AM @ 1 kHz 3V/m	A	Complies
Electrical Fast Transients / Burst	EN61000-4-4: 1995	0.5 kV on I/O Signal and Control Lines 1kV on Power Supply	B	Complies
Surge Immunity	EN61000-4-5: 1995	I/O Surge 0.5 kV Line to Earth 2kV Line to Line 1kV	B	Complies
RF Conducted Immunity	EN61000-4-6: 1996	150 kHz to 80MHz 3 Vrms 80% Mod.	A	Complies
Magnetic Immunity	EN61000-4-8: 1993	10A/M @ 50Hz (For CRT 1A/M)	A	Complies
Voltage Dips and Interruptions	EN61000-4-11: 1994	95% Reduction (10ms) 30% Reduction (500ms) <95% Reduction (5s)	B C C	Complies Complies Complies

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THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE: **NONE**

Section 2. Equipment Under Test (E.U.T.)

Manufacturer:	Benchmark Storage Innovations, Inc.
Name:	External DLT Tape Drive
Model Number:	DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP), DLT VS160 External Tape Drive (Tandberg)
Serial Number:	PHJ2F0009
Part Number:	N/A
Production Status:	Production
E.U.T. Arrival Date:	7/15/02

Description of E.U.T.:

External DLT Tape Drive

Clock, Oscillator, Highest Frequencies Utilized:

22MHz, 40MHz, 45MHz, 60MHz, 80MHz, and 100MHz

Modifications Incorporated in E.U.T.:
The E.U.T. has not been modified from what is described by the brand name and unique type identification stated above.

Justification:

The E.U.T. was configured for testing as per typical installation. Position and bundling of cables were investigated to establish maximum amplitude of emissions.

The following combinations were investigated to establish worst case configuration:
External tape drive controlled by a PC through a SCSI connection

Exercise Program:

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise Mode:
Continuous write is worst case for Radiation Emissions

E.U.T. Photographs:

Section 3. Equipment Configuration

Equipment Configuration List:

EQUIPMENT CONFIGURATION LIST (HARDWARE/PERIPHERALS):

Place an "*" next to EUT and any item that is part of the EUT.

Item	*	Generic Description	Manufacturer	Model No.	Serial #	Rev.	FCC ID Status[1]
(A)	*	External Tape Drive	Benchmark	DLT VS160e	PHJ2F0009		
(B)		Keyboard	HP	C4744-60201	1H0480672B		DOC
(C)		Mouse	Logitech	M-S34	LZN02317723		DZL211029
(D)		Serial Mouse	Logitech	M-MC13-DB9F	LTO69125929		DZLMMC13
(E)		PC	Dell	DHM	31XQ311		DOC
(F)		Printer	HP	C3980A	USDG011464		B94C3980A
(G)		Monitor	Dell	M990	CM2519		A3KM085
(H)							
(I)							
(J)							
(K)							
(L)							

[1] FCC ID STATUS
1. FCC DOC
2. FCC A/B Verification
3. None - (If performing FCC testing, contact lab manager)
4. Certification (include FCC ID in parenthesis)

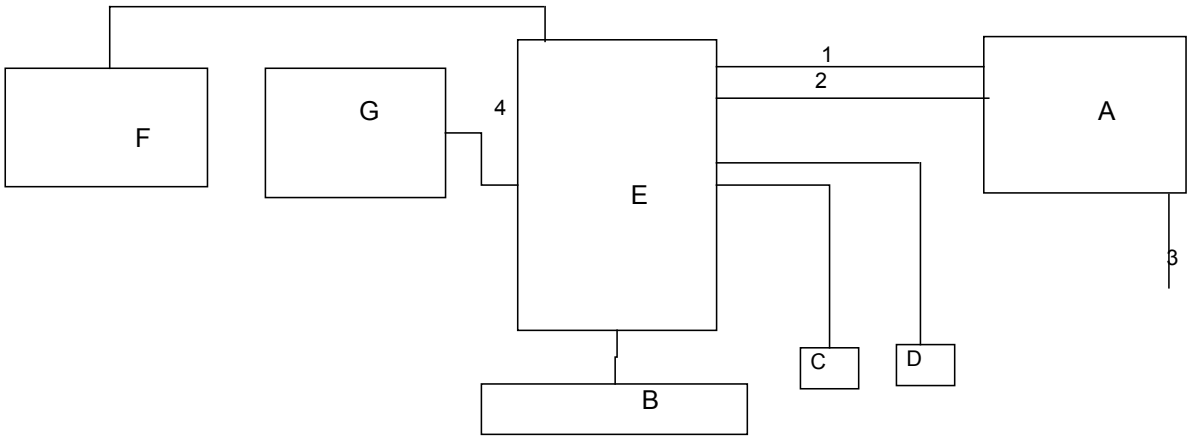
INTER-CONNECTION CABLES:

Place an "*" next to EUT and any item that is part of the EUT.

Item	*	Cable Type	Manufacturer	Ln (m)	Term[2]	Shield	Qty.
(1)		SCSI	Generic	2	3	foil/braid	1
(2)		SCSI	Generic	0.5	3	foil/braid	1
(3)		SCSI Terminator	Generic		4	Shielded	1
(4)		Video	Sony	1.5	1	Shielded	1
(5)							
(6)							
(7)							
(8)							
(9)							
(10)							
(11)							
(12)							
(13)							

[2] TERMINATION
1. Peripheral
2. Loopback
3. EUT
4. Resistive
5. Remote Equipment
6. Other _____

Configuration of the Equipment Under Test (E.U.T.):



Section 4. Conducted Emissions (Mains ports)

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits for conducted disturbance as defined by EN55022: 1998 for Class B Information Technology Equipment.

Specification Limits:

Limits for conducted disturbance at the mains ports

Frequency range MHz	Limits dB (μV)	
	Quasi-peak	Average
0.15 to 0.50	66-56	56 - 46
0.50 - 5.00	56	46
5.00 - 30.0	60	50
Notes: 1 The lower limit shall apply at the transition frequencies. 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

Test Method:

See Section 15.

Test # : CEPV-01

Tested By: Art Ruvalcaba

Date of Tests: 7/16/02

Test Conditions:
Test Voltage: 230 VAC

Temperature: 26˚C

Humidity: 37%

Test Results:

The E.U.T. complies.

The worst case emission is 44.2 dBuV at 0.218 MHz on the Neutral side of the line.
This is -18.7 dB below the quasi-peak specification limit of 62.9dBµV.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
696	AC Power source	Elgar	3001	305	CBU	N/A
1555	Filter high pass 5KHz	Solar Electronics	7930-5.0	933125	06/6/02	6/6/03
1553	CABLE 1m	KTL	RG223	N/A	8/6/01	8/6/02
1114	CABLE, 7m	KTL	RG223	N/A	11/9/01	N/A
1502	Quasi Peak Adapter	HP	A208051	60740636	9/27/01	9/26/02
1505	Test Receiver	Polorad	ESH-2	872095/002	1/24/02	1/24/03

Test Data – Conducted Emissions, Power Lines Test# CEPV-01

Conducted Emissions
Powerline Voltage Measurement

Complete	X			Job # : 2L0341E	Test # : CEPV-01
Preliminary				Page 1	of 1
Client Name :	Benchmark Storage Innovations, Inc.				
EUT Name :	External DLT Tape Drive				
EUT Model # :	DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandbe				
EUT Part # :	N/A				
EUT Serial # :	PHJ2F0009				
EUT Config. :	External tape drive controlled by a PC through a SCSI connection				
Specification :	EN 55022: 1998 Class B			Reference :	5.1
Transducer # :	696	Temp. (deg. C) :	26	Date :	7/16/02
HP Filter # :	1555	Humidity (%) :	37	Time :	8:40
Cable 1 # :	1553	EUT Voltage :	230 VAC	Staff :	Art Ruvalcaba
Cable 2 # :	1114	EUT Frequency :	50 Hz	Location :	Lab 5
Detector 1 # :	1502	Peak Bandwidth:	10kHz	Photo ID:	2L0341E CEPV-01
Detector 2 # :	1505	QP Bandwidth	10kHz		
Limiter # :	NA	Avg. Bandwidth	10kHz		

Meas. Freq. (MHz)	EUT Test Point	Detector Type (P,QP, A)	Limit Type (QP, A)	Meter Reading (dBuV)	Path Loss (dB)	Transducer Factor (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV) Q.P.	Spec.limit (dBuV) Avg.	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
0.15	H	QP	QP	43.0	0	0.2	43.2	66	56	-22.8	Pass	
0.15	H	A	A	18.0	0	0.2	18.2	66	56	-37.8	Pass	
0.218	H	QP	QP	42.0	0	0.2	42.2	62.9	52.895	-20.7	Pass	
0.218	H	A	A	26.0	0	0.2	26.2	62.9	52.895	-26.7	Pass	
0.325	H	QP	QP	26.2	0	0.2	26.4	59.58	49.578	-33.2	Pass	
0.325	H	A	A	14.0	0	0.2	14.2	59.58	49.578	-35.4	Pass	
20	H	P	A	19.0	0	0.5	19.5	60	50	-30.5	Pass	
21.4	H	P	A	23.0	0	0.5	23.5	60	50	-26.5	Pass	
23.3	H	P	A	24.4	0	0.5	24.9	60	50	-25.1	Pass	
24	H	P	A	23.5	0	0.5	24.0	60	50	-26.0	Pass	
30	H	P	A	22.9	0	0.5	23.4	60	50	-26.6	Pass	
0.15	N	QP	QP	46.0	0	0.2	46.2	66	56	-19.8	Pass	
0.15	N	A	A	18.0	0	0.2	18.2	66	56	-37.8	Pass	
0.218	N	QP	QP	44.0	0	0.2	44.2	62.9	52.895	-18.7	Pass	
0.218	N	A	A	31.0	0	0.2	31.2	62.9	52.895	-21.7	Pass	
0.327	N	QP	QP	23.0	0	0.2	23.2	59.53	49.527	-36.3	Pass	
0.327	N	A	A	12.0	0	0.2	12.2	59.53	49.527	-37.3	Pass	
10	N	P	A	25.8	0	0.2	26.0	60	50	-24.0	Pass	
21.4	N	P	A	22.0	0	0.5	22.5	60	50	-27.5	Pass	
23.3	N	P	A	24.8	0	0.5	25.3	60	50	-24.7	Pass	
24	N	P	A	22.7	0	0.5	23.2	60	50	-26.8	Pass	
30	N	P	A	23.7	0	0.5	24.2	60	50	-25.8	Pass	
											Scanned .150-30 MHz	

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Test Photographs - Test # CEPV-01

Section 5. Radiated Emissions

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits for radiated emissions as defined by EN55022: 1998 for Class B Information Technology Equipment.

Specification Limits:

Limits for radiated disturbance of Class B

Frequency range MHz	Quasi-peak Limits dB (μV/m) @ 10 m
30 to 230	30.0
230 to 1000	37.0
Notes: 1. The lower limit shall apply at the transition frequency. 2. Additional provisions may be required for cases where interference occurs.	

Test Method:

See Section 15.

Test # : REHE-01

Tested By: Art Ruvalcaba

Date of Tests: 7/15/02

Test Conditions:
Test Voltage: 230 VAC

Temperature: 27˚C

Humidity: 37%

Test Results:

The E.U.T. complies.

The worst case emission is 21.4 dBuV/m at 52 MHz in the Vertical polarity.
This is -8.6 dB below the quasi-peak specification limit of 30.0dBµV/m.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
760	Antenna biconical	Electro Metrics	MFC-25	477	5/9/02	5/9/03
1034	ANTENNA,LP	A.H. SYSTEMS	SAS-200/510	121	5/9/02	5/9/03
1522	Cable Assy, LAB 5 - DOATS	KTL	Site D OATS	N/A	1/21/02	1/21/03
1554	Amplifier, RF	RF Consultants	LNA-25	933125	11/9/01	11/9/02
1193	LIMITER	FISCHER	FCC-450B-1.25N	956	1/17/02	1/17/03
1502	Quasi Peak Adapter	HP	A208051	1950A01177	9/26/01	9/26/02

Test Data – Radiated Emissions, Electric Field, Test# REHE-01

Radiated Emissions Data

Complete	X			Job # : 2L0341E	Test # : REHE-01
Preliminary				Page 1	of 1
Client Name :	Benchmark Storage Innovations, Inc.				
EUT Name :	External DLT Tape Drive				
EUT Model # :	DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)				
EUT Part # :	N/A				
EUT Serial # :	PHJ2F0009				
EUT Config. :	External tape drive controlled by a PC through a SCSI connection				
Specification :	EN55022: 1998, Class B			Reference :	5.1
Rod. Ant. #:	NA	Temp. (deg. C) :	27	Date :	7/15/02
Bicon Ant.#:	760	Humidity (%) :	37	Time :	10:53
Log Ant.#:	1034	EUT Voltage :	230 VAC	Staff :	Art Ruvalcaba
Bilog Ant.#:	NA	EUT Frequency :	50 Hz	Photo ID:	2L0341E REHE-01
Dipole Ant.#:	NA	Phase:	Single	Peak Bandwidth:	100kHz
Cable#:	1522	Location:	DOATS	Video Bandwidth	100kHz
Preamp#:	1554	Distance:	10m		
Limiter#:	1193				
Atten #:	NA				
Detector#:	1502				

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
40	V	0	22.6	12.5	2.3	24.3	13.1	30.0	-16.9	Pass	
43	V	0	24.54	11.8	2.3	24.3	14.3	30.0	-15.7	Pass	
46	V	0	28.2	11	2.3	24.3	17.2	30.0	-12.8	Pass	
49.8	V	0	32.2	10.1	2.3	24.3	20.3	30.0	-9.7	Pass	
52	V	0	34	9.6	2.8	24.2	22.2	30.0	-7.8	Pass	REFER TO QP
52	V	0	33.2	9.6	2.8	24.2	21.4	30.0	-8.6	Pass	QP
96	V	0	30.2	10.2	3.3	24.4	19.3	30.0	-10.7	Pass	
120	V	0	21.2	12.4	3.9	24.2	13.3	30.0	-16.7	Pass	
144	V	0	21	13.1	4.3	24.4	14.0	30.0	-16.0	Pass	
147	V	0	20	13.1	4.3	24.4	13.0	30.0	-17.0	Pass	
240	V	0	23.4	14.6	5.6	24.3	19.3	37.0	-17.7	Pass	
49.8	H	0	27.3	10.1	2.3	24.3	15.4	30.0	-14.6	Pass	
96	H	0	21.5	10.2	3.3	24.4	10.6	30.0	-19.4	Pass	
120	H	0	24	12.4	3.9	24.2	16.1	30.0	-13.9	Pass	
144	H	0	22.1	13.1	4.3	24.4	15.1	30.0	-14.9	Pass	
360	V	0	25.1	15.5	6.8	24.5	22.9	37.0	-14.1	Pass	
400	V	0	21.4	15.9	8.2	24.4	21.1	37.0	-15.9	Pass	
										Scanned 30-1000 MHz	

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Test Photographs - Test # REHE-01

Section 6. Harmonics

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits on the magnitude of harmonic currents created by the equipment, as specified in EN 61000-3-2: 1995.

Specification Limits:

For Class A equipment, the harmonics of the input current shall not exceed the maximum permissible values given in Table 1 multiplied by a factor of 1.5.

Table 1 – Limits for Class A equipment.

Harmonic order n	Maximum permissible Harmonic current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	0.15 15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	0.23 8/n

Test Method:

See Section 15.

Test # : **Harm-01**

Tested By: **Art Ruvalcaba**

Date of Tests: **7/17/02**

Test Conditions:

Test Voltage: 230 VAC

Temperature: 24˚C

Humidity: 44%RH

Test Results:

The E.U.T. complies.

TEST EQUIPMENT

Number	Description	Manufacturer	Model Number	Serial Number	Calibrated	Due
793	Analyzer Harmonics	Combinova	300	115	7/9/02	7/9/03

Test Data – Harmonics Test# HARM-01

combinova ANALYZER 300 2002.07.17 07:17:16

Harmonics

Setup: 2L0341E
Live
Module: M1

Gen setting: 1(1) U : 229.72 V fu: 50.000 Hz
Analysed periods: 4 I : 224.4 mA P: 23.2 W
Limit: Class A (Standard) I1:103.2 mA
Note:
THD=88.77 % PASSED

No	A	Lim A	No	A	Lim A	No	A	Lim A
1	0.10324		15	0.03786	0.15000	29	0.00846	0.07759
2	0.00035	1.08000	16	0.00014	0.11500	30	0.00006	0.06133
3	0.09793	2.30000	17	0.02674	0.13235	31	0.00796	0.07258
4	0.00034	0.43000	18	0.00011	0.10222	32	0.00006	0.05750
5	0.09209	1.14000	19	0.01709	0.11842	33	0.00665	0.06818
6	0.00033	0.30000	20	0.00007	0.09200	34	0.00005	0.05412
7	0.08360	0.77000	21	0.00955	0.10714	35	0.00483	0.06429
8	0.00029	0.23000	22	0.00005	0.08364	36	0.00004	0.05111
9	0.07336	0.40000	23	0.00561	0.09783	37	0.00289	0.06081
10	0.00026	0.18400	24	0.00004	0.07667	38	0.00003	0.04842
11	0.06192	0.33000	25	0.00622	0.09000	39	0.00141	0.05769
12	0.00022	0.15333	26	0.00006	0.07077	40	0.00003	0.04600
13	0.04986	0.21000	27	0.00782	0.08333			
14	0.00018	0.13143	28	0.00006	0.06571			

Current range: 1 Ap

Next measure
Change to graph
Relative current
Write to disk

Appl: 1 1.2.2

Nemko

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Complete X
Preliminary

Job # : 2L0341E Test # : HARM-01
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Client Name : Benchmark Storage Innovations, Inc.
EUT Name : External DLT Tape Drive
EUT Model # : DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP), DLT VS160 External Tape Drive (Tandberg)
EUT Part # : N/A
EUT Serial # : PHJ2F0009
EUT Config. : External tape drive controlled by a PC through a SCSI connection

Specification : IEC 1000-3-2/3
Transducer # : 793
Power Supply#: 795

Temp. (deg. C) : 24
Humidity (%) : 44
EUT Voltage : 230 Vac
EUT Frequency : 50 Hz

Reference :
Date : 7/17/02
Time : 8:00
Staff : Art
Location : Lab 6
Photo ID: 2L0341E HARM-01

Harmonics Test Photographs:

Section 7. Flicker

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits on the level of voltage fluctuations produced by the equipment, as specified in EN 61000-3-3: 1995.

Specification Limits:

The limits shall be applicable to voltage fluctuations and flicker at the supply terminals of the equipment under test.

The following limits apply:

- The value of P_{st} shall not be greater than 1.0.
- The value of P_{lt} shall not be greater than 0.65.
- The relative steady-state voltage change, $d_{c,}$ shall not exceed 3%.
- The maximum relative voltage change, $d_{max,}$ shall not exceed 4%.
- The value of *d(t)* during a voltage change shall not exceed 3% for more than 200 ms.

If voltage changes are caused by manual switching or occur less frequently than once per hour, the P_{st} and P_{lt} requirements shall not be applicable. The three requirements related to voltage changes shall be applicable with the previously mentioned voltage values, multiplied by a factor of 1.33.

Test Method:

See Section 15.

Test # : **Flic-01**

Tested By: **Art Ruvalcaba**

Date of Tests: **7/17/02**

Test Conditions:

Test Voltage: 230 VAC

Temperature: 24˚C

Humidity: 44%RH

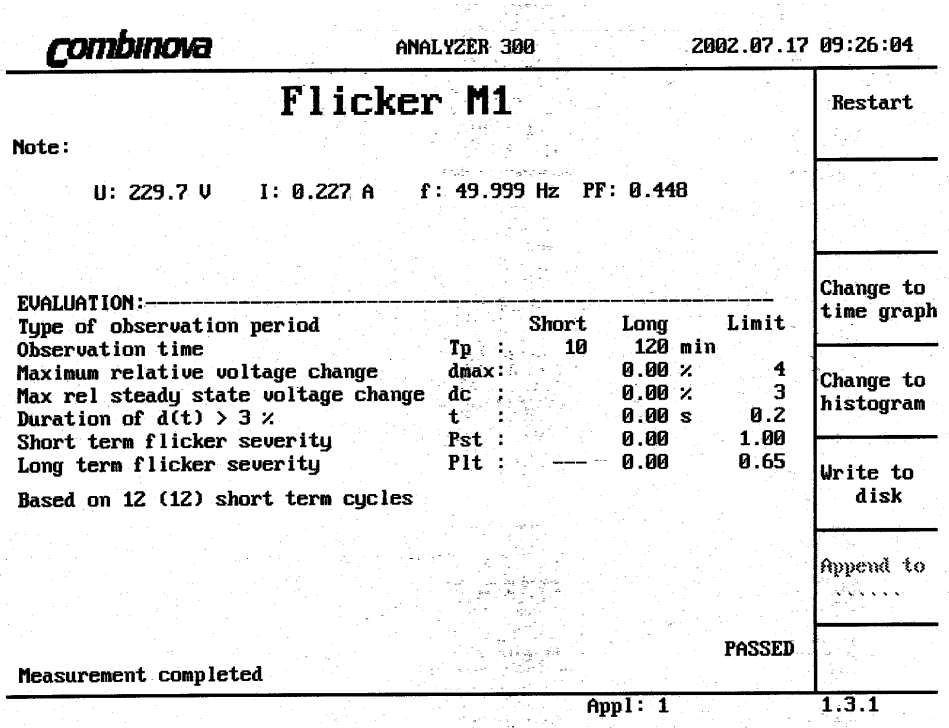
Test Results:

The E.U.T. complies.

TEST EQUIPMENT

Number	Description	Manufacturer	Model Number	Serial Number	Calibrated	Due
793	Analyzer Harmonics	Combinova	300	115	7/9/02	7/9/03

Test Data – Flicker Test# FLIC-01



combinova ANALYZER 300 2002.07.17 09:26:04

Flicker M1

Restart

Note:

U: 229.7 V I: 0.227 A f: 49.999 Hz PF: 0.448

Change to time graph

EVALUATION:

Type of observation period		Short	Long	Limit
Observation time	Tp :	10	120 min	
Maximum relative voltage change	dmax:		0.00 %	4
Max rel steady state voltage change	dc :		0.00 %	3
Duration of d(t) > 3 %	t :		0.00 s	0.2
Short term flicker severity	Pst :		0.00	1.00
Long term flicker severity	Plt :	---	0.00	0.65

Change to histogram

Based on 12 (12) short term cycles

Write to disk

Append to .....

PASSED

Measurement completed

Appl: 1 1.3.1

Nemko

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Complete X
Preliminary

Job # : 2L0341E Test # : FLIC-01
Page 1 of 1

Client Name : Benchmark Storage Innovations, Inc.
EUT Name : External DLT Tape Drive
EUT Model # : DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP), DLT VS160 External Tape Drive (Tandberg)
EUT Part # : N/A
EUT Serial # : PHJ2F0009
EUT Config. : External tape drive controlled by a PC through a SCSI connection

Specification : IEC 1000-3-2/3 Reference :
Transducer # : 793 Temp. (deg. C) : 24 Date : 7/17/02
Power Supply#: 795 Humidity (%) : 44 Time : 8:00
EUT Voltage : 230 Vac Staff : Art
EUT Frequency : 50 Hz Location : Lab 6
Photo ID: 2L0341E FLIC-01

Flicker Test Photographs:

Section 8. Electrostatic Discharge Immunity

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to electrostatics discharges.

Minimum Performance Criteria B

Performance Criteria:

Criteria A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

Test Method:

See Section 15.

Test # : ESDI-01

Tested By: Art Ruvalcaba

Date of Tests: 07/18/02

Test Conditions:
Test Voltage: 230

Temperature: 26˚C

Humidity: 39%

Test Results:

The E.U.T. complies.
The E.U.T. meets Performance Criteria A.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
565	Vertical coupling plane	ICC	NONE	449	CNR	CNR
560	ESD Simulator	Keytek	MZ-15/AC	9205392	10/25/01	10/25/02
1247	940 OHM GROUND STRAP	ICC	NONE	NONE	CNU	CNU

CNU = Calibration Not Required

Test Data – Electrostatic Discharge Test# ESDI-01

Electrostatic Discharge Data

Complete X | Job # : 2L0341E | Test # : ESDI-01
Preliminary | Page 1 of 2

Client Name : Benchmark Storage Innovations, Inc.
EUT Name : External DLT Tape Drive
EUT Model # : DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)
EUT Part # : N/A
EUT Serial # : PHJ2F0009
EUT Config. : External tape drive controlled by a PC through a SCSI connection

Specification : EN 55024 | Reference : IEC 61000-4-2
ESD Generator#: 560 | Temp. (deg. C) : 26 | Date : 7/18/02
Cable#: 1247 | Humidity (%) : 39 | Time : 14:10
EUT Voltage : 230 | Staff : Art Ruvalcaba
1. HCP X | EUT Frequency : 50 | Photo ID: 2L0341E ESDI-01
2. VCP X | Phase: Single | Performance Criteria: B
3 Top of EUT(middle) | Location: Lab 5 | Table Top or Floor Table
4. Top of EUT(back left) | 7. Top of EUT(front left) | 10. LEDs
5. Top of EUT (back right) | 8. Side of EUT(middle,front,back) right & left) | 11 Eject Buttons
6. Top of EUT(front right) | 9. Back of EUT,Mounting screws & Fan cover) | 12. Rear connectors
Does product have any type of insulated coating on exterior surfaces? Yes ____ No X
If yes, indicate where: ____

Test Point	ESD Level (kV)	Polarity	Contact or Air	Application Quantity	Effect Qty	Effects Type	Pass or Fail	Comments
1	2	(+/-)	Contact	25 / each	0	N/A	Pass	
1	4	(+/-)	Contact	25 / each	0	N/A	Pass	
1	8	(+/-)	Contact	25 / each	0	N/A	Pass	
2	2	(+/-)	Contact	25 / each	0	N/A	Pass	
2	4	(+/-)	Contact	25 / each	0	N/A	Pass	
2	8	(+/-)	Contact	25 / each	0	N/A	Pass	
3	2	(+/-)	Contact	25 / each	0	N/A	Pass	no Discharge
3	4	(+/-)	Contact	25 / each	0	N/A	Pass	
3	8	(+/-)	Contact	25 / each	0	N/A	Pass	
4	2	(+/-)	Contact	25 / each	0	N/A	Pass	no Discharge
4	4	(+/-)	Contact	25 / each	0	N/A	Pass	
4	8	(+/-)	Contact	25 / each	0	N/A	Pass	
5	2	(+/-)	Contact	25 / each	0	N/A	Pass	no Discharge
5	4	(+/-)	Contact	25 / each	0	N/A	Pass	
5	8	(+/-)	Contact	25 / each	0	N/A	Pass	
6	2	(+/-)	Contact	25 / each	0	N/A	Pass	no Discharge
6	4	(+/-)	Contact	25 / each	0	N/A	Pass	
6	8	(+/-)	Contact	25 / each	0	N/A	Pass	
7	2	(+/-)	Contact	25 / each	0	N/A	Pass	no Discharge
7	4	(+/-)	Contact	25 / each	0	N/A	Pass	
7	8	(+/-)	Contact	25 / each	0	N/A	Pass	

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Test Data – Electrostatic Discharge Test# ESDI-01Cont.

Electrostatic Discharge Data

Complete X
Preliminary

Job # : 2L0341E Test # : ESDI-01
Page 2 of 2

Client Name : Benchmark Storage Innovations, Inc.
EUT Name : External DLT Tape Drive
EUT Model # : DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)
EUT Part # : N/A
EUT Serial # : PHJ2F0009
EUT Config. : External tape drive controlled by a PC through a SCSI connection

Specification : EN 55024 Reference : IEC 61000-4-2

Test Point	ESD Level (kV)	Polarity	Contact or Air	Application Quantity	Effect Qty	Effects Type	Pass or Fail	Comments
8	2	(+/-)	Contact	25 / each	0	N/A	Pass	No Discharge
8	4	(+/-)	Contact	25 / each	0	N/A	Pass	
8	8	(+/-)	Contact	25 / each	0	N/A	Pass	
9	2	(+/-)	Contact	25 / each	0	N/A	Pass	No Discharge
9	4	(+/-)	Contact	25 / each	0	N/A	Pass	
9	8	(+/-)	Contact	25 / each	0	N/A	Pass	
10	2	(+/-)	Air	25 / each	0	N/A	Pass	No Discharge
10	4	(+/-)	Air	25 / each	0	N/A	Pass	No Discharge
10	8	(+/-)	Air	25 / each	0	N/A	Pass	
10	12	(+/-)	Air	10 / each	0	N/A	Pass	
11	2	(+/-)	Air	25 / each	0	N/A	Pass	No Discharge
11	4	(+/-)	Air	25 / each	0	N/A	Pass	No Discharge
11	8	(+/-)	Air	25 / each	0	N/A	Pass	
11	12	(+/-)	Air	10 / each	0	N/A	Pass	
12	2	(+/-)	Air	25 / each	0	N/A	Pass	No Discharge
12	4	(+/-)	Air	25 / each	0	N/A	Pass	No Discharge
12	8	(+/-)	Air	25 / each	0	N/A	Pass	
12	12	(+/-)	Air	10 / each	0	N/A	Pass	
13	2	(+/-)	Air	25 / each	0	N/A	Pass	No Discharge (SCSI Terminator-LED)
13	4	(+/-)	Air	25 / each	0	N/A	Pass	No Discharge
13	8	(+/-)	Air	25 / each	0	N/A	Pass	
13	12	(+/-)	Air	10 / each	0	N/A	Pass	
								Additional Test " Survival "
								Unit lost link , Unit functioned afterwwards
10	25	(+/-)	Air	25 / each	0	N/A	Pass	
11	25	(+/-)	Air	25 / each	0	N/A	Pass	
12	25	(+/-)	Air	25 / each	0	N/A	Pass	
13	25	(+/-)	Air	25 / each	0	N/A	Pass	

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Test Photographs - Test # ESDI-01

Section 9. Radiated Electromagnetic Immunity

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to radiated electromagnetic field energy.

Minimum Performance Criteria A

Performance Criteria:

Criteria A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

Test Method:

See Section 15.

Test # : RIHE-01

Tested By: Art Ruvalcaba

Date of Tests: 07/18/02

Test Conditions:
Test Voltage: 230

Temperature: 25˚C

Humidity: 45%

Test Results:

The E.U.T. complies.
The E.U.T. meets Performance Criteria A.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
411	SIGNAL GENERATOR	MARCONI	2022D	119223029	CNR	N/A
1990	CABLE, 4.8m	KTL	RG214	N/A	3/5/02	3/5/03
1039	CABLE, 8.5m	KTL	RG223	N/A	3/5/02	3/5/03
808	CABLE, 9.5m	KTL	RG213	N/A	11/9/01	11/9/02
412	RF AMPLIFIER	Amplifier Research	100W1000 M1A	21233	CNR	N/A
1131	Tripot	Coast	SAS-200/521	0	CNR	N/A
1156	ISOTROPIC FIELD PROBE	A.R.	FP2000	23365	6/14/02	6/14/03
404	ISOTROPIC FIELD MONITOR	AMPLIFIER RESEARCH	FM 2000	16662	CNR	N/A
1020	POWER METER	HEWLETT PACKARD	436A	1606A00481	8/21/01	8/21/02

Test Data – Radiated Electromagnetic Field Test# RIHE-01

Radiated Immunity Electric Field Test Data

Complete	X			Job # : 2L0341E	Test # : RIHE-01
Preliminary				Page 1	of 1
Client Name :	Benchmark Storage Innovations, Inc.				
EUT Name :	External DLT Tape Drive				
EUT Model # :	DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)				
EUT Part # :	N/A				
EUT Serial # :	PHJ2F0009				
EUT Config. :	External tape drive controlled by a PC through a SCSI connection				
Specification :	EN 55024			Reference :	IEC 61000-4-3
Signal Gen.#:	411	Temp. (deg. C) :	25	Date :	7/18/02
Signal Gen.#:	NA	Humidity (%) :	45	Time :	16:06
Cable#:	1990	EUT Voltage :	230	Staff :	Art Ruvalcaba
Cable#:	1039	EUT Frequency :	50	Photo ID:	2L0341E RIHE-01
Cable#:	808	Phase:	Single	Performance Criteria:	A
Amp#:	412	Location:	ANC	Table Top or Floor:	Table
Amp#:	NA	Monitor Probe#:	1156	Sweep rate:	N/A
Amp#:	NA	Field Monitor#:	404	Step Size:	1%
Amp#:	NA	Power Meter#:	1020	Modulated:	80%
Antenna#:	1131	Directional Cpler.:#	NA		
Antenna#:	NA				

Freq. Start (MHz)	Freq. Stop (MHz)	Field Strength (V/m)	Effect Qty	Effects Type	Polarity (H or V)	Front or Back	Pass or Fail	Comments:
80	1000	3	0	N/A	H	Front	Pass	
80	1000	3	0	N/A	V	Front	Pass	
80	1000	3	0	N/A	H	Back	Pass	
80	1000	3	0	N/A	V	Back	Pass	
80	1000	3	0	N/A	H	Right	Pass	
80	1000	3	0	N/A	V	Right	Pass	
80	1000	3	0	N/A	H	Left	Pass	
80	1000	3	0	N/A	V	Left	Pass	
								Scanned 80-1000MHz
					Dwell one Minute on all four sides both polarities on the following Frequncies:			
								80 MHz
								100 MHz
								120 MHz
								160 MHz
								230 MHz
								434 MHz
								460 MHz
								600 MHz
								863 MHz
								900 MHz

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Test Photographs - Test # RIHE-01

Section 10. Electrical Fast Transient / Burst

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to repetitive electrical fast transients (bursts), on supply, signal, or control lines.

Minimum Performance Criteria B

Performance Criteria:

Criteria A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

Test Method:

See Section 15.

Test # : EFTP-01

Tested By: Art Ruvalcaba

Date of Tests: 07/16/02

Test Conditions:
Test Voltage: 230 VAC

Temperature: 26˚C

Humidity: 38%

Test Results:

The E.U.T. complies.
The E.U.T. meets Performance Criteria A.

TEST EQUIPMENT

Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
590	PEFT (EFT generator)	Haefely	DGFT junior	589071-03	10/18/01	10/18/02
559	Capacitive clamp	ICC	0	0	CNR	N/A

Test Data – Electrical Fast Transient / Burst Test# EFTP-01

Electrically Fast Transient Data

Complete	X			Job # : 2L0341E	Test # : EFTP-01
Preliminary				Page 1	of 1
Client Name :	Benchmark Storage Innovations, Inc.				
EUT Name :	External DLT Tape Drive				
EUT Model # :	DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)				
EUT Part # :	N/A				
EUT Serial # :	PHJ2F0009				
EUT Config. :	External tape drive controlled by a PC through a SCSI connection				
Specification :	EN 55024			Reference :	IEC 61000-4-4
Generator#:	590	Temp. (deg. C) :	26	Date :	7/16/02
Clamp#:	559	Humidity (%) :	38	Time :	10:30
Probe#:	NA	EUT Voltage :	230 VAC	Staff :	Art Ruvalcaba
1. Pwr Line Hot	X	EUT Frequency :	50	Photo ID:	2L0341E EFTP-01
2. Pwr Line Ntrl	X	Phase:	Single	Performance Criteria:	B
3. Earth Ground	X	Location:	Lab 6	Table Top or Floor	Table
4.		7.		10.	
5.		8.		11	
6.		9.		12.	

Test Point	EFT Level (kV)	Direct or Capacitive	Polarity	Time Duration	Effects Number	Effects Type	Pass or Fail	Comment
1	0.500	Direct	+	1.08	0	N/A	Pass	
1	0.500	Direct	-	1.08	0	N/A	Pass	
1	1	Direct	+	1.08	0	N/A	Pass	
1	1	Direct	-	1.08	0	N/A	Pass	
2	0.500	Direct	+	1.08	0	N/A	Pass	
2	0.500	Direct	-	1.08	0	N/A	Pass	
2	1	Direct	+	1.08	0	N/A	Pass	
2	1	Direct	-	1.08	0	N/A	Pass	
3	0.500	Direct	+	1.08	0	N/A	Pass	
3	0.500	Direct	-	1.08	0	N/A	Pass	
3	1	Direct	+	1.08	0	N/A	Pass	
3	1	Direct	-	1.08	0	N/A	Pass	

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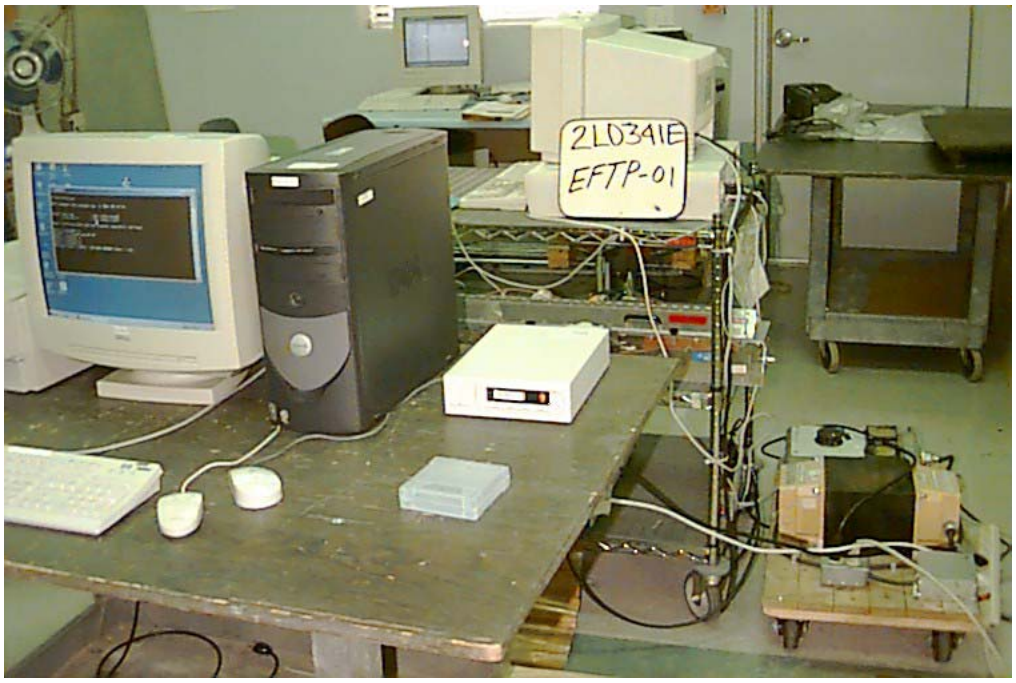
Test Photographs - Test # EFTP-01


2L0341E
EFTP-01

Test # : EFTI-01

Tested By: Art Ruvalcaba

Date of Tests: 07/16/02

Test Conditions:
Test Voltage: 230 VAC

Temperature: 26˚C

Humidity: 38%

Test Results:

The E.U.T. complies.
The E.U.T. meets Performance Criteria A.

TEST EQUIPMENT

Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
590	PEFT (EFT generator)	Haefely	DGFT junior	589071-03	10/18/01	10/18/02
559	Capacitive clamp	ICC	0	0	CNR	N/A

Test Data – Electrical Fast Transient / Burst Test# EFTI-01

Electrically Fast Transient Data

Complete	X			Job # : 2L0341E	Test # : EFTI-01
Preliminary				Page 1	of 1
Client Name :	Benchmark Storage Innovations, Inc.				
EUT Name :	External DLT Tape Drive				
EUT Model # :	DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)				
EUT Part # :	N/A				
EUT Serial # :	PHJ2F0009				
EUT Config. :	External tape drive controlled by a PC through a SCSI connection				
Specification :	EN 55024			Reference :	IEC 61000-4-4
Generator#:	590	Temp. (deg. C) :	26	Date :	7/16/02
Clamp#:	559	Humidity (%) :	38	Time :	10:45
Probe#:	NA	EUT Voltage :	230 VAC	Staff :	Art Ruvalcaba
1. Pwr Line Hot	NA	EUT Frequency :	50	Photo ID:	2L0341E EFTI-01
2. Pwr Line Ntrl	NA	Phase:	Single	Performance Criteria:	B
3. Earth Ground	NA	Location:	Lab 6	Table Top or Floor	Table
4.	Scsi cable from PC to EUT	7.		10.	
5.		8.		11	
6.		9.		12.	

Test Point	EFT Level (kV)	Direct or Capacitive	Polarity	Time Duration	Effects Number	Effects Type	Pass or Fail	Comment
4	0.250	Capacitive	+	1.08	0	N/A	Pass	
4	0.250	Capacitive	-	1.08	0	N/A	Pass	
4	0.500	Capacitive	+	1.08	0	N/A	Pass	
4	0.500	Capacitive	-	1.08	0	N/A	Pass	

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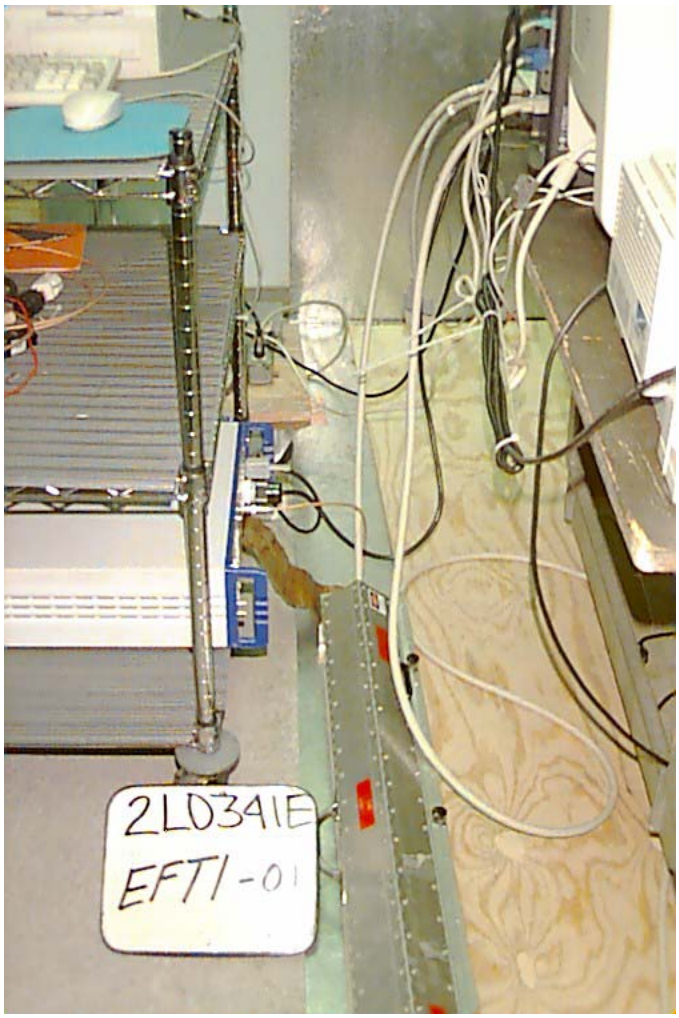
Test Photographs - Test # EFTI-01




2L0341E
EFT1-01

Section 11. Surge Immunity

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to electrical surge on supply lines and I/O lines.

Minimum Performance Criteria B

Performance Criteria:

Criteria A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

Test Method:

See Section 15.

Test # : SGIP-01

Tested By: Art Ruvalcaba

Date of Tests: 07/16/02

Test Conditions:
Test Voltage: 230 VAC

Temperature: 25˚C

Humidity: 37%

Test Results:

The E.U.T. complies.
The E.U.T. meets Performance Criteria A.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
585	SURGE GENERATOR	HAEFELY	P SURGE 4.1	83070-03	11/9/01	11/9/02
N/A	LIMITER	FISCHER	FCC-45013-1.2	181	N/A	N/A

Test Data – Surge Test# SGIP-01

Surge Immunity Test Data

Complete X
Preliminary

Job # : 2L0341E
Page 1 of 1
Test # : SGIP-01

Client Name : Benchmark Storage Innovations, Inc.
EUT Name : External DLT Tape Drive
EUT Model # : DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)
EUT Part # : N/A
EUT Serial # : PHJ2F0009
EUT Config. : External tape drive controlled by a PC through a SCSI connection

Specification : EN 55024: 1998
Generator#: 585
Plugin#: N/A
Temp. (deg. C) : 25
Humidity (%) : 37
EUT Voltage : 230 VAC
EUT Frequency : 50
Phase: Single
Location: Lab 6
Reference : IEC 61000-4-5
Date : 7/16/02
Time : 11:00
Staff : Art Ruvalcaba
Photo ID: 2L0341E SGIP-01
Performance Criteria: B
Table Top or Floor: Table

Coupling			L1-N			L1-PE			PE-N			
			Surge	Effect	Efect	Surge	Effect	Efect	Surge	Effect	Efect	
Level	Phase	Polarity	QTY	QTY	Type	QTY	QTY	Type	QTY	QTY	Type	Comments
0.5kV	90 Deg.	Pos.	5	0	N/A	5	0	N/A	5	0	N/A	
		Neg.	5	0	N/A	5	0	N/A	5	0	N/A	
	180 Deg	Pos.	5	0	N/A	5	0	N/A	5	0	N/A	
		Neg.	5	0	N/A	5	0	N/A	5	0	N/A	
	270 Deg	Pos.	5	0	N/A	5	0	N/A	5	0	N/A	
		Neg.	5	0	N/A	5	0	N/A	5	0	N/A	
1.0kV	90 Deg.	Pos.	5	0	N/A	5	0	N/A	5	0	N/A	
		Neg.	5	0	N/A	5	0	N/A	5	0	N/A	
	180 Deg	Pos.	5	0	N/A	5	0	N/A	5	0	N/A	
		Neg.	5	0	N/A	5	0	N/A	5	0	N/A	
	270 Deg	Pos.	5	0	N/A	5	0	N/A	5	0	N/A	
		Neg.	5	0	N/A	5	0	N/A	5	0	N/A	
2.0kV	90 Deg.	Pos.							5	0	N/A	
		Neg.							5	0	N/A	
	180 Deg	Pos.							5	0	N/A	
		Neg.							5	0	N/A	
	270 Deg	Pos.							5	0	N/A	
		Neg.							5	0	N/A	
4.0kV	90 Deg.	Pos.										
		Neg.										
	180 Deg	Pos.										
		Neg.										
	270 Deg	Pos.										
		Neg.										

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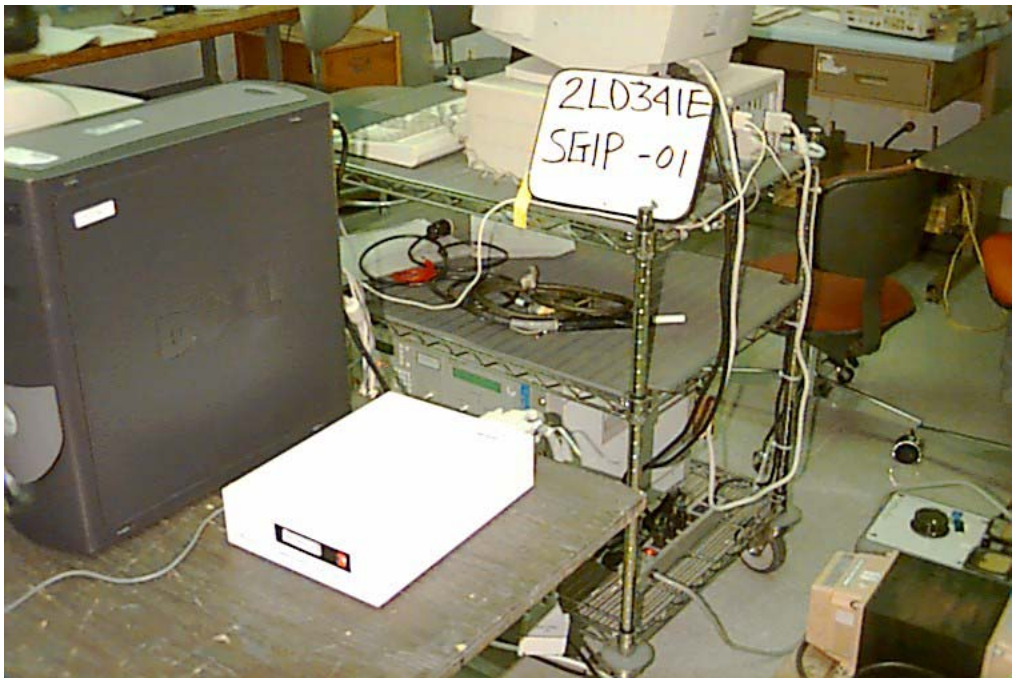
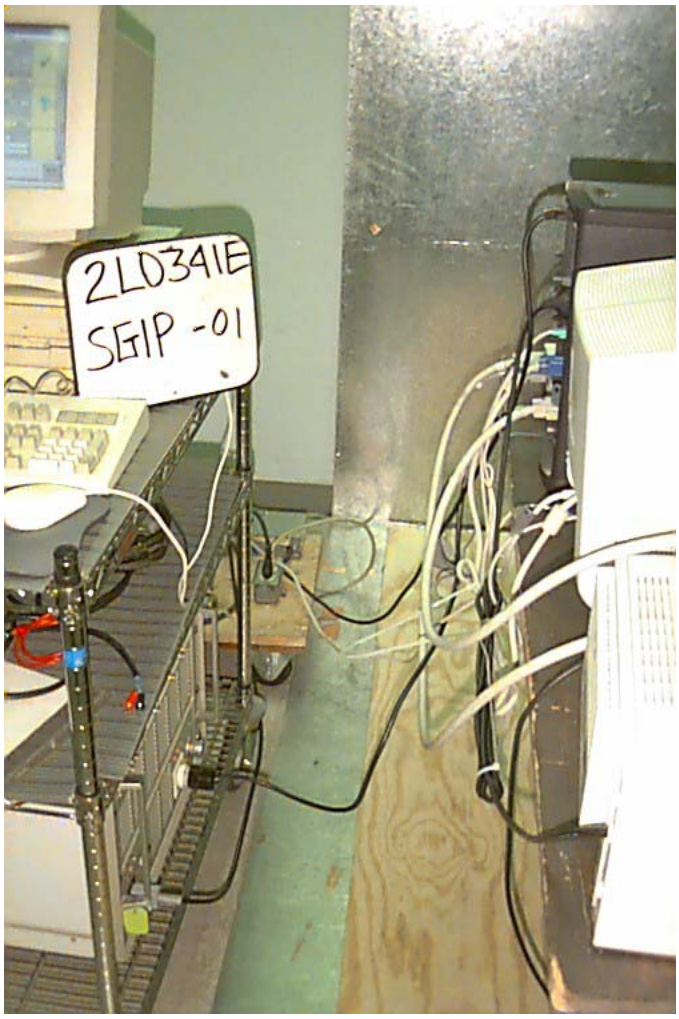
Test Photographs - Test # SGIP-01




2L0341E
SGIP -01

Section 12. RF Common Mode (A.M.)

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the electromagnetic fields generated from intentional radiators.

Minimum Performance Criteria A

Performance Criteria:

Criteria A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

Test Method:

See Section 15.

Test # : CIPV-01

Tested By: Art Ruvalcaba

Date of Tests: 07/18/02

Test Conditions:
Test Voltage: 230 VAC

Temperature: 23˚C

Humidity: 39%

Test Results:

The E.U.T. complies.
The E.U.T. meets Performance Criteria A.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
717	SIGNAL GENERATOR	MARCONI	2022D	119144/023	CNR	N/A
572	CABLE, 6.7m	KTL	RG223	N/A	8/8/01	8/8/02
1019	CABLE, 9.5m	KTL	RG223	N/A	8/6/01	8/6/02
1976	CABLE .5m	KTL	RG223	N/A	3/5/02	3/5/03
804	CABLE, 1m	KTL	RG213	N/A	10/1/01	10/1/02
1147	INJECTION CLAMP, .01-100MHz	TEGAM	Q5236-1	10985	CNR	N/A
1282	Amplifier	IFI	404A	1073907	CNR	N/A
1165	Amplifier	Amplifier Research	10w 1000	1749	CNR	N/A
761	3 module HP stack(Anal/Displ/Q-Peak Adapt)	Hewlett Packard	8567A/Disp/85650A	2541A00109/2542A10537/2521A00608	10/23/01	10/23/02
715	Injection clamp	Fisher	F-140	83	CNR	N/A

Test Data – R.F. Common Mode (A.M.) Test# CIPV-01

Conducted Immunity Test Data

Complete X
Preliminary

Job # 2L0341E Test # : CIPV-01
Page 1 of 1

Client Name : Benchmark Storage Innovations, Inc.
EUT Name : External DLT Tape Drive
EUT Model # : DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)
EUT Part # : N/A
EUT Serial # : PHJ2F0009
EUT Config. : External tape drive controlled by a PC through a SCSI connection

Specification : EN 55024:1998 Reference : EN 61000-4-6

Signal Gen.#:	717	Temp. (deg. C) :	23	Date :	7/18/02
Cable#:	572	Humidity (%) :	39	Time :	14:30
Cable#:	1019	EUT Voltage :	230 VAC	Staff :	Art Ruvalcaba
Cable#:	1976	EUT Frequency :	50 Hz	Photo ID:	2L0341E CIPV-01
Cable#:	804	Phase:	Single	Performance Criteria:	A
Clamp#:	1147	Location:	SE	Table Top or Floor:	Table
Amp#:	1282	Analyzer#:	761	Sweep rate:	N/A
Amp#:	1165	Clamp#:	715	Step Size:	1%
				Modulated:	80%

Freq. Start (MHz)	Freq. Stop (MHz)	Field Strength (Vrms)	Time Duration (min)	Effect Qty	Effects Type	Pass or Fail	Comments:
0.15	80	3	35	0	N/A	Pass	Power Cable
					Dwell one Minute on the following Frequncies:		
							.200 MHz
							1 MHz
							7.1 MHz
							13.56 MHz
							21 MHz
							27.12 MHz
							40.68 MHz
							22 MHz
							40 MHz
							45 MHz
							60 MHz
							80 MHz
							Scanned .150-80 MHz

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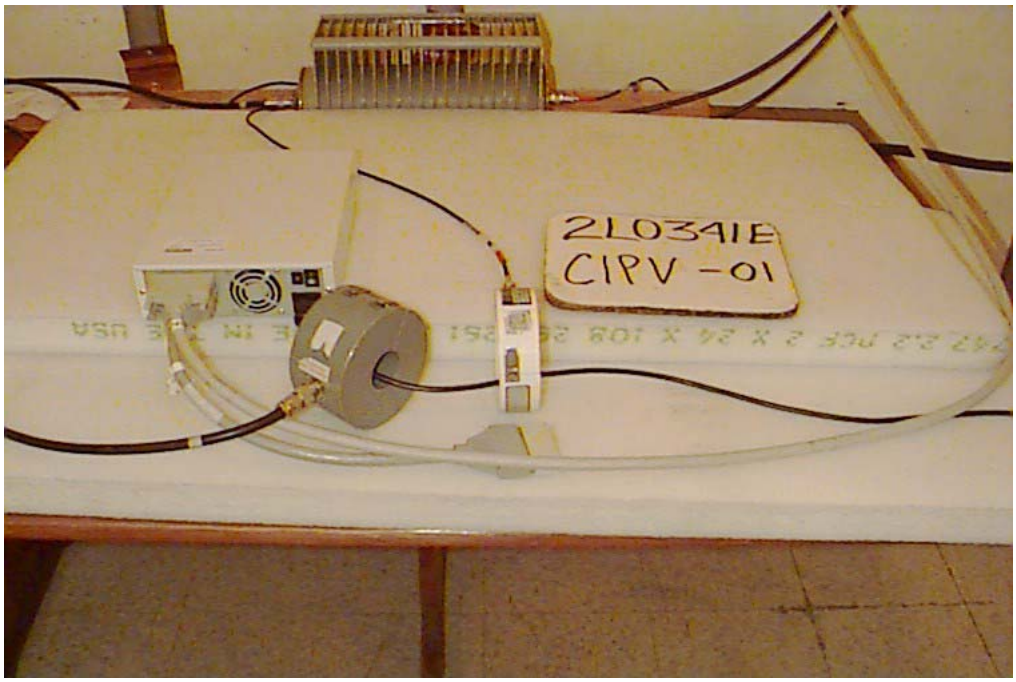
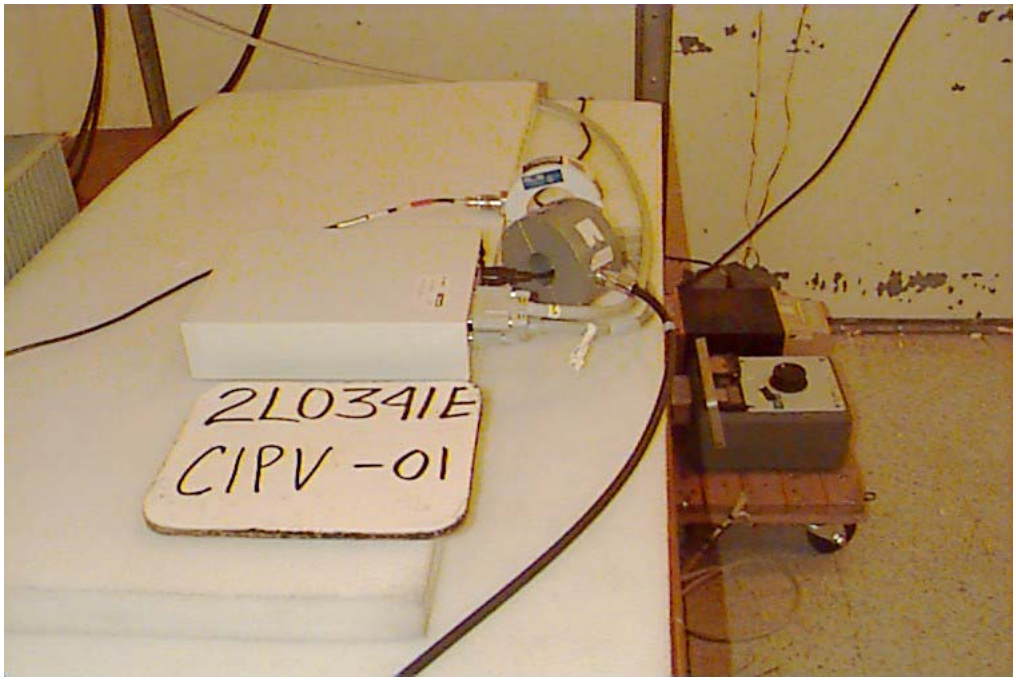
Test Photographs - Test # CIPV-01





Test # : CIIV-01

Tested By: Art Ruvalcaba

Date of Tests: 07/18/02

Test Conditions:
Test Voltage: 230 VAC

Temperature: 23˚C

Humidity: 39%

Test Results:

The E.U.T. complies.
The E.U.T. meets Performance Criteria A.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
717	SIGNAL GENERATOR	MARCONI	2022D	119144/023	CNR	N/A
572	CABLE, 6.7m	KTL	RG223	N/A	8/8/01	8/8/02
1019	CABLE, 9.5m	KTL	RG223	N/A	8/6/01	8/6/02
1976	CABLE .5m	KTL	RG223	N/A	3/5/02	3/5/03
804	CABLE, 1m	KTL	RG213	N/A	10/1/01	10/1/02
1147	INJECTION CLAMP, .01-100MHz	TEGAM	Q5236-1	10985	CNR	N/A
1282	Amplifier	IFI	404A	1073907	CNR	N/A
761	3 module HP stack(Anal/Displ/Q-Peak Adapt)	Hewlett Packard	8567A/Disp/85650A	2541A00109/2542A10537/2521A00608	10/23/01	10/23/02
715	Injection clamp	Fisher	F-140	83	CNR	N/A

Test Data – R.F. Common Mode (A.M.) Test# CIIV-01

Conducted Immunity Test Data

Complete	X			Job # 2L0341E	Test # : CIIV-01
Preliminary				Page 1	of 1

Client Name :	Benchmark Storage Innovations, Inc.
EUT Name :	External DLT Tape Drive
EUT Model # :	DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)
EUT Part # :	N/A
EUT Serial # :	PHJ2F0009
EUT Config. :	External tape drive controlled by a PC through a SCSI connection

Specification :	EN 55024:1998			Reference :	EN 61000-4-6
Signal Gen.#:	717	Temp. (deg. C) :	23	Date :	7/18/02
Cable#:	572	Humidity (%) :	39	Time :	14:36
Cable#:	1019	EUT Voltage :	230 VAC	Staff :	Art Ruvalcaba
Cable#:	1976	EUT Frequency :	50 Hz	Photo ID:	2L0341E CIPV-01
Cable#:	804	Phase:	Single	Performance Criteria:	A
Clamp#:	1147	Location:	SE	Table Top or Floor:	Table
Amp#:	1282	Analyzer#:	761	Sweep rate:	N/A
Amp#:	NA	Clamp#:	715	Step Size:	1%
				Modulated:	80%

Freq. Start (MHz)	Freq. Stop (MHz)	Field Strength (Vrms)	Time Duration (min)	Effect Qty	Effects Type	Pass or Fail	Comments:
0.15	80	3	35	0	N/A	Pass	I/O Line
					Dwell one Minute on the following Frequncies:		
							.200 MHz
							1 MHz
							7.1 MHz
							13.56 MHz
							21 MHz
							27.12 MHz
							40.68 MHz
							22 MHz
							40 MHz
							45 MHz
							60 MHz
							80 MHz
							Scanned .150-80 MHz

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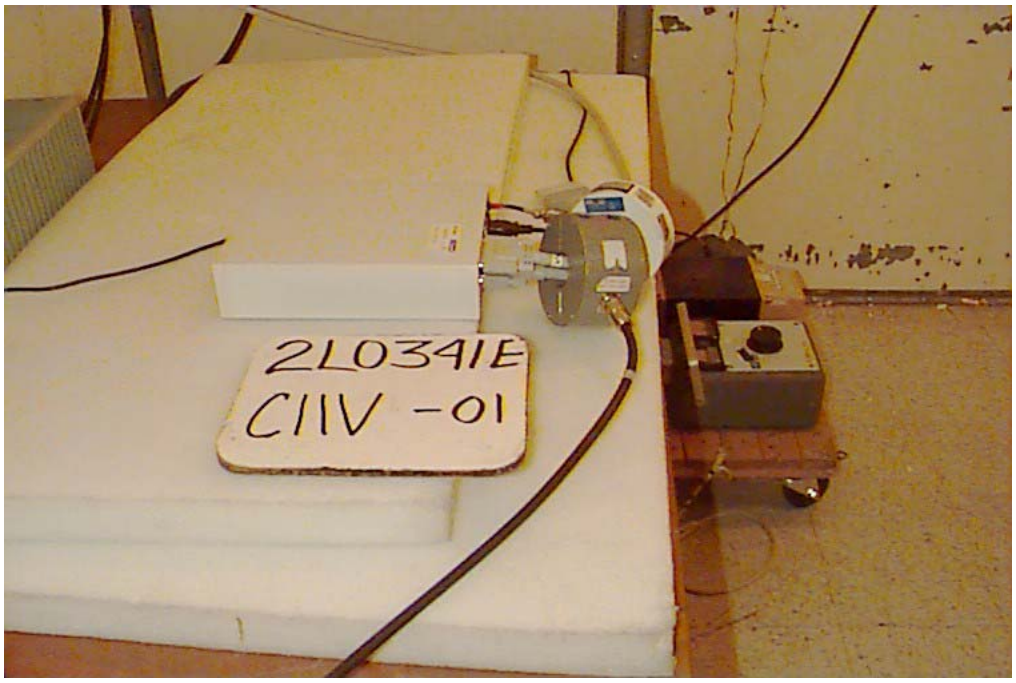
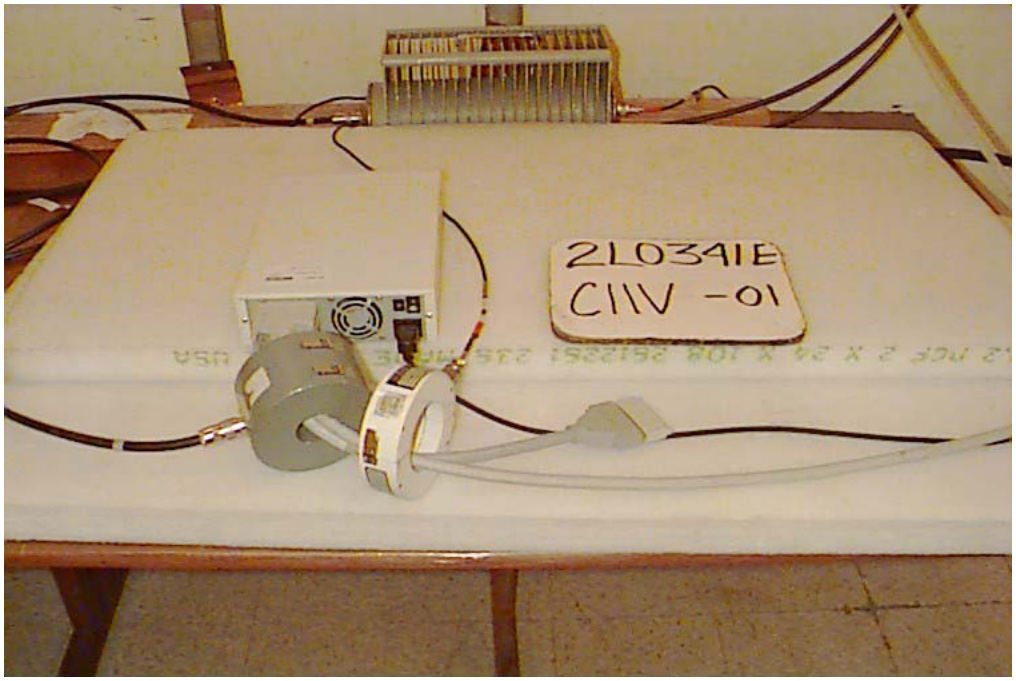
Test Photographs - Test # CIIV-01





Section 13. Magnetic Immunity

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to magnetic disturbances at power frequency related to industrial installations and power plants.

Minimum Performance Criteria A

Performance Criteria:

Criteria A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

Test Method:

See Section 15.

Test # : RILM-01

Tested By: ART

Date of Tests: 07/17/02

Test Conditions:
Test Voltage: 230 Vac

Temperature: 24˚C

Humidity: 43%

Test Results:

The E.U.T. complies.
The E.U.T. meets Performance Criteria A.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
696	AC Power source	Elgar	3001	305	CBU	N/A
649	Surge Implulse generator	Compliance Design	CDL 1000i	none	10/9/01	10/9/02
659	WAVE P/I 6KV/3KA	COMPLIANCE DESIGN	CDI-1000i	NONE	10/9/01	10/9/02
1461	Mag Loop	KTL	90T10A	1	CNR	CNR
488	Multimeter - True RMS	FLUKE	87	57270211	10/25/01	10/25/02
1321	MULTIMETER	FLUKE	77	35756819	10/25/01	10/25/03

Test Data – Magnetic Immunity Test# RILM-01

Magnetic Immunity Test Data

Complete	X			Job # : 2L0341E	Test # : RILM-01
Preliminary				Page 1	of 1
Client Name :	Benchmark Storage Innovations, Inc.				
EUT Name :	External DLT Tape Drive				
EUT Model # :	DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)				
EUT Part # :	N/A				
EUT Serial # :	PHJ2F0009				
EUT Config. :	External tape drive controlled by a PC through a SCSI connection				
Specification :	EN 55024:1998			Reference :	EN 61000-4-8
Voltage Source#:	696	Temp. (deg. C) :	24	Date :	7/17/02
Surge Generator#:	649	Humidity (%) :	43	Time :	11:00
Plugin#:	659	EUT Voltage :	230 Vac	Staff :	ART
Loop Antenna#:	1461	EUT Frequency :	50 Hz	Photo ID:	2L0341E RILM-01
Voltmeter#:	488	Phase:	Single	Performance Criteria:	A
Voltmeter#:	1321	Location:	Lab 6	Table Top or Floor:	Table

Freq. or Surge	Field Strength (A/m)	Time Duration (mins)	Effects Number	Effects Type	Pol. (X, Y, or Z)	Pass or Fail	Comments:
50Hz	10	5	0	N/A	X	PASS	
50Hz	10	5	0	N/A	Y	PASS	
50Hz	10	5	0	N/A	Z	PASS	

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Test Photographs - Test # RILM-01

Section 14. Voltage Dips and Interruptions

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) when subjected to voltage dips, short interruptions, and voltage variations.

Minimum Performance Criteria B (10ms) and Criteria C (100ms) for voltage dips and Criteria C (5000ms) for voltage interruptions.

Performance Criteria:

Criteria A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criteria C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

Test Method:

See Section 15.

Test # : VDIP-01

Tested By: Art Ruvalcaba

Date of Tests: 07/16/02

Test Conditions:
Test Voltage: 230 VAC

Temperature: 24˚C

Humidity: 39%

Test Results:

The E.U.T. complies.

Voltage Dip (10ms):
The E.U.T. meets Performance Criteria A.

Voltage Dip (500ms):
The E.U.T. meets Performance Criteria A.

Voltage Dip (5000ms):
The E.U.T. meets Performance Criteria C.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
795	SWITCHING AMPLIFIER	ELGAR	SW 5250A	834	9/11/01	9/11/02

Test Data – Voltage Dips and Interruptions Test# VDIP-01

Voltage Dips and Interruptions Test Data

Complete: X
Preliminary:
Job # : 2L0341E
Test # : VDIP-01
Page 1 of 1

Client Name : Benchmark Storage Innovations, Inc.
EUT Name : External DLT Tape Drive
EUT Model # : DLT VS160e (Benchmark), Storage Works DLT-VS-160/320 External (HP),DLT VS160 External Tape Drive (Tandberg)
EUT Part # : N/A
EUT Serial # : PHJ2F0009
EUT Config. : External tape drive controlled by a PC through a SCSI connection

Specification : EN 55024: 1998
Reference : IEC 61000-4-11

Voltage Source#: 795

Temp. (deg. C) :	24	Date :	7/16/02
Humidity (%) :	39	Time :	15:40
EUT Voltage :	230 VAC	Staff :	Art Ruvalcaba
EUT Frequency :	50	Photo ID:	2L0341E VDIP-01
Phase:	Single	Performance Criteria:	See Below
Location:	Lab 6	Table Top or Floor:	Table

Voltage Reduction (%)	Test Level (Volts)	Test Duration (ms)	Test Application Quantity	Spec. Perf. Criteria	EUT Actual Perf.	Comments
30%	161	500	3	B	A	
95%	9.4	10	3	C	A	
95%	9.4	5000	3	C	C	

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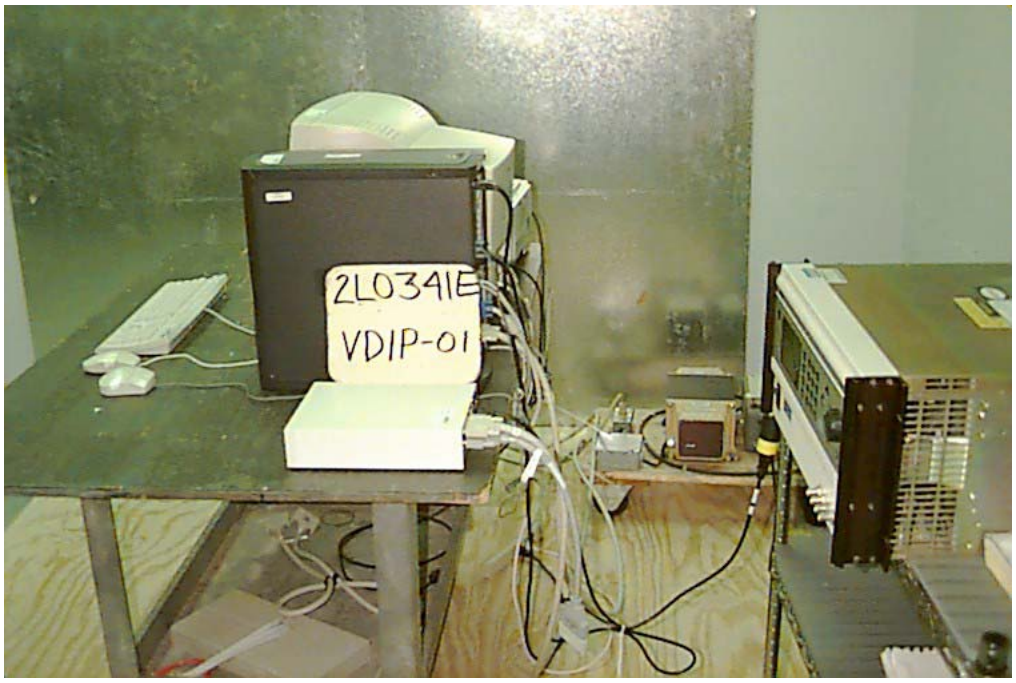
Test Photographs - Test # VDIP-01

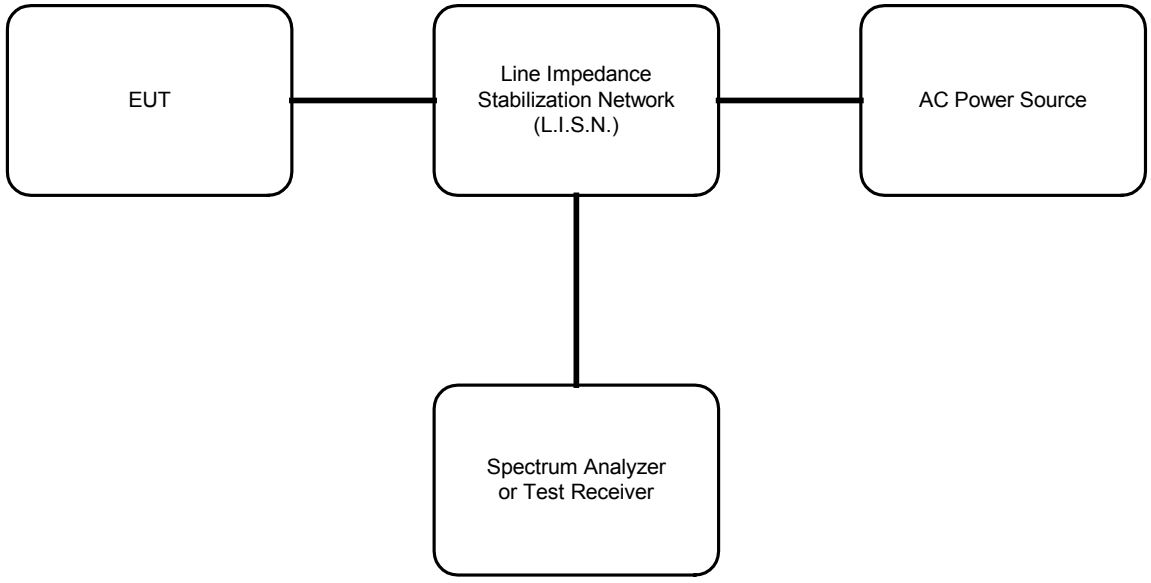


Section 15. Test Methods and Block Diagrams.

Conducted Emissions (Mains Ports)

- Applicable Test Standard: EN55022: 1998 Information Technology Equipment.
- The test set-up is as per the test configuration diagram.
- The E.U.T. is configured as typically used.
- The E.U.T. and any accessories are operated with typical load conditions.
- Conducted powerline measurements are made from 150 kHz to 30 MHz.
- For each current carrying conductor of each power cord associated with the E.U.T., the emission closest to the limit is recorded.
- Final measurements are made using a spectrum analyzer with 10 kHz RBW, peak detector.
- Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR quasi-peak detector.
- Bandwidths used on the test receiver are those specified in EN55022.

Test Configuration - Powerline Conducted Emissions:

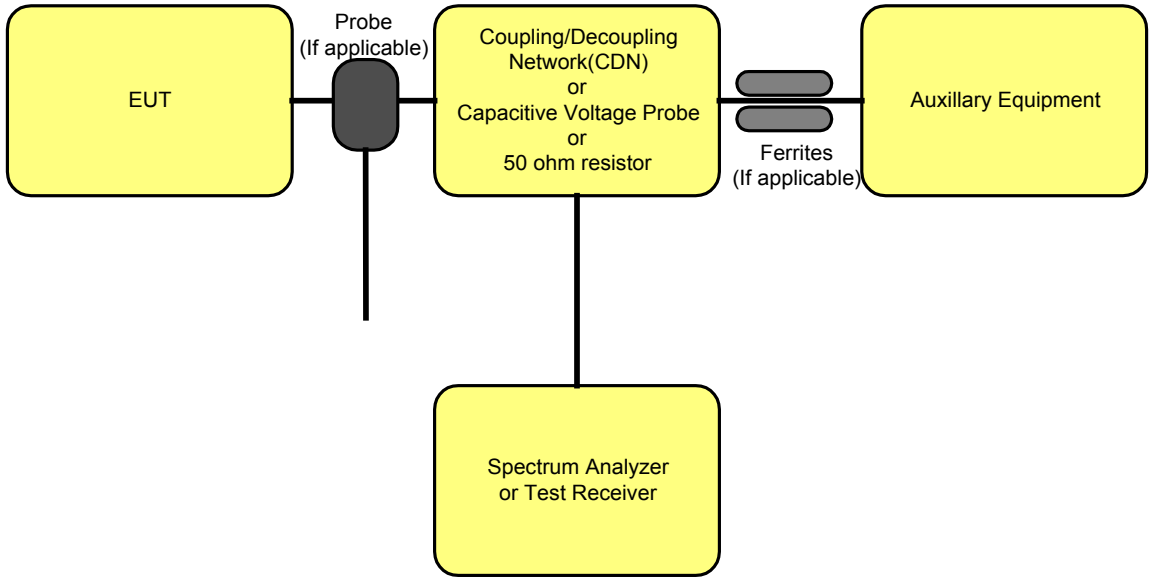


Conducted Emissions (Telecommunication Ports)

Test Method:

- Applicable Test Standard: CISPR 22: 1997 Information Technology Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement (EN 55022: 1998).
- The test set-up is as per the test configuration diagram and as further defined in CISPR 22: 1997 (EN 55022: 1998).
- The E.U.T. is configured as typically used.
- The E.U.T. and any accessories are operated with typical load conditions. LAN cable measurements may be taken with a LAN utilization in excess of 10%.
- For each telecommunication port, conducted current and/or voltage measurements are made from 150 kHz to 30 MHz.
- Measurements are taken with peak, quasi-peak, and/or average detectors. Quasi-peak and/or average detector measurements take precedence over peak detector measurements.
- Detector bandwidths are those specified in CISPR 22: 1997 (EN 55022: 1998).

Test Configuration:



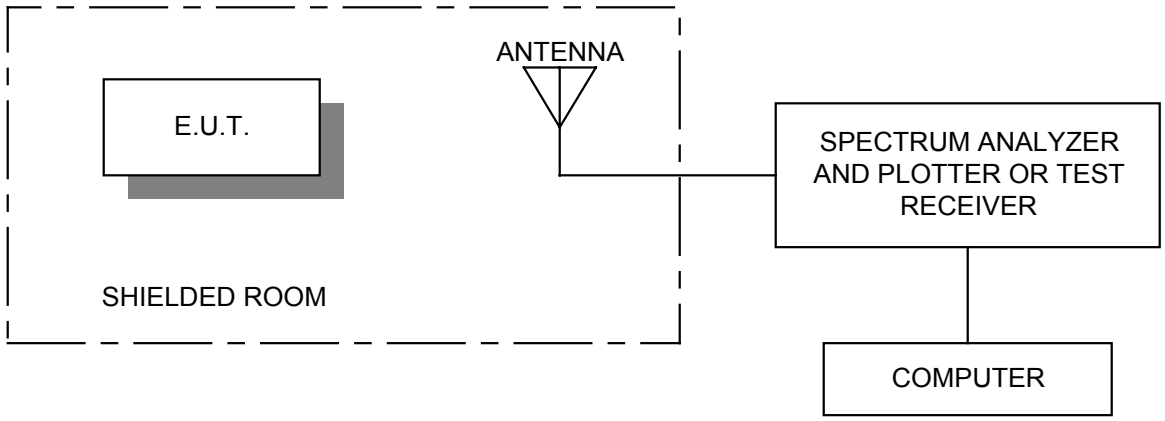
Radiated Emissions

Test Method - Radiated Emissions:

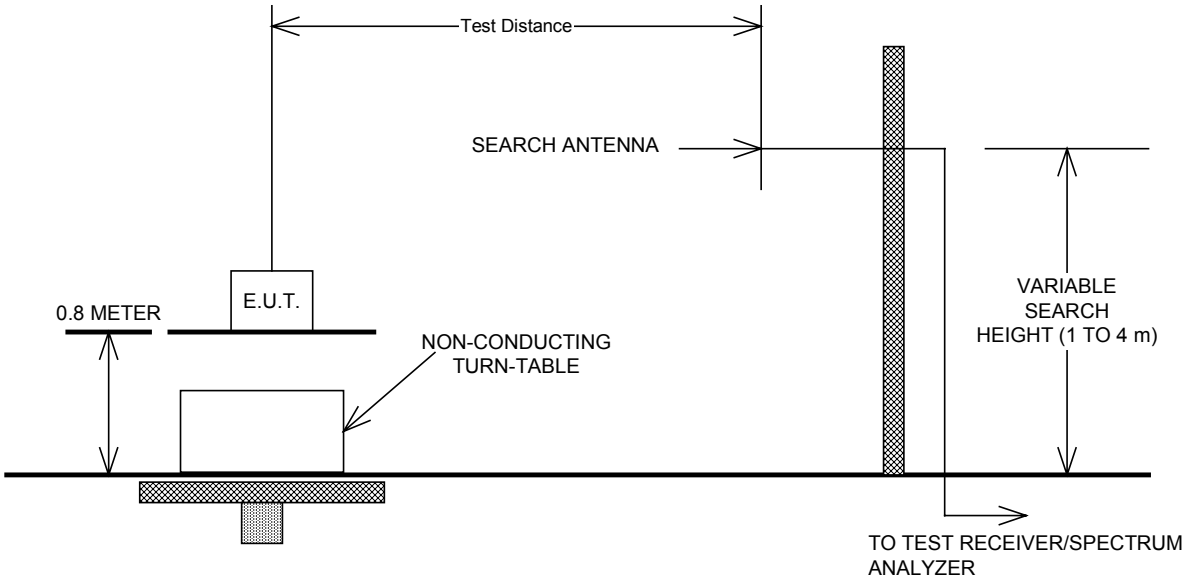
- Applicable Test Standard: EN55022: 1998 Information Technology Equipment.
- The test set-up in the shielded room is as per the test configuration diagram.
- The E.U.T. is configured as typically used.
- The E.U.T. and any accessories are operated with typical load conditions.
- Radiated emissions measurements are made from 30 MHz to 1000 MHz.
- The equipment was prescanned in the shielded room using a spectrum analyzer and broadband antenna to produce a list of frequencies to be investigated in the open area test site.
- The equipment is then set-up on an open area test site.
- Variations in antenna height, antenna polarization, and E.U.T. azimuth are explored to produce the emission that has the highest amplitude relative to the limit.
- The frequencies noted in the preliminary test are investigated on the open-air site where amplitude measurements are made.
- If ambient signal field strength is high at 10 meter, the measurements may be performed at 3 meter and extrapolated to the requisite distance.
- All emissions within ±5 dB of the limit are re-measured using a dipole antenna.
- If less than six emissions are better than 20 dB below limit, the noise level of the measuring instrument at representative frequencies is also reported.
- Any emissions above 1 GHz are measured using a horn antenna and low noise pre-amplifier.

Test Configuration - Radiated Emissions:

Radiated Pre-scan:



Outdoor Test Site for Radiated Emissions:

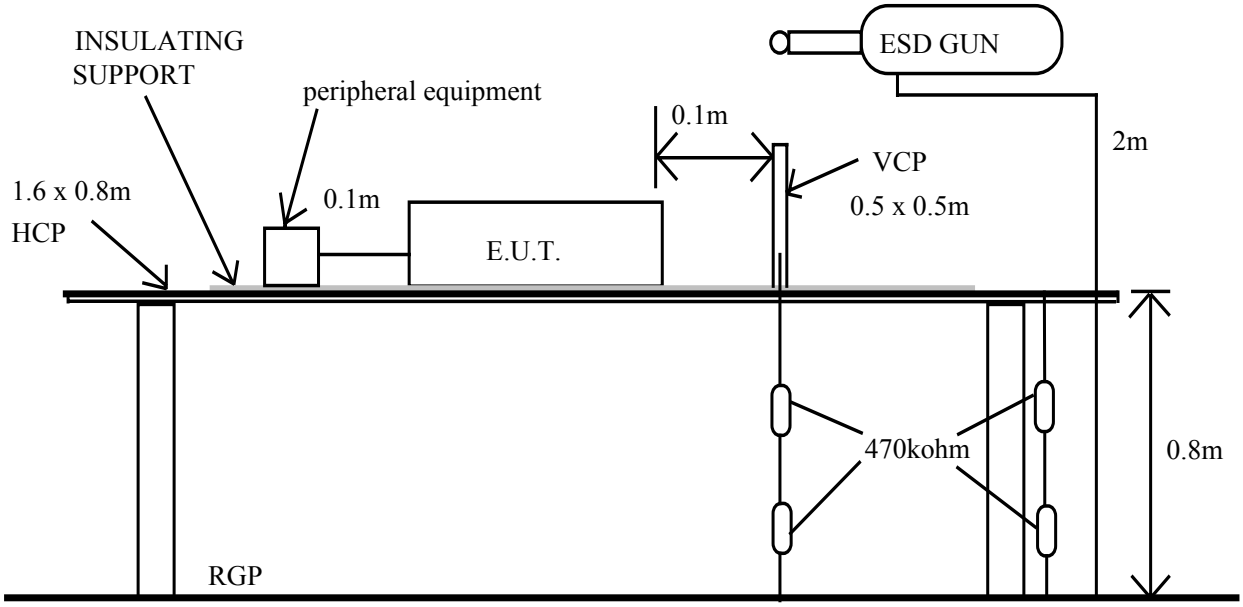


Electrostatic Discharge

Test Method - Electrostatic Discharge:

- Applicable Test Method: EN61000-4-2: 1995.
- The test set-up is as per the test configuration diagram.
- The electrostatic discharge has been applied to all points and surfaces which are accessible to personnel during normal usage of the E.U.T. (refer to test data table for a listing).
- The generator is re-triggered for a new single discharge.
- This procedure is repeated ten times in each polarity for each point.
- The E.U.T. is exercised during testing.

Test Configuration - Electrostatic Discharge:



The reference ground plane size projects beyond the horizontal coupling plane by at least 0.5 m on all sides.

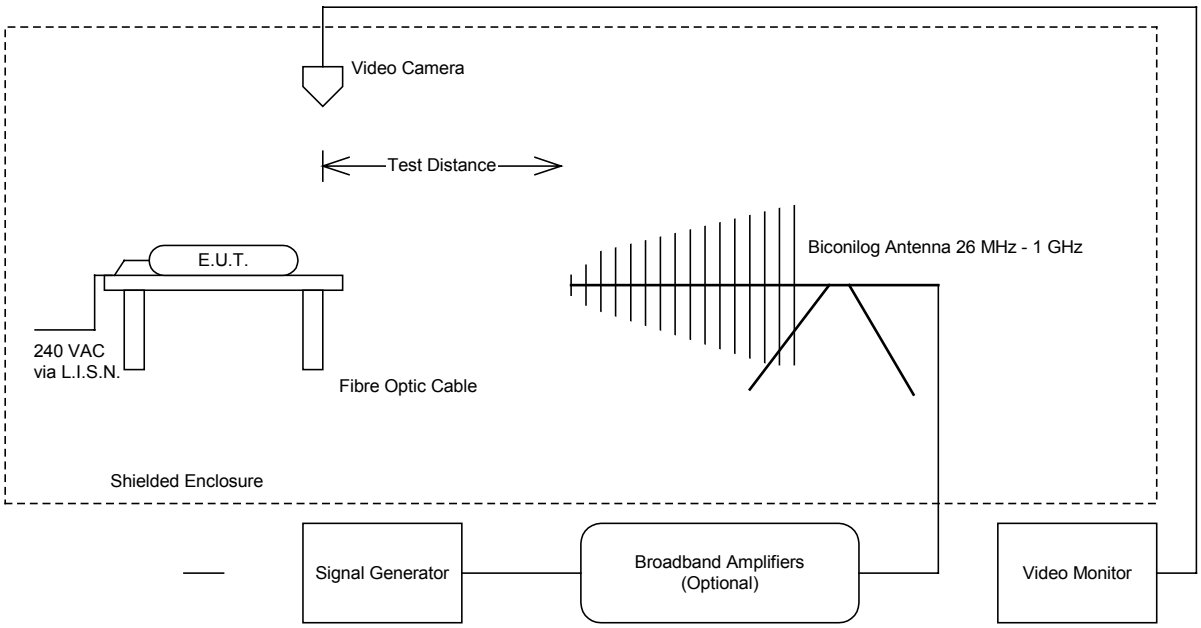
HCP - Horizontal Coupling Plane VCP - Vertical Coupling Plane RGP - Reference Ground Plane

Radiated Electromagnetic Field (Shielded Room)

Test Method - Radiated Electromagnetic Field (Shielded Room):

- Applicable Test Method: EN61000-4-3: 1997.
- The E.U.T. is placed in the center of the Shielded Room and connected to power and signal leads.
- The test set-up is as per the test configuration diagram.
- The frequency range is swept from 80 to 1000 MHz.
- The modulation is 80% AM with a 1 kHz sinewave.
- The sweep rate is 1.5 x 10^{-3} decades second or slower.
- The step size is 1% of previous frequency (i.e. previous frequency * 1.01).
- The antenna is rotated in order to test both horizontal and vertical polarization.
- The E.U.T is exercised during testing.

Test Configuration - Radiated Electromagnetic Immunity (Shielded Room)

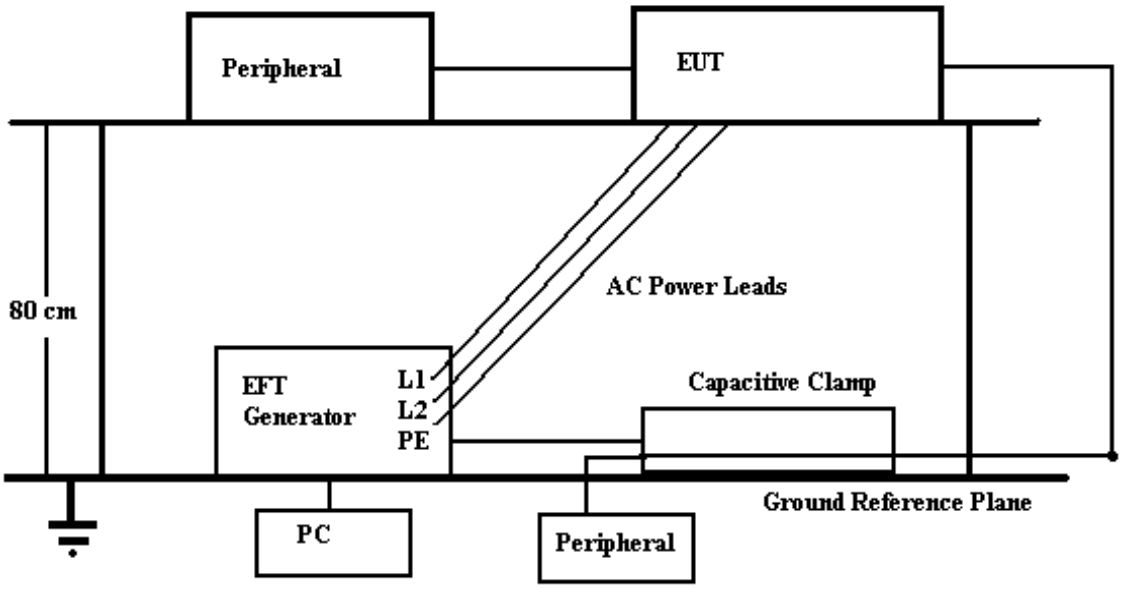


Electrical Fast Transient/Burst/Surge

Test Method - Electrical Fast Transient/Burst/Surge:

- Applicable Test Method: EN61000-4-4: 1995 and EN61000-4-5: 1995.
- The E.U.T. is configured as shown in the test configuration diagram.
- The waveform is verified before testing commenced.

Test Configuration – Electrical Fast Transient/Burst/Surge:



The EFT/Burst/Surge waveform is directly coupled to the AC mains cable of the E.U.T. via Mains Coupler E4551. EFT/Burst only are indirectly coupled to the data I/O cables via the CCL-4/S Capacitive Clamp.

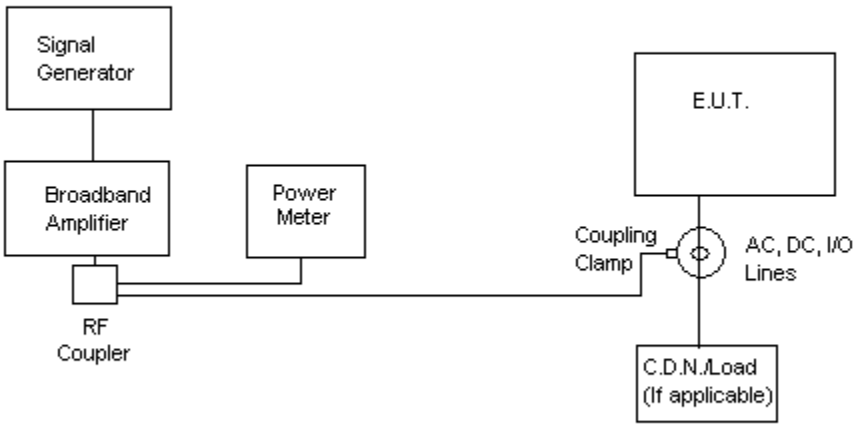
R.F. Common Mode (A.M)

Test Method - R.F. Common Mode (A.M.):

- Applicable Test Method: EN61000-4-6: 1996.
- The E.U.T. is configured as shown in the test configuration diagram.
- The frequency range is swept from 150 kHz to 80 MHz.
- The disturbance signal is 80% amplitude modulated with a 1 kHz sinewave.
- The rate of sweep is 1.5×10^{-3} decades per second or slower.
- The frequency is incremented at 1% of the start and thereafter 1 % of the preceding frequency value.

Test Configuration - R.F. Common Mode (A.M.):

Setting Immunity Levels:

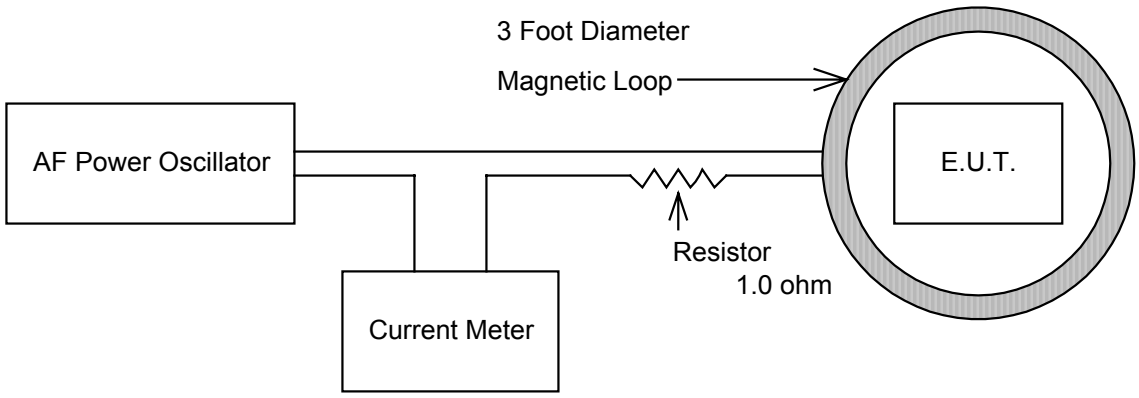


Magnetic Immunity

Test Method - Magnetic Immunity:

- Applicable Test Method: EN 50082-1: 1997 (EN 61000-4-8: 1993).
- The test set-up is as per the test configuration diagram.
- Power and other functional electrical quantities are applied to the E.U.T.
- Preliminary verification of equipment performance is carried out.
- The continuous magnetic field is applied at 50 Hz.

Test Configuration - Magnetic Immunity:



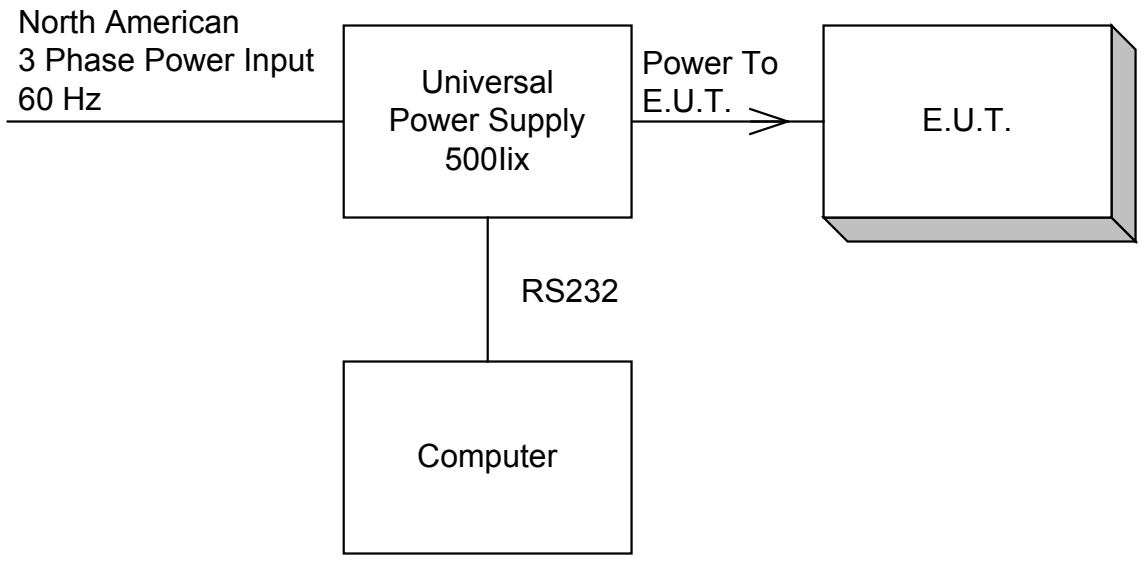
The current meter is used to calibrate the magnetic field

Voltage Dips and Interruptions

Test Method - Voltage Dips and Interruptions:

- Power to the E.U.T. is varied per the requirements specified in EN61000-4-11.
- The E.U.T. is monitored for normal operation.

Test Configuration – Voltage Dips and Interruptions Tests:

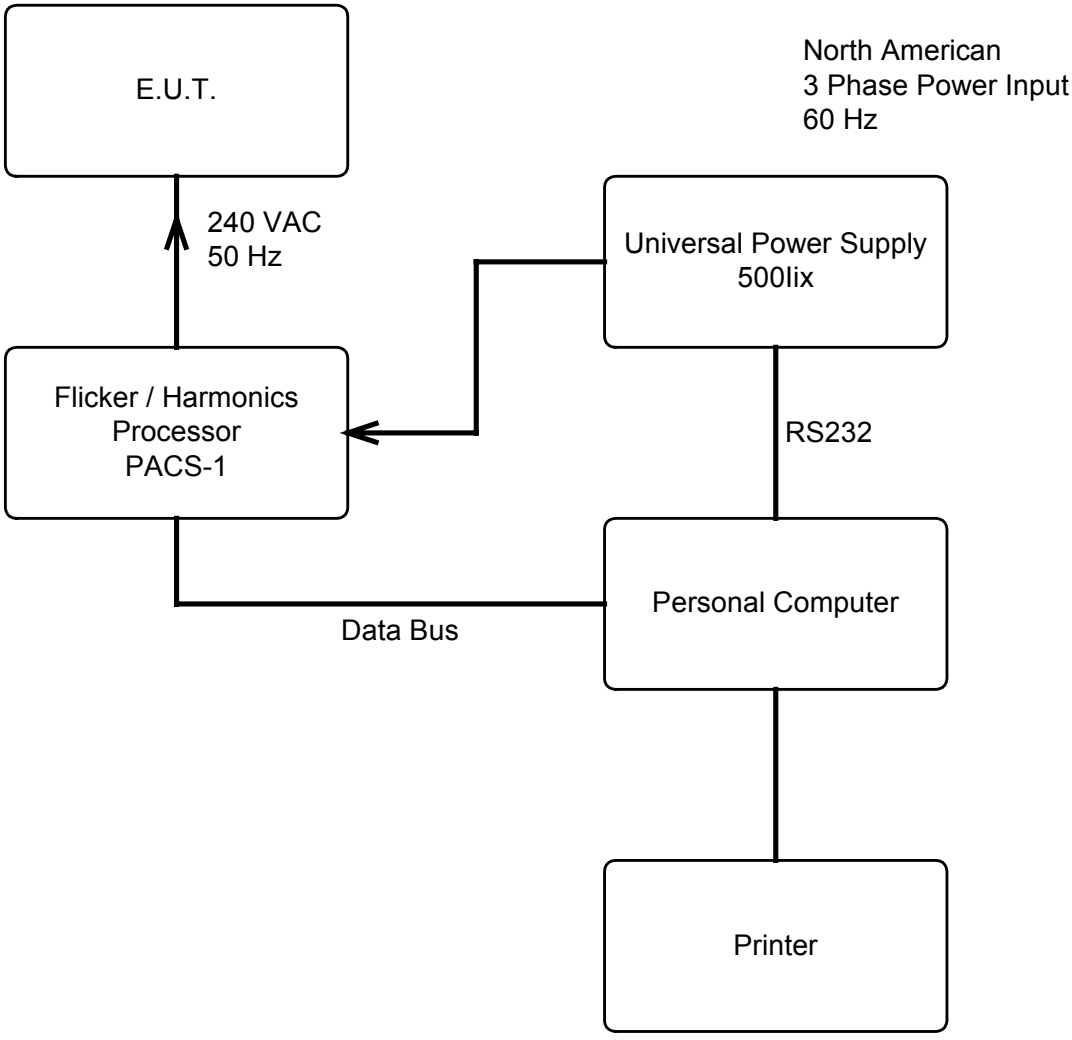


Harmonics

Test Method – Harmonics:

- Applicable Test Method: EN 61000-3-2: 1995.
- The E.U.T. is configured as shown in the test configuration diagram.

Test Configuration – Harmonics:

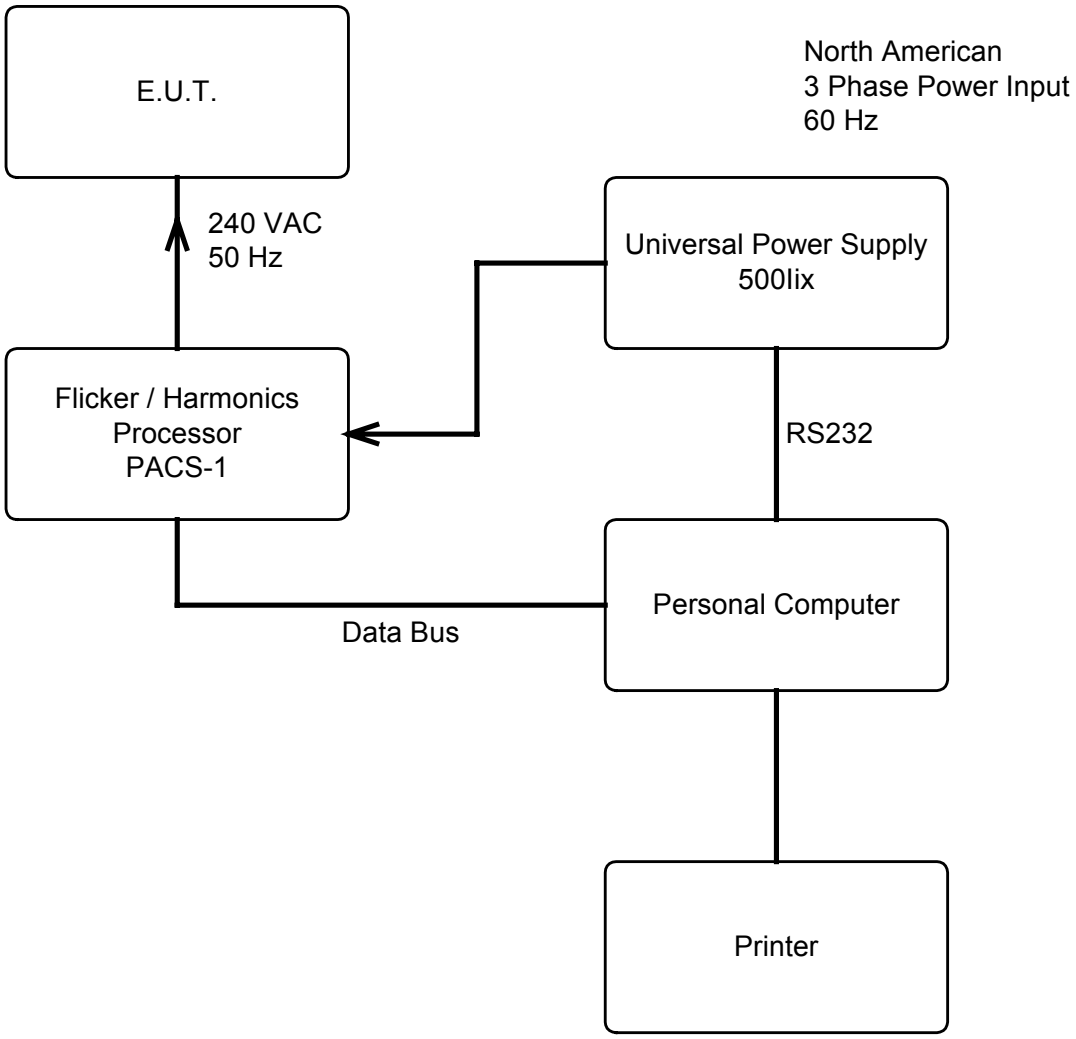


Flicker

Test Method – Flicker

- Applicable Test Method: EN 61000-3-3: 1995.
- The E.U.T. is configured as shown in the test configuration diagram.
- The equipment is exercised for not less than 5 minutes and not more than 15 minutes.

Test Configuration – Flicker :



Section 16. Performance Criteria.

Date: 7/9/02

Nemko USE ONLY
JOB #: 2L0341E

Company: Benchmark Storage Innovations

MANUFACTURER'S PERFORMANCE CRITERIA

The enclosed Performance Criteria Form is required to be completed before the start of immunity tests. The passing or failing of the test is almost exclusively dependent on the criteria that have been established by the manufacturer. However, some cases

Performance criteria have been grouped into three categories, namely A, B, and C:

Performance Criteria A: Normal operation of the EUT is expected.

Please define:

No soft errors during testing. Test software "test.exe rev 1.0" continues to run with no reported errors.

Performance Criteria B: Degradation of product performance is allowed only during the application of the test. No change of stored data is allowed.

Please define:

Soft errors are allowed.

Performance Criteria C: Temporary loss of function is allowed as long as the operator can restore proper operation after completion of the test.

Please define:

Hard errors are allowed.

Manufacturer's Representative: Dennis King at Percept Technology

Performance Criteria should be as specific as possible. For example:

Criteria A: Green LED indicator ON. Meter reading between 5 and 10.
Criteria B: Meter reading outside the 5 and 10 range but returning to normal range after application of the electromagnetic phenomena. Red LED on would be considered a failure.
Criteria C: Display indicates “error” message. User must press reset button in order for normal operation to continue. EUT behaves normally after the reset button has been depressed.

Addendum 2: DLT VS160e VCCI Report (100 VAC)

EMC Test Report Summary

According to ISO/IEC Guide 25 & EN 45001

Product Type / Number:

Benchmark Storage Innovations, Inc DLT VS160e External Tape Drive,
Hewlett Packard StorageWorks DLT-VS-160/320 External Tape Drive,
Tandberg DLT VS160 External Tape Drive

Hewlett-Packard Company
Fort Collins Hardware Test Center M/S 63
3404 E. Harmony Rd.
Ft. Collins, CO 80528 - 9599 USA
Phone: (970) 898-3601
FAX: 970-898-7367
Email: jim_laubach@hp.com

EMC Test Report Summary: 02-40ES-067-I
Date: 28 June 2002

This report shall not be reproduced except in full without the written approval of the testing laboratory.
The results in this report apply only to the sample(s) tested.

A2LA Certificate number: 0905-01

BSMI Registration number: SL2-IN-E-1011
DATech Registration number: TTI-P-G053/92-50

FCC Listing number: 31040/SIT 1300F2
VCCI Registration numbers: C820 and R787

Client

Contact person: Singh, Shawn
Company: Percept Technology
Address: 4735 Walnut St. #E
Boulder, CO 80301
Telephone: (303) 444-7480

Test Period

Equipment received on 21June 2002
Tests were performed: from 21 June 2002 to 22 June 2002
Witnesses (other than the test technician): None

Test Report Authorization

Technical review by:

Brian Annis (EMC Test Engineer) Date: 28 June 2002

Report authorized by:

Jim Laubach (Test Lab Manager) Date: 28 June 2002

Equipment Under Test (EUT)

Product Type	Merchandising Name	Product Number	Serial Number
Mass Storage-External	**Benchmark Storage Innovations, Inc DLT VS160e**	**DLT VS160e**	**DL2020636**
Mass Storage-External	**Hewlett Packard StorageWorks DLT-VS-160/320**	**DLT-VS-160/320**	**DL2020636**
Mass Storage-External	**Tandberg DLT VS160**	**DLT VS160**	**DL2020636**

Measurement Uncertainty

Measurement Uncertainty calculations are on file and available from the Test Laboratory upon request

Environmental Conditions

Environmental Conditions for the individual tests are included in the test report(s).

TEST SPECIFICATIONS AND SUMMARY RESULTS			
Test No.	EMISSIONS	Result	Comments
1	**Conducted Emissions/Mains** CISPR 22:1997 + A1 EN55022:1998 + A1 AS/NZS 3548 (Australia) VCCI (Japan) GOST R 51318.22-99 (Russia) CNS 13438 (Taiwan) CFR 47 (US)	**P**	**Class B** CE(258)_WO#1199_[22]Percept Technology_SKUNA_100V_X.doc CISPR 22 Class B
2	**Radiated Emissions** CISPR 22:1997 + A1 EN55022:1998 + A1 AS/NZS 3548 (Australia) VCCI (Japan) GOST R 51318.22-99 (Russia) CNS 13438 (Taiwan) CFR 47 (US)	**P**	**Class B** RE(267)_WO#1200 PERCEPT 160[22]_SKUNA_LO-B_100V_1_X.doc CISPR 22 Class B
3	**Harmonic Current Emission** IEC/EN 61000-3-2:1998	**ND**	
4	**Voltage Fluctuations and Flicker** IEC/EN 61000-3-3:1995	**ND**	
Test No.	IMMUNITY	Result	Comments
5	**Electrostatic Discharge Immunity** CISPR 24:1997 IEC/EN 61000-4-2:1999 EN 55024:1998 AS/NZS 4252.1	**ND**	
6	**Radiated Field Immunity** CISPR 24:1997 IEC 61000-4-3:1995 / EN 61000-4-3:1996 EN 55024:1998 AS/NZS 4252.1	**ND**	
7	**Fast Transients Immunity** CISPR 24:1997 IEC/EN 61000-4-4:1995 EN 55024:1998 AS/NZS 4252.1	**ND**	
8	**Surge Immunity** CISPR 24:1997 IEC/EN 61000-4-5:1995 EN 55024:1998	**ND**	
9	**Conducted Immunity** CISPR 24:1997 IEC/EN 61000-4-6:1996 EN 55024:1998	**ND**	
10	**Power Frequency Magnetic Field Immunity** CISPR 24:1997 IEC/EN 61000-4-8:1993 EN 55024:1998	**ND**	
11	**Voltage Dips, Short Interruptions and Voltage Variations Immunity (PQF)** CISPR 24:1997 IEC/EN 61000-4-11:1994 EN 55024:1998	**ND**	
P=Passed F=Failed ND=Not Done N/A=Not Applicable			

Additional Information:

(Explain why a certain Test was Not Done (**ND**) or was Not Applicable (**N/A**))

SEE ATTACHED JUSTIFICATIONS

Fort Collins Hardware Test Center

3404 East Harmony Road, Fort Collins, Colorado 80528
Telephone: 970-898-3319 Fax: 970-898-7367

WORKORDER NUMBER	**1199**
TEST TYPE	**Conducted Emissions (CE)**
TEST NAME	**Class B CISPR 22**
DATE TEST PERFORMED	**21 Jun 2002**
CUSTOMER PROJECT ALIAS	**Percept**
HTC PROJECT NAME	**[22] Percept Technology**
SECONDARY QUALS	**NA**
MODEL NUMBER	**DLT VS160e**
SKU/UNIT#	**NA**
EUT POWER	**100V 60Hz**
QUANTITY TESTED	**1**
CUSTOMER NAME	**Shawn Singh**
COMPANY NAME	**Percept Technology**
COMPANY ADDRESS	**4735 Walnut St. #E** **Boulder, CO 80301**
TECHNICIAN	**Don Lighthart**
ENGINEER	**Brian Annis**
REVIEWED BY	**Steve Brauns**

APPROVED BY: DATE: 7/8/2002

Brian Annis

R-787 C-820 90633 SL2-IN-E-1011 TTI-P-G053/92-50 ACCREDITED 0905-01

SUMMARY	Passed
DEVIATIONS	None
COMMENTS	None

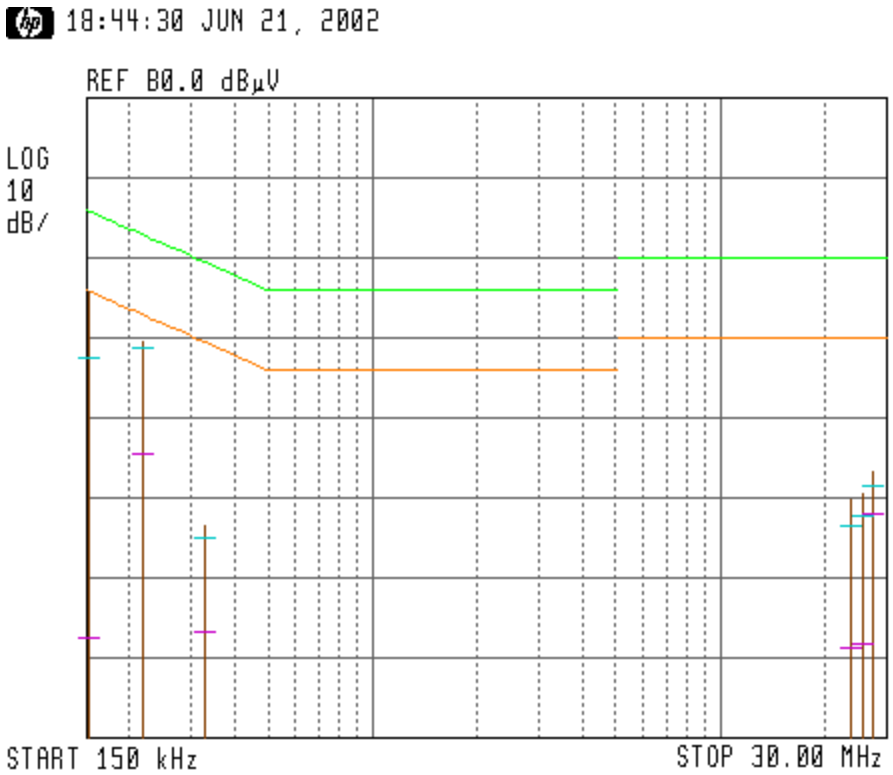
TEST DATA

CISPR Class B Limits

Data for Benchmark DLT VS160e External Tape Drive, LISN1 (Line)

Signal Number	Freq [MHz]	Peak Reading (dBuV)	QP Reading (dBuV)	QP Limit (dBuV)	QP Margin (dB)	Avg Reading (dBuV)	Avg Limit (dBuV)	Avg Margin (dB)	P/F
1	.153	56.02	47.63	65.86	18.23	12.75	55.86	43.11	P
2	.219	49.61	48.83	62.84	14.01	35.71	52.84	17.13	P
3	27.278	33.40	31.95	60.00	28.05	28.11	50.00	21.89	P
4	25.342	30.61	27.99	60.00	32.01	12.05	50.00	37.95	P
5	23.362	29.91	26.55	60.00	33.45	11.59	50.00	38.41	P
6	.327	26.75	25.04	59.52	34.48	13.49	49.52	36.03	P
					14.0			**17.1**	

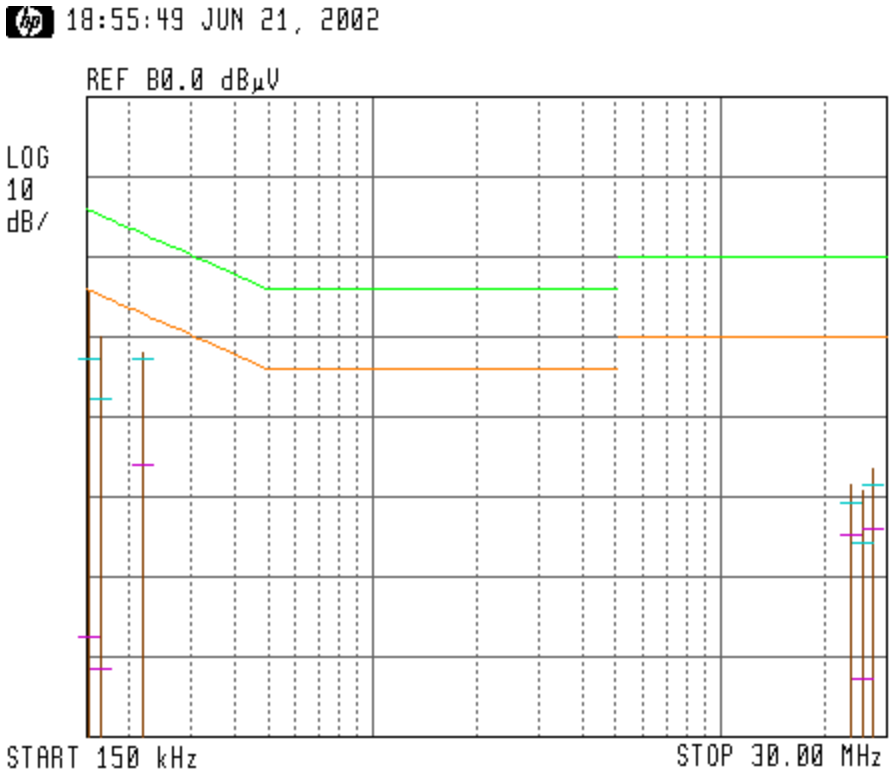
Note: To account for test system losses and gains, a correction factor is added to the spectrum analyzer readings to produce the “corrected” signal levels. This correction factor is equal to the cable losses minus the preamplifier gain.



Data for Benchmark DLT VS160e External Tape Drive, LISN1 (Neutral) CISPR Class B Limits

Signal Number	Freq [MHz]	Peak Reading (dBuV)	QP Reading (dBuV)	QP Limit (dBuV)	QP Margin (dB)	Avg Reading (dBuV)	Avg Limit (dBuV)	Avg Margin (dB)	P/F
1	.153	55.51	47.48	65.82	18.34	12.58	55.82	43.24	P
2	.166	50.23	42.18	65.15	22.97	8.97	55.15	46.18	P
3	.219	48.11	47.29	62.86	15.57	34.23	52.86	18.63	P
4	27.284	33.62	31.78	60.00	28.22	26.37	50.00	23.63	P
5	23.386	31.74	29.52	60.00	30.48	25.64	50.00	24.36	P
6	25.310	30.92	24.31	60.00	35.69	7.78	50.00	42.22	P
					15.6			**18.6**	

Note: To account for test system losses and gains, a correction factor is added to the spectrum analyzer readings to produce the “corrected” signal levels. This correction factor is equal to the cable losses minus the preamplifier gain.



EUT DESCRIPTION & SYSTEM CONFIGURATION

Equipment Under Test

Part ID	Mfgr	Model	Description	SN	FCC ID
11110	Hewlett Packard	C6427A	HP 930C Color Printer	CN0801S4DB	None
11055	Hewlett Packard	C4744-60201	HP PS/2 Keyboard w/2 Meter Shielded Cable	1H04806722B	None
11146	Logitech	M-S34	Logitech PS/2 Mouse w/2 Meter Shielded	LZN02317723	None
11542	DELL	DHM	DELL DHM TOWER SERVER PC	31XQ311	None
11113	Hewlett Packard	GDM-IW9012	HP A7217A 24^ Monitor	JP13601282	None
11617	Hewlett Packard	F1816-80027	HP Jornada 720 Palmtop PC	SG14870380	None
11707	Hewlett Packard	F1279B	Jornada AC/DC Adapter for 720 Palmtop PC w/2 Meter Shielded Cable	226762	None
12686	Benchmark	DLT VS160e	Benchmark VS160e External Tape Drive	DL2020636	None

Cables

ID	Qty	Type	Mfgr	Model	Length	Shield	Description
74	1	SCSI	Generic	N/A	2 Meters	Yes	Wide SCSI Cable
49	1	Parallel	Belkin	N/A	2 Meter	Yes	DB25 Parallel Printer Cable
58	1	Power	Hewlett Packard	E53771SP	6 Foot	No	HP 930C Color Printer Power Cable
52	1	Video	Total Technologies	N/A	2 Meter	Yes	Video Cable w/Blue Connectors (Ferrited on Both Ends)
48	1	Serial	HP	F1224-80004	1.5 Meter	Yes	Jornada 720 Serial Cable (ferrited)
57	1	Power	Volex	8120-6313	6 Foot	No	HP Jornada 720 Palmtop PC Power Cable
88	3	Power	Generic	8120-1378	8 Foot	No	Generic Computer Power Cable

PERFORMANCE CRITERIA

Code	N/A
Description	Not applicable for this test type.

TEST ENVIRONMENT

EUT Condition	Functional and undamaged relative to test
EUT Configuration/Function	EUT, SPU, MONITOR, VIDEO CABLE, PRINTER, PARALLEL CABLE, MOUSE, KEYBOARD, PALMTOP PC, SERIAL CABLE, AC ADAPTER, 5 - POWER CABLES
[1,2] EUT Power	100V, 60Hz
Environmental Conditions	21 deg C, 45 %RH, 100.8 KPa

[1] Unless otherwise noted, the 115VAC/60Hz power source is the Ft. Collins public power supply system, and the 230VAC/50Hz source is a variable-voltage 50Hz motor generator. These voltages are specified to within ± 5%, and frequency is specified within ± 1%.

[2] For BSMI qualification testing, emissions are also evaluated at 110V/60Hz and 220V/60Hz, using the Elgar power source.

EUT SOFTWARE/FIRMWARE

Name	Rev	Functionality/Description
Windows NT	4.0	service pack 6
Drivediag	7.0	ASPI to write to external tape drive continuously

TEST DESCRIPTION

For ITE equipment. Measurements are made from 150 KHz-30 MHz, using average and quasi-peak detectors on all active phases (and neutral, if applicable). The worst-case readings are reported (minimum of 6), and must pass CISPR 22 Class B limits.

TEST PROCEDURE

TP004 - Conducted Emissions Test Procedure Rev 3.0

TEST AUTOMATION SOFTWARE

Name	Revision
CE Func Test	1.3
Test Manager	0.8

TEST AND MEASUREMENT EQUIPMENT

ID	Mfgr	Model	Description	Serial #	Last Cal	Int	Cal Due
409	Elgar	1751SX	Elgar (AC Power Source)	3140	12/3/2001	12	12/31/2002
452	Rhode & Swartz	ESH-2-Z5	LISN (Artificial Mains)	872094/044	9/4/2001	12	9/30/2002
544	Elgar	1751SX	Elgar (AC Power Source)	3138	12/3/2001	12	12/31/2002
613	HP	8657B	Signal Generator	3520U06216	9/5/2001	12	9/30/2002
653	Vaisala	HMI41	Temp/Humidity Indicator	R5110009	5/8/2002	12	5/31/2003
695	EMCO	20AMPLISN	Custom 20A LISN	9709-2001	9/7/2001	12	9/30/2002
696	EMCO	20AMPLISN	Custom 20A LISN	9709-2002	9/7/2001	12	9/30/2002
698	EMCO	20AMPLISN	Custom 20A LISN	9709-2004	9/7/2001	12	9/30/2002
699	EMCO	20AMPLISN	Custom 20A LISN	9709-2005	9/7/2001	12	9/30/2002
700	EMCO	50AMPLISN	Custom 50A LISN	9709-2006	9/7/2001	12	9/30/2002
701	HP	EC4014	Switch Matrix & Cables	NA	9/7/2001	12	9/30/2002
778	HP	85420E	RF Filter Section	3705A00202	8/31/2001	12	8/31/2002
779	HP	85422E	EMI Receiver 9KHz-2.9GHz	3746A00246	8/31/2001	12	8/31/2002
782	Fischer	801-T4	CDN-T4	2026	9/30/2001	12	9/30/2002
788	HP	3488A	Switch Controller	2719A14509	NA	12	
831	Elgar	9012	Programmer	498000	12/3/2001	12	12/31/2002

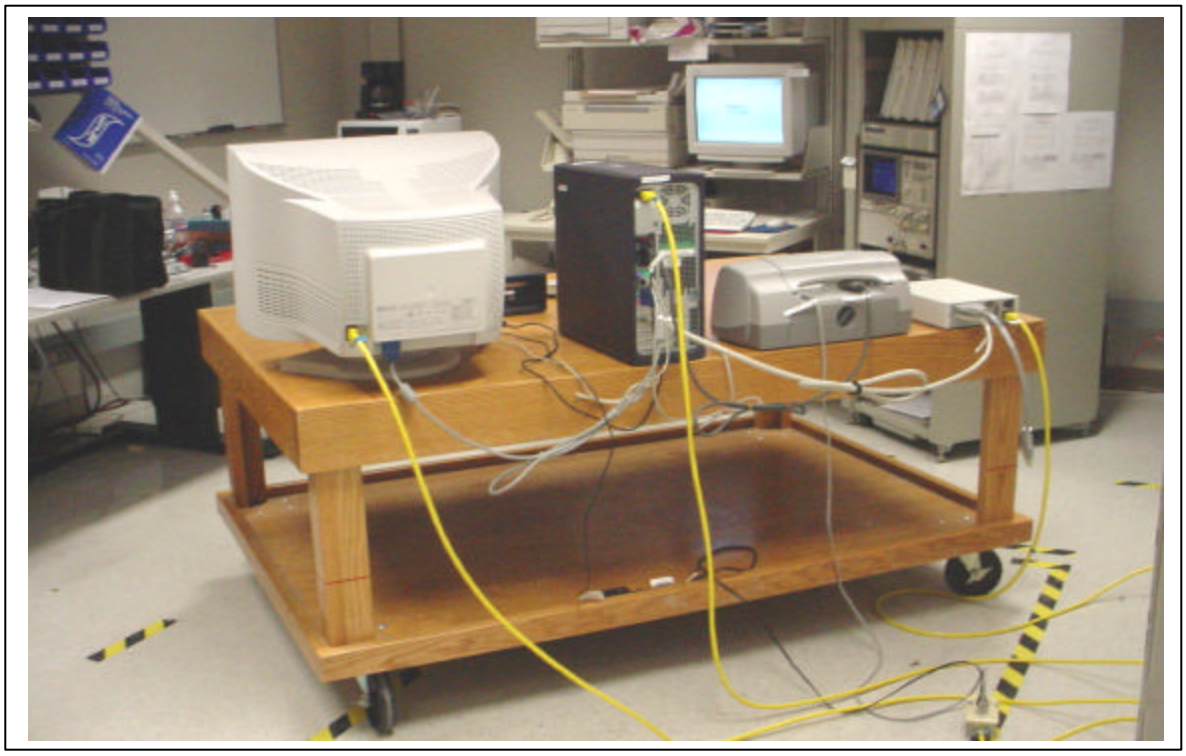
REGULATORY STANDARDS

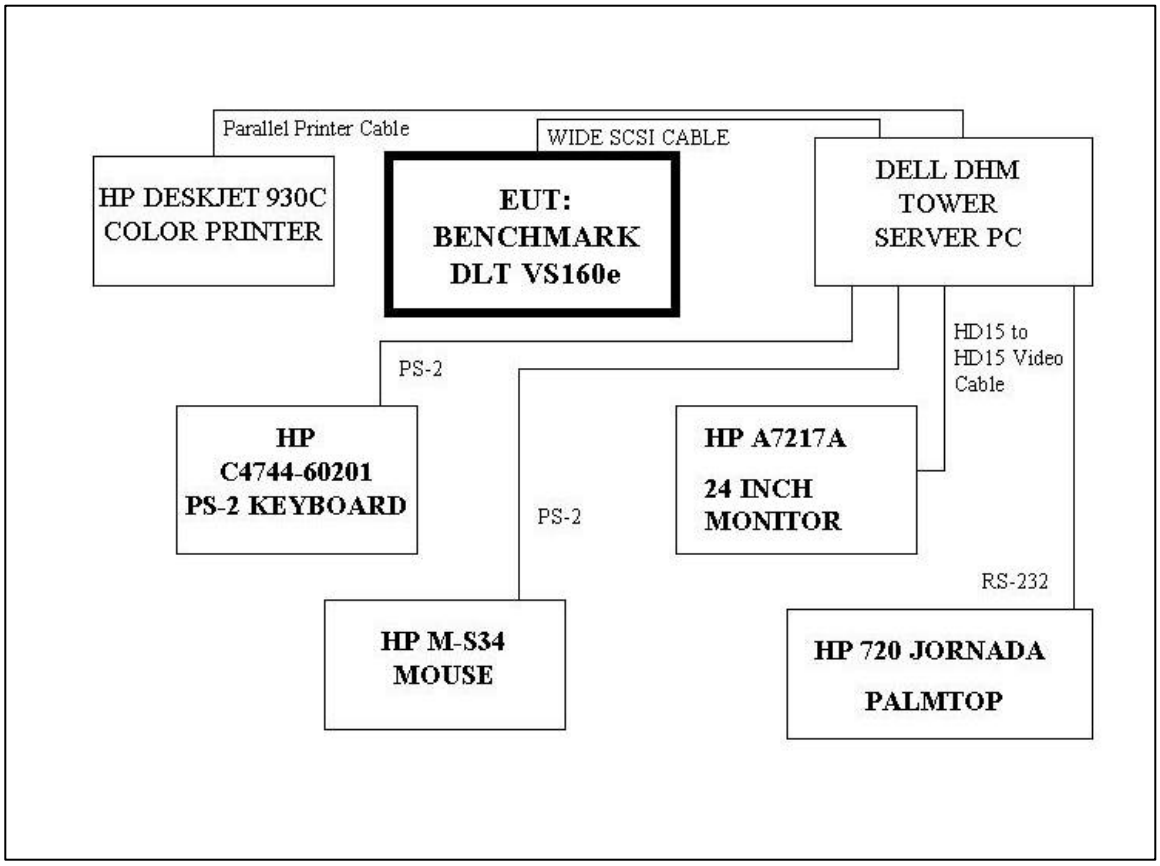
Where applicable, the test methods are compliant with the following regulatory standards:

AS/NZS 3548:1995	CISPR 22:1993	CNS13803:	CNS13438:1997
ANSI C63.4:1992	FCC Part 15:1996	CISPR 11:1997	EN 55011:1998
AS/NZS 2064:1997	EN 55022:1994		

THE RESULTS OF THIS REPORT ARE INCLUSIVE ONLY OF THE UNITS TESTED.
THIS REPORT MAY NOT BE REPRODUCED IN ANY PART
WITHOUT THE WRITTEN CONSENT OF THE FORT COLLINS HARDWARE TEST CENTER.
ã COPYRIGHT HEWLETT PACKARD CO. 1997-2002


If Alarm
Sounds




Parallel Printer Cable
WIDE SCSI CABLE
HP DESKJET 930C
COLOR PRINTER
EUT:
BENCHMARK
DLT VS160e
DELL DHM
TOWER
SERVER PC
HD15 to
HD15 Video
Cable
PS-2
HP
C4744-60201
PS-2 KEYBOARD
HP A7217A
24 INCH
MONITOR
PS-2
RS-232
HP M-S34
MOUSE
HP 720 JORNADA
PALMTOP

WORKORDER NUMBER	**1200 PERCEPT 160**
TEST TYPE	**RADIATED EMISSIONS**
REGULATION/STANDARD	**Class B CISPR 22**
EUT POWER	**100 Volts AC @ 60 Hz, 1-Phase Power**
DATE TEST PERFORMED	**Jun 22, 2002**
PROJECT NAME	**DLT VS160e**
MODEL NUMBER	**DLT VS160e**
QUANTITY TESTED	**1**
CUSTOMER NAME	**Percept Technology**
COMPANY NAME	**Benchmark Storage Innovations**
COMPANY ADDRESS	**3122 Sterling Circle Boulder, CO 80301**
TECHNICIAN	**Don Lighthart**
ENGINEER	**Brian Annis**
REVIEWED BY	**Steve Brauns**

APPROVED BY:  DATE: 7/8/2002

Brian Annis

ACCREDITED 0905-01 FC 90633 DQTech TTI-P-G053/92-50 BSMI SL2-IN-E-1011 VCCI R-787 C-820

.

SUMMARY:	System passed by 5.2 dB
DEVIATIONS:	NONE
COMMENTS:	PASSED

RADIATED EMISSIONS DATA – Class B CISPR 22

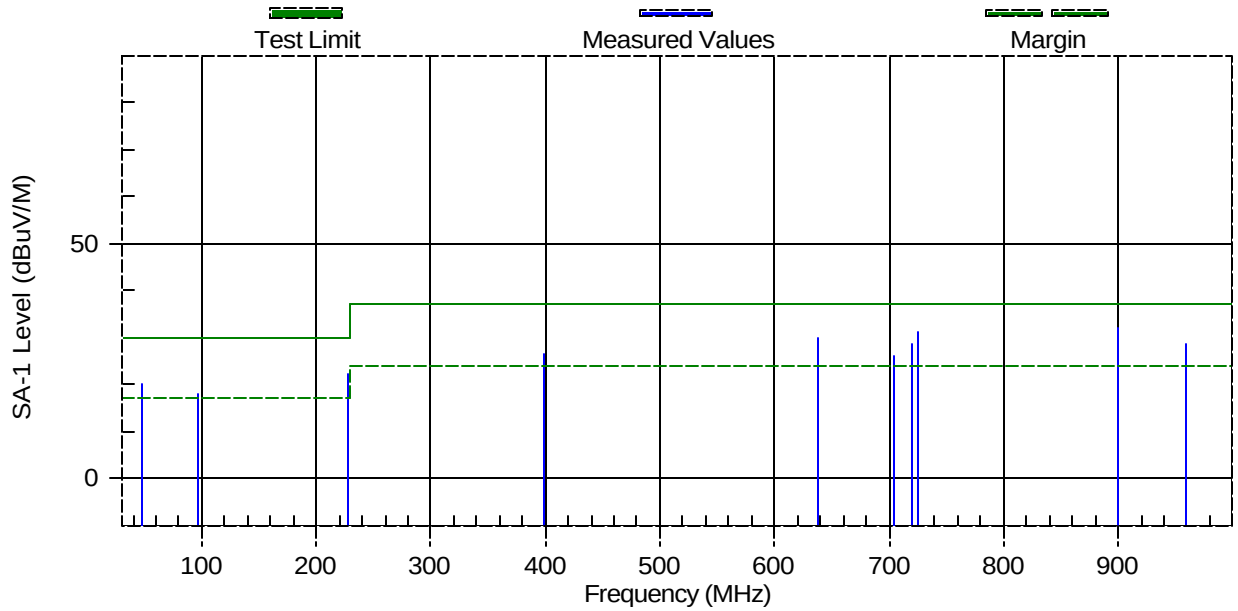
Frequency [MHz]	Polarity [V/H] Height [cm] Azimuth [deg]	Receiver Reading (dBuV)	Correction Factor[1] (dB)	Corrected Reading[2] (dBuV)	Margin (dB)	Limit (dBuV)
899.98	H,100,345	63.6	-31.8	31.8	5.2	37.0
726.0	V,230,356	63.9	-33.0	30.9	6.1	37.0
637.97	V,290,340	63.6	-33.7	29.9	7.1	37.0
227.51	V,100,81	65.7	-43.4	22.3	7.7	30.0
959.99	H,100,158	60.1	-31.5	28.6	8.4	37.0
720.0	V,245,359	61.5	-33.1	28.4	8.6	37.0
47.19	V,100,274	62.2	-42.2	20.0	10.0	30.0
398.62	H,251,218	63.2	-36.9	26.3	10.7	37.0
703.97	V,238,351	59.5	-33.4	26.1	10.9	37.0
96.02	V,128,301	61.0	-43.1	17.9	12.1	30.0

[1] To account for test system losses and gains, a correction factor is added to the spectrum analyzer readings to produce the "corrected" signal levels. This correction factor is the sum of the antenna factor and the cable losses, minus the preamplifier gain.

[2] Quasi-peak detection used for all final signal measurements <= 1 GHz, average detection used > 1 GHz.

Final Test Results

1200 PERCEPT 160 / PERCEPT_DLT-VS160_B-LO / DL2020636 / 6/22/2002 @ 1:11:12 AM



EUT DESCRIPTION & SYSTEM CONFIGURATION:

Equipment Under Test:

Product Type	Model	Ser. No.	Description
EXTERNAL TAPE DRIVE	DLT VS160e	DL2020636	BENCHMARK STORAGE DLT VS160e EXTERNAL TAPE DRIVE (HTC# 12686)

EUT Support Equipment:

Product Type	Model	Ser. No.	Description
AC POWER CABLE	8120-1378	N/A	(STANDARD) 8Ft. UNSHIELDED PC POWER CABLE (3 CABLES)
KEYBOARD	C4744-60201	1H04806722B	HP (HTC# 11055) PS/2 KEYBOARD w/2 METER SHIELDED CABLE
MONITOR	GDM-IW9012	JP13601282	HP (HTC# 11113) 24 in. FLAT SCREEN COLOR MONITOR
MOUSE	M-S34	LZN02317723	LOGITECH (HTC# 11146) PS/2 MOUSE w/2 METER SHIELDED CABLE
PALMTOP AC/DC ADAPTER	F1279B	226762	HP (HTC# 11707) JORNADA AC/DC ADAPTER w/2 METER SHIELDED CABLE FOR 720 PALMTOP PC
PALMTOP PC	F1816-80027	SG14870380	HP (HTC# 11617) 720 JORNADA PALMTOP PC
PALMTOP POWER CABLE	8120-6313	N/A	HP (CABLE ID# 57) JORNADA 6 Ft. UNSHIELDED POWER CABLE FOR 720 PALMTOP PC
PALMTOP SERIAL CABLE	F1224-80004	N/A	HP (CABLE ID# 48) JORNADA 2 METER SHIELDED FERRITED SERIAL CABLE FOR 720 PALMTOP PC
PRINTER CABLE	F2A046-06	N/A	BELKIN (CABLE ID# 49) DB25 2 METER DOUBLE SHIELDED PARALLEL PRINTER CABLE
PRINTER POWER CABLE	E53771SP	NA	HP (CABLE ID# 58) 2 METER UNSHIELDED PRINTER POWER CABLE
PRINTER	C6427A	CN0801S4DB	HP (HTC# 11110) DESKJET 930C COLOR PRINTER
SCSI CABLE	N/A	N/A	GENERIC (CABLE ID# 74) 2 METER SHIELDED WIDE SCSI CABLE
SPU	DHM	31XQ311	DELL (HTC# 11542) DHM TOWER SERVER
VIDEO CABLE	E193793	N/A	TOTAL TECHNOLOGIES (CABLE ID# 52) 2 METER SHIELDED VIDEO CABLE (BLUE ENDS)

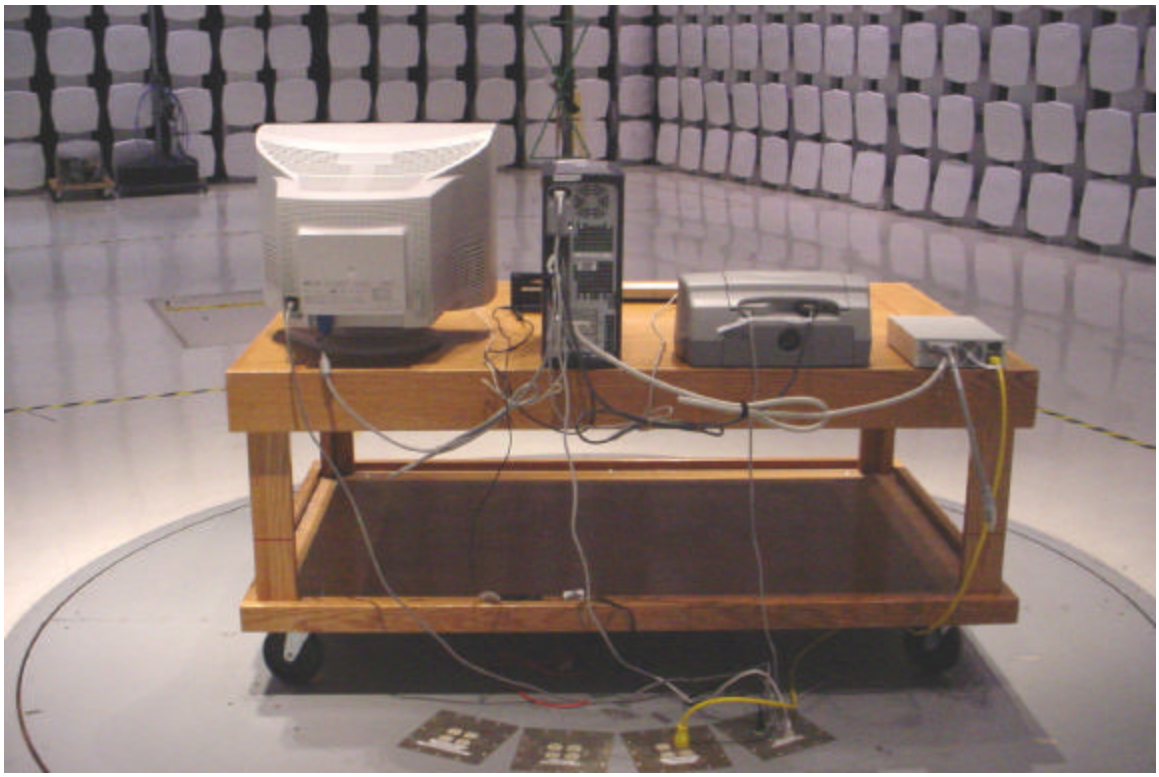
TEST ENVIRONMENT

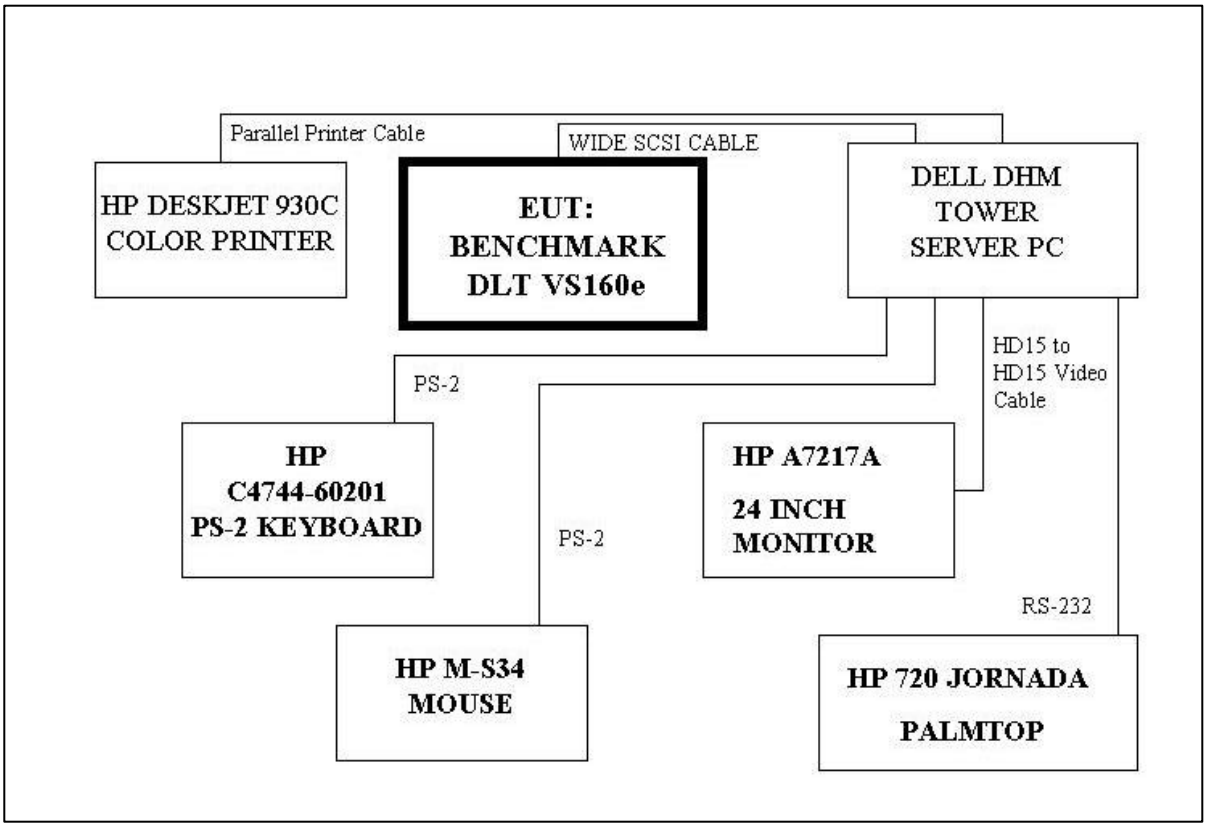
EUT Condition	Functional and undamaged
EUT Software/Firmware	WINDOWS 2000, DRIVEDIAG 7.0
EUT Verification	ASPI TO WRITE DATA TO EXTERNAL TAPE DRIVE CONTINIOUSLY
EUT/System Description	EUT, SPU, MONITOR, VIDEO CABLE, PRINTER, PARALLEL CABLE, SCSI CABLE, MOUSE, KEYBOARD, PALMTOP, SERIAL CABLE, AC ADAPTER, 5 - POWER CABLES
[3,4] EUT Power	100 Volts AC @ 60 Hz, 1-Phase Power
Environmental Conditions	23.3 Deg C, 43.0 % RH, 100.8 kPa

[3] 115V/60Hz power source is the Ft. Collins public power supply system (filtered), and the 230V/50Hz source is the 50Hz motor generator. Power voltages are specified to within ± 5%, and power frequencies are specified to within ± 1%.

[4] For BSMI qualification, emissions are also evaluated at 110V/60Hz and 220V/60Hz, using the Elgar power source.

EUT/SYSTEM PHOTOGRAPHS & DIAGRAMS




Parallel Printer Cable
WIDE SCSI CABLE
HP DESKJET 930C COLOR PRINTER
EUT: BENCHMARK DLT VS160e
DELL DHM TOWER SERVER PC
HD15 to HD15 Video Cable
PS-2
HP C4744-60201 PS-2 KEYBOARD
HP A7217A 24 INCH MONITOR
PS-2
RS-232
HP M-S34 MOUSE
HP 720 JORNADA PALMTOP

TEST DESCRIPTION/PROCEDURE

A system verification test is performed prior to each test run. This "functional" test sequentially transmits a signal at predetermined frequencies across the spectrum of interest, and compares the signal levels received at each antenna with reference values determined when the system was known to be functioning properly. The received signal levels must be within ± 1 dB of the reference values for the functional test to pass. Prior to each test run, any necessary adjustments are also made to the turntable and mast controllers to maintain their specified positioning tolerances (± 5°, ± 3cm). This test measures the radiated emissions of products from 30 MHz to 1000 MHz, as required, using a broadband receiving antenna, preamplifier, quasi-peak adapter, and spectrum analyzer. Testing is performed entirely in a 10-meter semi-anechoic chamber that meets the Normalized Site Attenuation requirements of ANSI C63.4. and CISPR 22. During prescan testing, the turntable is positioned to enable measurements at 16 separate azimuth angles. At each turntable azimuth, peak emission levels are then recorded for antenna elevations of 100, 250, and 400 cm, in both horizontal and vertical polarizations. When prescan testing is completed, the frequency list is typically sorted to include all signals within 6 dB of the specified limit, and must include a minimum of 6 discrete signals. If necessary, the list is re-sorted to include more signals. Each signal in this reduced list is then re-measured using quasi-peak or average detection, at the turntable and antenna positions where the highest signal level was found during prescan. These quasi-peaked and averaged results are then used to generate the final frequency list. During the final test, each signal in the final frequency list is maximized by rotating the turntable and adjusting the antenna position for a maximum signal level on the spectrum analyzer. These maximum signal levels are then measured and recorded by the test softw are. Quasi-peak detection is used for signals at frequencies less than 1000 MHz, using a bandwidth of 120 kHz and a 20 ms sweep time. Signals greater than 1000 MHz are averaged, using a bandwidth of 1 MHz and a 20 ms sweep time. With the exception of the final signal maximization, the test is completely automated using Hewlett-Packard's *Radiated Emissions Module* (REM 2.2.6) test software. This process is documented in the FCHTC's *Radiated Emissions Test Procedure* (TP018).

TEST AND MEASUREMENT EQUIPMENT

ID	Description	Model	Mfgr	Serial #	Calibration ID	Cal'd	Cal Int	Cal Due
753	Antenna, Horn 1-18 GHz	3115	EMCO	9811-5627	EC3115-5627	22-Sep-01	12	30-Sep-02
688	Bilog Antenna 30MHz-2GHz	CBL6112A	Chase	2232	EC6112-2232	11-Oct-01	12	31-Oct-02
692	Front End, 10m North	EC4013	HP	NA	EC4013	27-Jan-02	12	31-Jan-03
685	Front-End, 10m South	EC4009	HP	NA	EC4009	27-Jan-02	12	31-Jan-03
690	Mast/Turntable Controller	SC98V	Sunol	101797-2	NA	-	-	-
691	Mast/Turntable Controller	SC98V	Sunol	111997-1	NA	-	-	-
599	Quasi-Peak Adapter	85650A	HP	3303A01782	C85650A-01782	21-Mar-02	6	30-Sep-02
670	Signal Generator, 9 Khz - 4 GHz	8648D	HP	3613A00177	EC8648D-00177	31-Aug-00	24	31-Aug-02
674	Spectrum Analyzer	8566B	HP	3638A08701	EC8566B-08701	25-Mar-02	6	30-Sep-02
659	Spectrum Analyzer	8566B	HP	3638A08625	EC8566B-08625	17-Oct-01	12	31-Oct-02
605	Temp/Humidity Indicator	RH70AC	Omega	200-95-02759	RH70AC-02759	05-Oct-01	12	31-Oct-02
689	Turntable/Mast Controller	2090	EMCO	9708-1246	NA	-	-	-
759	10-Meter Semi-Anechoic	AP85	EMC Test	0001	AP85-0001	4-Oct-01	12	31-Oct-02
500	Antenna, Horn 1-18 GHz	3115	EMCO	9210-3947	EC3115-3947	09-Sep-01	12	30-Sep-02
687	Bilog Antenna 30MHz-2GHz	CBL6112A	Chase	2279	EC6112-2279	26-Sep-01	12	30-Sep-02
790	Synthesized CW Generator	8671B	HP	3034A01165	8671B-01165	5-Sep-01	12	30-Sep-02
409	AC Power Source	1751SX	Elgar	3140	EC1751-3140	3-Dec-01	12	31-Dec-02
544	AC Power Source	1751SX	Elgar	3138	EC1751-3138	3-Dec-01	12	31-Dec-02
831	Controller Module	9012	Elgar	498000	EC9012-98000	3-Dec-01	12	31-Dec-02
797	Motor Generator	60-470364	Horlick	75419-3	EC60-470364	27-Jul-01	12	31-Jul-02
409	Elgar (AC Power Source)	1751SX	Elgar	3140	1751SX-3140	03-Dec-01	12	31-Dec-02
544	Elgar (AC Power Source)	1751SX	Elgar	3138	1751SX-3138	03-Dec-01	12	31-Dec-02
831	Elgar Programmer Unit	9012	Elgar	498000	9012-498000	3-Dec-01	12	31-Dec-02

REGULATORY STANDARDS

Where applicable, test methods are compliant with the following regulatory standards:

EN55022:1998-09	CISPR 22:1997-11	ANSI C63.4-1992	CNS 13438:1997-05
EN 55011:1998-05	CISPR 11:1997-12	FCC Parts 2, 15, 18	CNS 13803
AS/NZS 3548:1995	AS/NZS 2064:1997	EN 61326:1997 + A1:1998	VCCI

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Addendum 3: DLT VS160e FCC (CISPR) Radiated Emissions Report (110 VAC)

Fort Collins Hardware Test Center

3404 East Harmony Road, Fort Collins, Colorado 80528
Telephone: 970-898-3319 Fax: 970-898-7367

WORKORDER NUMBER	**1196 PERCEPT 160**
TEST TYPE	**RADIATED EMISSIONS**
REGULATION/STANDARD	**CNS 13438 Class B**
EUT POWER	**110 Volts AC @ 60 Hz, 1-Phase Power**
DATE TEST PERFORMED	**Jun 21, 2002**
PROJECT NAME	**DLT VS160e**
MODEL NUMBER	**DLT VS160e (Benchmark), StorageWorks DLT-VS-160/320 External (HP), DLT VS160 External Tape Drive (Tandberg)**
QUANTITY TESTED	**1**
CUSTOMER NAME	**Percept Technology**
COMPANY NAME	**Benchmark Storage Innovations**
COMPANY ADDRESS	**3122 Sterling Circle Boulder, CO 80301**
TECHNICIAN	**Don Lighthart**
ENGINEER	**Brian Annis**
REVIEWED BY	**John Sifford**

APPROVED BY:  Date: 6/27/2002

Brian Annis

ACCREDITED 0905-01 FC 90633 DOTech TTI-P-G053/92-50 BSMI SL2-IN-E-1011 VCCI R-787 C-820

.

SUMMARY:	System passed by 5.7 dB
DEVIATIONS:	NONE
COMMENTS:	PASSED

RADIATED EMISSIONS DATA – CNS 13438 Class B

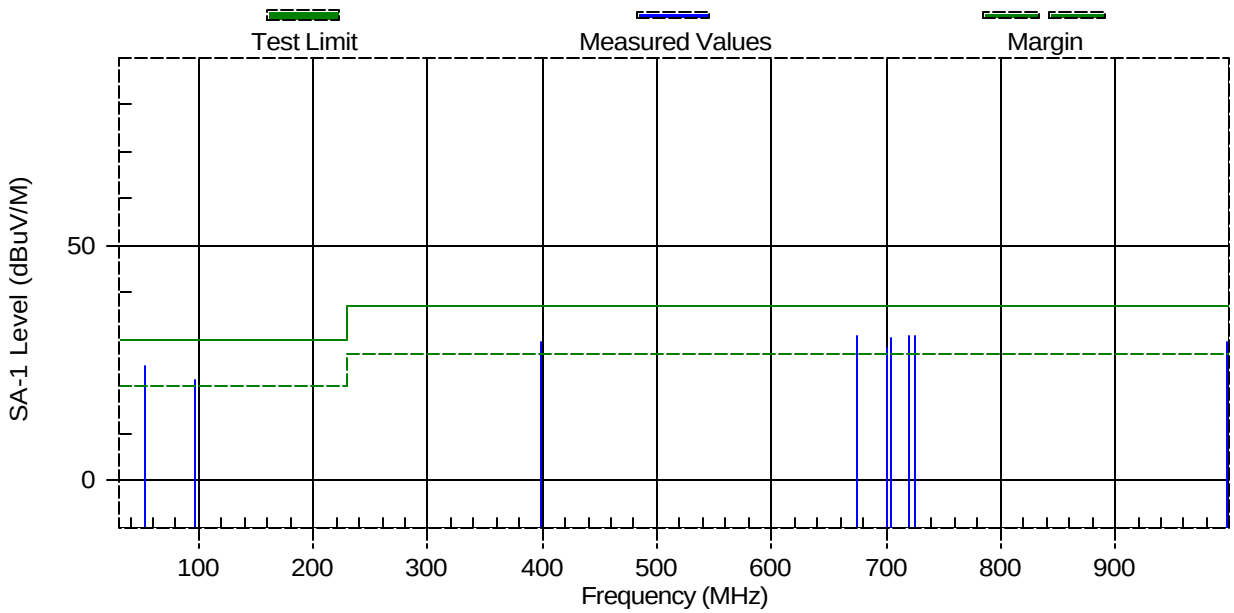
Frequency [MHz]	Polarity [V/H] Height [cm] Azimuth [deg]	Receiver Reading (dBuV)	Correction Factor[1] (dB)	Corrected Reading[2] (dBuV)	Margin (dB)	Limit (dBuV)
52.84	V,100,6	68.3	-44.0	24.3	5.7	30.0
675.0	V,242,188	64.3	-33.5	30.8	6.2	37.0
720.0	V,211,183	63.9	-33.1	30.8	6.2	37.0
726.04	V,250,0	63.7	-33.0	30.7	6.3	37.0
703.97	V,221,352	63.8	-33.4	30.4	6.6	37.0
53.17	V,100,90	66.8	-44.1	22.7	7.3	30.0
998.46	V,121,18	60.3	-30.9	29.4	7.6	37.0
398.76	H,248,201	66.1	-36.9	29.2	7.8	37.0
700.03	V,220,187	61.7	-33.4	28.3	8.7	37.0
96.03	V,121,272	64.3	-43.1	21.2	8.8	30.0

[1] To account for test system losses and gains, a correction factor is added to the spectrum analyzer readings to produce the "corrected" signal levels. This correction factor is the sum of the antenna factor and the cable losses, minus the preamplifier gain.

[2] Quasi-peak detection used for all final signal measurements <= 1 GHz, average detection used > 1 GHz.

Final Test Results

1196 PERCEPT 160 / PERCEPT_DLT-VS160_A-LO / DL2020635 / 6/21/2002 @ 6:07:22 PM



EUT DESCRIPTION & SYSTEM CONFIGURATION:

Equipment Under Test:

Product Type	Model	Ser. No.	Description
EXTERNAL TAPE DRIVE	DLT VS160e (Benchmark), StorageWorks DLT-VS-160/320 External (HP), DLT VS160 External Tape Drive (Tandberg)	DL2020635	BENCHMARK STORAGE DLT VS160e EXTERNAL TAPE DRIVE (HTC# 12685)

EUT Support Equipment:

Product Type	Model	Ser. No.	Description
AC POWER CABLE	8120-1378	N/A	(STANDARD) 8Ft. UNSHIELDED PC POWER CABLE (4 CABLES)
KEYBOARD	C4744-60201	1H04806722B	HP (HTC# 11055) PS/2 KEYBOARD w/2 METER SHIELDED CABLE
MONITOR	GDM-IW9012	JP13601282	HP (HTC# 11113) 24 in. FLAT SCREEN COLOR MONITOR
MOUSE	M-S34	LZN02317723	LOGITECH (HTC# 11146) PS/2 MOUSE w/2 METER SHIELDED CABLE
PALMTOP AC/DC ADAPTER	F1279B	226762	HP (HTC# 11707) JORNADA AC/DC ADAPTER w/2 METER SHIELDED CABLE FOR 720 PALMTOP PC
PALMTOP PC	F1816-80027	SG14870380	HP (HTC# 11617) 720 JORNADA PALMTOP PC
PALMTOP POWER CABLE	8120-6313	N/A	HP (CABLE ID# 57) JORNADA 6 Ft. UNSHIELDED POWER CABLE FOR 720 PALMTOP PC
PALMTOP SERIAL CABLE	F1224-80004	N/A	HP (CABLE ID# 48) JORNADA 2 METER SHIELDED FERRITED SERIAL CABLE FOR 720 PALMTOP PC
PRINTER CABLE	F2A046-06	N/A	BELKIN (CABLE ID# 49) DB25 2 METER DOUBLE SHIELDED PARALLEL PRINTER CABLE
PRINTER POWER CABLE	E53771SP	NA	HP (CABLE ID# 58) 2 METER UNSHIELDED PRINTER POWER CABLE
PRINTER	C6427A	CN0801S4DB	HP (HTC# 11110) DESKJET 930C COLOR PRINTER
SCSI CABLE	N/A	N/A	GENERIC (CABLE ID# 74) 2 METER SHIELDED WIDE SCSI CABLE
SPU	DHM	31XQ311	DELL (HTC# 11542) DHM TOWER SERVER
VIDEO CABLE	E193793	N/A	TOTAL TECHNOLOGIES (CABLE ID# 52) 2 METER SHIELDED VIDEO CABLE (BLUE ENDS)

TEST ENVIRONMENT

EUT Condition	Functional and undamaged
EUT Software/Firmware	WINDOWS 4.0, DRIVEDIAG 7.0
EUT Verification	ASPI TO WRITE DATA TO EXTERNAL TAPE DRIVE CONTINIOUSLY
EUT/System Description	EUT, SPU, MONITOR, VIDEO CABLE, PRINTER, PARALLEL CABLE, SCSI CABLE, MOUSE, KEYBOARD, PALMTOP, SERIAL CABLE, AC ADAPTER, 5 - POWER CABLES
[3,4] EUT Power	110 Volts AC @ 60 Hz, 1-Phase Power
Environmental Conditions	23.0 Deg C, 43.0 % RH, 100.6 kPa

[3] 115V/60Hz power source is the Ft. Collins public power supply system (filtered), and the 230V/50Hz source is the 50Hz motor generator. Power voltages are specified to within ± 5%, and power frequencies are specified to within ± 1%.

[4] For BSMI qualification, emissions are also evaluated at 110V/60Hz and 220V/60Hz, using the Elgar power source.

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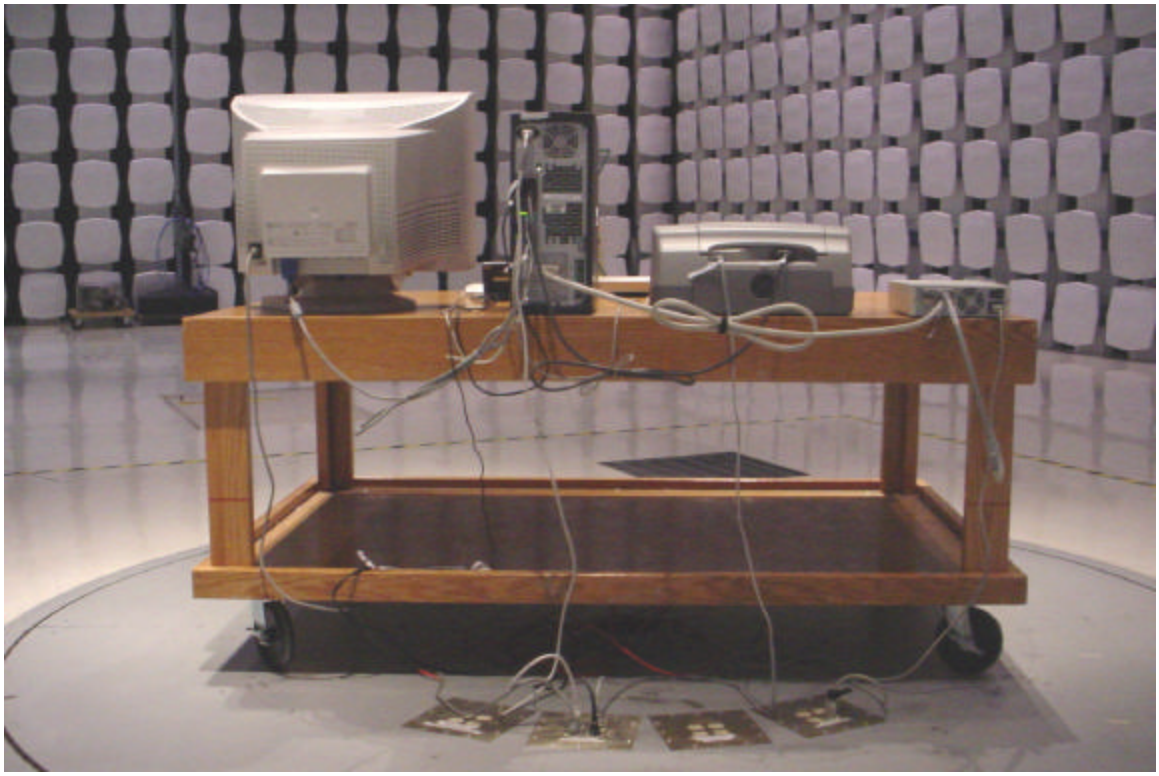

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TEST AND MEASUREMENT EQUIPMENT

ID	Description	Model	Mfgr	Serial #	Calibration ID	Cal'd	Cal Int	Cal Due
753	Antenna, Horn 1-18 GHz	3115	EMCO	9811-5627	EC3115-5627	22-Sep-01	12	30-Sep-02
688	Bilog Antenna 30MHz-2GHz	CBL6112A	Chase	2232	EC6112-2232	11-Oct-01	12	31-Oct-02
692	Front End, 10m North	EC4013	HP	NA	EC4013	27-Jan-02	12	31-Jan-03
685	Front-End, 10m South	EC4009	HP	NA	EC4009	27-Jan-02	12	31-Jan-03
690	Mast/Turntable Controller	SC98V	Sunol	101797-2	NA	-	-	-
691	Mast/Turntable Controller	SC98V	Sunol	111997-1	NA	-	-	-
599	Quasi-Peak Adapter	85650A	HP	3303A01782	C85650A-01782	21-Mar-02	6	30-Sep-02
670	Signal Generator, 9 Khz - 4 GHz	8648D	HP	3613A00177	EC8648D-00177	31-Aug-00	24	31-Aug-02
674	Spectrum Analyzer	8566B	HP	3638A08701	EC8566B-08701	25-Mar-02	6	30-Sep-02
659	Spectrum Analyzer	8566B	HP	3638A08625	EC8566B-08625	17-Oct-01	12	31-Oct-02
605	Temp/Humidity Indicator	RH70AC	Omega	200-95-02759	RH70AC-02759	05-Oct-01	12	31-Oct-02
689	Turntable/Mast Controller	2090	EMCO	9708-1246	NA	-	-	-
759	10-Meter Semi-Anechoic	AP85	EMC Test	0001	AP85-0001	4-Oct-01	12	31-Oct-02
500	Antenna, Horn 1-18 GHz	3115	EMCO	9210-3947	EC3115-3947	09-Sep-01	12	30-Sep-02
687	Bilog Antenna 30MHz-2GHz	CBL6112A	Chase	2279	EC6112-2279	26-Sep-01	12	30-Sep-02
790	Synthesized CW Generator	8671B	HP	3034A01165	8671B-01165	5-Sep-01	12	30-Sep-02
409	AC Power Source	1751SX	Elgar	3140	EC1751-3140	3-Dec-01	12	31-Dec-02
544	AC Power Source	1751SX	Elgar	3138	EC1751-3138	3-Dec-01	12	31-Dec-02
831	Controller Module	9012	Elgar	498000	EC9012-98000	3-Dec-01	12	31-Dec-02
797	Motor Generator	60-470364	Horlick	75419-3	EC60-470364	27-Jul-01	12	31-Jul-02
409	Elgar (AC Power Source)	1751SX	Elgar	3140	1751SX-3140	03-Dec-01	12	31-Dec-02
544	Elgar (AC Power Source)	1751SX	Elgar	3138	1751SX-3138	03-Dec-01	12	31-Dec-02
831	Elgar Programmer Unit	9012	Elgar	498000	9012-498000	3-Dec-01	12	31-Dec-02

REGULATORY STANDARDS

Where applicable, test methods are compliant with the following regulatory standards:

EN55022:1998-09	CISPR 22:1997-11	ANSI C63.4-1992	CNS 13438:1997-05
EN 55011:1998-05	CISPR 11:1997-12	FCC Parts 2, 15, 18	CNS 13803
AS/NZS 3548:1995	AS/NZS 2064:1997	EN 61326:1997 + A1:1998	VCCI

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Addendum 4: DLT VS160e FCC (CISPR) Conducted Emissions Report (110 VAC)

Fort Collins Hardware Test Center

3404 East Harmony Road, Fort Collins, Colorado 80528
Telephone: 970-898-3319 Fax: 970-898-7367

WORKORDER NUMBER	**1197**
TEST TYPE	**Conducted Emissions (CE)**
TEST NAME	**CNS 13438 Class B**
DATE TEST PERFORMED	**21 Jun 2002**
CUSTOMER PROJECT ALIAS	**Percept**
HTC PROJECT NAME	**[22] Percept Technology**
SECONDARY QUALS	**NA**
MODEL NUMBER	**DLT VS160e (Benchmark), StorageWorks DLT-VS-160/320 External (HP), DLT VS160 External Tape Drive (Tandberg)**
SKU/UNIT#	**NA**
EUT POWER	**110V 60Hz**
QUANTITY TESTED	**1**
CUSTOMER NAME	**Percept Technology**
COMPANY NAME	**Benchmark Storage Innovations**
COMPANY ADDRESS	**3122 Sterling Circle Boulder, CO 80301**
TECHNICIAN	**Don Lighthart**
ENGINEER	**Brian Annis**
REVIEWED BY	**John Sifford**

APPROVED BY: Date: 6/27/2002

Brian Annis

VCCI R-787 C-820 FC 90633 BSMI SL2-IN-E-1011 DOTech TTI-P-G053/92-50 A2LA ACCREDITED 0905-01

SUMMARY	Passed
DEVIATIONS	None
COMMENTS	None

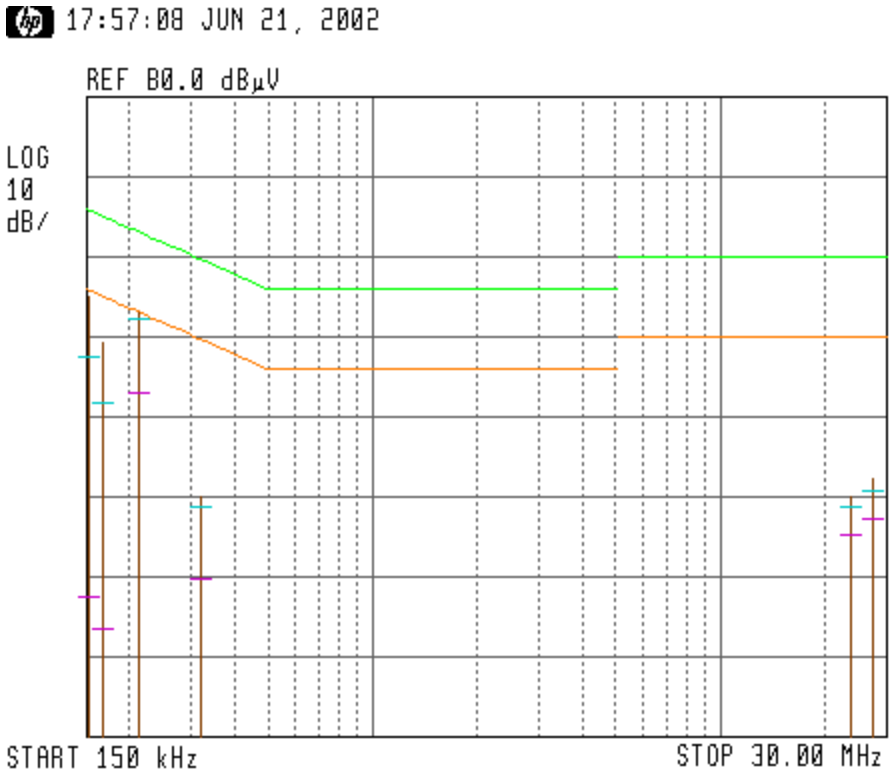
TEST DATA

Data for Benchmark VS160e External Tape Drive, LISN1 (Line)

CNS 13438 Class B Limits

Signal Number	Freq [MHz]	Peak Reading (dBuV)	QP Reading (dBuV)	QP Limit (dBuV)	QP Margin (dB)	Avg Reading (dBuV)	Avg Limit (dBuV)	Avg Margin (dB)	P/F
1	.153	55.35	47.84	65.82	17.98	17.72	55.82	38.10	P
2	.213	53.24	52.63	63.09	10.46	43.24	53.09	9.85	P
3	.168	49.21	41.82	65.06	23.24	13.68	55.06	41.38	P
4	27.272	32.41	31.02	60.00	28.98	27.34	50.00	22.66	P
5	23.379	30.32	28.91	60.00	31.09	25.41	50.00	24.59	P
6	.320	30.13	29.12	59.70	30.58	20.03	49.70	29.67	P
					10.5			**9.9**	

Note: To account for test system losses and gains, a correction factor is added to the spectrum analyzer readings to produce the “corrected” signal levels. This correction factor is equal to the cable losses minus the preamplifier gain.

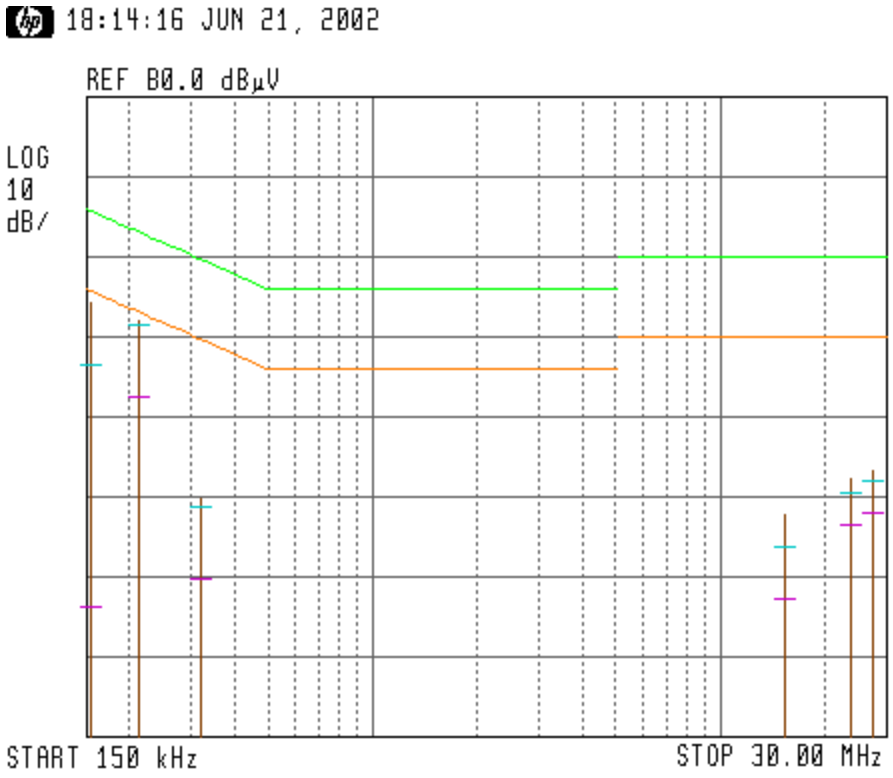


Data for Benchmark VS160e External Tape Drive, LISN1 (Neutral)

CISPR Class B Limits

Signal Number	Freq [MHz]	Peak Reading (dBuV)	QP Reading (dBuV)	QP Limit (dBuV)	QP Margin (dB)	Avg Reading (dBuV)	Avg Limit (dBuV)	Avg Margin (dB)	P/F
1	.155	54.38	46.60	65.71	19.11	16.67	55.71	39.04	P
2	.213	52.26	51.71	63.07	11.36	42.55	53.07	10.52	P
3	27.277	33.56	32.13	60.00	27.87	28.29	50.00	21.71	P
4	23.381	32.40	30.58	60.00	29.42	26.89	50.00	23.11	P
5	.320	29.97	28.91	59.70	30.79	19.99	49.70	29.71	P
6	15.190	28.03	24.03	60.00	35.97	17.43	50.00	32.57	P
					11.4			**10.5**	

Note: To account for test system losses and gains, a correction factor is added to the spectrum analyzer readings to produce the “corrected” signal levels. This correction factor is equal to the cable losses minus the preamplifier gain.



EUT DESCRIPTION & SYSTEM CONFIGURATION

Equipment Under Test

Part ID	Mfgr	Model	Description	SN	FCC ID
12685	Benchmark	DLT VS160e (Benchmark), StorageWorks DLT-VS-160/320 External (HP), DLT VS160 External Tape Drive (Tandberg)	Benchmark VS160e External Tape Drive	DL2020635	None
11110	Hewlett Packard	C6427A	HP 930C Color Printer	CN0801S4DB	None
11055	Hewlett Packard	C4744-60201	HP PS/2 Keyboard w/2 Meter Shielded Cable	1H04806722B	None
11146	Logitech	M-S34	Logitech PS/2 Mouse w/2 Meter Shielded	LZN02317723	None
11542	DELL	DHM	DELL DHM TOWER SERVER PC	31XQ311	None
11113	Hewlett Packard	GDM-IW9012	HP A7217A 24 in. Monitor	JP13601282	None
11617	Hewlett Packard	F1816-80027	HP Jornada 720 Palmtop PC	SG14870380	None
11707	Hewlett Packard	F1279B	Jornada AC/DC Adapter for 720 Palmtop PC w/2 Meter Shielded Cable	226762	None

Cables

ID	Qty	Type	Mfgr	Model	Length	Shield	Description
74	1	SCSI	Generic	N/A	2 Meters	Yes	Wide SCSI Cable
49	1	Parallel	Belkin	N/A	2 Meter	Yes	DB25 Parallel Printer Cable
58	1	Power	Hewlett Packard	E53771SP	6 Foot	No	HP 930C Color Printer Power Cable
52	1	Video	Total Technologies	N/A	2 Meter	Yes	Video Cable w/Blue Connectors (Ferrited on Both Ends)
48	1	Serial	HP	F1224-80004	1.5 Meter	Yes	Jornada 720 Serial Cable (ferrited)
57	1	Power	Volex	8120-6313	6 Foot	No	HP Jornada 720 Palmtop PC Power Cable
88	3	Power	Generic	8120-1378	8 Foot	No	Generic Computer Power Cable

PERFORMANCE CRITERIA

Code	N/A
Description	Not applicable for this test type.

TEST ENVIRONMENT

EUT Condition	Functional and undamaged relative to test
EUT Configuration/Function	EUT, SPU, MONITOR, VIDEO CABLE, PRINTER, PARALLEL CABLE, MOUSE, KEYBOARD, PALMTOP PC, SERIAL CABLE, AC ADAPTER, 5 POWER CABLES
[1,2] **EUT Power**	110V, 60Hz
Environmental Conditions	21 deg C, 45 %RH, NA inHg

[1] Unless otherwise noted, the 115VAC/60Hz power source is the Ft. Collins public power supply system, and the 230VAC/50Hz source is a variable-voltage 50Hz motor generator. These voltages are specified to within ± 5%, and frequency is specified within ± 1%.

[2] For BSMI qualification testing, emissions are also evaluated at 110V/60Hz and 220V/60Hz, using the Elgar power source.

EUT SOFTWARE/FIRMWARE

Name	Rev	Functionality/Description
Windows NT	4.0	service pack 6
Drivediag	7.0	ASPI to write to external tape drive continiously

TEST DESCRIPTION

Measurements are made from 150 KHz-30 MHz, using average and quasi-peak detectors on all active phases (and neutral, if applicable). The worst-case readings are reported (minimum of 6), and must pass CNS 13438 Class B limits. Equipment under test is selected to be representative of a typical system marketed to customers, and is configured per the requirements of CNS 13438 and CNS 13803. EUT typically evaluated at both 110V/60Hz and 220V/60Hz.

TEST PROCEDURE

TP004 - Conducted Emissions Test Procedure Rev 3.0

TEST AUTOMATION SOFTWARE

Name	Revision
CE Func Test	1.3
Test Manager	0.8

TEST AND MEASUREMENT EQUIPMENT

ID	Mfgr	Model	Description	Serial #	Last Cal	Int	Cal Due
409	Elgar	1751SX	Elgar (AC Power Source)	3140	12/3/2001	12	12/31/2002
452	Rhode & Swartz	ESH-2-Z5	LISN (Artificial Mains)	872094/044	9/4/2001	12	9/30/2002
544	Elgar	1751SX	Elgar (AC Power Source)	3138	12/3/2001	12	12/31/2002
613	HP	8657B	Signal Generator	3520U06216	9/5/2001	12	9/30/2002
653	Vaisala	HMI41	Temp/Humidity Indicator	R5110009	5/8/2002	12	5/31/2003
695	EMCO	20AMPLISN	Custom 20A LISN	9709-2001	9/7/2001	12	9/30/2002
696	EMCO	20AMPLISN	Custom 20A LISN	9709-2002	9/7/2001	12	9/30/2002
698	EMCO	20AMPLISN	Custom 20A LISN	9709-2004	9/7/2001	12	9/30/2002
699	EMCO	20AMPLISN	Custom 20A LISN	9709-2005	9/7/2001	12	9/30/2002
700	EMCO	50AMPLISN	Custom 50A LISN	9709-2006	9/7/2001	12	9/30/2002
701	HP	EC4014	Switch Matrix & Cables	NA	9/7/2001	12	9/30/2002
778	HP	85420E	RF Filter Section	3705A00202	8/31/2001	12	8/31/2002
779	HP	85422E	EMI Receiver 9KHz-2.9GHz	3746A00246	8/31/2001	12	8/31/2002
782	Fischer	801-T4	CDN-T4	2026	9/30/2001	12	9/30/2002
788	HP	3488A	Switch Controller	2719A14509	NA	0	NA
831	Elgar	9012	Programmer	498000	12/3/2001	12	12/31/2002

REGULATORY STANDARDS

Where applicable, the test methods are compliant with the following regulatory standards:

EN55022:1998-09	CISPR 22:1997-11	ANSI C63.4-1992	CNS 13438:1997-05
EN 55011:1998-05	CISPR 11:1997-12	FCC Parts 2, 15, 18	CNS 13803
AS/NZS 3548:1995	AS/NZS 2064:1997	EN 61326:1997 + A1:1998	VCCI

THE RESULTS OF THIS REPORT ARE INCLUSIVE ONLY OF THE UNITS TESTED.
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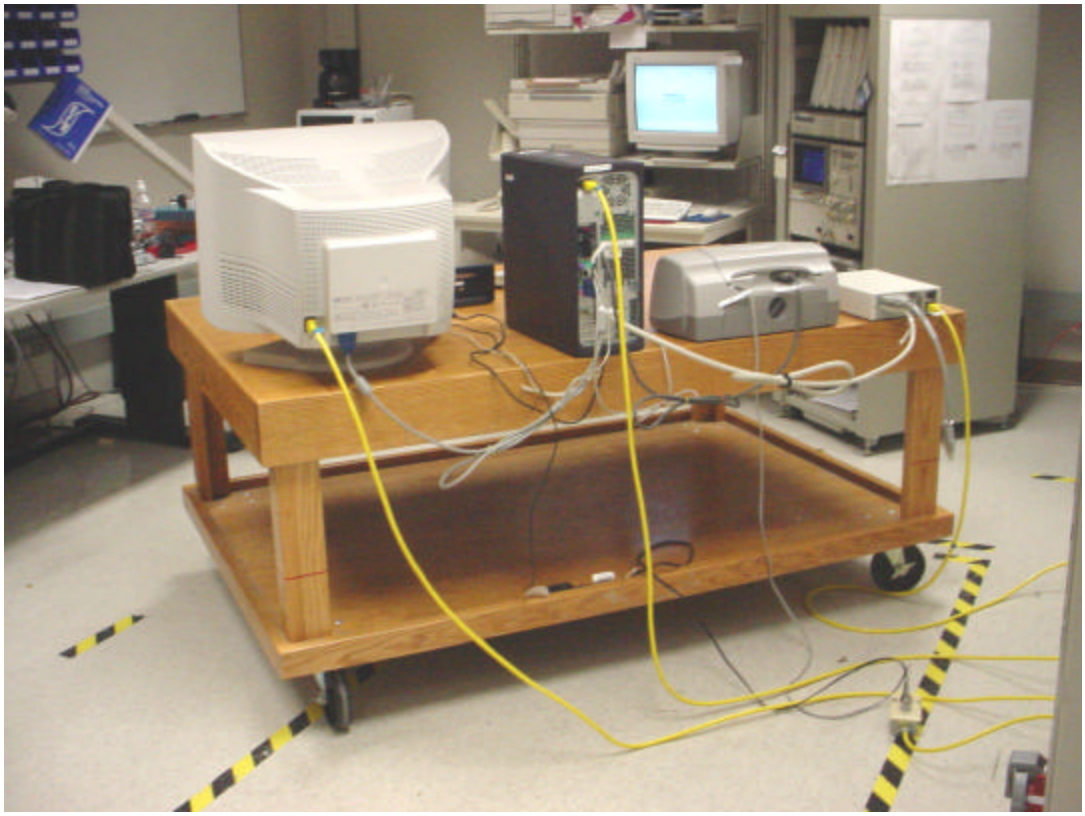
If Alarm
Sounds



Addendum 5: DLT VS160 CISPR 24 Immunity Report (230 VAC)

EMC IMMUNITY - TEST REPORT (Full)

Test Report No.	**BC203896**	Issue Date:	**Thu 25/Jul/2002**
Model / Serial No.	**DLT VS160 (Benchmark), PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP), 80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg) / SN: PHJ2F00021**		
Product Type	**Internal Tape Drive**		
Client	**Benchmark Storage Innovations Inc.**		
Manufacturer	**Benchmark Storage Innovations Inc.**		
License holder	**Benchmark Storage Innovations Inc.**		
Address	**3122 Sterling Circle**		
	Boulder, Co 80301		
Test Criteria Applied	**EN 55024**		
Test Result	**PASS**		
Test Project Number	**BC203896**		Electromagnetic Compatibility - Information technology equipment - Immunity Characteristics - Limits and methods of measurements
References			
Total Pages Including Appendices:	38		

Reviewed By : Robert Cresswell

Approved By : Todd Seeley

TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 17025 and EN 45001.

TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.

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NVLAP Lab code 100271-1

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty for Radiated Immunity is calculated to be ±2.41. All other measurements are subjective and therefore, uncertainty calculations are not required.

EUT Received Date: 22-Jul-2002

Testing Start Date: 22-Jul-2002

Testing End Date: 23-Jul-2002

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The tests were performed according to the following regulations :

1. EMC Directive 89/336/EEC
2. EN55024: 1997, +A1:1998
3. CISPR24: 1997

Description	Specification	Test Media	Test Level		Criteria	
			Required	Met	Min	Met
ESD Immunity	EN-61000-4-2	Contact Air	4.0 kV 8.0 kV	8.0 kV 15.0 kV 25kV	B B C	A A C
Radiated Immunity	EN-61000-4-3	80 MHz-1.0 GHz 1 kHz Sine (80% AM)	3 V/m	3 V/m	A	A
EFT/Burst Immunity	EN-61000-4-4	AC Port	1.0 kV	1.0 kV	B	A
Surge Immunity	EN-61000-4-5	AC Mains	2.0 kV/1.0 kV	2.0 kV/1.0 kV	B	A
Conducted Immunity	EN-61000-4-6	150 kHz-80 MHz 1 kHz Sine (80% AM) AC Mains Port	3 Volts	3 Volts	A	A
Power. Frequency Magnetic Fields	EN-61000-4-8	50 Hz	1 A/m	10 A/m	A	A
AC Dips, Interruptions, Variations	EN-61000-4-11	95% Reduction, Dips 30% Reduction, Dips 95% Reduction, Interruptions	10mS/0.5 Periods 500mS/25 Periods 5 Sec/250 Periods	10mS/0.5 Periods 500mS/25 Periods 5 Sec/250 Periods	B C C	A A C

GENERAL REMARKS:

The following Model Numbers are identical to the unit tested: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP), 80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg).

Modifications required to pass:

None

Test Specification Deviations: Additions to or Exclusions from:

None

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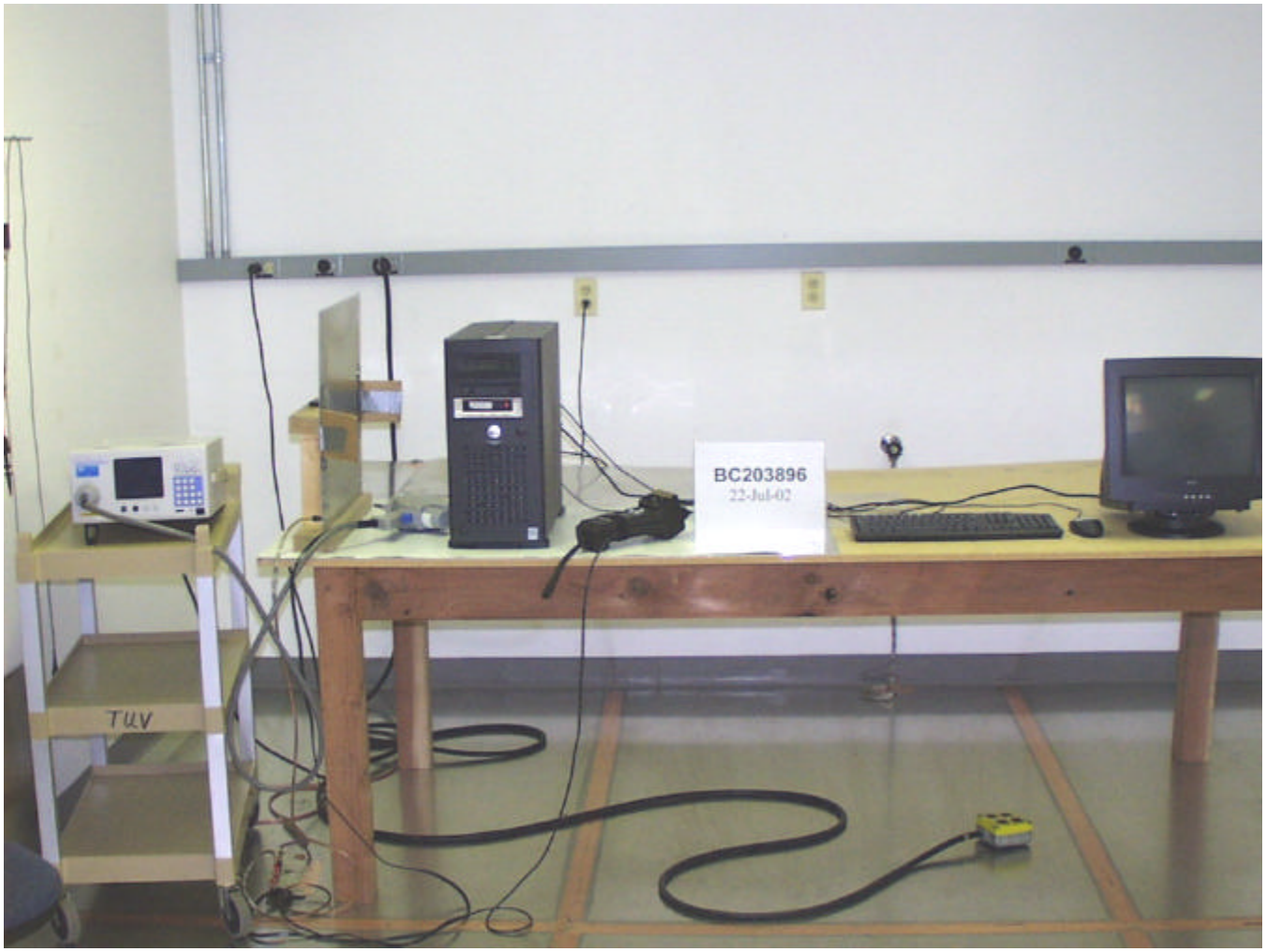
Test-setup photo(s):
Electrostatic Discharge (ESD)
EN 61000-4-2



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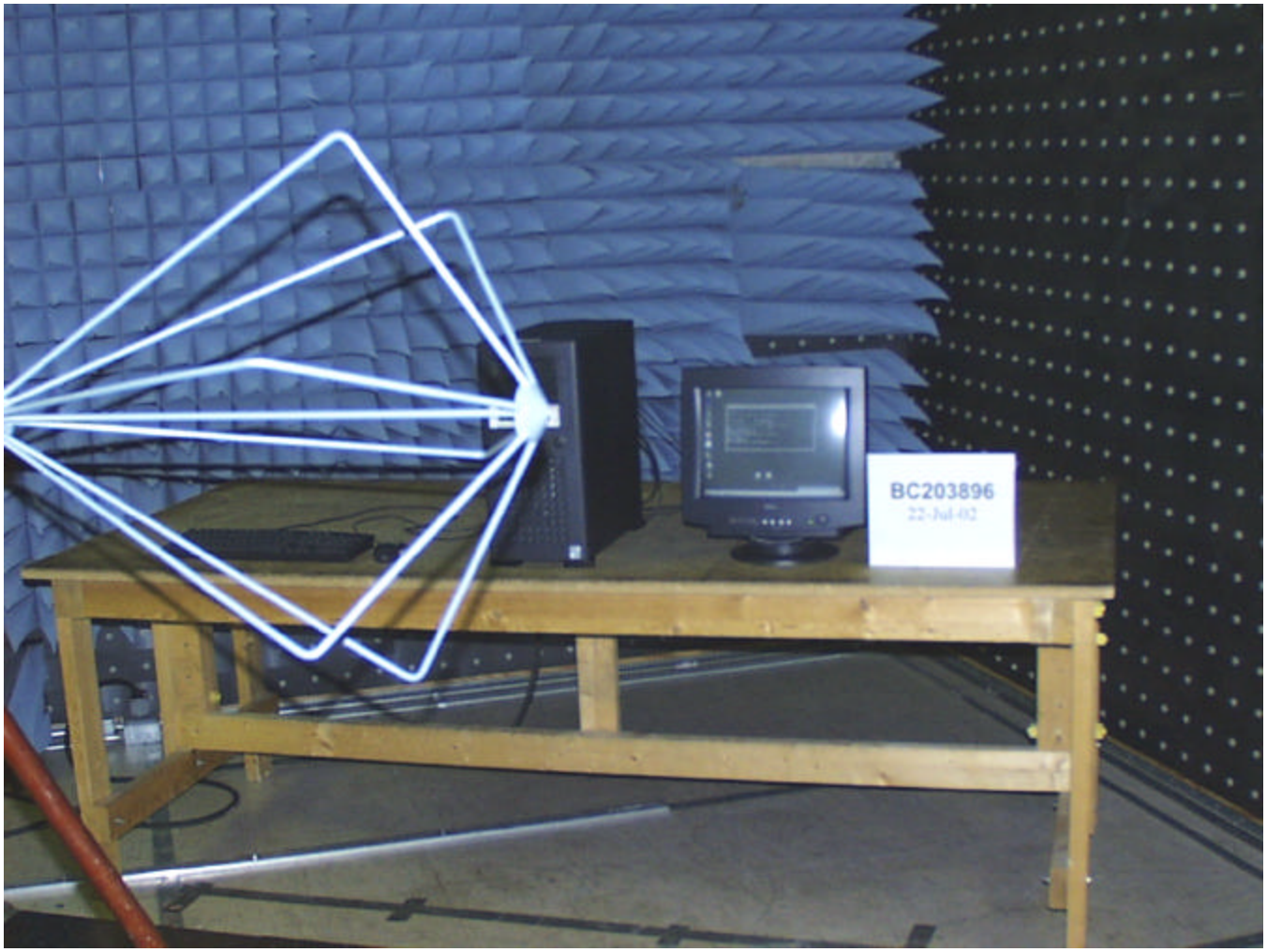
Test-setup photo(s):
Radiated Immunity (Front side)
EN 61000-4-3



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Test-setup photo(s):
Radiated Immunity (Back side)
EN 61000-4-3

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Test-setup photo(s):
Electrical Fast Transients (EFT) Power Lines
EN 61000-4-4

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Test-setup photo(s):
Surge
EN 61000-4-5

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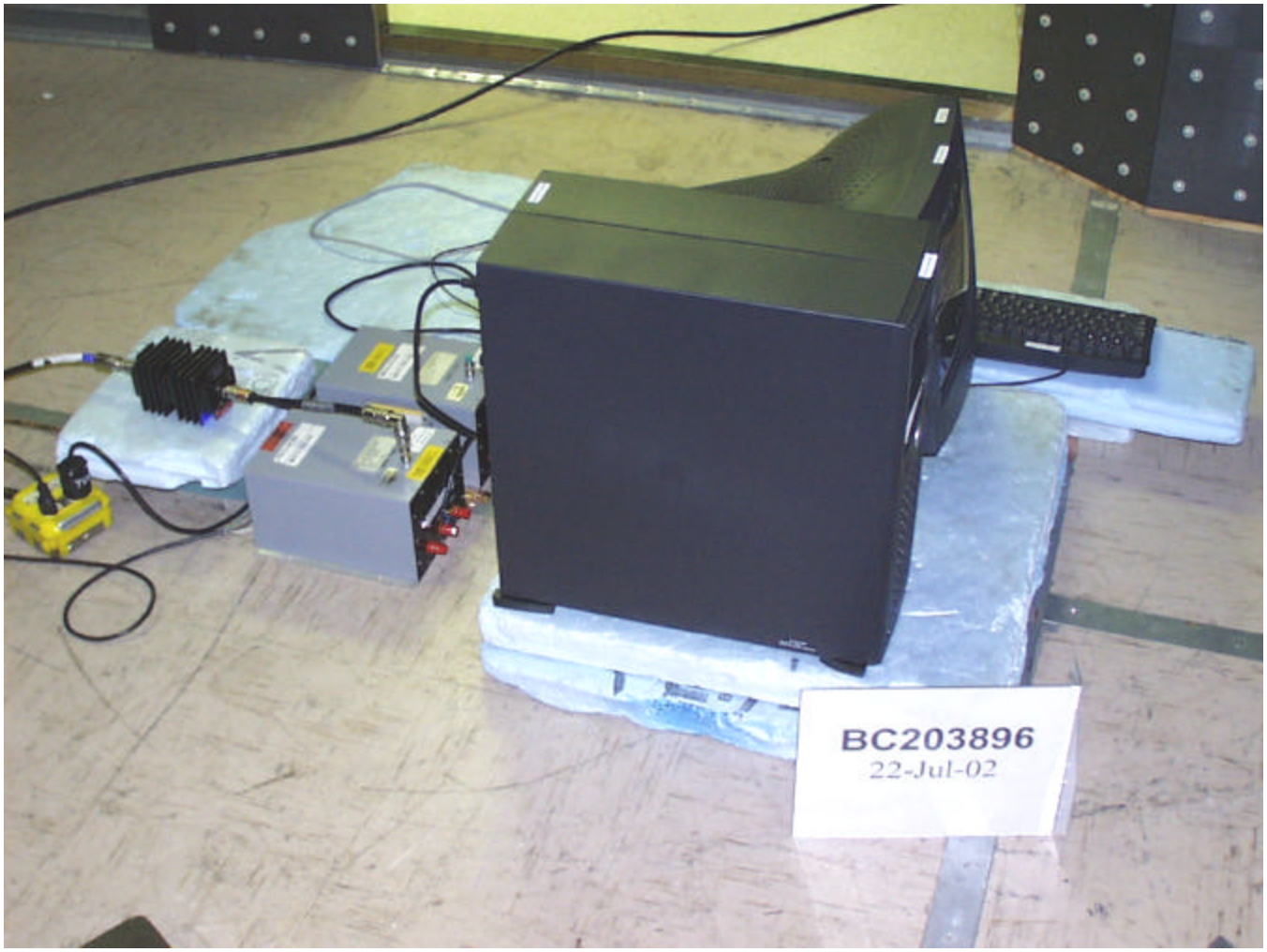
Test-setup photo(s):
Conducted Disturbances, Powerlines
EN 61000-4-6



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Test-setup photo(s):
Powerline Magnetic Fields
EN 61000-4-8

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Test-setup photo(s):
Powerline Dips and Interruptions
EN 61000-4-11

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Appendix A

Test Data Sheets

and

Test Equipment Used

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ESD IMMUNITY

Test Report No.	BC203896	Test Area:	Groundplane	Date: 23/Jul/2002	
Test Method	**EN61000-4-2**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021	**Note: "ND" denotes the term "No Discharge"**			
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160(Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Point Location	Discharge Type		2 kV reps		4 kV reps		6 kV reps		8 kV reps		-- kV reps		Complies		Criteria Met	Remarks
	Direct/ Indirect	Contact/ Air	+	-	+	-	+	-	+	-	+	-	Yes	No		
HCP	Indirect	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Front
HCP	Indirect	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Right
HCP	Indirect	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Left
HCP	Indirect	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Back
VCP	Indirect	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Front
VCP	Indirect	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Right
VCP	Indirect	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Left
VCP	Indirect	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Back
1	Direct	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Back of PC near AC Connecto
2	Direct	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Back of PC near key/mouse
3	Direct	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Back of PC near Video Conn.
4	Direct	Contact	25	25	25	25	25	25	25	25	-	-	✓		**A**	Back of PC middle
The contact ESD points tested were selected by the client. The other sides of the computer were plastic, and no contact Discharge points exist.																

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ESD IMMUNITY

Test Report No.	BC203896	Test Area:	Groundplane	Date: 22/Jul/2002	
Test Method	**EN61000-4-2**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021	**Note: "ND" denotes the term "No Discharge"**			
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Point Location	Discharge Type		2 kV reps		4 kV reps		8 kV reps		12 kV reps		15 kV reps		Complies		Criteria Met	Remarks
	Direct/ Indirect	Contact/ Air	+	-	+	-	+	-	+	-	+	-	Yes	No		
5	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Front Right Side
6	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Front Left Side
7	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Front Top Side
8	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Front Bottom Side
9	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Button Top
10	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Button left side
11	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Media LED
12	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Clean LED
13	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Fault LED
14	Direct	Air	20	20	20	20	20	20	10	10	10	10	✓		**A**	Ready LED

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ESD IMMUNITY

Test Report No.	BC203896	Test Area:	Groundplane	Date: 22/Jul/2002	
Test Method	**EN61000-4-2**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021	**Note: "ND" denotes the term "No Discharge"**			
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160(Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Point Location	Discharge Type		25 kV reps		-- kV reps		-- kV reps		-- kV reps		-- kV reps		Complies		Criteria Met	Remarks
	Direct/ Indirect	Contact/ Air	+	-	+	-	+	-	+	-	+	-	Yes	No		
5	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Front Right Side
6	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Front Left Side
7	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Front Top Side
8	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Front Bottom Side
9	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Button Top
10	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Button left side
11	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Media LED
12	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Clean LED
13	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Fault LED
14	Direct	Air	10	10	-	-	-	-	-	-	-	-	✓		**C**	Ready LED

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ESD IMMUNITY - TEST POINT MAP

Test Report No.	BC203896	Test Area:	Groundplane	Date: 22/Jul/2002	
Test Method	**EN61000-4-2**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021				
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

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ESD IMMUNITY - TEST POINT MAP

Test Report No.	BC203896	Test Area:	Groundplane	Date: 22/Jul/2002	
Test Method	**EN61000-4-2**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021				
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

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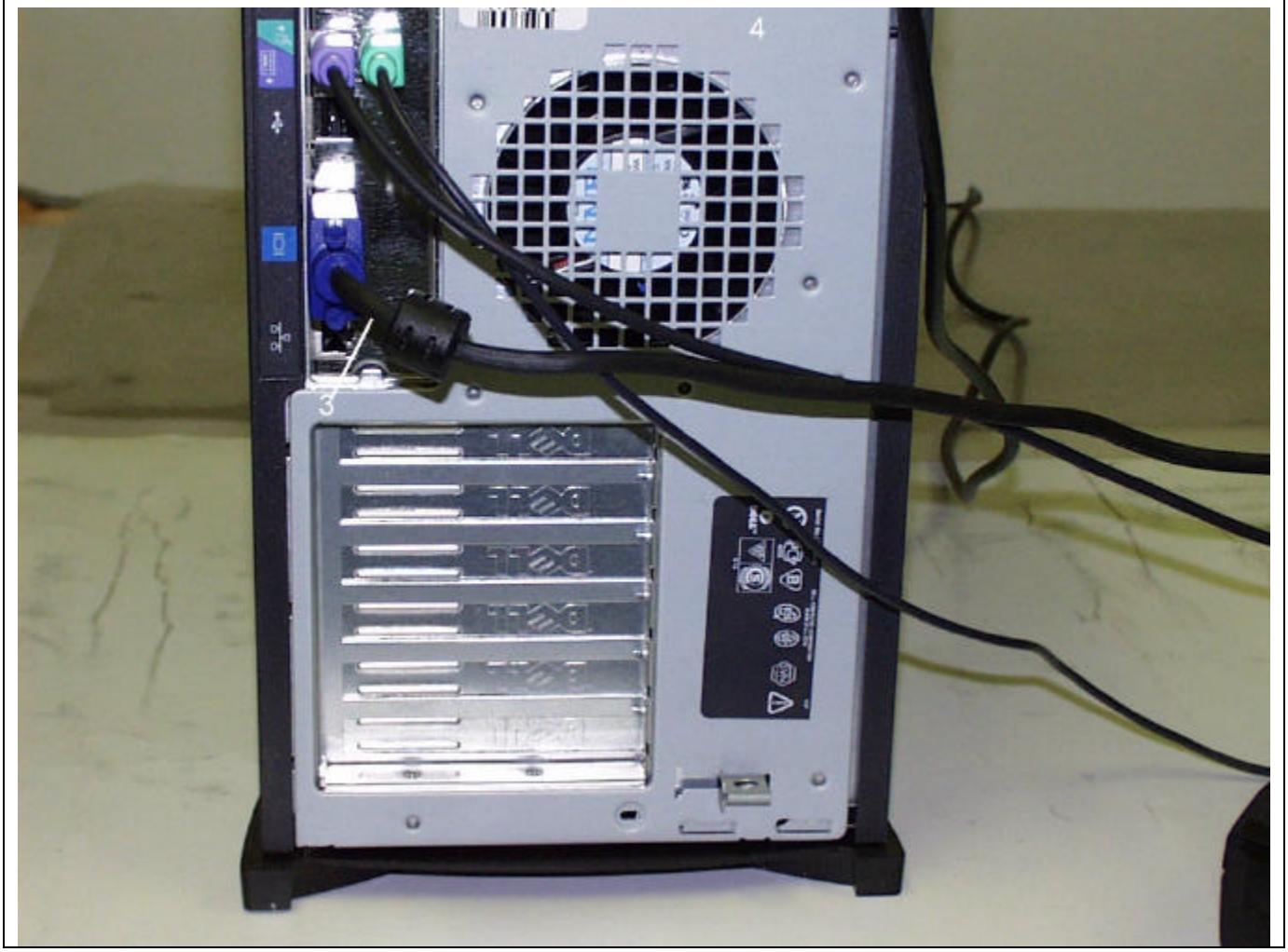
ESD IMMUNITY - TEST POINT MAP

Test Report No.	BC203896	Test Area:	Groundplane	Date: 22/Jul/2002	
Test Method	**EN61000-4-2**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021				
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				



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RADIATED IMMUNITY

Test Report No.	BC203896	Test Area:	CC-1	Date: 22/Jul/2002	**EUT Positional Legend**
Test Method	EN61000-4-3	EUT Power:	230 VAC 50 Hz		1 / 2 FRONT 4 / 3 / 5=Top 6=Bottom
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021	Dwell Time: 3 Sec. Freq. Step: 70 pts/Octave			
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP), 80/160GB Half-High DLTVS Tape Drive (IBM),				
	DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Freq. (MHz)	Test Level (Volts/m)	Modulation TYPE	Modulation FREQ. (Hz)	Modulation %	Modulation Wave form	Field Polarity (H/V)	Test Dist. (M)	EUT Face (1 to 6)	Complies Yes	Complies No	Criteria Met	Remarks
80	3 V/m	AM	1000	80	SINE	H	2	1	✓		**A**	
↓	3 V/m	AM	1000	80	SINE	H	2	1	✓		**A**	
1000	3 V/m	AM	1000	80	SINE	H	2	1	✓		**A**	
900	3 V/m	AM	200	100	SQUARE	H	2	1	✓		**A**	Cell Phone modulation
80	3 V/m	AM	1000	80	SINE	H	2	1	✓		**A**	EUT Clock
100	3 V/m	AM	1000	80	SINE	H	2	1	✓		**A**	EUT Clock
80	3 V/m	AM	1000	80	SINE	V	2	1	✓		**A**	
↓	3 V/m	AM	1000	80	SINE	V	2	1	✓		**A**	
1000	3 V/m	AM	1000	80	SINE	V	2	1	✓		**A**	
900	3 V/m	AM	200	100	SQUARE	V	2	1	✓		**A**	Cell Phone modulation
80	3 V/m	AM	1000	80	SINE	V	2	1	✓		**A**	EUT Clock
100	3 V/m	AM	1000	80	SINE	V	2	1	✓		**A**	EUT Clock
80	3 V/m	AM	1000	80	SINE	H	2	2	✓		**A**	
↓	3 V/m	AM	1000	80	SINE	H	2	2	✓		**A**	
1000	3 V/m	AM	1000	80	SINE	H	2	2	✓		**A**	
900	3 V/m	AM	200	100	SQUARE	H	2	2	✓		**A**	Cell Phone modulation
80	3 V/m	AM	1000	80	SINE	H	2	2	✓		**A**	EUT Clock
100	3 V/m	AM	1000	80	SINE	H	2	2	✓		**A**	EUT Clock
80	3 V/m	AM	1000	80	SINE	V	2	2	✓		**A**	
↓	3 V/m	AM	1000	80	SINE	V	2	2	✓		**A**	
1000	3 V/m	AM	1000	80	SINE	V	2	2	✓		**A**	
900	3 V/m	AM	200	100	SQUARE	V	2	2	✓		**A**	Cell Phone modulation
80	3 V/m	AM	1000	80	SINE	V	2	2	✓		**A**	EUT Clock
100	3 V/m	AM	1000	80	SINE	V	2	2	✓		**A**	EUT Clock
80	3 V/m	AM	1000	80	SINE	H	2	3	✓		**A**	
↓	3 V/m	AM	1000	80	SINE	H	2	3	✓		**A**	
1000	3 V/m	AM	1000	80	SINE	H	2	3	✓		**A**	
900	3 V/m	AM	200	100	SQUARE	H	2	3	✓		**A**	Cell Phone modulation

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RADIATED IMMUNITY

Test Report No.	BC203896	Test Area:	CC1-1	Date: 22/Jul/2002	**EUT Positional Legend**
Test Method	EN61000-4-3	EUT Power:	230 VAC 50 Hz		1 / 2 FRONT 4 / 3 / 5=Top 6=Bottom
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021	Dwell Time: 3 Sec. Freq. Step: 70 pts/Octave			
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP), 80/160GB Half-High DLTVS Tape Drive (IBM),				
	DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Freq. (MHz)	Test Level (Volts/m)	Modulation TYPE	Modulation FREQ. (Hz)	Modulation %	Modulation Wave form	Field Polarity (H/V)	Test Dist. (M)	EUT Face (1 to 6)	Complies Yes	Complies No	Criteria Met	Remarks
80	3 V/m	AM	1000	80	SINE	H	2	3	✓		**A**	EUT Clock
100	3 V/m	AM	1000	80	SINE	H	2	3	✓		**A**	EUT Clock
80	3 V/m	AM	1000	80	SINE	V	2	3	✓		**A**	
↓	3 V/m	AM	1000	80	SINE	V	2	3	✓		**A**	
1000	3 V/m	AM	1000	80	SINE	V	2	3	✓		**A**	
900	3 V/m	AM	200	100	SQUARE	V	2	3	✓		**A**	Cell Phone modulation
80	3 V/m	AM	1000	80	SINE	V	2	3	✓		**A**	EUT Clock
100	3 V/m	AM	1000	80	SINE	V	2	3	✓		**A**	EUT Clock
80	3 V/m	AM	1000	80	SINE	H	2	4	✓		**A**	
↓	3 V/m	AM	1000	80	SINE	H	2	4	✓		**A**	
1000	3 V/m	AM	1000	80	SINE	H	2	4	✓		**A**	
900	3 V/m	AM	200	100	SQUARE	H	2	4	✓		**A**	Cell Phone modulation
80	3 V/m	AM	1000	80	SINE	H	2	4	✓		**A**	EUT Clock
100	3 V/m	AM	1000	80	SINE	H	2	4	✓		**A**	EUT Clock
80	3 V/m	AM	1000	80	SINE	V	2	4	✓		**A**	
↓	3 V/m	AM	1000	80	SINE	V	2	4	✓		**A**	
1000	3 V/m	AM	1000	80	SINE	V	2	4	✓		**A**	
900	3 V/m	AM	200	100	SQUARE	V	2	4	✓		**A**	Cell Phone modulation
80	3 V/m	AM	1000	80	SINE	V	2	4	✓		**A**	EUT Clock
100	3 V/m	AM	1000	80	SINE	V	2	4	✓		**A**	EUT Clock

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EFT/BURST IMMUNITY

Test Report No.	BC203896	Test Area:	CC1-1	Date: 22/Jul/2002
Test Method	**EN61000-4-4**	EUT Power:	230 VAC 50 Hz	
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %		
EUT Serial No.	PHJ2F00021	**Burst Frequency = 5.0 kHz unless noted otherwise in the remarks area**		
EUT Mfgr:	Benchmark			
EUT Description:	Internal Tape Drive			
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)			
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),			
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)			
Tested By:	Todd Seeley			

Test Level (Kv)	Test Time (Sec)	Polarity + Or -	PE	N	L1	L2	L3	Coupl. Clamp	Complies Yes	Complies No	Criteria Met	Remarks
1.0	60	+			X				✓		A	AC Mains (PC)
1.0	60	+		X					✓		A	
1.0	60	+	X						✓		A	
1.0	60	-			X				✓		A	
1.0	60	-		X					✓		A	
1.0	60	-	X						✓		A	

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SURGE IMMUNITY

Test Report No.	BC203896	Test Area:	CC1-1	Date: 22/Jul/2002	
Test Method	**EN61000-4-5**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021				
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Level (kV)	Events (Count)	Polarity + or -	PE	N	L1	L2	L3	Phase Angle	Complies Yes	Complies No	Criteria Met	Remarks
0.5	5	+	X	X				0	✓		A	AC MAINS (PC) DIFFERENTIAL MODE
0.5	5	+	X		X			0	✓		A	
0.5	5	+		X	X			0	✓		A	
0.5	5	-	X	X				0	✓		A	
0.5	5	-	X		X			0	✓		A	
0.5	5	-		X	X			0	✓		A	
0.5	5	+	X	X				90	✓		A	
0.5	5	+	X		X			90	✓		A	
0.5	5	+		X	X			90	✓		A	
0.5	5	-	X	X				90	✓		A	
0.5	5	-	X		X			90	✓		A	
0.5	5	-		X	X			90	✓		A	
0.5	5	+	X	X				180	✓		A	
0.5	5	+	X		X			180	✓		A	
0.5	5	+		X	X			180	✓		A	
0.5	5	-	X	X				180	✓		A	
0.5	5	-	X		X			180	✓		A	
0.5	5	-		X	X			180	✓		A	
0.5	5	+	X	X				270	✓		A	
0.5	5	+	X		X			270	✓		A	
0.5	5	+		X	X			270	✓		A	
0.5	5	-	X	X				270	✓		A	
0.5	5	-	X		X			270	✓		A	
0.5	5	-		X	X			270	✓		A	

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SURGE IMMUNITY

Test Report No.	BC203896	Test Area:	CC1-1	Date: 22/Jul/2002	
Test Method	**EN61000-4-5**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021				
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Level (kV)	Events (Count)	Polarity + or -	PE	N	L1	L2	L3	Phase Angle	Complies Yes	Complies No	Criteria Met	Remarks
1.0	5	+	X	X				0	✓		A	AC MAINS (PC) DIFFERENTIAL MODE
1.0	5	+	X		X			0	✓		A	
1.0	5	+		X	X			0	✓		A	
1.0	5	-	X	X				0	✓		A	
1.0	5	-	X		X			0	✓		A	
1.0	5	-		X	X			0	✓		A	
1.0	5	+	X	X				90	✓		A	
1.0	5	+	X		X			90	✓		A	
1.0	5	+		X	X			90	✓		A	
1.0	5	-	X	X				90	✓		A	
1.0	5	-	X		X			90	✓		A	
1.0	5	-		X	X			90	✓		A	
1.0	5	+	X	X				180	✓		A	
1.0	5	+	X		X			180	✓		A	
1.0	5	+		X	X			180	✓		A	
1.0	5	-	X	X				180	✓		A	
1.0	5	-	X		X			180	✓		A	
1.0	5	-		X	X			180	✓		A	
1.0	5	+	X	X				270	✓		A	
1.0	5	+	X		X			270	✓		A	
1.0	5	+		X	X			270	✓		A	
1.0	5	-	X	X				270	✓		A	
1.0	5	-	X		X			270	✓		A	
1.0	5	-		X	X			270	✓		A	

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SURGE IMMUNITY

Test Report No.	BC203896	Test Area:	CC1-1	Date: 22/Jul/2002	
Test Method	**EN61000-4-5**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021				
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Level (kV)	Events (Count)	Polarity + or -	PE	N	L1	L2	L3	Phase Angle	Complies Yes	Complies No	Criteria Met	Remarks
2.0	5	+	X	X				0	✓		A	AC MAINS (PC) COMMON MODE
2.0	5	+	X		X			0	✓		A	
2.0	5	-	X	X				0	✓		A	
2.0	5	-	X		X			0	✓		A	
2.0	5	+	X	X				90	✓		A	
2.0	5	+	X		X			90	✓		A	
2.0	5	-	X	X				90	✓		A	
2.0	5	-	X		X			90	✓		A	
2.0	5	+	X	X				180	✓		A	
2.0	5	+	X		X			180	✓		A	
2.0	5	-	X	X				180	✓		A	
2.0	5	-	X		X			180	✓		A	
2.0	5	+	X	X				270	✓		A	
2.0	5	+	X		X			270	✓		A	
2.0	5	-	X	X				270	✓		A	
2.0	5	-	X		X			270	✓		A	

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CONDUCTED IMMUNITY

Test Report No.	BC203896	Test Area:	CC1-1	Date: 22/Jul/2002	
Test Method	**EN61000-4-6**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021	Dwell Time: 3 Sec. Freq. Step: 70 pts/Octave			
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160(Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Frequency (MHz)	Test Level (Volts emf)	Modulation			Wave Form	Injection Source	Complies?		Met	Remarks
		Type	Freq. (Hz)	%			Yes	No		
.150	3 Volts	AM	1000	80	SINE	CDN	✓		**A**	AC Mains (PC)
↓	3 Volts	AM	1000	80	SINE	CDN	✓		**A**	AC Mains (PC)
80	3 Volts	AM	1000	80	SINE	CDN	✓		**A**	AC Mains (PC)
22	3 Volts	AM	1000	80	SINE	CDN	✓		**A**	EUT Clock
40	3 Volts	AM	1000	80	SINE	CDN	✓		**A**	EUT Clock
45	3 Volts	AM	1000	80	SINE	CDN	✓		**A**	EUT Clock
60	3 Volts	AM	1000	80	SINE	CDN	✓		**A**	EUT Clock
80	3 Volts	AM	1000	80	SINE	CDN	✓		**A**	EUT Clock

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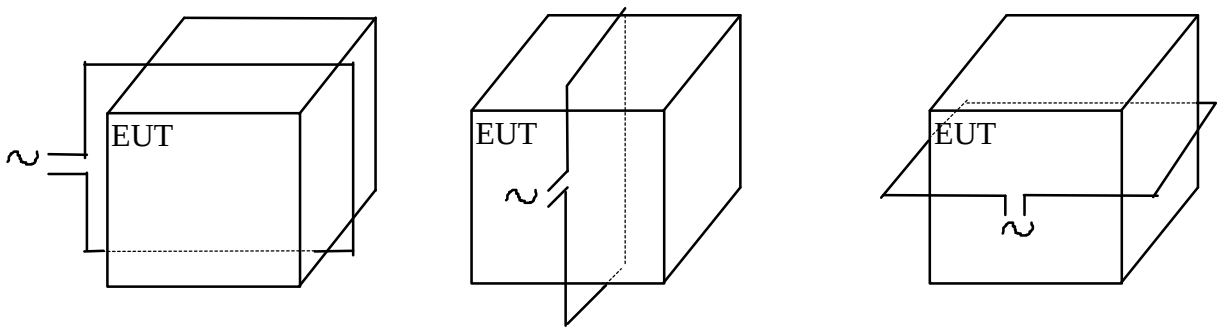
MAGNETIC FIELDS

Test Report No.	BC203896	Test Area:	CC1-1	Date: 22/Jul/2002	
Test Method	**EN61000-4-8**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021				
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Axis	Field Strength (A/M)	Test Time (Seconds)	Mag Field Freq. Hz	Complies		Criteria Met	Remarks
				Yes	No		
X	10	60	50	✓		**A**	
Y	10	60	50	✓		**A**	
Z	10	60	50	✓		**A**	

X **Y** **Z**



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VOLTAGE DIPS & SHORT INTERRUPTIONS

Test Report No.	BC203896	Test Area:	CC1-1	Date: 22/Jul/2002	
Test Method	**EN61000-4-11**	EUT Power:	230 VAC 50 Hz		
EUT Model No.	DLT VS160 (Benchmark)	Temp: 23°C Pressure: 85 kPA Humidity: 42 %			
EUT Serial No.	PHJ2F00021				
EUT Mfgr:	Benchmark				
EUT Description:	Internal Tape Drive				
Test Notes:	The following Model Numbers are identical to the unit tested. (all data applies)				
	PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP),				
	80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)				
Tested By:	Todd Seeley				

Test Level %V Nominal	Phase Angle	Repetitions	Duration (Cycles)	Complies		Criteria Met	Remarks
				Yes	No		
<5%	0	3	0.5	✓		**A**	
<5%	180	3	0.5	✓		**A**	
70%	0	3	25	✓		**A**	
<5%	0	3	250	✓		**C**	

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Equipment Report

23-Jul-2002

Project Number: BC203896 **Project Date:** 23-Jul-2002

Company Name: **Benchmark Storage Innovations Inc.**

Equip ID	Manufacturer	Model Number	Serial Number	Description	Date	Calibration Interval	Due	Cal Code
Test Performed -11		Voltage Swells/Dips						
8340	PACIFIC POWER SOURCE	360AMXT/UPC32	0165	AC Power Supply		0		Y
8341	PACIFIC POWER	9014	0212	AMX Series Magnetics Module		0		Y
Test Performed -2		Electrostatic Discharge						
7632	KEYTEK	MZ-15/EC	9512437	MiniZap ESD Simulator	21-Dec-2001	12	21-Dec-2002	B
7633	KEYTEK	MZ TPC-2	9601207	ESD Omni-Tip	21-Dec-2001	12	21-Dec-2002	B
8248	NOISEKEN	ESS-200AX	8089C011357	ESD Simulator	15-Mar-2002	12	15-Mar-2003	B
Test Performed -3		Radiated Immunity						
6730	EMCO	3146	9402-3775	Log Periodic Antenna		0		Y
7531	EMCO	3104C	3519	Biconical Antenna		0		Y
7634	WERLATONE	C5982	10385	Directional Coupler (80-1000 MHz)	15-Jan-2002	12	15-Jan-2003	B
8260	MARCONI	2024	112113/020	Signal Generator	15-Nov-2001	12	15-Nov-2002	G
8277	AMPLIFIFIER RESEARCH	100W1000M1	17673	Ultra-broadband amplifier		0		Y
8391	HEWLETT PACKARD	8482A	2349A14570	Power Sensor Set 3	01-Oct-2001	12	01-Oct-2002	G
8398	HEWLETT PACKARD	436A	2101A11989	Power Meter (set 1)	18-Mar-2002	12	18-Mar-2003	G
Test Performed -4		EFT/Burst						
8278	KEYTEK	CE-40	9512446	EFT Simulator Module and Coupler	21-May-2002	12	21-May-2003	B

Cal Code Legend: G=Out Source, Y=No Cal required, R=Out of Service, B=In-House Verification Required ***1 of 2***

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Test Performed -5	Surge							
8385	KEYTEK	CE50	9512389	CE50 Surge Module	11-Feb-2002	12	11-Feb-2003	B
Test Performed -6	Conducted Immunity							
7533	ENI	3100L	124	RF Amplifier		0		Y
7641	WIENSCHEL	40-10-43	GF553	Attenuator - 10dB	20-Mar-2002	12	20-Mar-2003	B
8260	MARCONI	2024	112113/020	Signal Generator	15-Nov-2001	12	15-Nov-2002	G
8328	WERLATONE	C5091	5768	Directional Coupler	09-Sep-2001	12	09-Sep-2002	B
8355	FISCHER	FCC-801-M3-25	13	Coupling / Decoupling Network		0		Y
8356	FISCHER	FCC-801-M3-25	12	Coupling / Decoupling Network		0		Y
8391	HEWLETT PACKARD	8482A	2349A14570	Power Sensor Set 3	01-Oct-2001	12	01-Oct-2002	G
8398	HEWLETT PACKARD	436A	2101A11989	Power Meter (set 1)	18-Mar-2002	12	18-Mar-2003	G
Test Performed -8	Magnetic Immunity							
8379	SOLAR	7334-1	927606	Loop sensor	19-Oct-2001	12	19-Oct-2002	G
7533	ENI	3100L	124	RF Amplifier		0		Y
8377	POWERSTAT	3PN117C	2168	Variable Auto Transformer		0		Y
8445	HEWLETT PACKARD	34401A	3146A08123	Digital Multimeter	15-Nov-2001	12	15-Nov-2002	G

Cal Code Legend: G=Out Source, Y=No Cal required, R=Out of Service, B=In-House Verification Required ***2 of 2***

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Appendix B

Test Plan

and

Constructional Data Form

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Form

EMC Test Plan and Constructional Data Form

PRODUCT SERVICE

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- ***NOTE: This information will be input into your test report as shown below.***
Press the F1 key at any time to get HELP for the current field selected.

Company: Benchmark Storage Innovations, Inc.

Address: 3122 Sterling Circle

Boulder, CO 80301

Contact: Bob Foster Position: Associate Compliance Engineer

Phone: 303-444-7480 x-107 Fax: 303-444-1565

E-mail Address: bobf@percept.com

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description: Internal Tape Drive

EUT Name: Internal Tape Drive

Model No.: DLT VS160 (Benchmark), PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP), 80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg) Serial No.: PHJ2F00021

Product Options: None

Configurations to be tested: Tape drive installed in a Dell MMP server half-height drive bay

Test Objective

☒ EMC Directive 89/336/EEC (EMC)
Std:

☐ Machinery Directive 89/392/EEC (EMC
Std:

☐ Medical Device Directive 93/42/EEC (EMC)
Std:

☐ Vehicle Directive 72/245/EEC (EMC)
Std:

☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

☐ FCC: Class ☐ A ☐ B Part
☐ VCCI: Class ☐ A ☐ B
☐ BCIQ: Class ☐ A ☐ B
☐ Canada: Class ☐ A ☐ B
☐ Australia: Class ☐ A ☐ B
☐ Other:

Form

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

TÜV Product Service Certification Requested

☐ Attestation of Conformity (AoC) ☐ International EMC Mark (IEM)

☐ Certificate of Conformity (CoC) ☐ Compliance Document

Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III

(Press **F1** when field is selected to show additional information on Protection Class.)

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - *Complete this section if testing will not be attended by the customer.*

If a failure occurs, TUV Product Service should:

☒ Call contact listed above, if not available then stop testing. (After hrs phone): _____

☐ Continue testing to complete test series.

☐ Continue testing to define corrective action.

☐ Stop testing.

EUT Specifications and Requirements

Length: 8.7" Width: 5.8" Height: 1.6" Weight: 3 lbs

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: +5, +12 VDC (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): 1.2 A, 0.5 A Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

Home/consumer, office

EMC Test Plan and Constructional Data Form

EUT Power Cable				
☐ Permanent	OR	☒ Removable	Length (in meters):	0.5
☐ Shielded	OR	☒ Unshielded		
☐ Not Applicable				

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables

Interface				Shielding									
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
Keyboard cable	☐	☒	1	☒	☐	Foil		DIN		2	☐	☒
Monitor cable	☐	☒	1	☒	☐	Foil over braid		VGA		1	☐	☒
Mouse cable	☐	☒	1	☒	☐	Foil		DIN		2	☐	☒
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐

TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

EUT Software.

Revision Level: Ver. 1.0

Description: Benchmark proprietary test software: "Test.exe"

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing.
Consult with your TÜV Product Service Representative if additional assistance is required.

1. Datastreaming; 32kB blocks

2.

3.

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

Description	*Model #*	*Serial #*	*FCC ID #*
Dell Server	PowerEdge 1400	7H94L11	FCC Logo
Dell VGA Monitor	E551	46632-1B580GB	FCC Logo
Dell Keyboard	RT7D00	37171-1AL-1032	AQ-7D0080COB
Logitech Mouse	M-S34	LNA14302615	DZL211029

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
22 MHz			Write Drivers
40 MHz			
45 MHz			
60 MHz			
80 MHz			sDRAM
100 MHz			DRAM

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

(PLEASE INSERT "**ELECTRONIC SIGNATURE**" BELOW IF POSSIBLE)

Authorization Signatures

Bob Foster	18 July 2002
Customer authorization to perform tests according to this test plan.	Date
Bob Foster	18 July 2002
Test Plan/CDF Prepared By (please print)	Date
Todd Tuckey	23 July 2002
Reviewed by TÜV Product Service Associate	Date

EMC Test Plan and Constructional Data Form

Test Name	Test Specification	Required Performance
EN55024: 1998 Immunity Tests		
Electrostatic Discharge Immunity	EN61000-4-2	Criteria B: +/- 2, 4kV, +/- 6, 8kV (contact (25 discharges shall be applied for each voltage and polarity at each test point) +/- 2, 4, 8kV, +/- 12kV, +/- 15kV air (20 discharges shall be applied for each voltage and polarity at each test point) Criteria C: +/- 25kV air hardware survival (10 discharges shall be applied for each voltage and polarity at each test point)
Radiated Electromagnetic Immunity	EN61000-4-3	Criteria A: 3 V/m, 80 MHz to 1 GHz All Four sides (front, rear, left, and right) Dwell on clock frequencies
Electrical Fast Transient / Burst Immunity	EN61000-4-4	Criteria B: 1.0kV (AC)
Electrical Surge Immunity	EN61000-4-5	Criteria B: 1.0kV differential 2.0kV common
Conducted Electromagnetic Immunity	EN61000-4-6	Criteria A: 3 V, 0.15 MHz to 80 MHz (AC)
Power Frequency Magnetic Field Immunity	EN61000-4-8	Criteria A: 10 A/m
AC Voltage Variations Immunity	EN61000-4-11	Criteria B: >95% drop for 0.5 cycle 30% drop for 25 cycles >95% drop for 250 cycles

Addendum 6: DLT VS160 Magnetic Interference Report

Fort Collins Hardware Test Center

3404 East Harmony Road, Fort Collins, Colorado 80528
Telephone: 970-898-3319 Fax: 970-898-7367

WORKORDER NUMBER	**1382**
TEST TYPE	**Magnetic Interference - Non-Operating**
TEST NAME	**HP ETM 765, Non-operating Magnetic Field Interference Test (Includes C1+)**
DATE TEST PERFORMED	**25 Jul 2002**
CUSTOMER PROJECT ALIAS	**Percept Technology**
HTC PROJECT NAME	**[22] Percept Technology**
SECONDARY QUALS	**NA**
MODEL NUMBER	**DLT VS160**
SKU/UNIT#	**NA**
EUT POWER	**NA**
QUANTITY TESTED	**1**
CUSTOMER NAME	**Shawn Singh**
COMPANY NAME	**Benchmark Storage Innovations, Inc.**
COMPANY ADDRESS	**3122 Sterling Circle Boulder, CO 80301**
TECHNICIAN	**Scott Parker**
ENGINEER	**Brian Annis**
REVIEWED BY	**John Sifford**

APPROVED BY:  DATE: 8/2/2002

Brian Annis

SUMMARY	Passed
DEVIATIONS	None
COMMENTS	None

TEST DATA

Axis	Distance (ft)	Pass/Fail	Comments	Worst Case
X	7	Pass		Front
Y	7	Pass		Top
Z	7	Pass		Top

EUT DESCRIPTION & SYSTEM CONFIGURATION

Equipment Under Test

Part ID	Mfgr	Model	Description	SN	FCC ID
12867	Benchmark	DLT VS160	Benchmark VS160 Internal Tape Drive	PHJ2F00017	None

PERFORMANCE CRITERIA

Code	HPMAGINTTP
Description	Magnetic field strength must be less than or equal to 2 milligauss at a distance of 7 feet (2.1 m) from any point on the surface of the product.

TEST ENVIRONMENT

EUT Condition	Functional and undamaged relative to test
EUT Configuration/Function	EUT inside final shipping packaging.
[1]EUT Power	NA
Environmental Conditions	21 deg C, 41 %RH, NA inHg

[1] Unless otherwise noted, the 115VAC/60Hz power source is the Ft. Collins public power supply system, and the 230VAC/50Hz source is the 50Hz motor generator. These voltages are specified to within ± 5%, and frequency is specified wthin ± 1%.

EUT SOFTWARE/FIRMWARE

Name	Rev	Functionality/Description
NA	NA	NA

TEST DESCRIPTION

Equipment is tested while in its shipping carton. Maximum observed d.c. magnetic field intensity emitted from the top, bottom and side surfaces of the Equipment Under Test, measured at a distance of 7 feet from the tested surface shall not exceed 2 milligauss.

TEST AUTOMATION SOFTWARE

Name	Revision
NA	N/a

TEST AND MEASUREMENT EQUIPMENT

ID	Mfgr	Model	Description	Serial #	Last Cal	Int	Cal Due
728	Lakeshore	M420	Gaussmeter	42915	6/13/2002	12	6/30/2003
835	Lakeshore	MLA-5006-HJ	Lake Shore Gamma Probe	H07244	7/23/2002	12	7/31/2003

REGULATORY STANDARDS

Where applicable, the test methods are compliant with the following regulatory standards:

HP ETM Section 765.006:			

THE RESULTS OF THIS REPORT ARE INCLUSIVE ONLY OF THE UNITS TESTED.
THIS REPORT MAY NOT BE REPRODUCED IN ANY PART
WITHOUT THE WRITTEN CONSENT OF THE FORT COLLINS HARDWARE TEST CENTER.
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Addendum 7: DLT VS160e Magnetic Interference Report

Fort Collins Hardware Test Center

3404 East Harmony Road, Fort Collins, Colorado 80528
Telephone: 970-898-3319 Fax: 970-898-7367

WORKORDER NUMBER	**1383**
TEST TYPE	**Magnetic Interference - Non-Operating**
TEST NAME	**HP ETM 765, Non-operating Magnetic Field Interference Test (Includes C1+)**
DATE TEST PERFORMED	**25 Jul 2002**
CUSTOMER PROJECT ALIAS	**Percept Technology**
HTC PROJECT NAME	**[22] Percept Technology**
SECONDARY QUALS	**NA**
MODEL NUMBER	**DLT VS160e**
SKU/UNIT#	**NA**
EUT POWER	**NA**
QUANTITY TESTED	**1**
CUSTOMER NAME	**Shawn Singh**
COMPANY NAME	**Benchmark Storage Innovations, Inc.**
COMPANY ADDRESS	**3122 Sterling Circle Boulder, CO 80301**
TECHNICIAN	**Scott Parker**
ENGINEER	**Brian Annis**
REVIEWED BY	**John Sifford**

APPROVED BY:  DATE: 8/2/2002

Brian Annis

SUMMARY	Passed
DEVIATIONS	None
COMMENTS	None

TEST DATA

Axis	Distance (ft)	Pass/Fail	Comments	Worst Case
X	7	Pass		Front
Y	7	Pass		Top
Z	7	Pass		Top

EUT DESCRIPTION & SYSTEM CONFIGURATION

Equipment Under Test

Part ID	Mfgr	Model	Description	SN	FCC ID
12866	Benchmark	DLT VS160e	Benchmark VS160e External Tape Drive	PHJ2F00082	None

PERFORMANCE CRITERIA

Code	HPMAGINTTP
Description	Magnetic field strength must be less than or equal to 2 milligauss at a distance of 7 feet (2.1 m) from any point on the surface of the product.

TEST ENVIRONMENT

EUT Condition	Functional and undamaged relative to test
EUT Configuration/Function	EUT inside final shipping packaging.
[1]EUT Power	NA
Environmental Conditions	21 deg C, 41 %RH, NA inHg

[1] Unless otherwise noted, the 115VAC/60Hz power source is the Ft. Collins public power supply system, and the 230VAC/50Hz source is the 50Hz motor generator. These voltages are specified to within ± 5%, and frequency is specified within ± 1%.

EUT SOFTWARE/FIRMWARE

Name	Rev	Functionality/Description
NA	NA	NA

TEST DESCRIPTION

Equipment is tested while in its shipping carton. Maximum observed d.c. magnetic field intensity emitted from the top, bottom and side surfaces of the Equipment Under Test, measured at a distance of 7 feet from the tested surface shall not exceed 2 milligauss.

TEST AUTOMATION SOFTWARE

Name	Revision
NA	N/a

TEST AND MEASUREMENT EQUIPMENT

ID	Mfgr	Model	Description	Serial #	Last Cal	Int	Cal Due
728	Lakeshore	M420	Gaussmeter	42915	6/13/2002	12	6/30/2003
835	Lakeshore	MLA-5006-HJ	Lake Shore Gamma Probe	H07244	7/23/2002	12	7/31/2003

REGULATORY STANDARDS

Where applicable, the test methods are compliant with the following regulatory standards:

HP ETM Section 765.006:			

THE RESULTS OF THIS REPORT ARE INCLUSIVE ONLY OF THE UNITS TESTED.
THIS REPORT MAY NOT BE REPRODUCED IN ANY PART
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Addendum 8: DLT VS160 Shock and Vibration Test Report

VSTAPE™

VALUSMART

ValuSmart Tape 160 and 160e

Shock and Vibration Report

Confidential

BENCHMARK

STORAGE INNOVATIONS

Vibration and Shock Test Report—VS160

John deLassus 5/20/02, amended 9/17/02

Objective: Objective of the operational testing is to determine if the VS160 can functionally write and read while being exposed to vibration and shock conditions that the drive might be exposed to in the field. Purpose of the non-operational non-packaged is to determine if the drive experiences any physical damage when exposed to higher levels of vibration and shock that the drive might encounter in the field while not writing or reading. Unless noted otherwise, all testing is done on both internal configuration and external single enclosure configuration.

Method: The Benchmark VS160 Product Specification was used to determine conditions for all testing. For operational testing, drives were set up in all 3 axes and were commanded to write to tape while being subjected to these shock and vibration conditions. The drives were then commanded to go back and read the same data to ensure that the written data had integrity. For non-operational testing, the drives were exposed to the non-op. conditions first (in all 3 axes), then the same write/read tests were run on the drives. The drives also were subjected to continuous load unload operational testing for 30 minutes total at the 4 lowest resonant frequencies in all 3 axes. For most testing, one drive was used per axis per test while drives were rotated between axes for similar tests so that all drives were exposed to testing in all 3 axes. No packaged testing was included in this test series.

Exit Criteria: The drive must not have any physical damage and must have no data loss, i.e., no hard failures that are non-recoverable, with the exception of the 62G shock, which has a requirement of no physical damage during this operational test. No load/unload failures may occur.

Results: The drives passed all vibration tests. The drives passed all shock tests. All drives had all screws still fully inserted with some holding torque. Actual value to loosen was not measured. Physical position of all of the critically adjusted components was measured before and after testing with negligible changes.

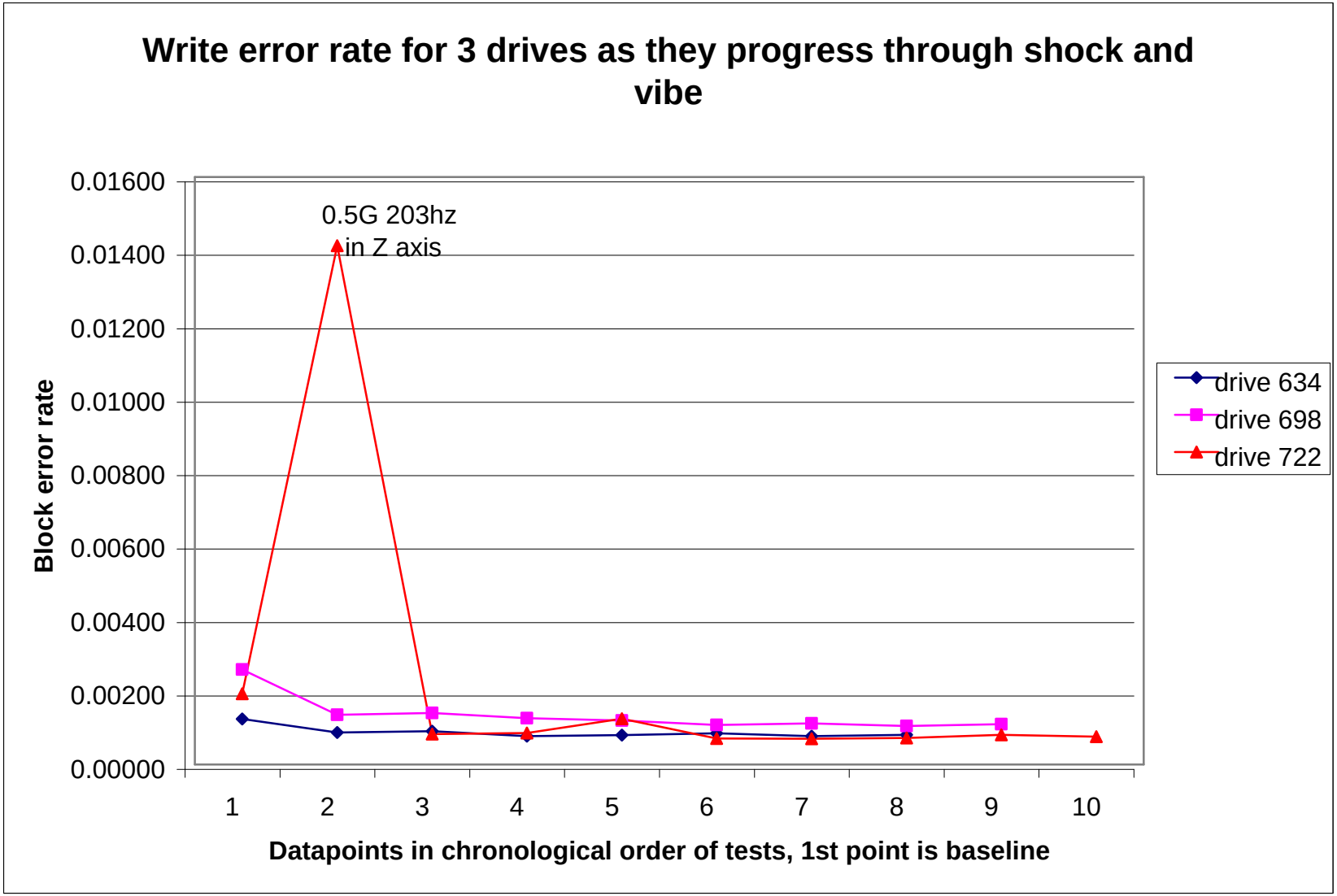
Details of Testing:

1. Testing done on May 7, 8, 9, 13, June 24, 25, July 29, Aug.27, 28, Sept. 10, 11, and 13, 2002 at Storage Tek APT division.
2. Test engineers: John deLassus and Pete Richardson (of Storage Tek).
3. The following drive serial numbers were used for testing: DL2020634, 698, 722, PHJ2F00131, 024, 180, PHJ2F00203, 169, and 142. Most of these drives had some form of testing in all 3 axes, though some were used just for single tests.
4. For all operational tests, drives were commanded to write data serially (file marks) for at least 4 logical tracks so that if the head actuator were to be shocked or vibrated off track, it would have a chance to damage previously written tracks. This would be detected in subsequent reads.
5. Some testing was done in outer tracks to ensure that the drive still functioned properly in the extremes of the actuator travel while subjected to these conditions.

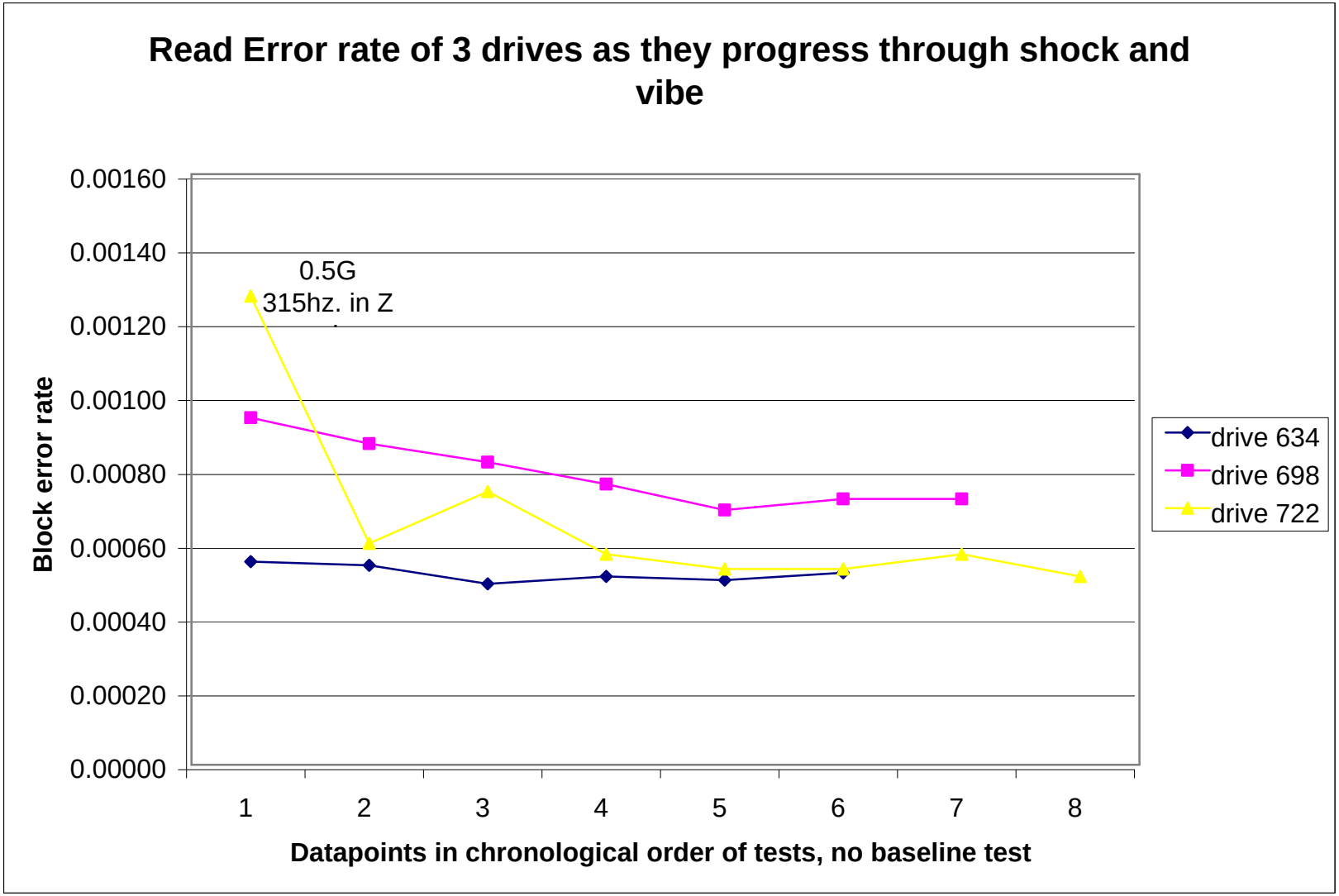
6. The following attributes were measured before and after the testing to determine if any significant movement of the mechanical components occurred:
    a. Head Azimuth =====> results: approx. 1 minute decrease--negligible
    b. Head Zenith =====> results: approx.2 minutes decrease--negligible
    c. Roller Heights =====> results: approx. .0007 to .0011" roller spread--negligible.
    d. Lateral Tape motion ====> results: no change
    e. Head Actuator Mapping (TMR) ===> results: approx. 35u" peak to peak degradation—negligible
    f. Screw Movement: No screws were loose. They were all fully inserted and tightened to some degree.
7. Used rev. 3.7 mechanisms with the following changes for much of the testing, then repeated the most difficult tests with 4.0+ mechs.
    a. Glued in spacers to support board in the middle (in the same location as rev.4.0 mechs).
    b. Used thick (rev. 2.0) bluelight board
    c. Used thin (rev. 3.0) tailgate board
    d. Used matching PCB shield (to match 2.0 bluelight board)
    e. Used 5mm long screws in all locations to match 4.0 mech.
8. Initial testing was done with 5.1 level firmware and additional testing was done as F/W was improved. The most recent testing was done with F/W level 15.4.
9. Ran drives with the following **Operational shock and vibration specifications—all tests passed**:
    a. **Operational Sine Sweep** 5 – 500 – 5hz. @ ½ octave/minute **0.5G**, 0 peak, then dwelled at 4 lowest resonant frequencies per axis (if resonance existed) for 15 minutes each.
    b. **Operational Random** 5 – 500 hz., **0.25Grms**, 10 minutes/axis using the following power spectral density (PSD): 0.00005 g2/hz @ 5hz, 0.00017 g2/hz @20hz., 0.00017 g2/hz. @200hz., 0.000065 g2/hz. @ 500hz.
    c. **Operational Random Overstress** 10 – 500hz., **0.5Grms**, 10minutes/axis using the following PSD: 0.0004 g2/hz.@ 10hz., 0.00069 g2/hz.@ 20hz., 0.00069 g2/hz. @200hz., 0.00026 g2/hz.@ 500hz.
    d. **Operational Standalone ½ sine pulse 5G/11ms**., 10 pulses per all 3 axes x 2 directions, 1 pulse every 6 seconds.
    e. **Operational Standalone ½ sine pulse 8G/10ms**, 1 pulse per all 3 axes x 2 directions.
    f. **Operational Standalone ½ sine pulse 10G/10ms,** 1 pulse per all 3 axes x 2 directions. (internal only) (this test is not required but was done to show margin in the 8G test)
    g. **Operational Standalone ½ sine pulse 62G/2ms**, 10 pulses per all 3 axes, 1 pulse every 6 seconds---no damage occurred.
10. Ran drives with the following **Non-Operational shock and vibration specifications—all tests passed**:
    a. **Non-operational Sine Sweep** 10 – 500 – 10hz. @ ½ octave/minute **1.0G**, 0 peak, then dwelled at 4 lowest resonant frequencies per axis (if resonance existed) for 15 minutes each.
    b. **Non-operational Random** 5 – 500 hz., **2.41Grms**, 10 minutes/axis using the following PSD: 0.020 g2/hz.@ 5hz., 0.020 g2/hz.@ 100hz., 0.011 g2/hz.@ 137hz., 0.011 g2/hz.@ 350hz., 0.0052 g2/hz.@ 500hz.
    c. **Non-operational Standalone 40G/10ms square wave** once in each of the 3 axes x 2 directions (6 total)
    d. **Non-operational Standalone 142G/2ms ½ sine pulse** once in each of the 3 axes x 2 directions (6 total).

e. **Non-operational Standalone 90G/3ms ½ sine pulse** once in each of the 3 axes x 2 directions (6 total)

Data, Graphs, and Pictures:



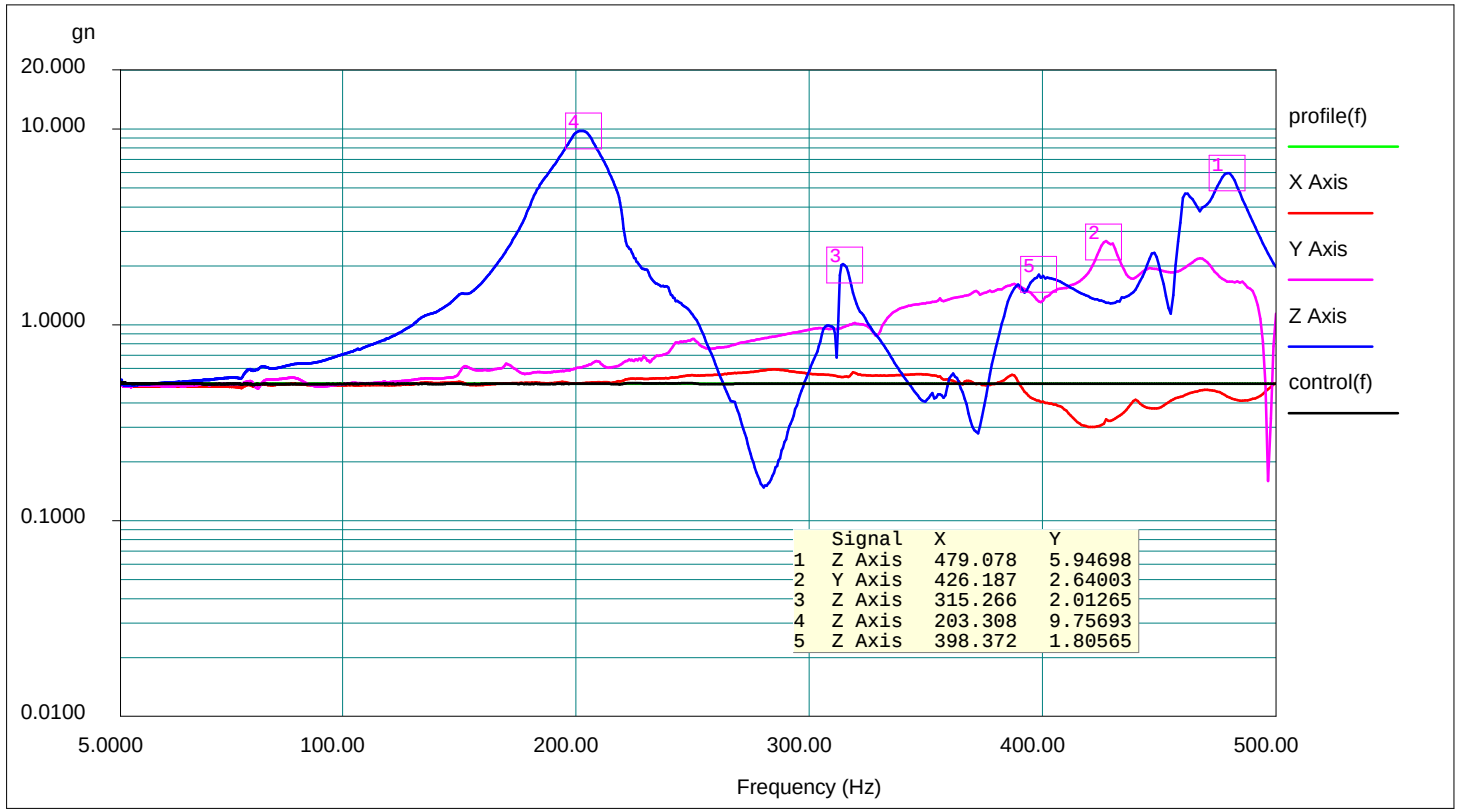
Write Error rates did not degrade throughout the tests with the exception of the one resonance shown



Read Error rates did not degrade throughout the tests

Internal Graphs Shown First:

BENCHMARK DLT Drives
X axis S/N01 ; Y Axis S/N02 ; Z Axis S/N 03
Project File Name: Sine.prj
Profile Name: 1.0G & 0.05In Pk-Pk. Test Type: Swept Sine Run Folder: .\APT# 02-10176 May 07,2002 11-01-31

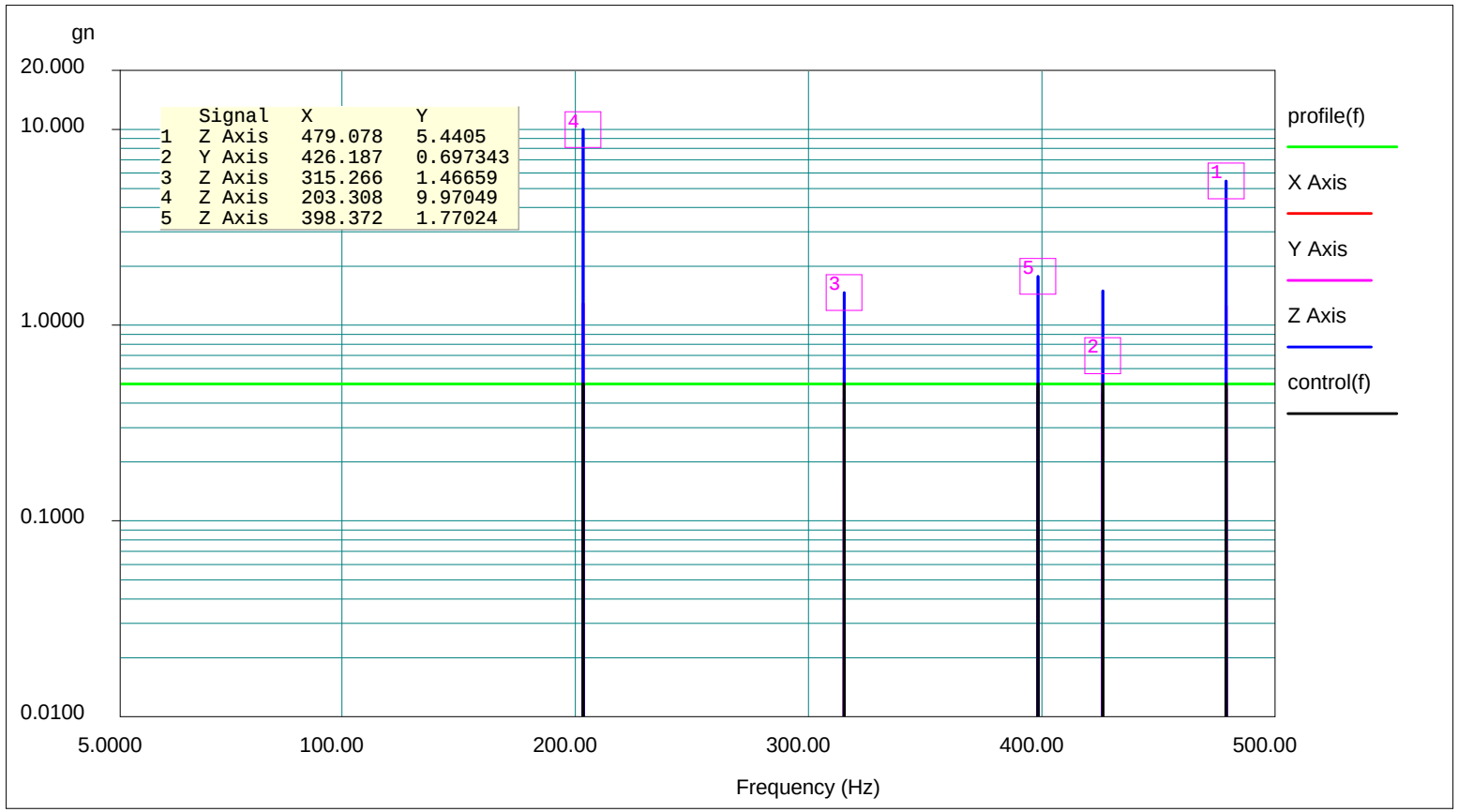


Level:	0 dB	Control Peak:	0.498511 gn	Full Level Time:	00:26:36	Sweep Type:	Logarithmic
Frequency:	5.000490 Hz	Demand Peak:	0.500000 gn	Time Remaining:	00:00:00	Sweep Rate:	0.5 Oct/Min

Data saved at 11:28:32 AM, Tuesday, May 07, 2002 Report created at 11:28:33 AM, Tuesday, May 7, 2002

Operational Sine Sweep 5 – 500 – 5 hz, 0.5G, Resonances highlighted

BENCHMARK DLT Drives
X axis S/N01 ; Y Axis S/N02 ; Z Axis S/N 03
Project File Name: Sine.prj
Profile Name: 1.0G & 0.05In Pk-Pk. Test Type: Swept Sine Run Folder: .\APT# 02-10176 Dwell (short) May 07,2002 13-24-08

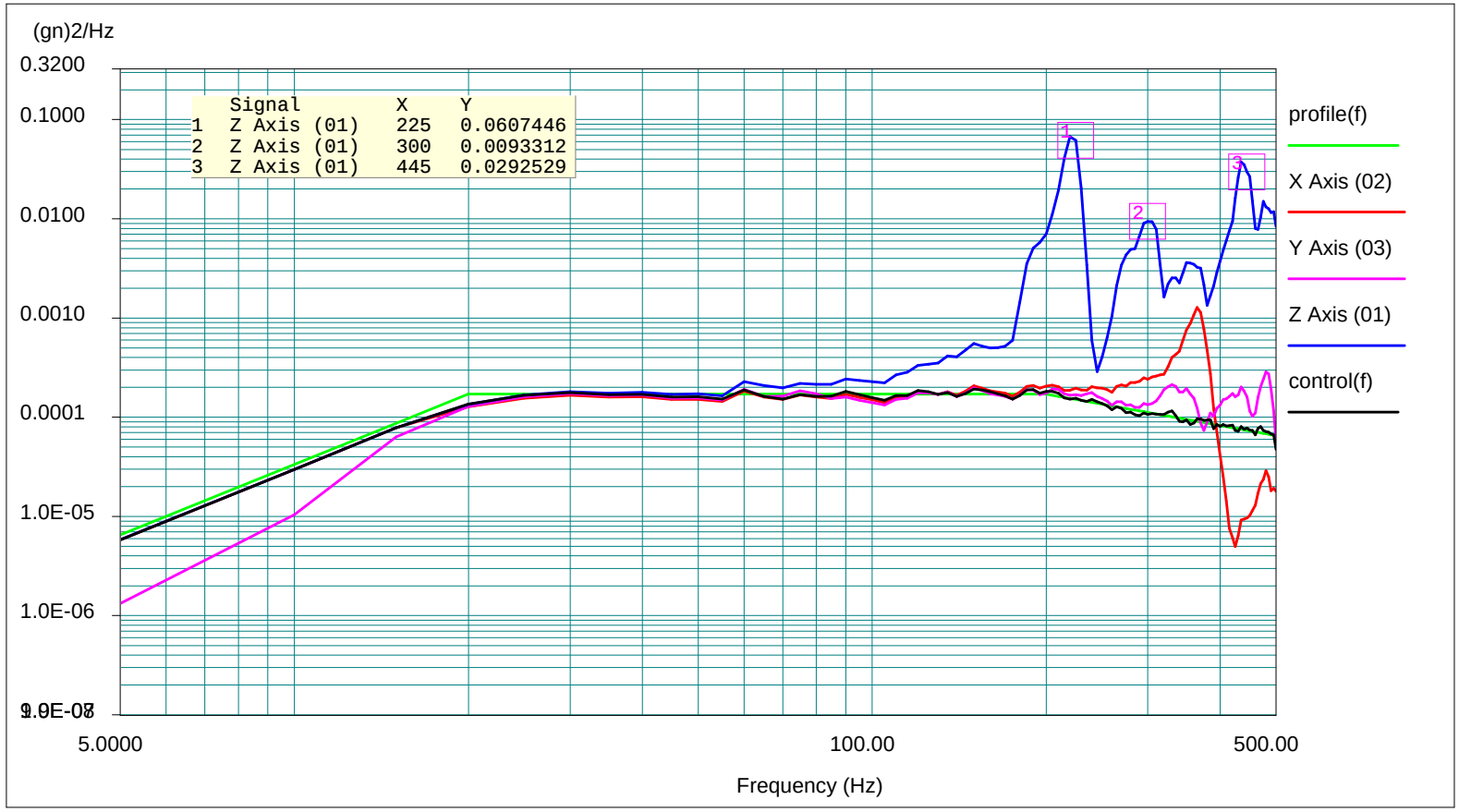


Level:	0 dB	Control Peak:	0.499883 gn	Full Level Time:	00:29:11	Sweep Type:	Logarithmic
Frequency:	479.000000 Hz	Demand Peak:	0.500000 gn	Time Remaining:	00:27:24	Sweep Rate:	1 Oct/Min

Data saved at 01:53:36 PM, Tuesday, May 07, 2002 Report created at 01:53:37 PM, Tuesday, May 7, 2002

Operational Dwell at 0.5G at Resonant frequencies

BENCHMARK DLT Drives
X Axis S/N02 ; Y Axis S/N03 ; Z Axis S/N 01
Project File Name: Random.prj
Profile Name: Nav-Mat Test Type: Random Run Folder: .\APT# 02-10176 Random May 07,2002 15-53-36



Level: 0 dB

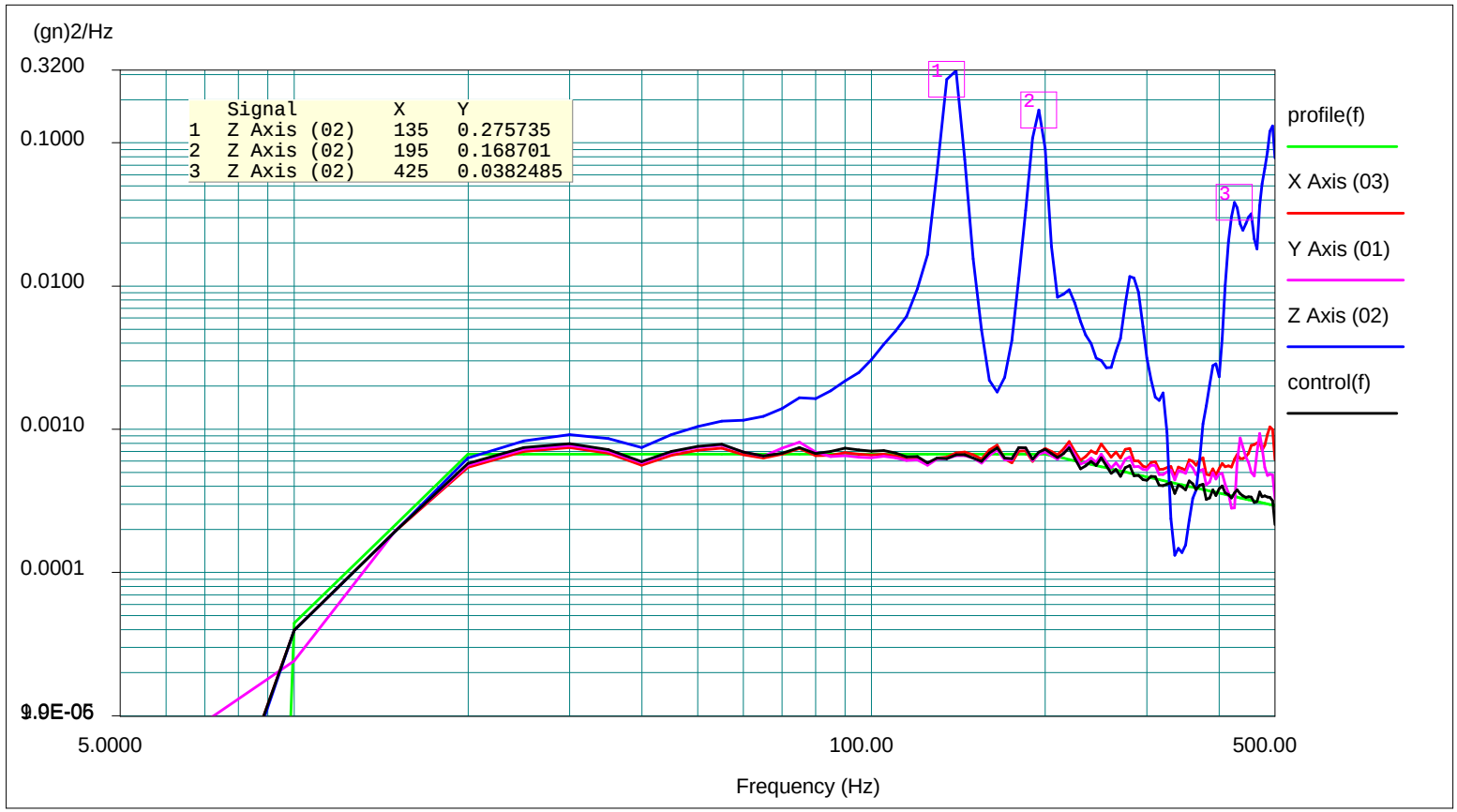
Control RMS:	0.249064 gn	Full Level Elapsed Time:	00:10:00	Lines:	225	Frame Time:	0.200000 Seconds
Demand RMS:	0.249297 gn	Remaining Time:	00:00:00	DOF:	154	dF:	5.000000 Hz

Data saved at 04:04:33 PM, Tuesday, May 07, 2002 Report created at 04:04:34 PM, Tuesday, May 7, 2002

Operational Random 10 – 500 hz. 0.25Grms Resonances highlighted

BENCHMARK DLT Drives
X Axis S/N03 ; Y Axis S/N01 ; Z Axis S/N02

Project File Name: Random.prj
Profile Name: Nav-Mat Test Type: Random Run Folder: .\APT# 02-10176 May 07,2002 14-52-29



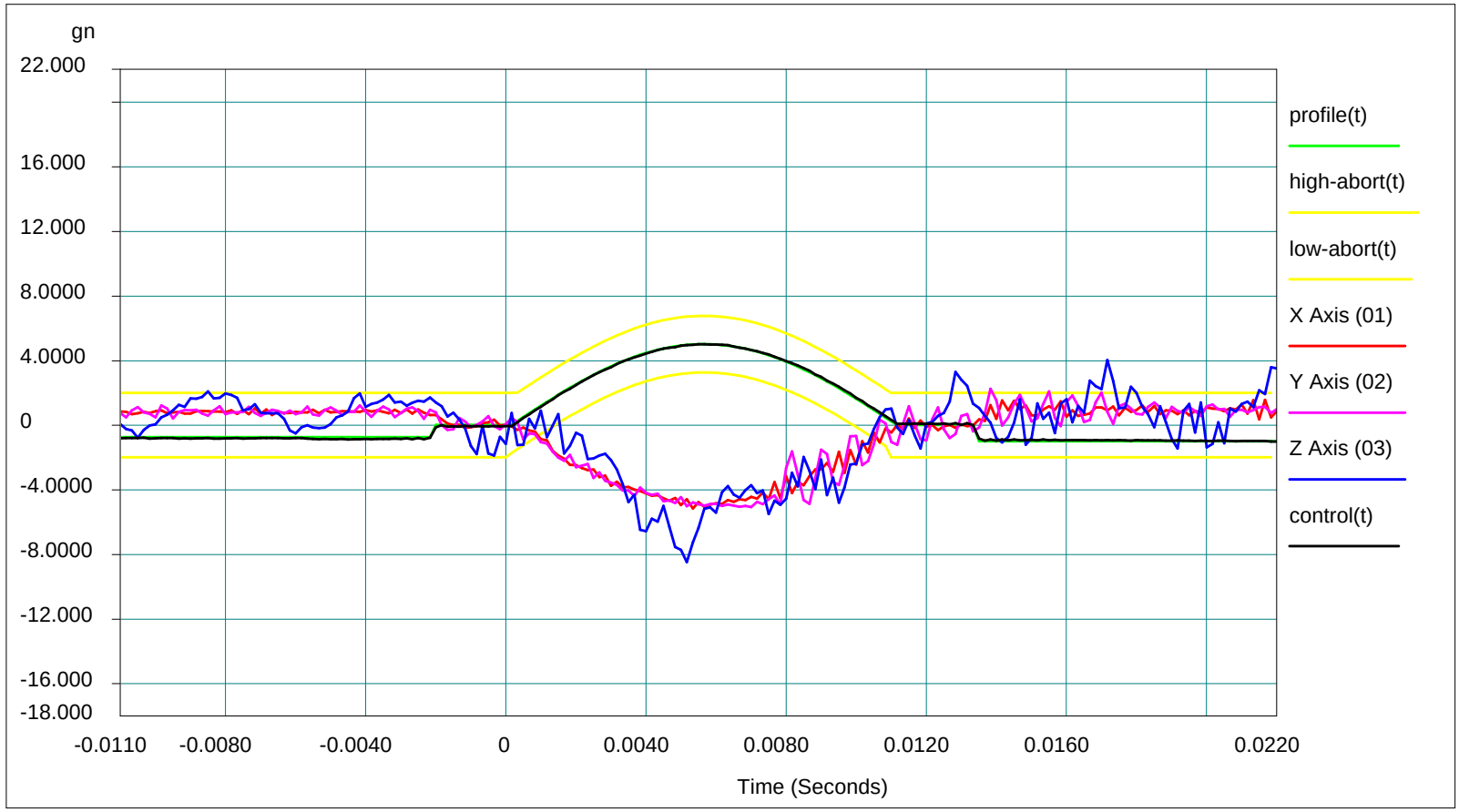
Level: 0 dB

Control RMS:	0.506653 gn	Full Level Elapsed Time:	00:10:00	Lines:	225	Frame Time:	0.200000 Seconds
Demand RMS:	0.502113 gn	Remaining Time:	00:00:00	DOF:	154	dF:	5.000000 Hz

Data saved at 03:03:37 PM, Tuesday, May 07, 2002 Report created at 03:03:38 PM, Tuesday, May 7, 2002

Operational Random Overstress 10 – 500 hz. 0.5Grms Resonances highlighted

Benchmark VS160 Drives # 1,2 & 3
5G's @ 11ms Op Shock
Project File Name: OpShock.prj
Profile Name: 5gn 11mSec Test Type: Classical Shock Run Folder: .\APT# 02-10176 May 08,2002 10-42-16

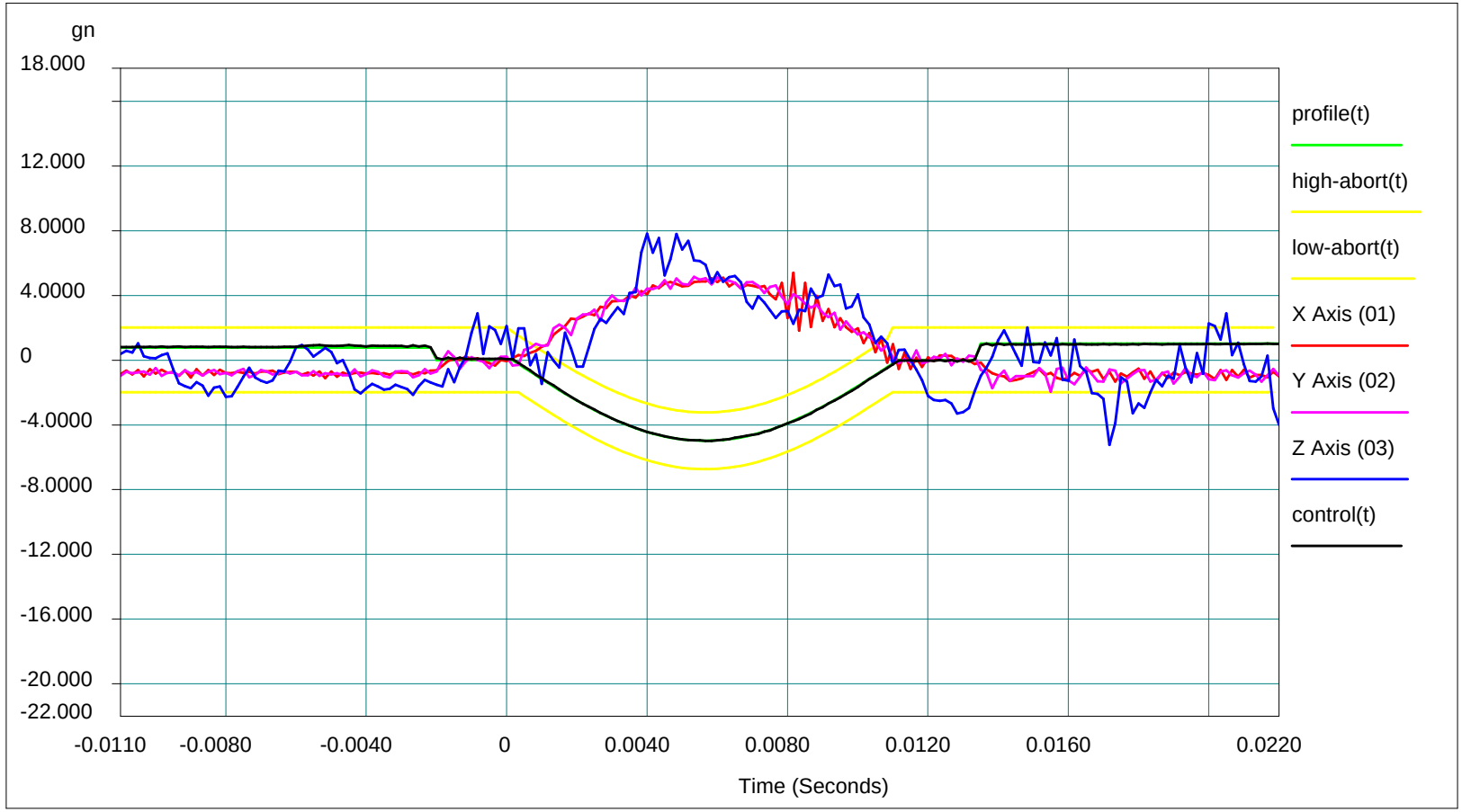


Level:	0 dB	Block Size:	2048	Elapsed Pulses:	14		
Frame Time:	0.341333 Seconds	Control Peak:	5.009162 gn	Control RMS:	0.738677 gn	Full Level Elapsed Pulses:	4
dT:	0.000167 Seconds	Demand Peak:	5.000000 gn	Demand RMS:	0.733424 gn	Remaining Pulses:	22
Pulse Type:	Half Sine	Amplitude:	5.000000 gn	Pulse Width:	11.000001 ms		

Data saved at 10:43:40 AM, Wednesday, May 08, 2002 Report created at 10:43:46 AM, Wednesday, May 8, 2002

Operational Shock, ½ sine 5G/11ms positive direction

Benchmark VS160 Drives # 1,2 & 3
5G's @ 11ms Op Shock
Project File Name: OpShock.prj
Profile Name: 5gn 11mSec Test Type: Classical Shock Run Folder: .\APT# 02-10176 May 08,2002 10-42-16

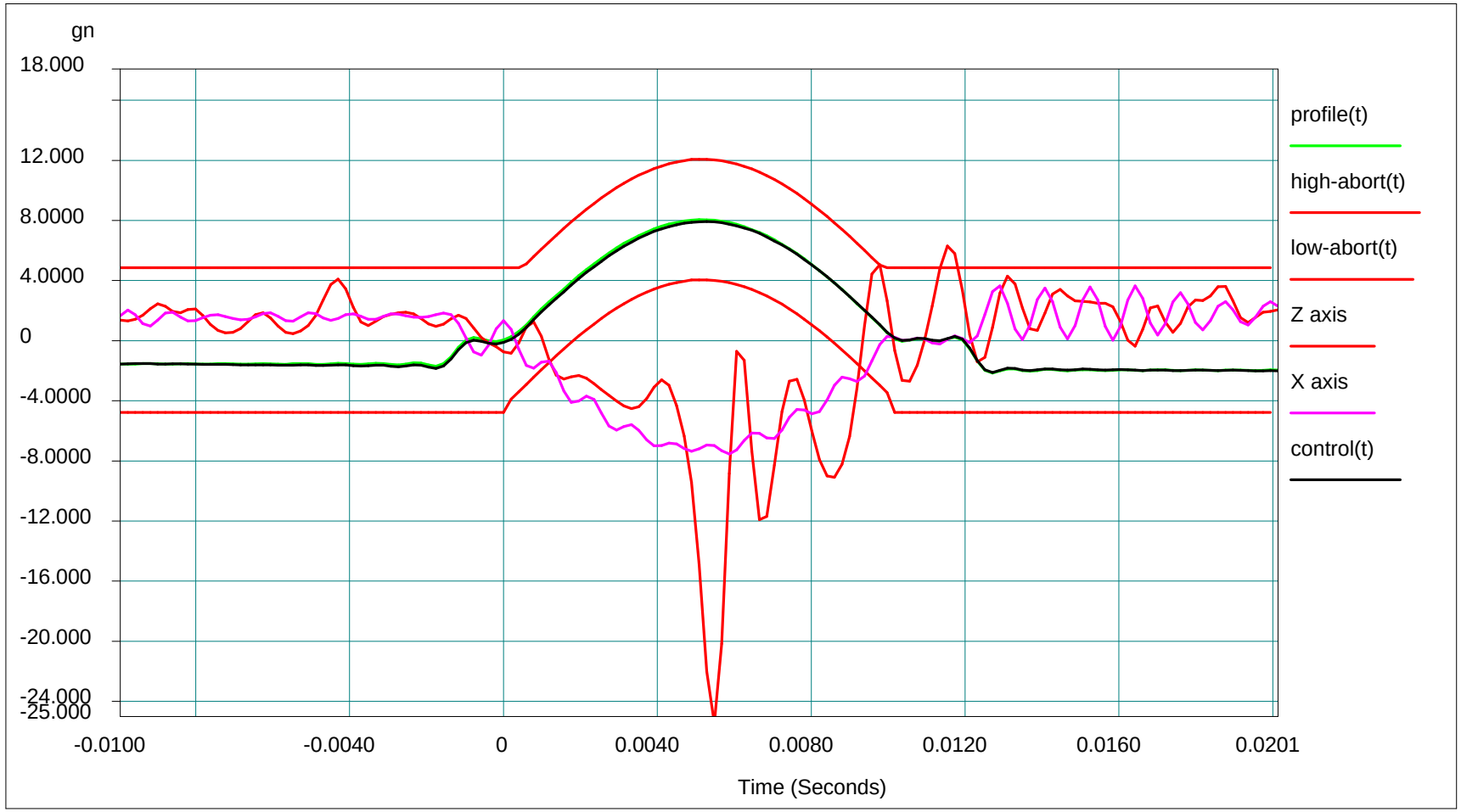


Level:	0 dB	Block Size:	2048	Elapsed Pulses:	28		
Frame Time:	0.341333 Seconds	Control Peak:	5.005188 gn	Control RMS:	0.737469 gn	Full Level Elapsed Pulses:	14
dT:	0.000167 Seconds	Demand Peak:	5.000000 gn	Demand RMS:	0.733424 gn	Remaining Pulses:	8
Pulse Type:	Half Sine	Amplitude:	5.000000 gn	Pulse Width:	11.000001 ms		

Data saved at 10:46:30 AM, Wednesday, May 08, 2002 Report created at 10:46:32 AM, Wednesday, May 8, 2002

Operational Shock, ½ sine 5G/11ms negative direction

Project File Name: One drive in Y (labeled X) and One drive in Z
Profile Name: 8gn 10mSec Test Type: Classical Shock Run Folder: .\02-10341 Aug 27,2002 15-29-07

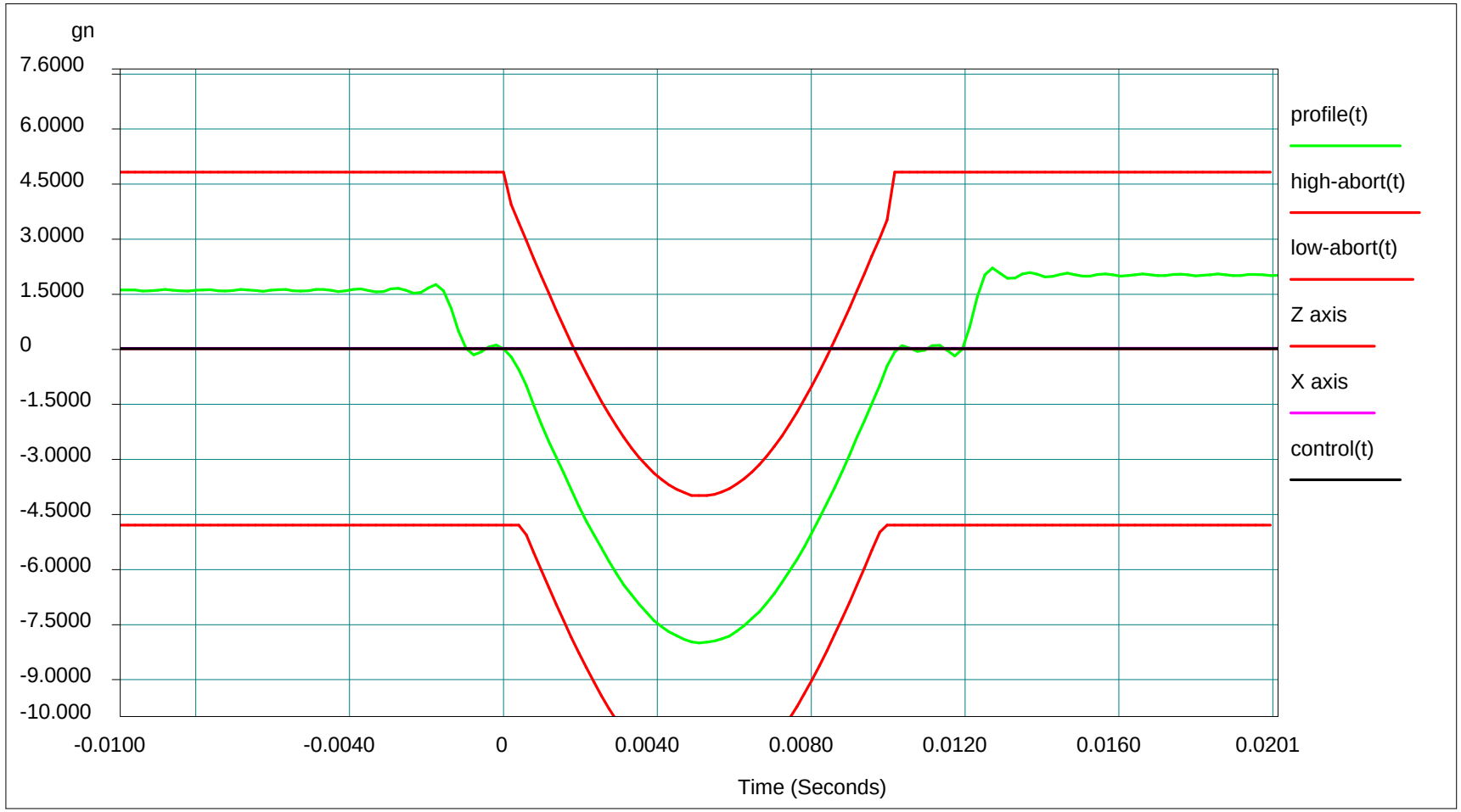


Level:	0 dB	Block Size:	1024	Elapsed Pulses:	28		
Frame Time:	0.200000 Seconds	Control Peak:	7.863080 gn	Control RMS:	1.496481 gn	Full Level Elapsed Pulses:	20
dT:	0.000195 Seconds	Demand Peak:	8.000000 gn	Demand RMS:	1.507400 gn	Remaining Pulses:	21
Pulse Type:	Half Sine	Amplitude:	8.000000 gn	Pulse Width:	10.000001 ms		

Data saved at 03:41:16 PM, Tuesday, August 27, 2002 Report created at 03:42:30 PM, Tuesday, August 27, 2002

Operational Shock, ½ sine 8G/10ms positive direction

Project File Name: One drive in Y (labeled X) and One drive in Z
Profile Name: 8gn 10mSec Test Type: Classical Shock Run Folder: .\02-10341 Aug 27,2002 16-07-41



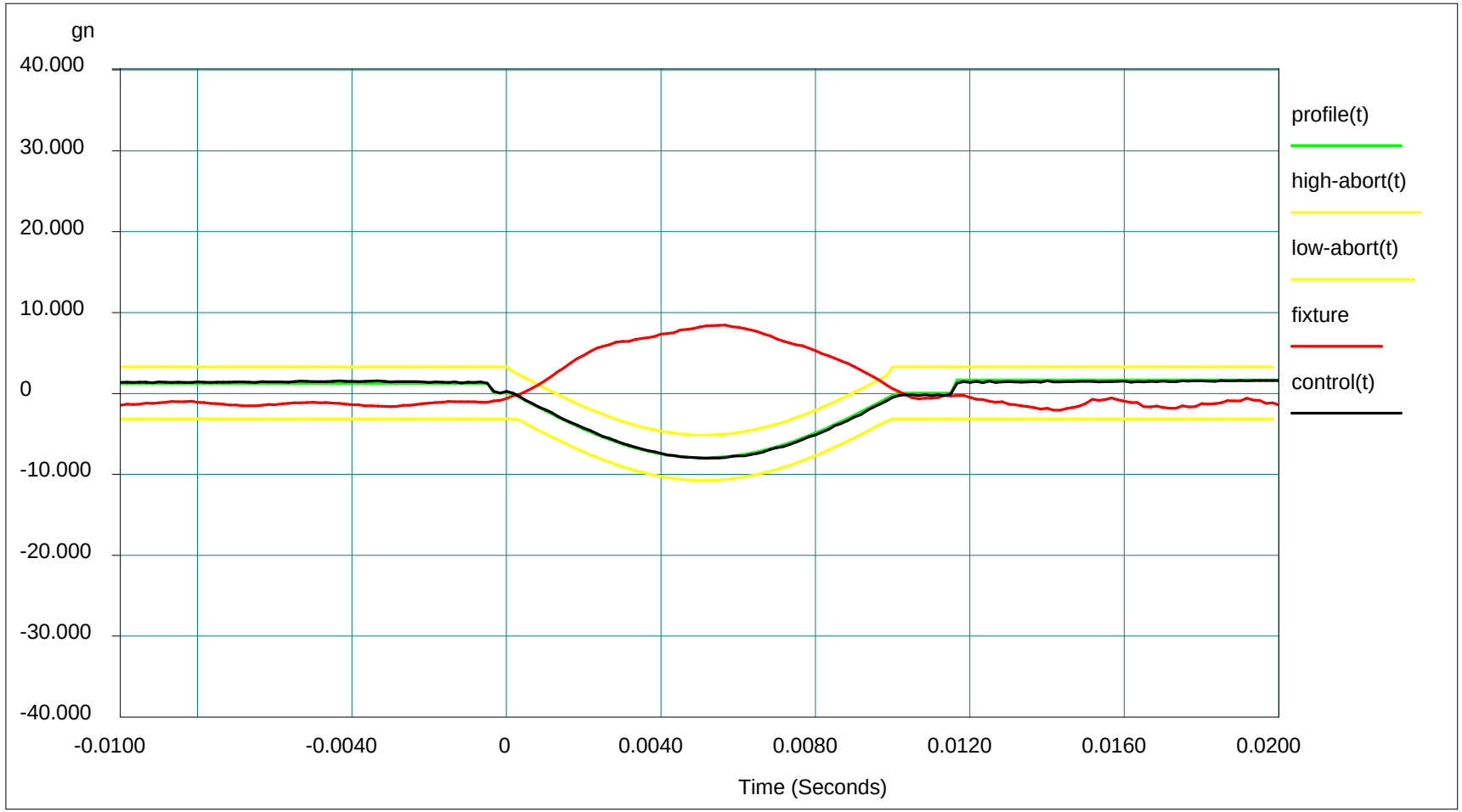
Level:	0 dB	Block Size:	1024	Elapsed Pulses:	28		
Frame Time:	0.200000 Seconds	Control Peak:	7.878549 gn	Control RMS:	1.498207 gn	Full Level Elapsed Pulses:	20
dT:	0.000195 Seconds	Demand Peak:	8.000000 gn	Demand RMS:	1.507400 gn	Remaining Pulses:	21
Pulse Type:	Half Sine	Amplitude:	8.000000 gn	Pulse Width:	10.000001 ms		

Data saved at 04:15:19 PM, Tuesday, August 27, 2002 Report created at 04:15:28 PM, Tuesday, August 27, 2002

(Drive accelerometer responses not shown)

Operational Shock, ½ sine 8G/10ms negative direction

8G's @ 10ms Op Shock
Project File Name: One drive in X axis
Profile Name: 8gn 10mSec Test Type: Classical Shock Run Folder: .\APT# 02-10176 May 13,2002 14-00-32



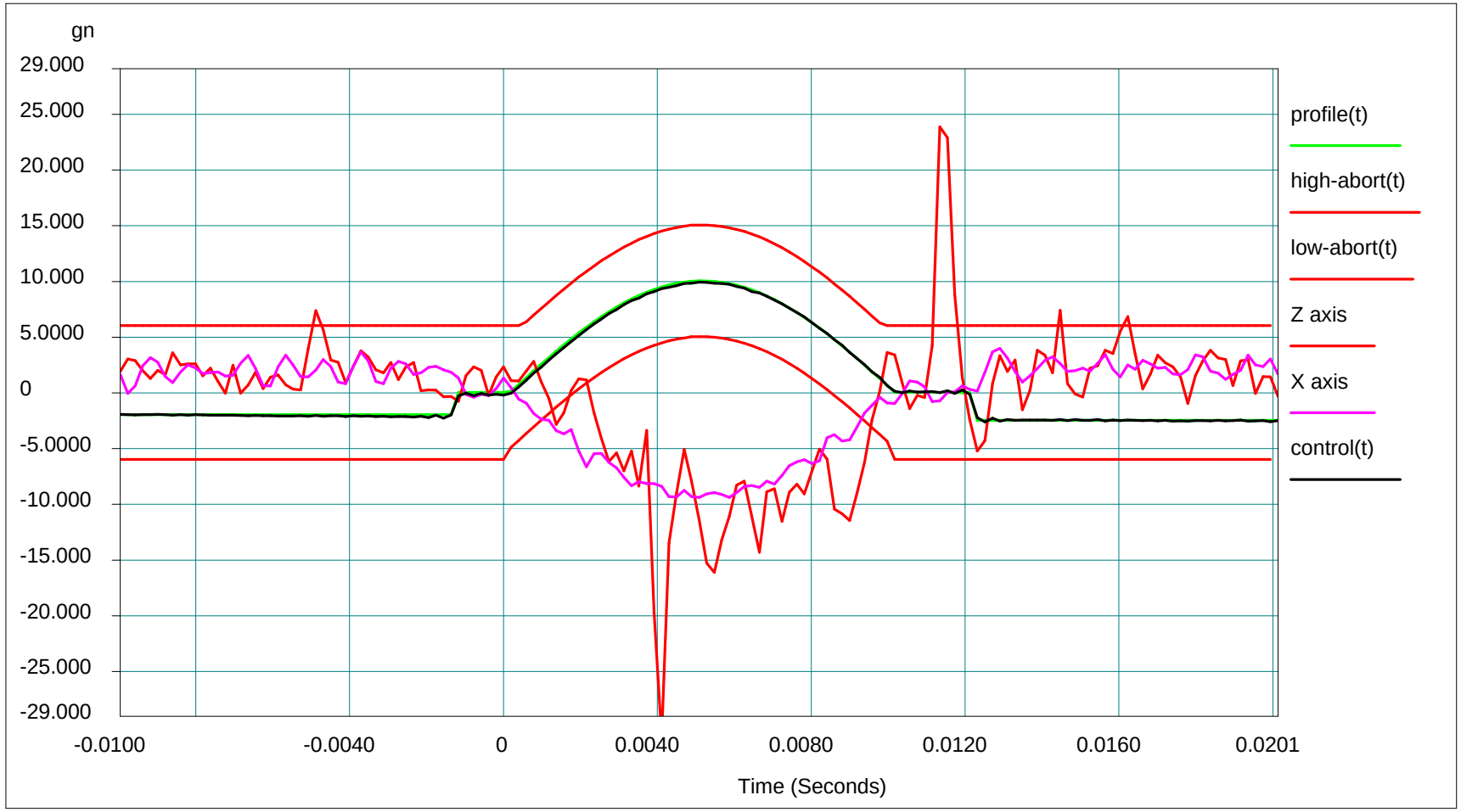
Level:	0 dB	Block Size:	2048	Elapsed Pulses:	11		
Frame Time:	0.341333 Seconds	Control Peak:	8.072436 gn	Control RMS:	1.132630 gn	Full Level Elapsed Pulses:	2
dT:	0.000167 Seconds	Demand Peak:	8.000000 gn	Demand RMS:	1.118983 gn	Remaining Pulses:	14
Pulse Type:	Half Sine	Amplitude:	8.000000 gn	Pulse Width:	10.000001 ms		

Data saved at 02:08:42 PM, Monday, May 13, 2002 Report created at 02:08:47 PM, Monday, May 13, 2002

(Drive accelerometer response not shown—accel. is mounted fixture)

Operational Shock, ½ sine 8G/10ms positive direction

Internal Drives
One Y (labeled X) and One Z
Project File Name: OPshock.prj
Profile Name: 10gn 10mSec Test Type: Classical Shock Run Folder: .\02-10341 Aug 28,2002 09-35-12

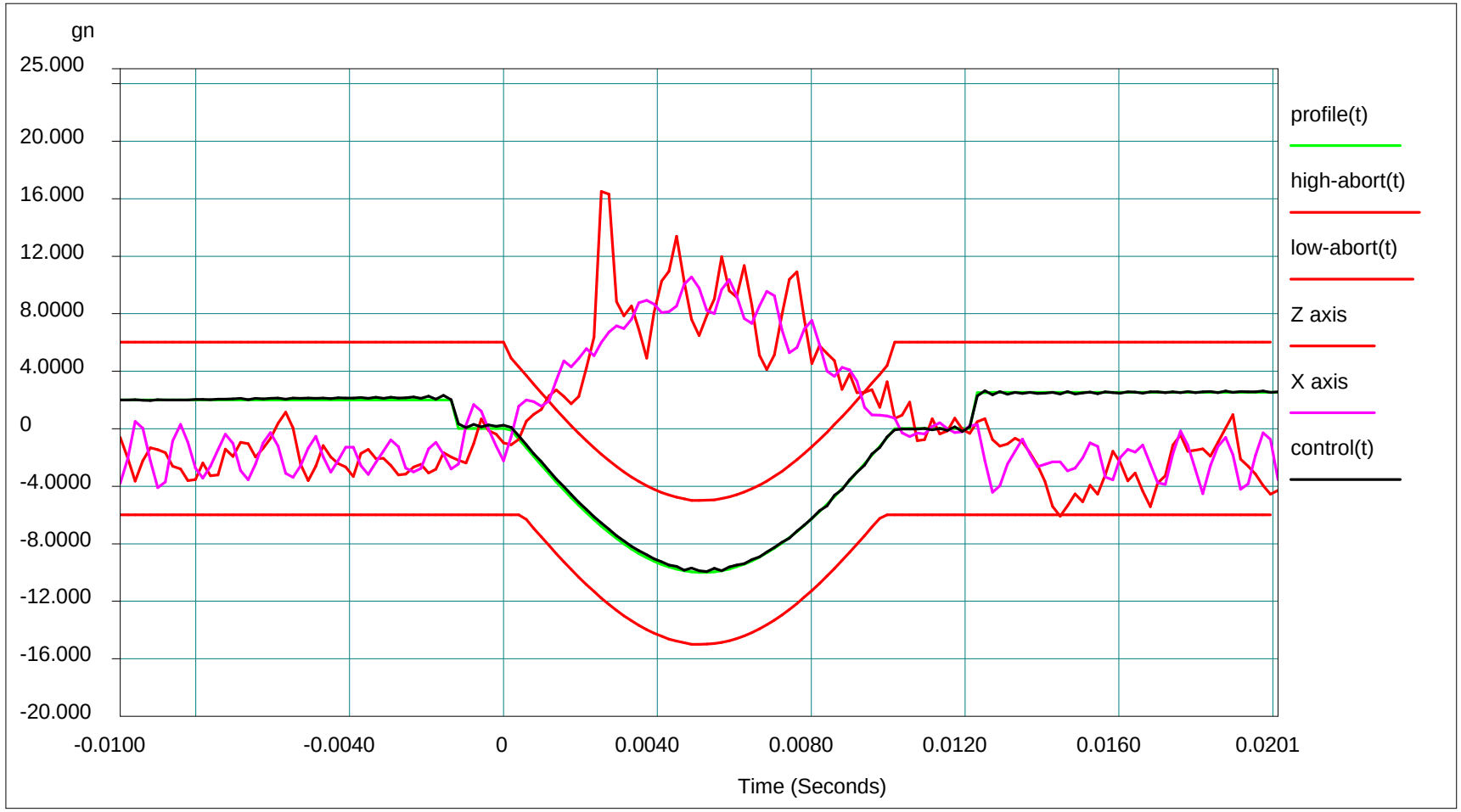


Level:	0 dB	Block Size:	1024	Elapsed Pulses:	18		
Frame Time:	0.200000 Seconds	Control Peak:	9.889442 gn	Control RMS:	1.879047 gn	Full Level Elapsed Pulses:	10
dT:	0.000195 Seconds	Demand Peak:	10.000000 gn	Demand RMS:	1.888299 gn	Remaining Pulses:	31
Pulse Type:	Half Sine	Amplitude:	10.000000 gn	Pulse Width:	10.000001 ms		

Data saved at 09:38:12 AM, Wednesday, August 28, 2002 Report created at 09:38:13 AM, Wednesday, August 28, 2002

Operational Shock, ½ sine 10G/10ms positive direction

Internal Drives
One Y and One Z
Project File Name: OPshock.prj
Profile Name: 10gn 10mSec Test Type: Classical Shock Run Folder: .\02-10341 Aug 28,2002 10-07-45

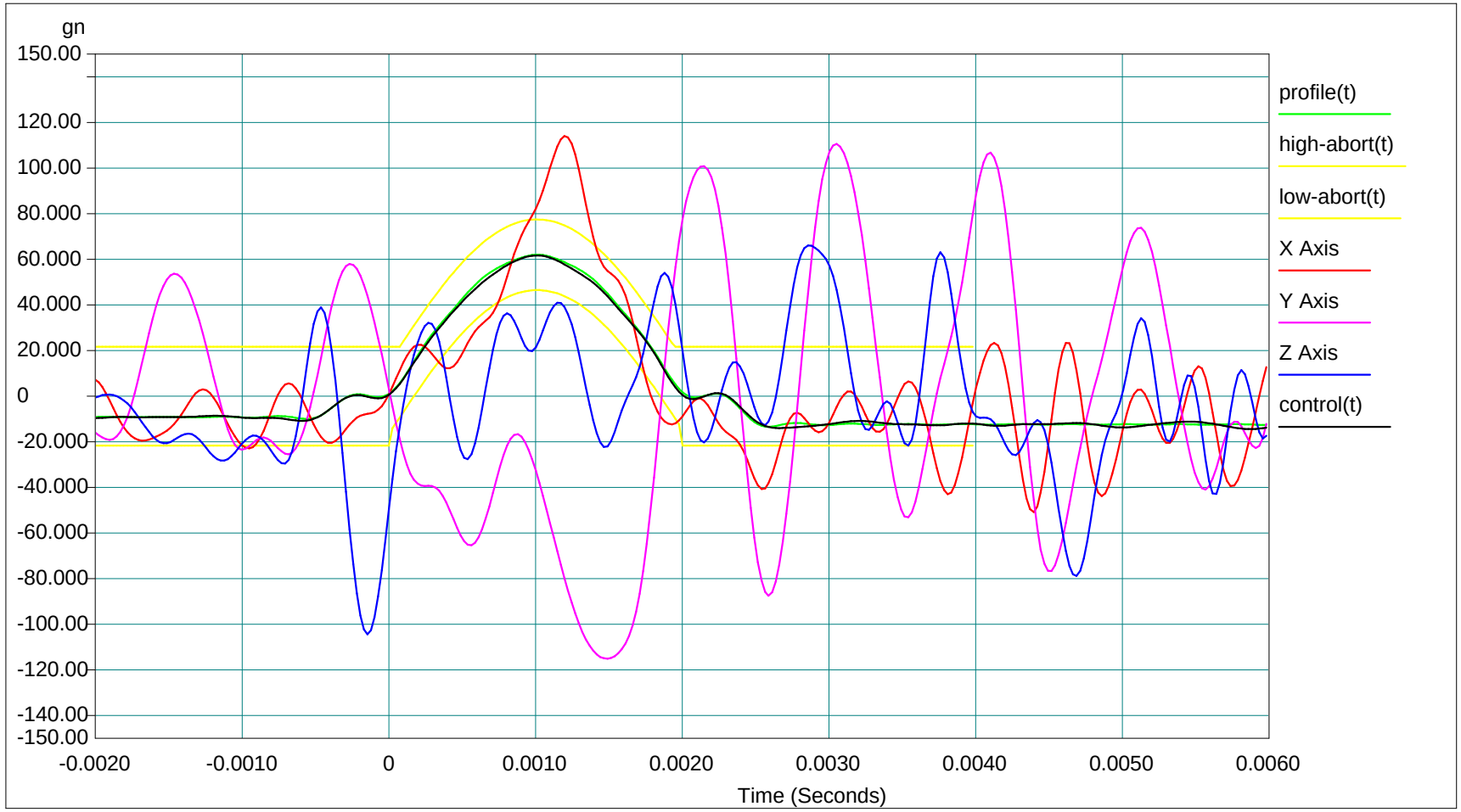


Level:	0 dB	Block Size:	1024	Elapsed Pulses:	28		
Frame Time:	0.200000 Seconds	Control Peak:	9.944679 gn	Control RMS:	1.879794 gn	Full Level Elapsed Pulses:	20
dT:	0.000195 Seconds	Demand Peak:	10.000000 gn	Demand RMS:	1.888299 gn	Remaining Pulses:	21
Pulse Type:	Half Sine	Amplitude:	10.000000 gn	Pulse Width:	10.000001 ms		

Data saved at 10:17:28 AM, Wednesday, August 28, 2002 Report created at 10:17:30 AM, Wednesday, August 28, 2002

Operational Shock, ½ sine 10G/10ms negative direction

BENCHMARK DLT SHock 62 G 2 msec
X Axis S/N03; Y Axis SN01; Z Axis S/N 02
Project File Name: OpShock.prj
Profile Name: 62gn 2mSec Test Type: Classical Shock Run Folder: .\APT# 02-10176 May 08,2002 16-00-49

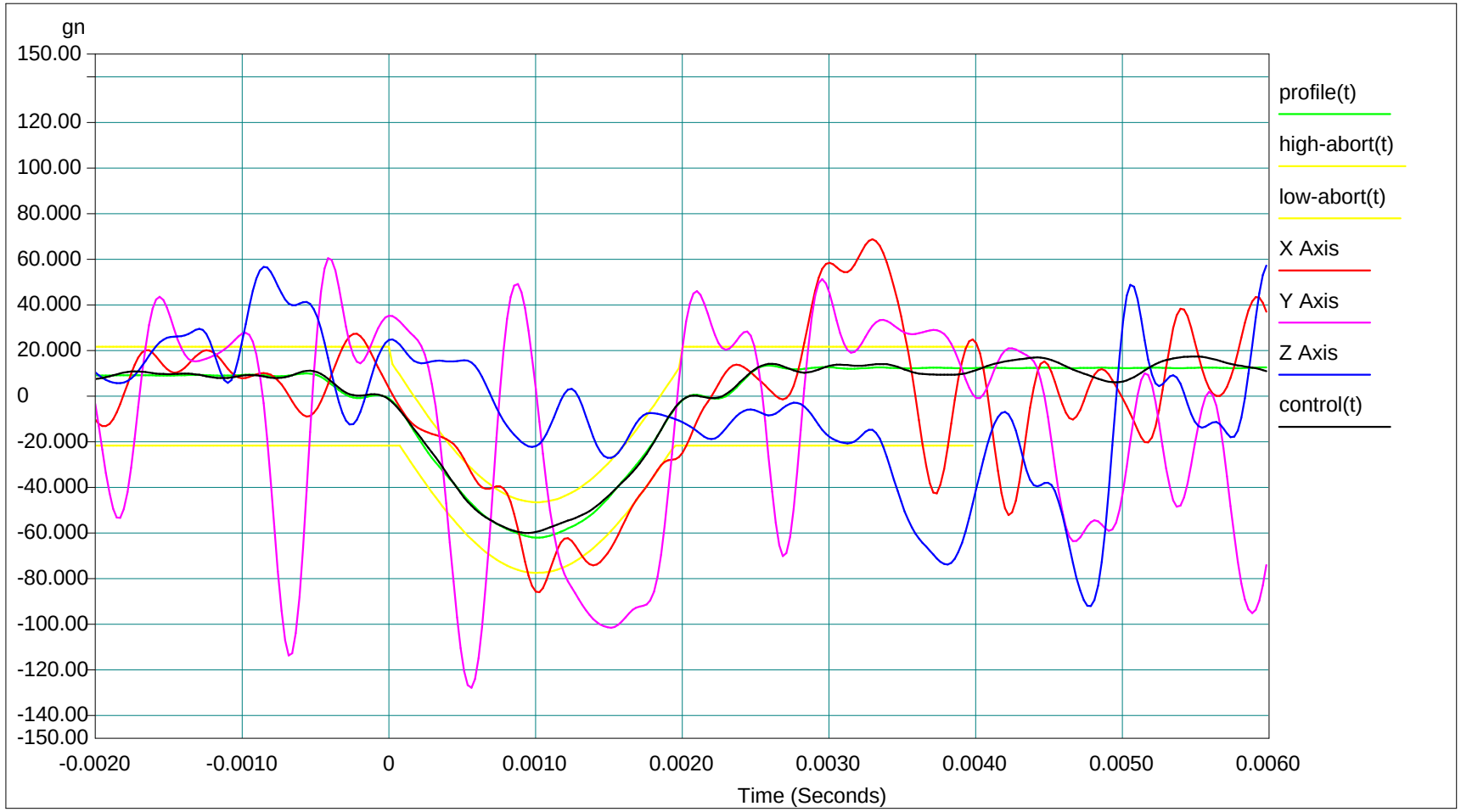


Level:	0 dB	Block Size:	2048	Elapsed Pulses:	13		
Frame Time:	0.050000 Seconds	Control Peak:	61.737804 gn	Control RMS:	9.944210 gn	Full Level Elapsed Pulses:	3
dT:	0.000024 Seconds	Demand Peak:	62.000000 gn	Demand RMS:	10.071122 gn	Remaining Pulses:	10
Pulse Type:	Half Sine	Amplitude:	62.000000 gn	Pulse Width:	2.000000 ms		

Data saved at 04:02:09 PM, Wednesday, May 08, 2002 Report created at 04:02:11 PM, Wednesday, May 8, 2002

Operational Standalone ½ sine 62G/2ms positive direction

BENCHMARK DLT SHock 62 G 2 msec
X Axis S/N03; Y Axis SN01; Z Axis S/N 02
Project File Name: OpShock.prj
Profile Name: 62gn 2mSec Test Type: Classical Shock Run Folder: .\APT# 02-10176 May 08,2002 16-30-00

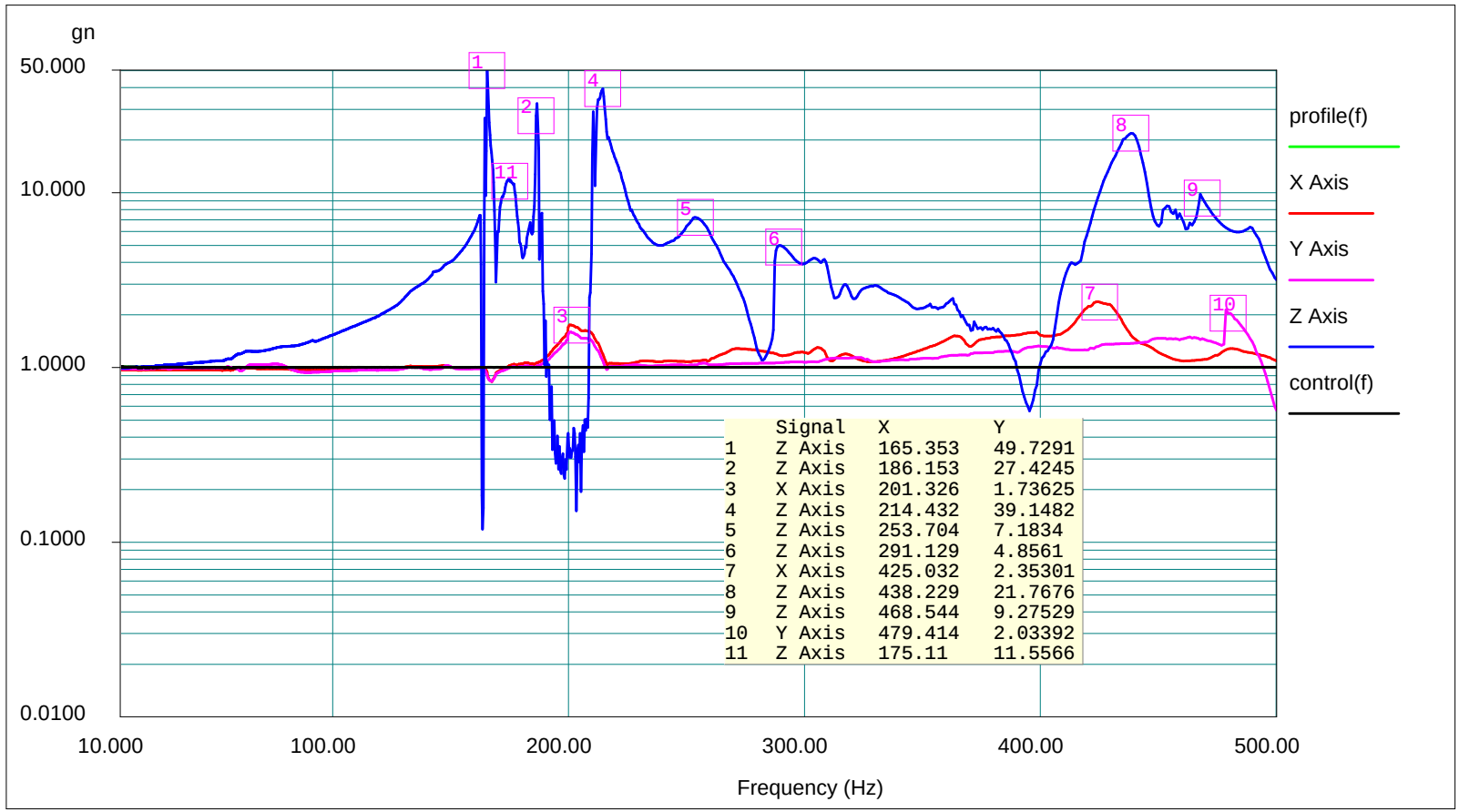


Level:	0 dB	Block Size:	2048	Elapsed Pulses:	24		
Frame Time:	0.050000 Seconds	Control Peak:	60.000980 gn	Control RMS:	10.006186 gn	Full Level Elapsed Pulses:	10
dT:	0.000024 Seconds	Demand Peak:	62.000000 gn	Demand RMS:	10.071122 gn	Remaining Pulses:	0
Pulse Type:	Half Sine	Amplitude:	62.000000 gn	Pulse Width:	2.000000 ms		

Data saved at 04:31:17 PM, Wednesday, May 08, 2002 Report created at 04:31:20 PM, Wednesday, May 8, 2002

Operational Standalone ½ sine 62G/2ms negative direction

BENCHMARK DLT Drives
X axis S/N01 ; Y Axis S/N02 ; Z Axis S/N 03
Project File Name: Sine.prj
Profile Name: 1.0G & 0.05In Pk-Pk. Test Type: Swept Sine Run Folder: .\APT# 02-10176 Sine 1.0G May 08,2002 11-20-42



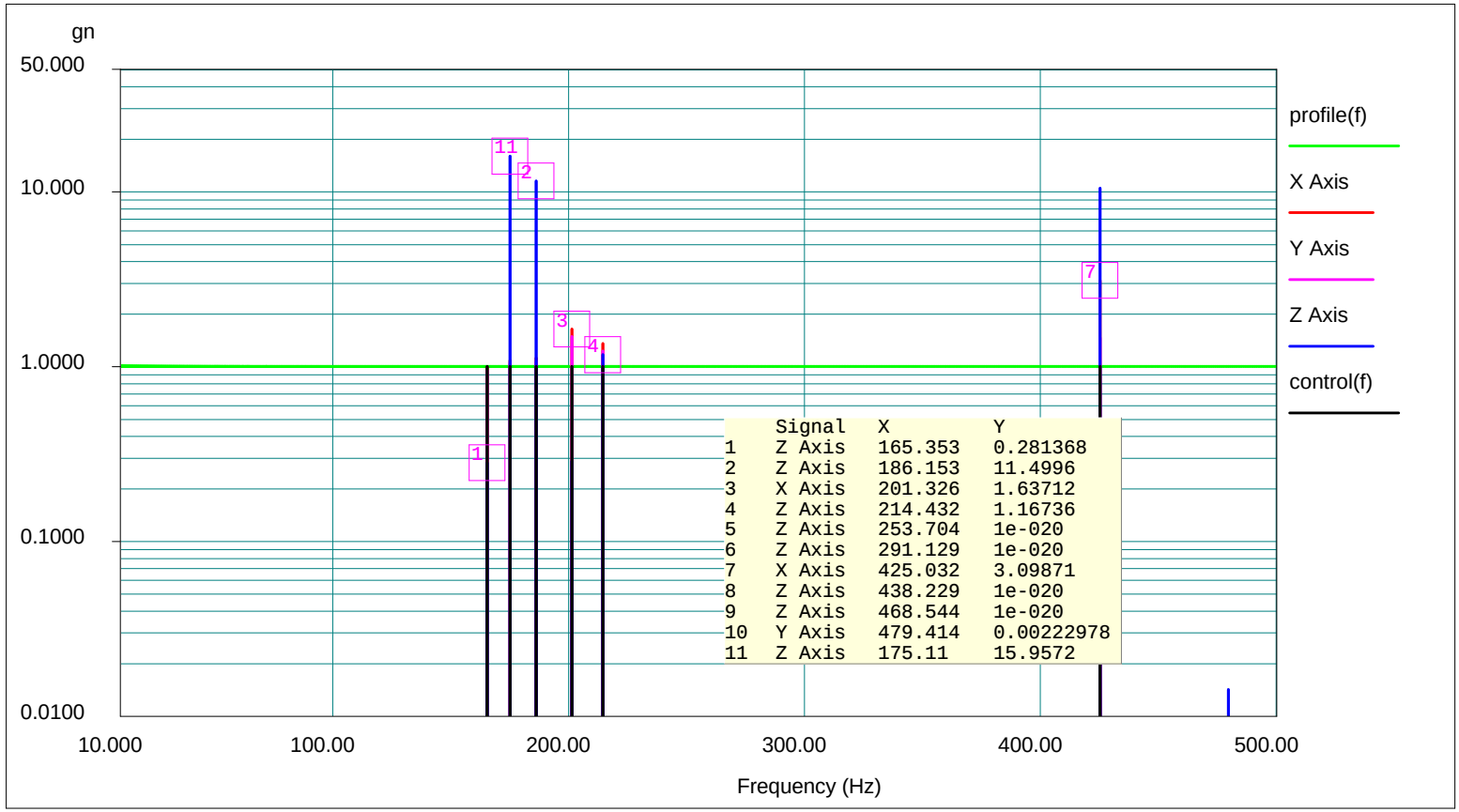
	Signal	X	Y
1	Z Axis	165.353	49.7291
2	Z Axis	186.153	27.4245
3	X Axis	201.326	1.73625
4	Z Axis	214.432	39.1482
5	Z Axis	253.704	7.1834
6	Z Axis	291.129	4.8561
7	X Axis	425.032	2.35301
8	Z Axis	438.229	21.7676
9	Z Axis	468.544	9.27529
10	Y Axis	479.414	2.03392
11	Z Axis	175.11	11.5566

Level:	0 dB	Control Peak:	1.004468 gn	Full Level Time:	00:22:35	Sweep Type:	Logarithmic
Frequency:	10.000048 Hz	Demand Peak:	1.000000 gn	Time Remaining:	00:00:00	Sweep Rate:	0.5 Oct/Min

Data saved at 11:47:12 AM, Wednesday, May 08, 2002 Report created at 11:47:17 AM, Wednesday, May 8, 2002

Non-Operational Sine Sweep 10 – 500 – 10 hz. 1.0G Resonances highlighted

BENCHMARK DLT Drives
X axis S/N01 ; Y Axis S/N02 ; Z Axis S/N 03
Project File Name: Sine.prj
Profile Name: 1.0G & 0.05In Pk-Pk. Test Type: Swept Sine Run Folder: .\APT# 02-10176 Dwell 1.0G May 08,2002 11-51-55

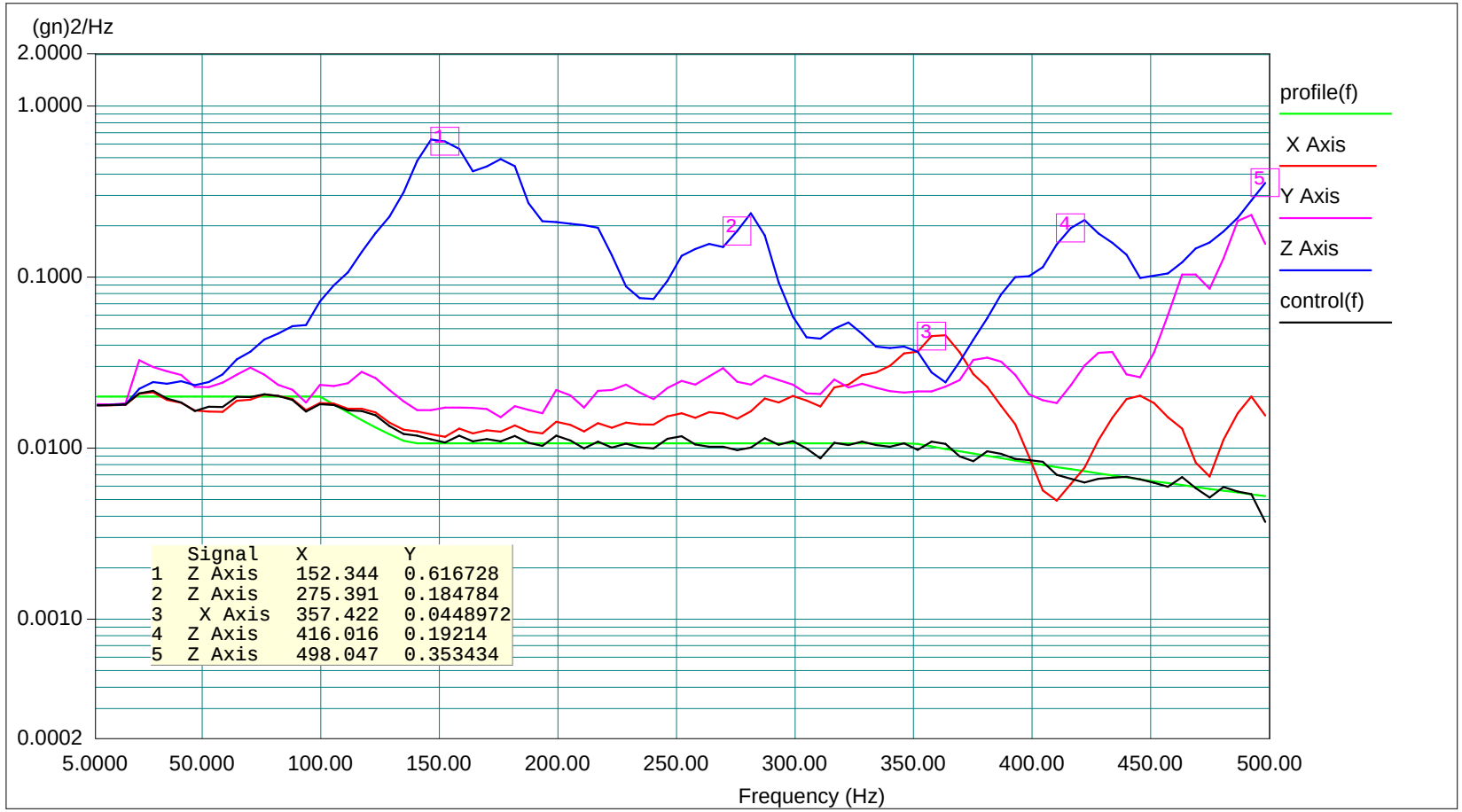


Level:	0 dB	Control Peak:	0.999879 gn	Full Level Time:	01:45:00	Sweep Type:	Logarithmic
Frequency:	479.399994 Hz	Demand Peak:	1.000000 gn	Time Remaining:	00:22:35	Sweep Rate:	1 Oct/Min

Data saved at 01:37:58 PM, Wednesday, May 08, 2002 Report created at 01:38:00 PM, Wednesday, May 8, 2002

Non-operational Dwell at 1.0G at Resonant frequencies

BENCHMARK DLT
X Axis S/N03 ; Y AAxis S/N01 ; Z Axis S/N02
Project File Name: Random.prj
Profile Name: Nav-Mat Test Type: Random Run Folder: .\APT 02-10176 Random NonOp May 08,2002 14-51-41

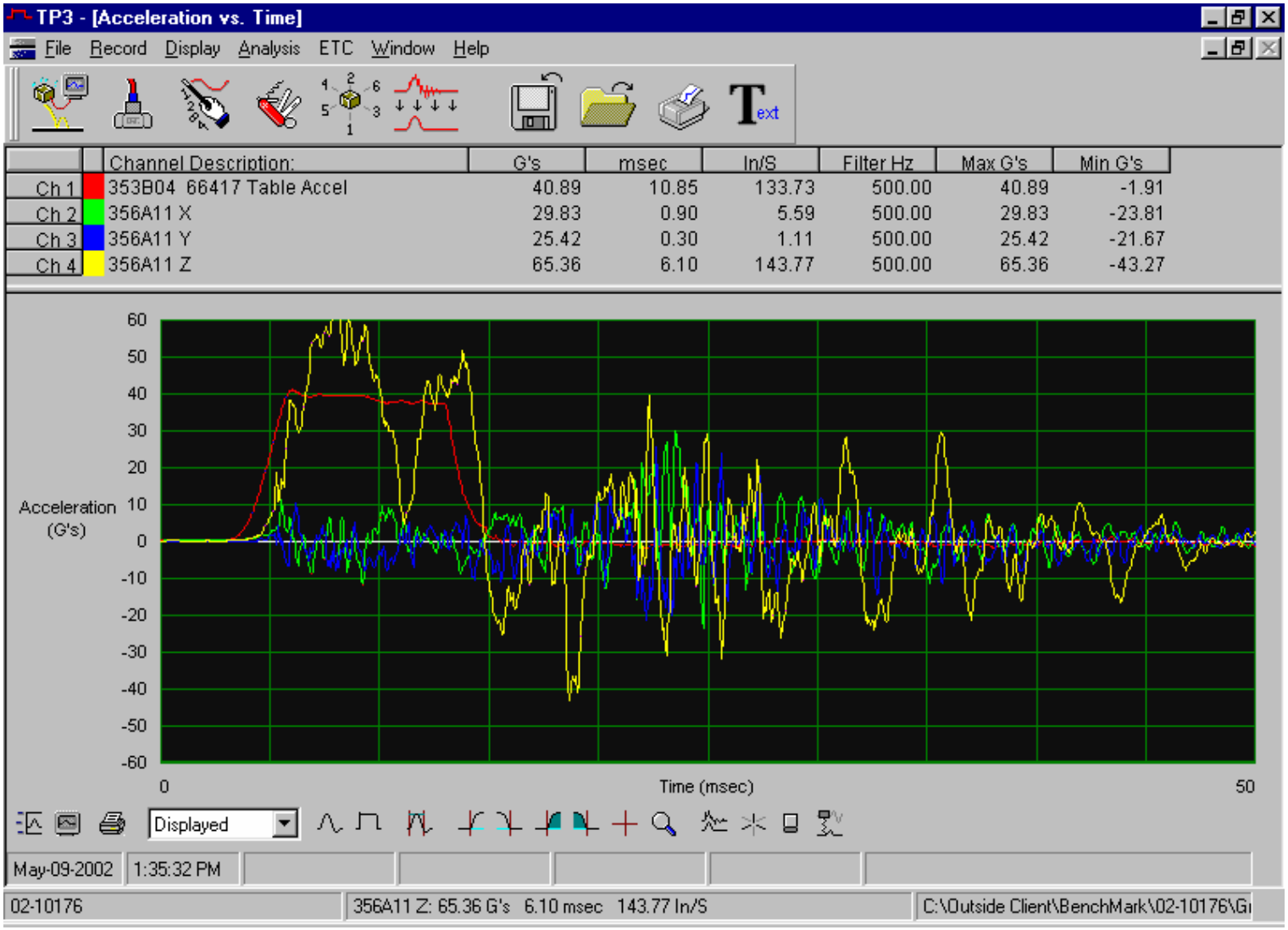


Level: 0 dB

Control RMS:	2.402242 gn	Full Level Elapsed Time:	00:10:00	Lines:	225	Frame Time:	0.170667 Seconds
Demand RMS:	2.419539 gn	Remaining Time:	00:00:00	DOF:	154	dF:	5.859375 Hz

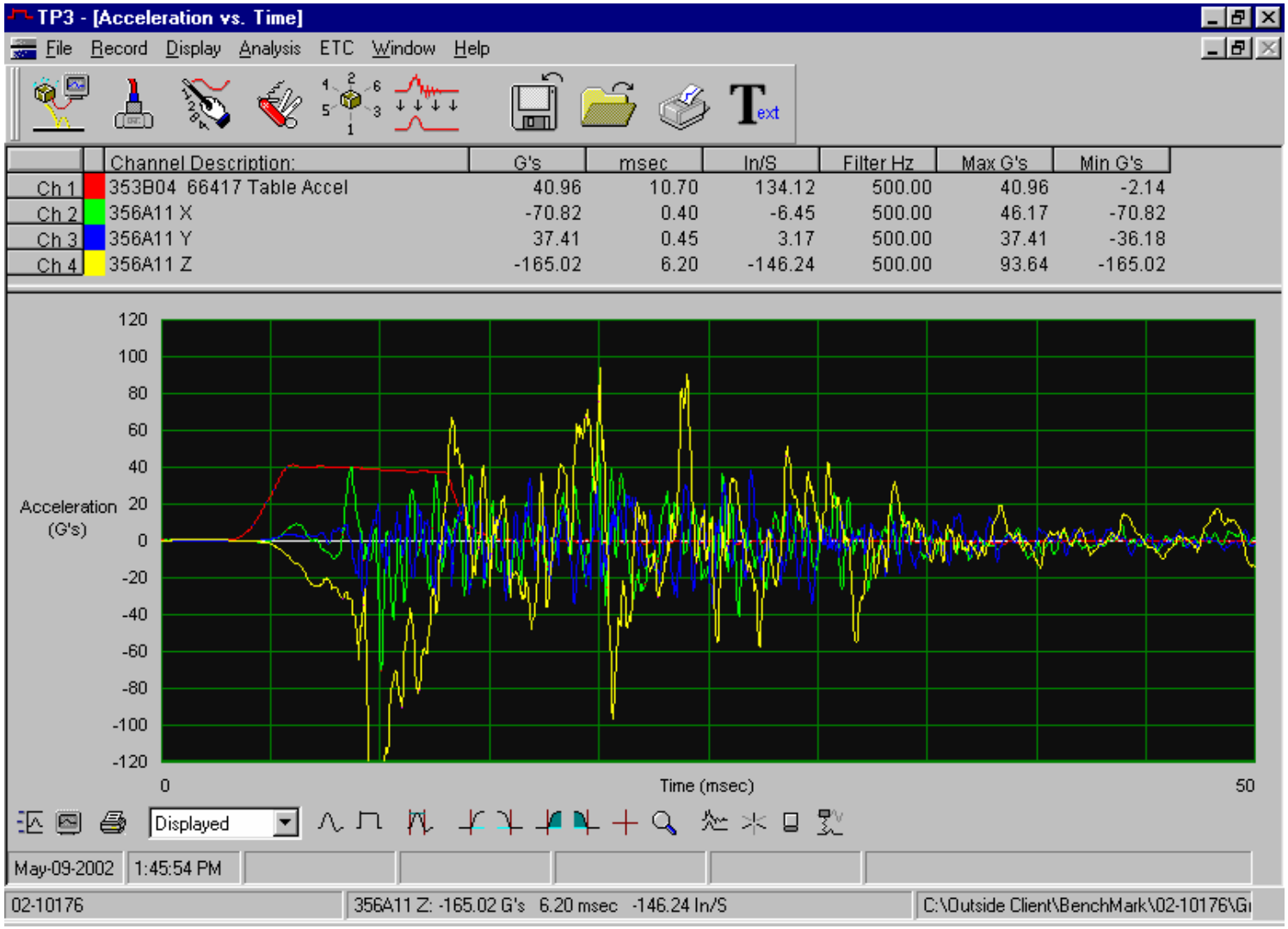
Data saved at 03:02:37 PM, Wednesday, May 08, 2002 Report created at 03:02:43 PM, Wednesday, May 8, 2002

Non-operational Random 5 – 500 hz. 2.41Grms Resonances highlighted



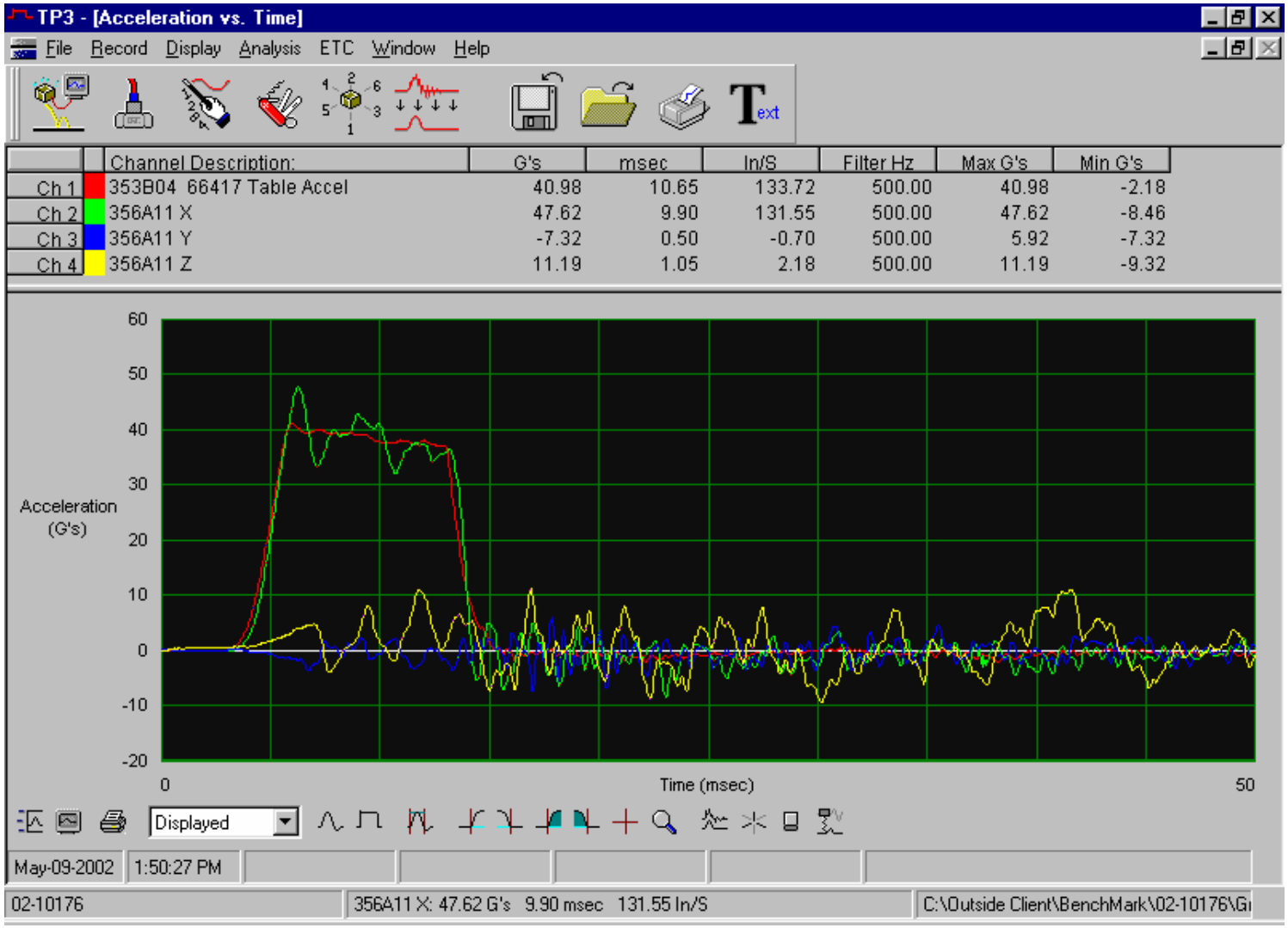
3 axis accelerometer used and displayed

Non-operational Standalone 40G/10ms square wave positive Z axis



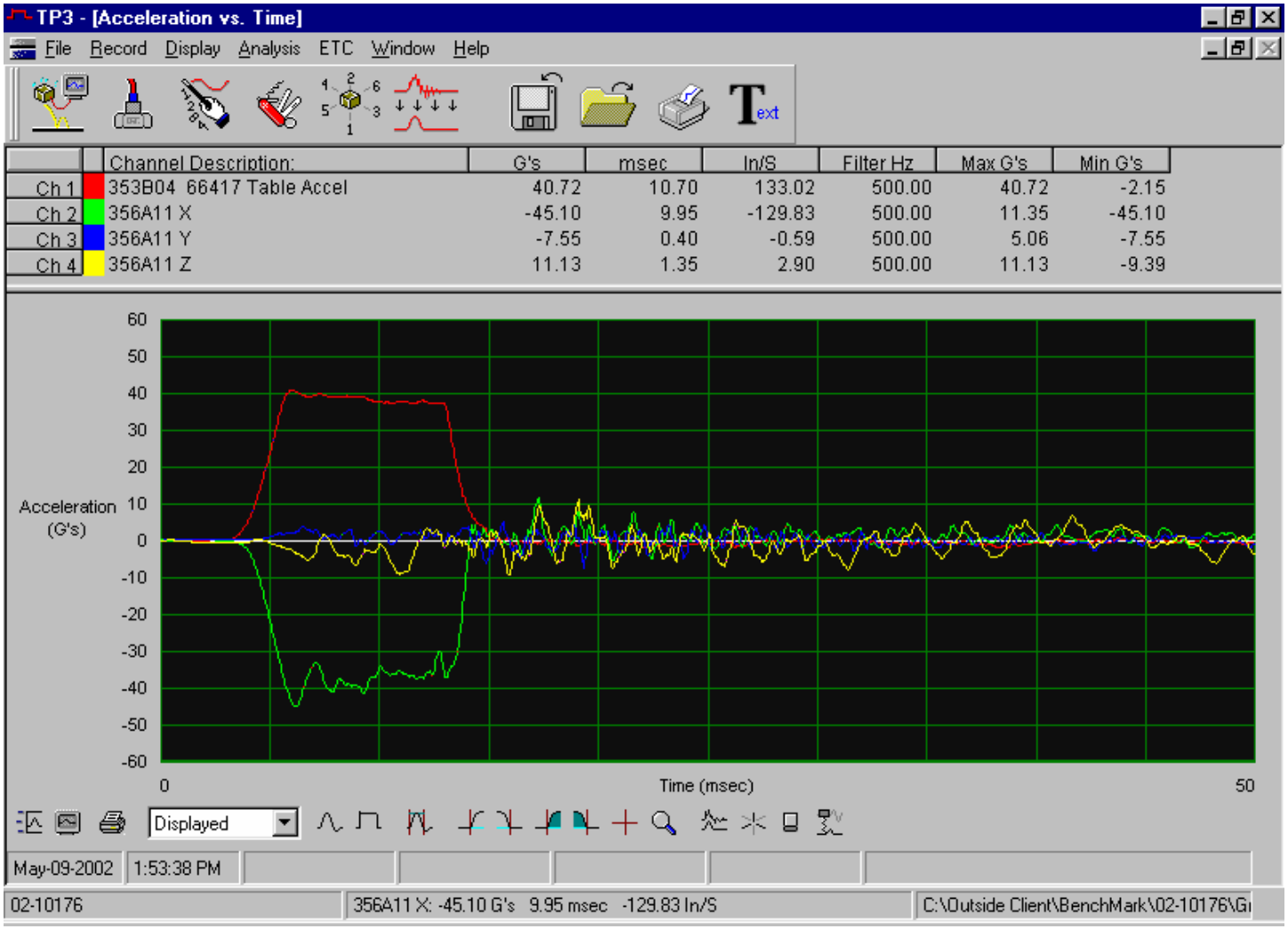
3 axis accelerometer used and displayed

Non- operational Standalone 40G/10ms square wave negative Z axis



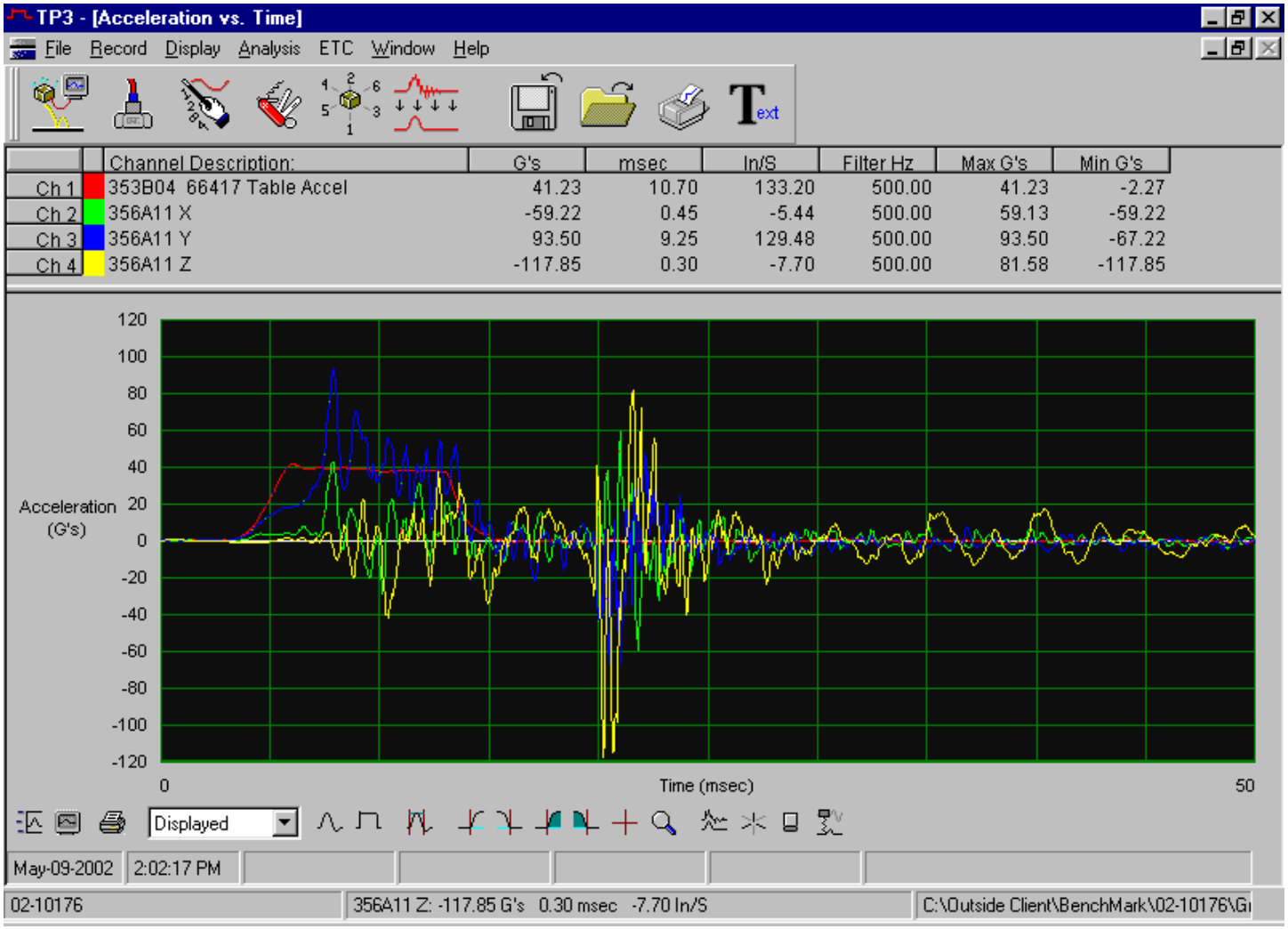
3 axis accelerometer used and displayed

Non- operational Standalone 40G/10ms square wave positive X axis



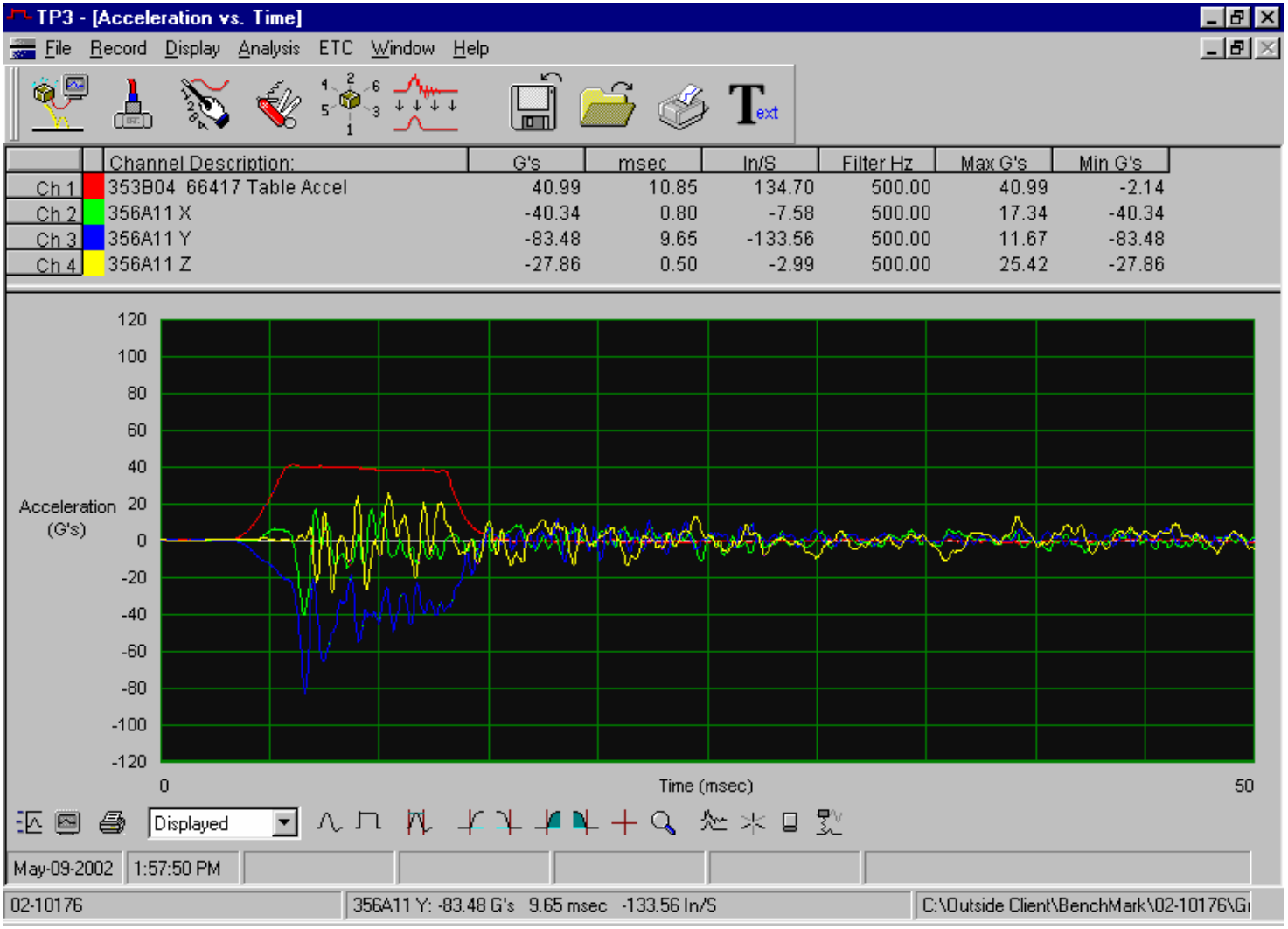
3 axis accelerometer used and displayed

Non- operational Standalone 40G/10ms square wave negative X axis



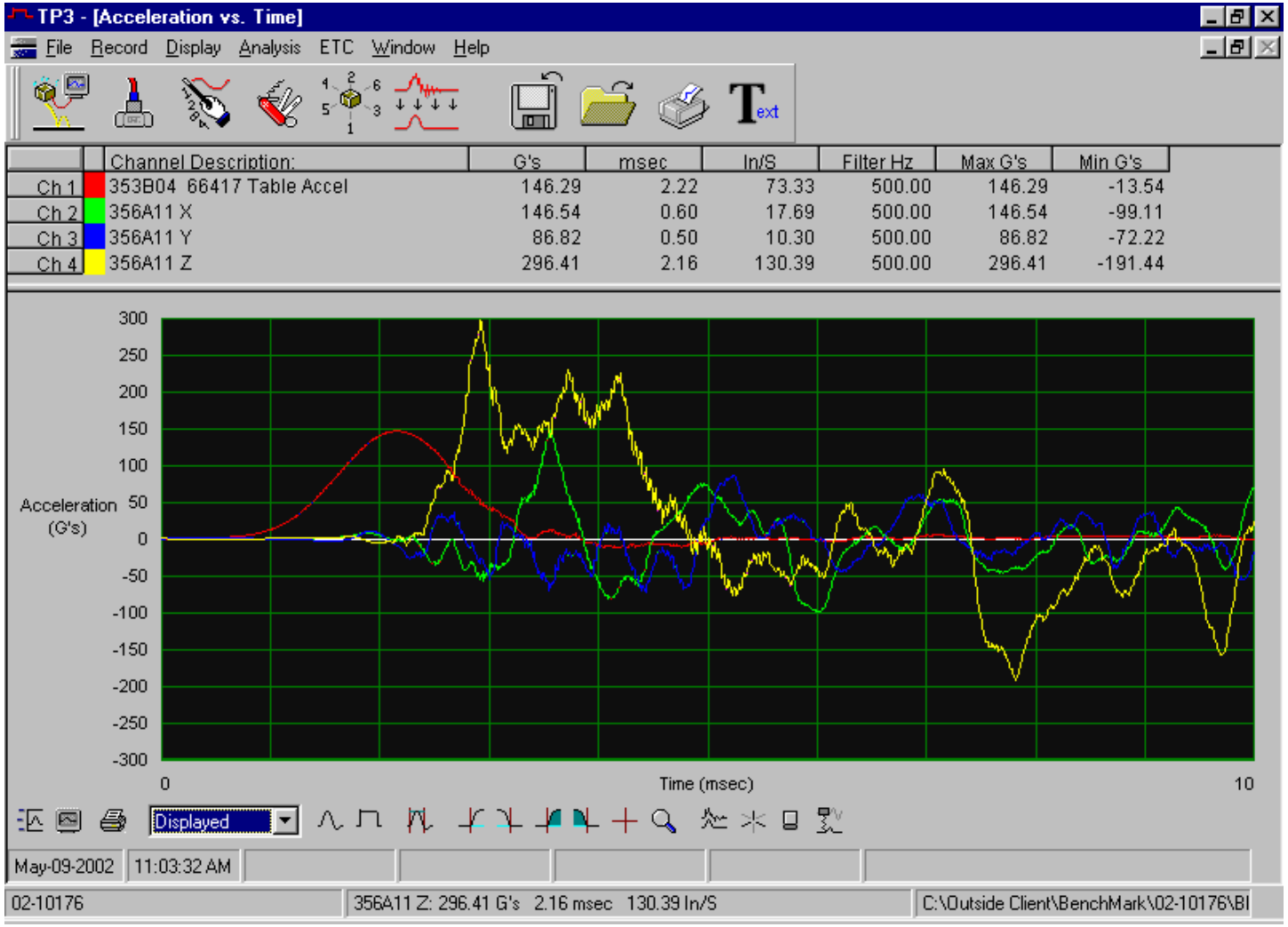
3 axis accelerometer used and displayed

Non- operational Standalone 40G/10ms square wave positive Y axis



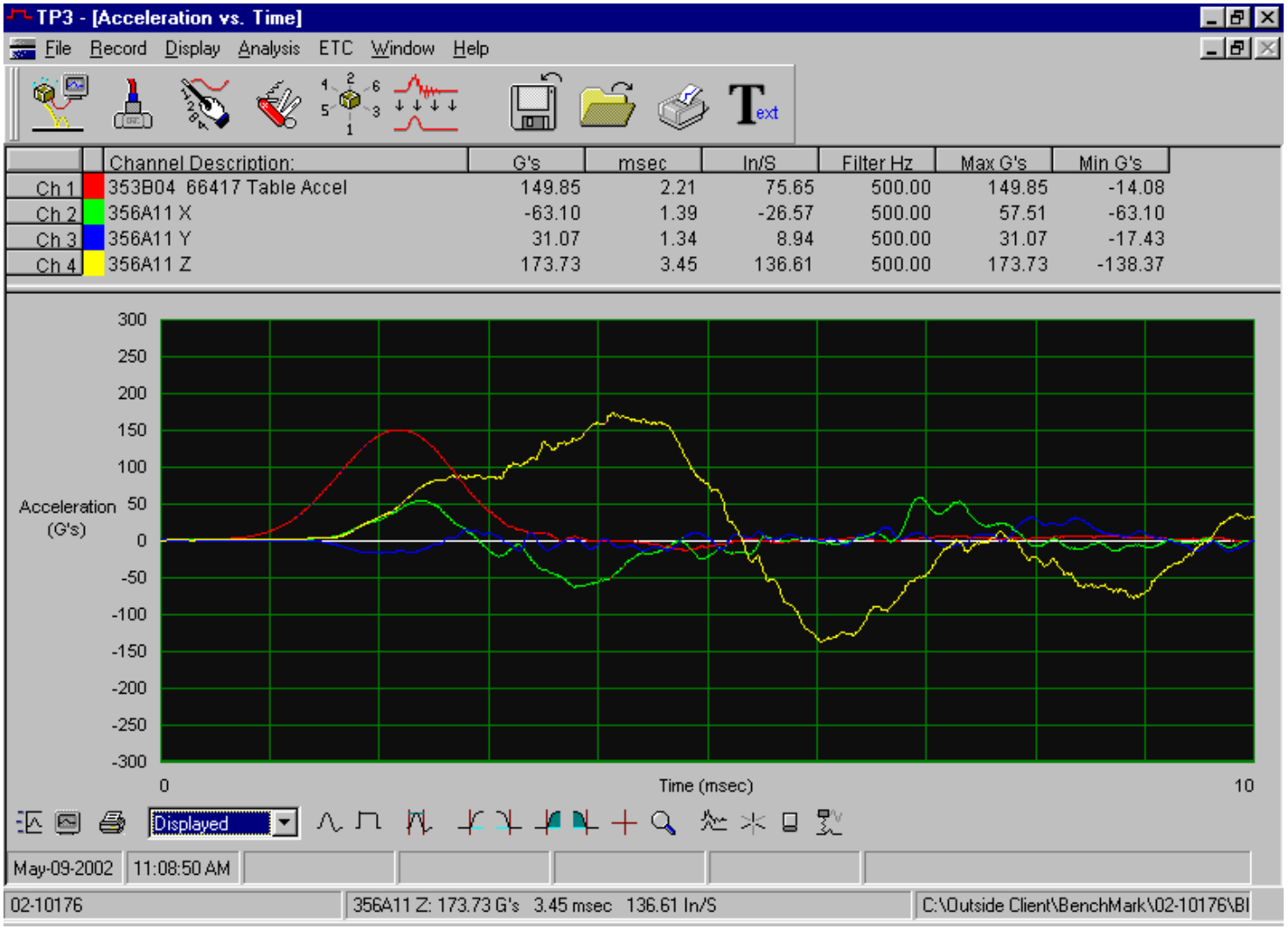
3 axis accelerometer used and displayed

Non- operational Standalone 40G/10ms square wave negative Y axis



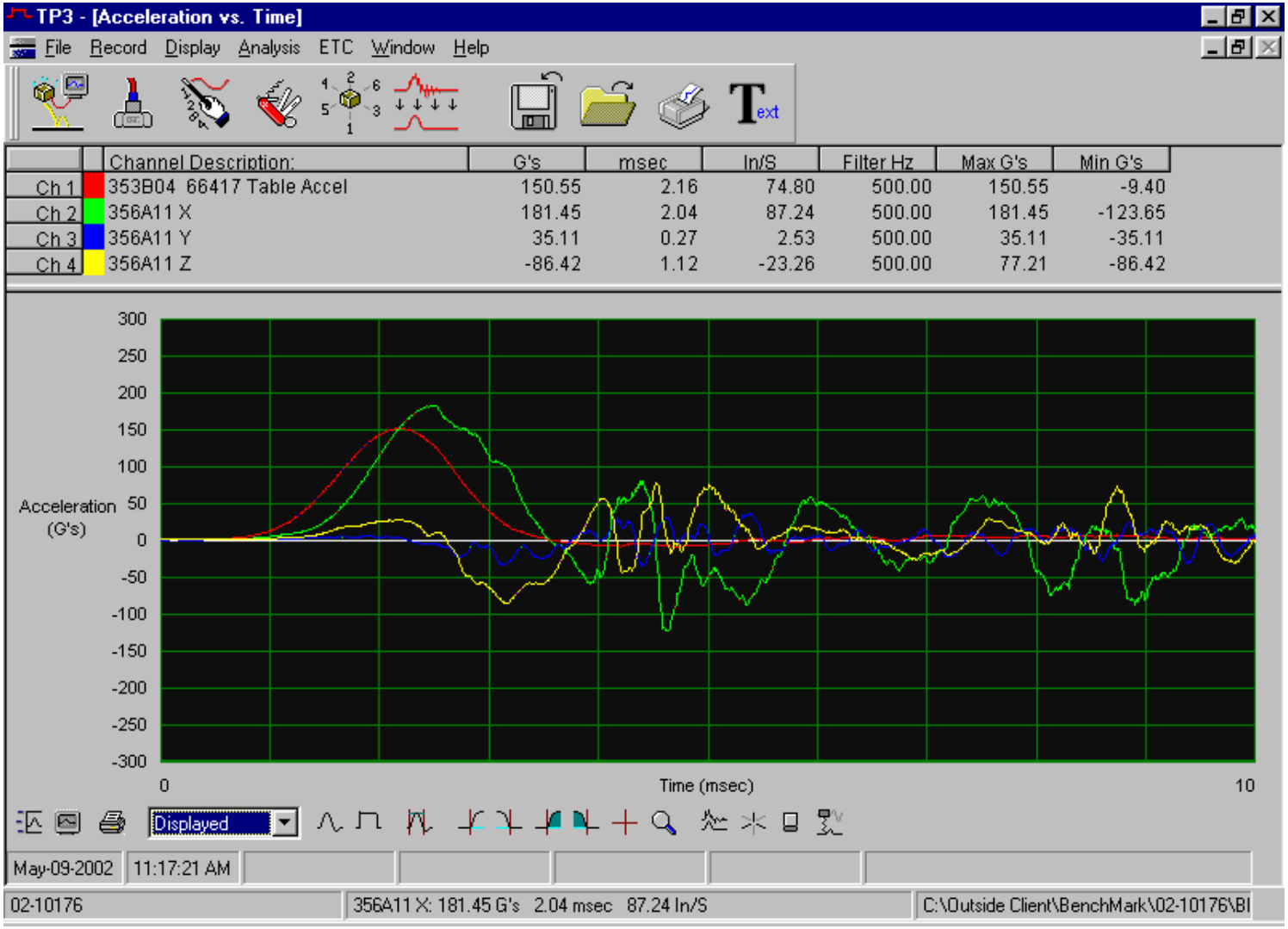
3 axis accelerometer used and displayed

Non- operational Standalone 142G/2ms ½ sine pulse positive Z axis



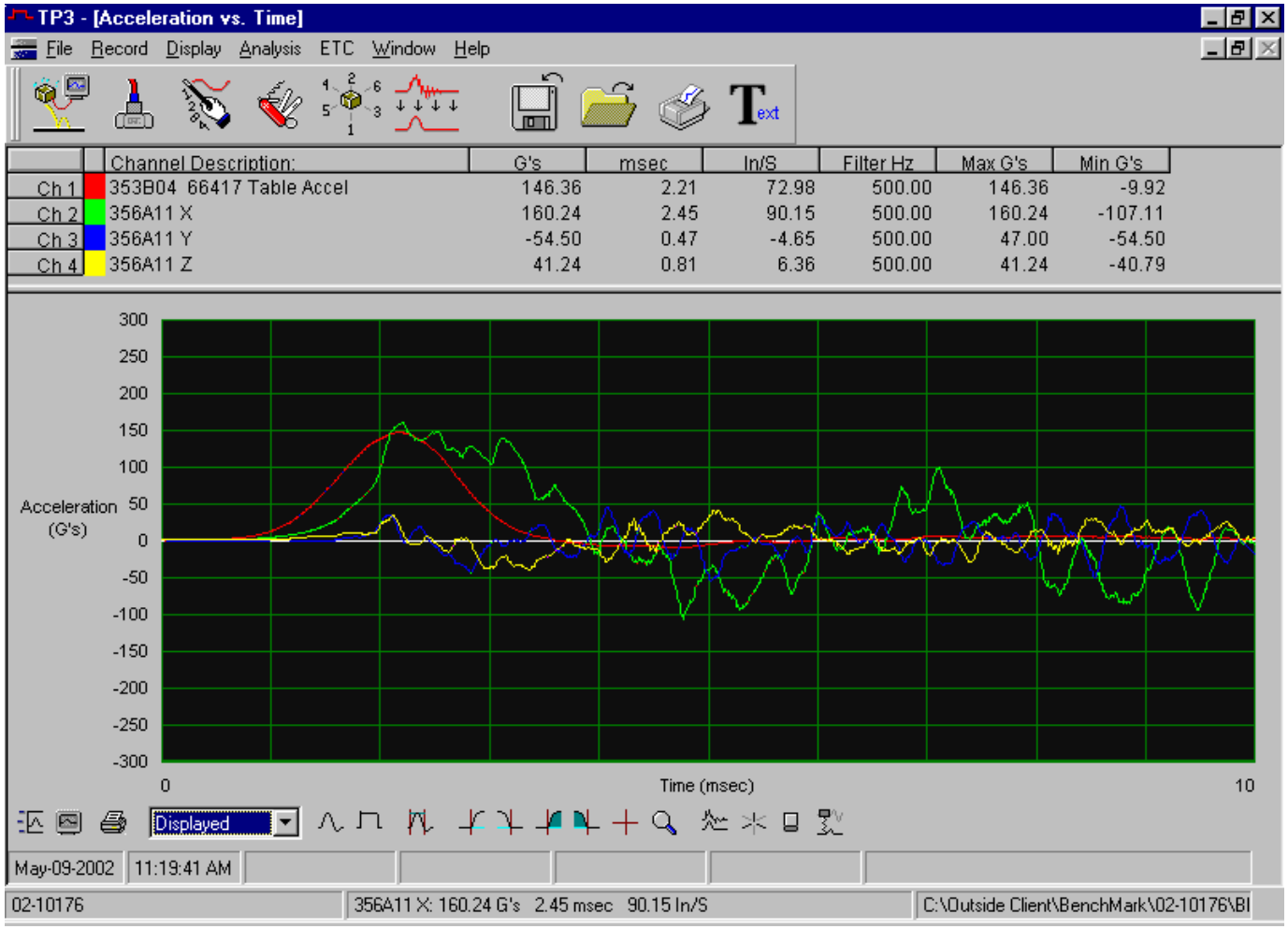
3 axis accelerometer used and displayed

Non- operational Standalone 142G/2ms ½ sine pulse negative Z axis



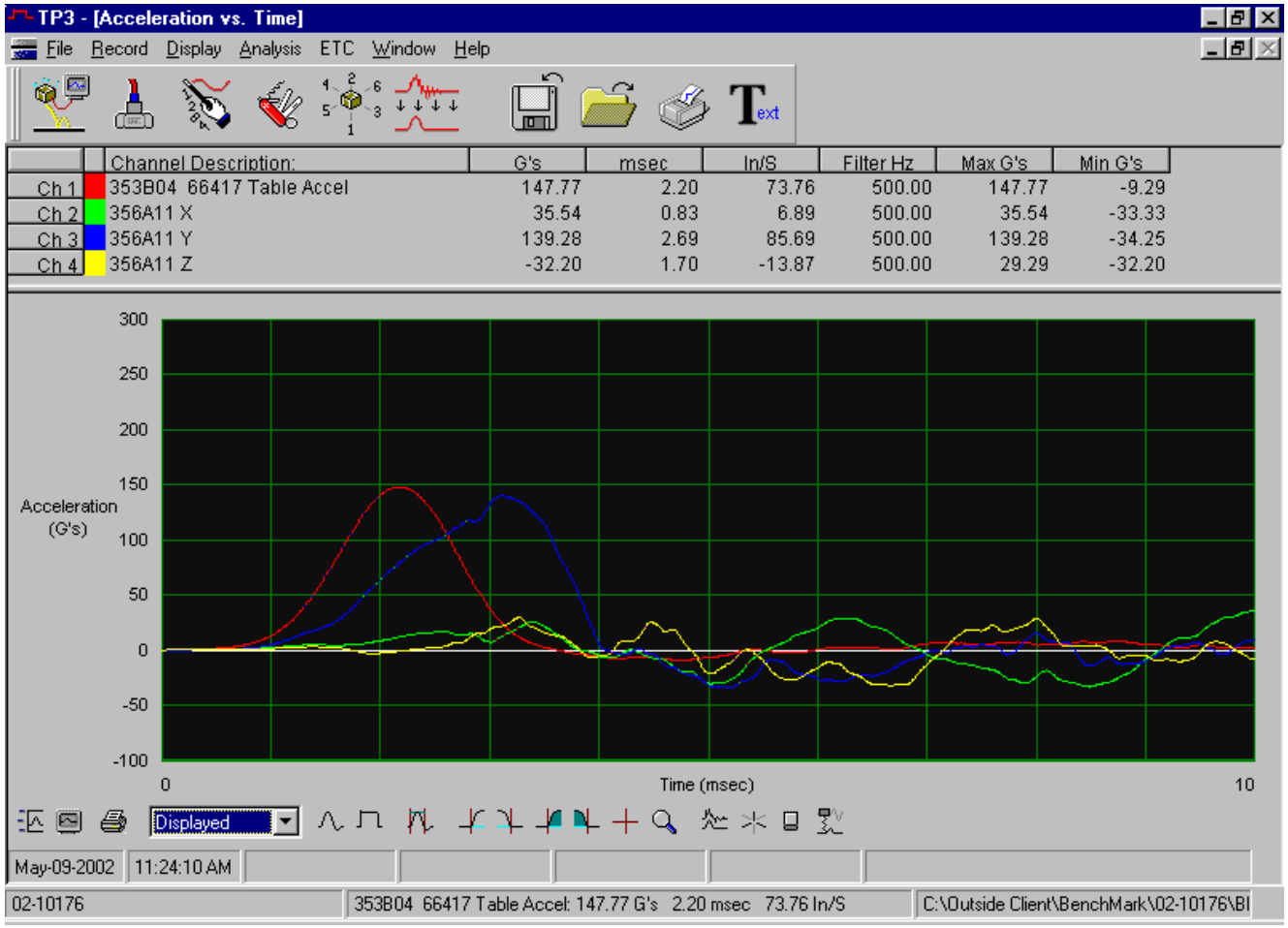
3 axis accelerometer used and displayed

Non- operational Standalone 142G/2ms ½ sine pulse positive X axis



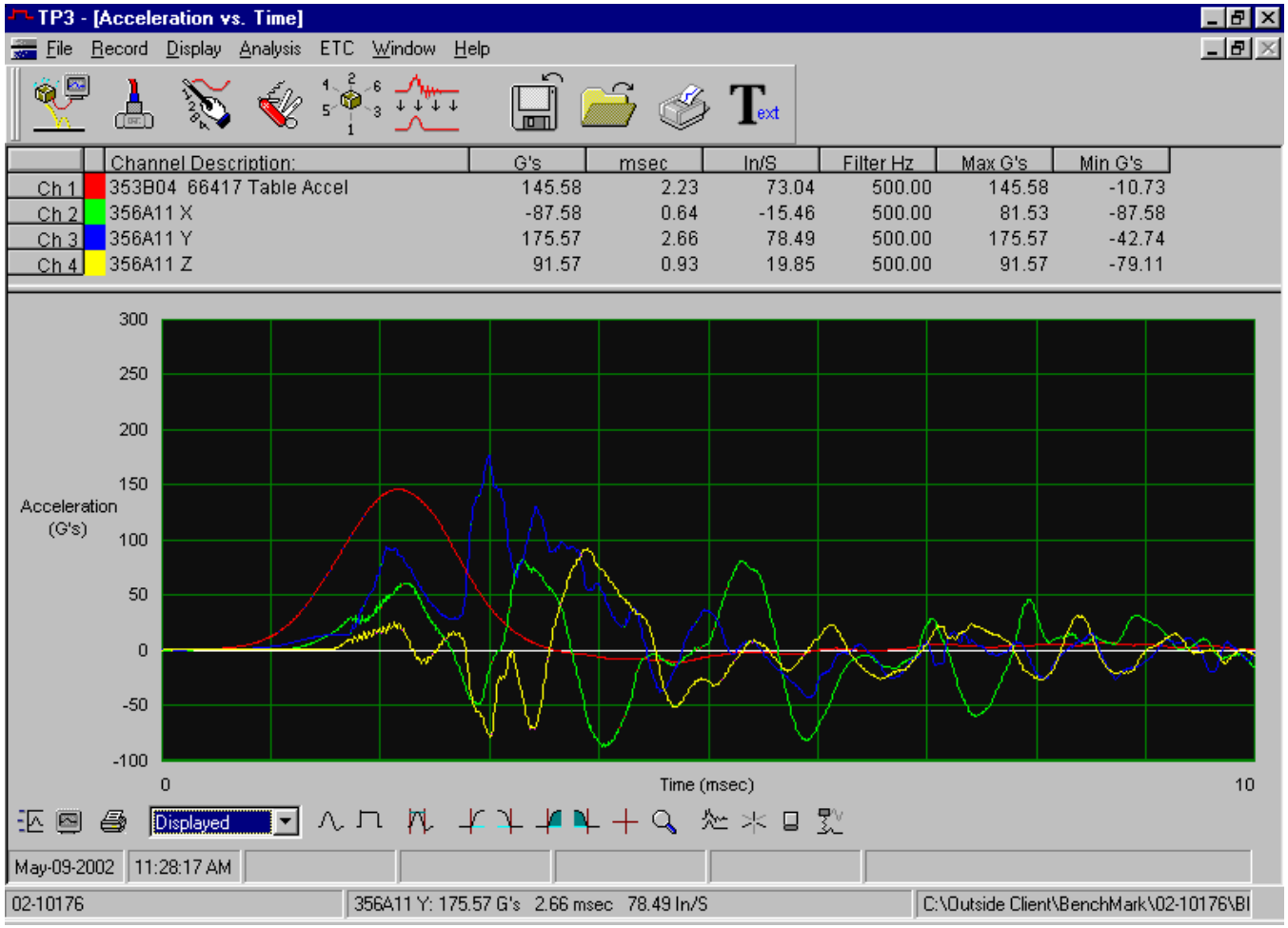
3 axis accelerometer used and displayed

Non- operational Standalone 142G/2ms ½ sine pulse negative X axis



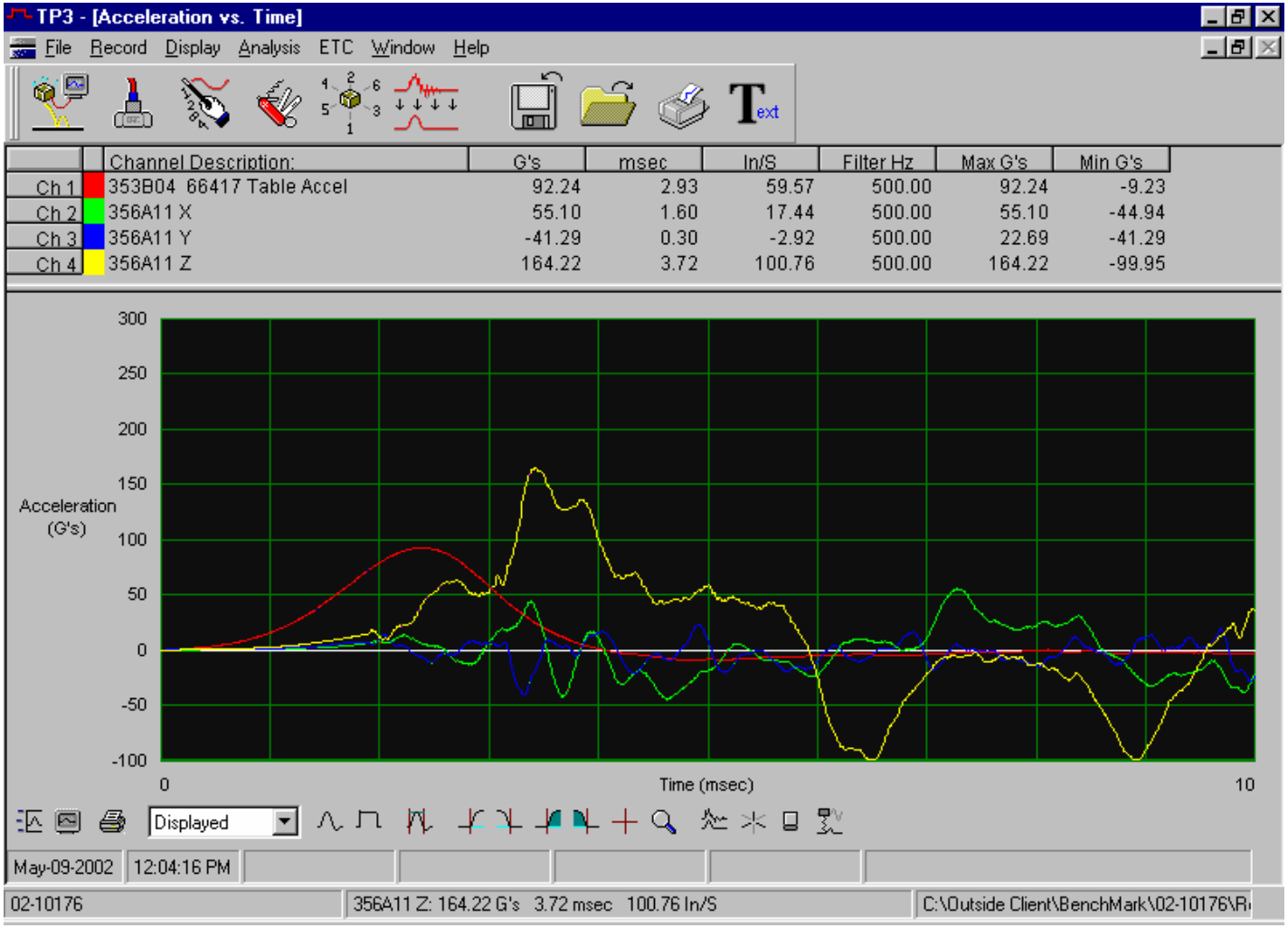
3 axis accelerometer used and displayed

Non- operational Standalone 142G/2ms ½ sine pulse positive Y axis



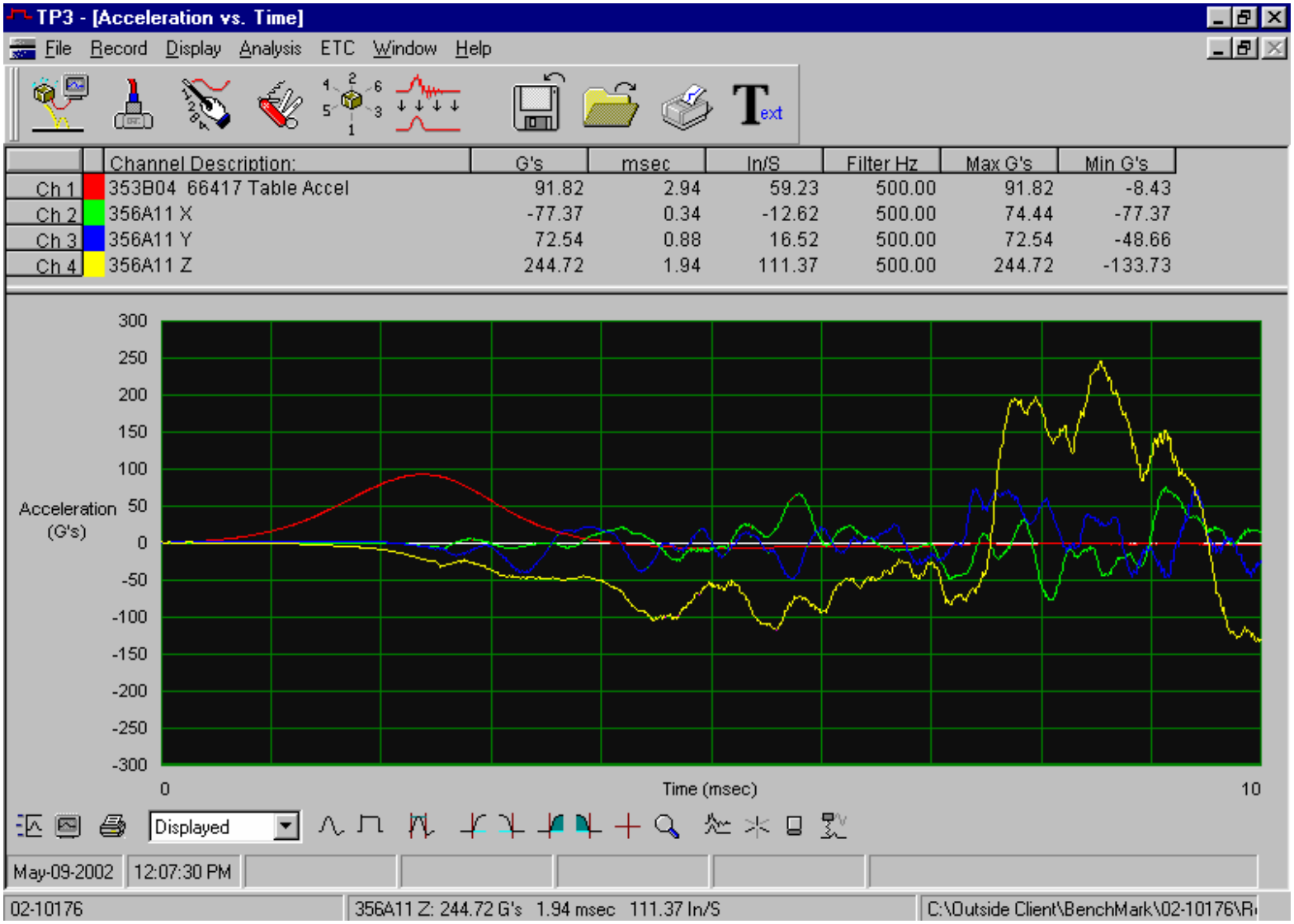
3 axis accelerometer used and displayed

Non- operational Standalone 142G/2ms ½ sine pulse negative Y axis



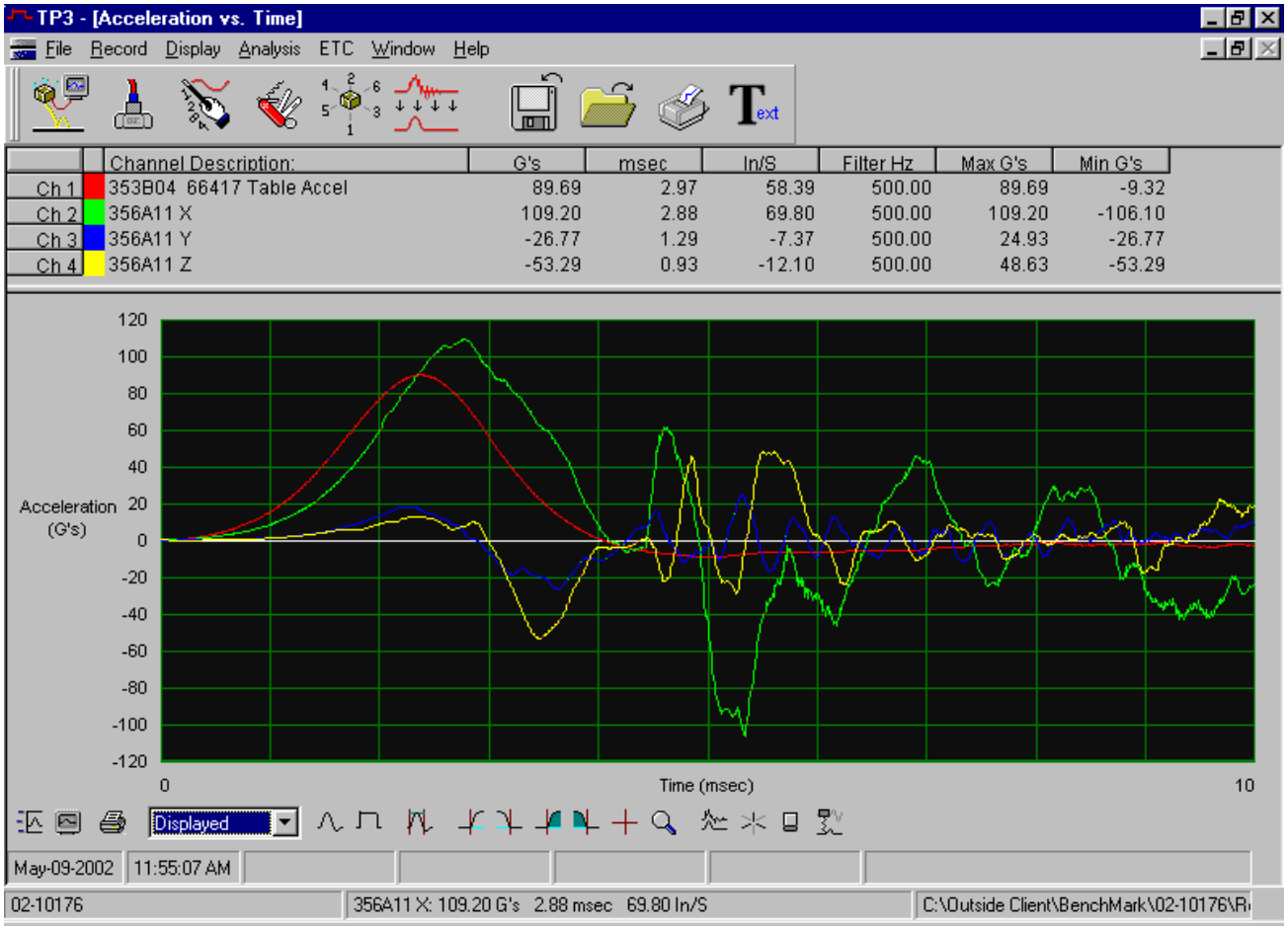
3 axis accelerometer used and displayed

Non- operational Standalone 90G/3ms ½ sine pulse positive Z axis



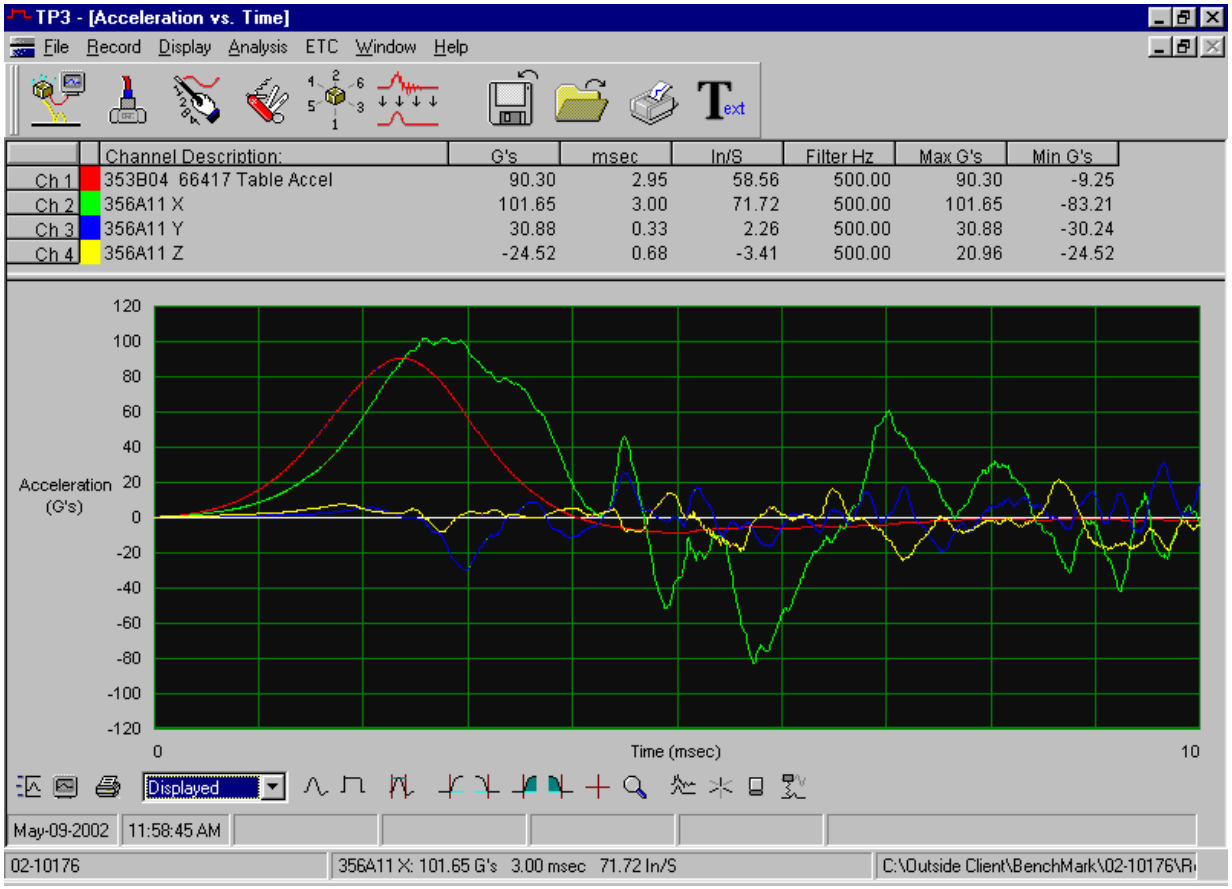
3 axis accelerometer used and displayed

Non- operational Standalone 90G/3ms ½ sine pulse negative Z axis



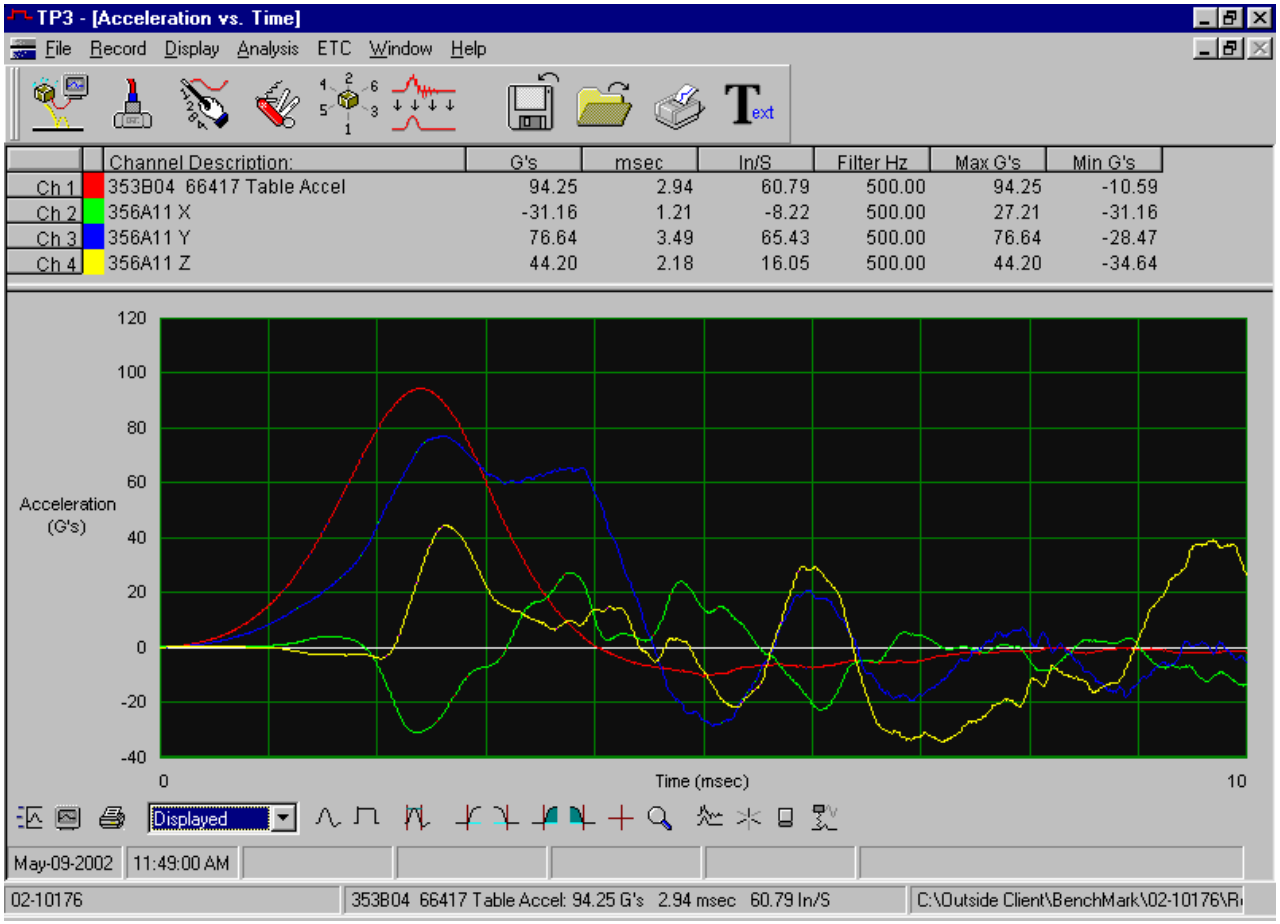
3 axis accelerometer used and displayed

Non- operational Standalone 90G/3ms ½ sine pulse positive X axis



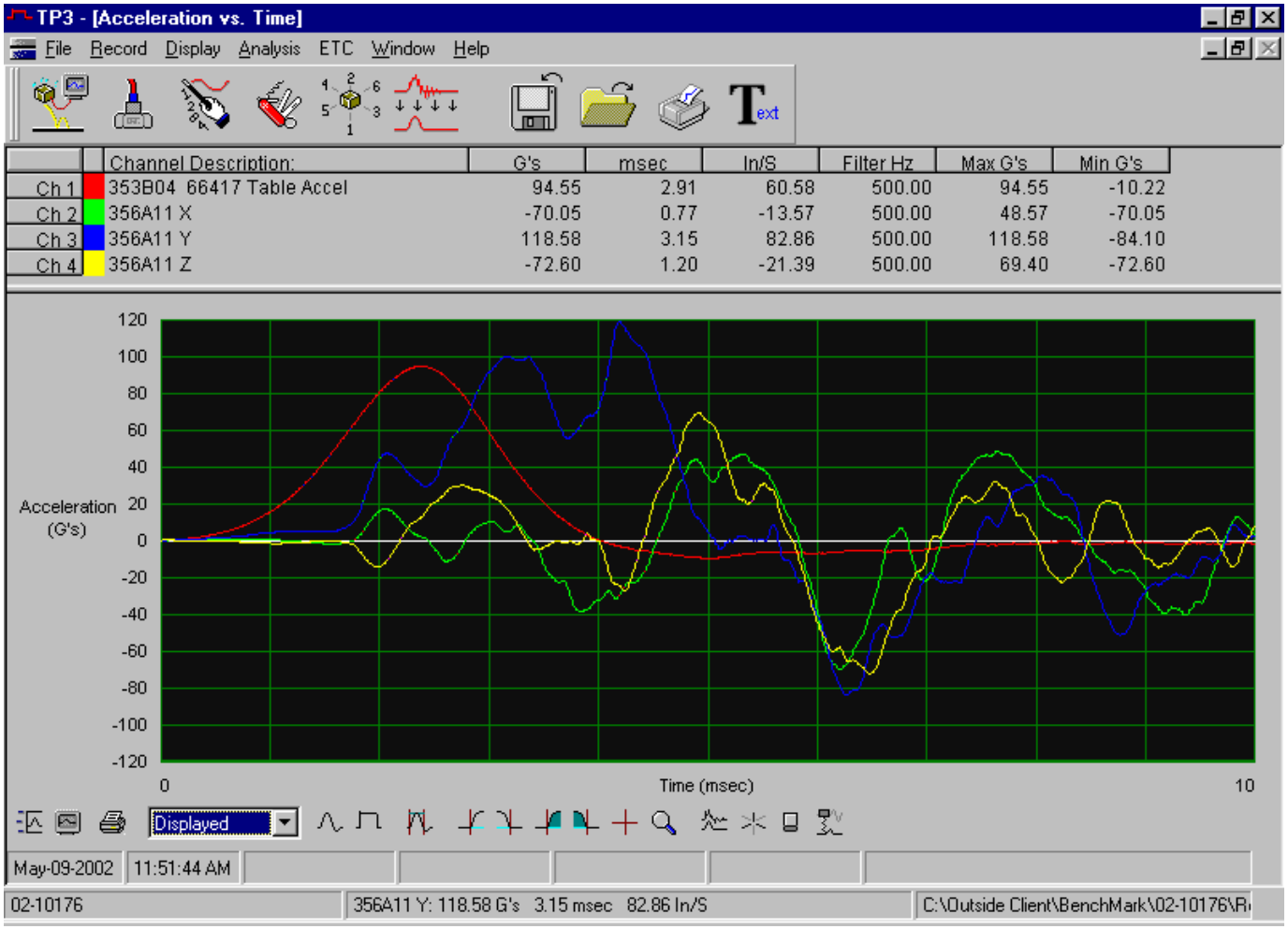
3 axis accelerometer used and displayed

Non- operational Standalone 90G/3ms ½ sine pulse negative X axis



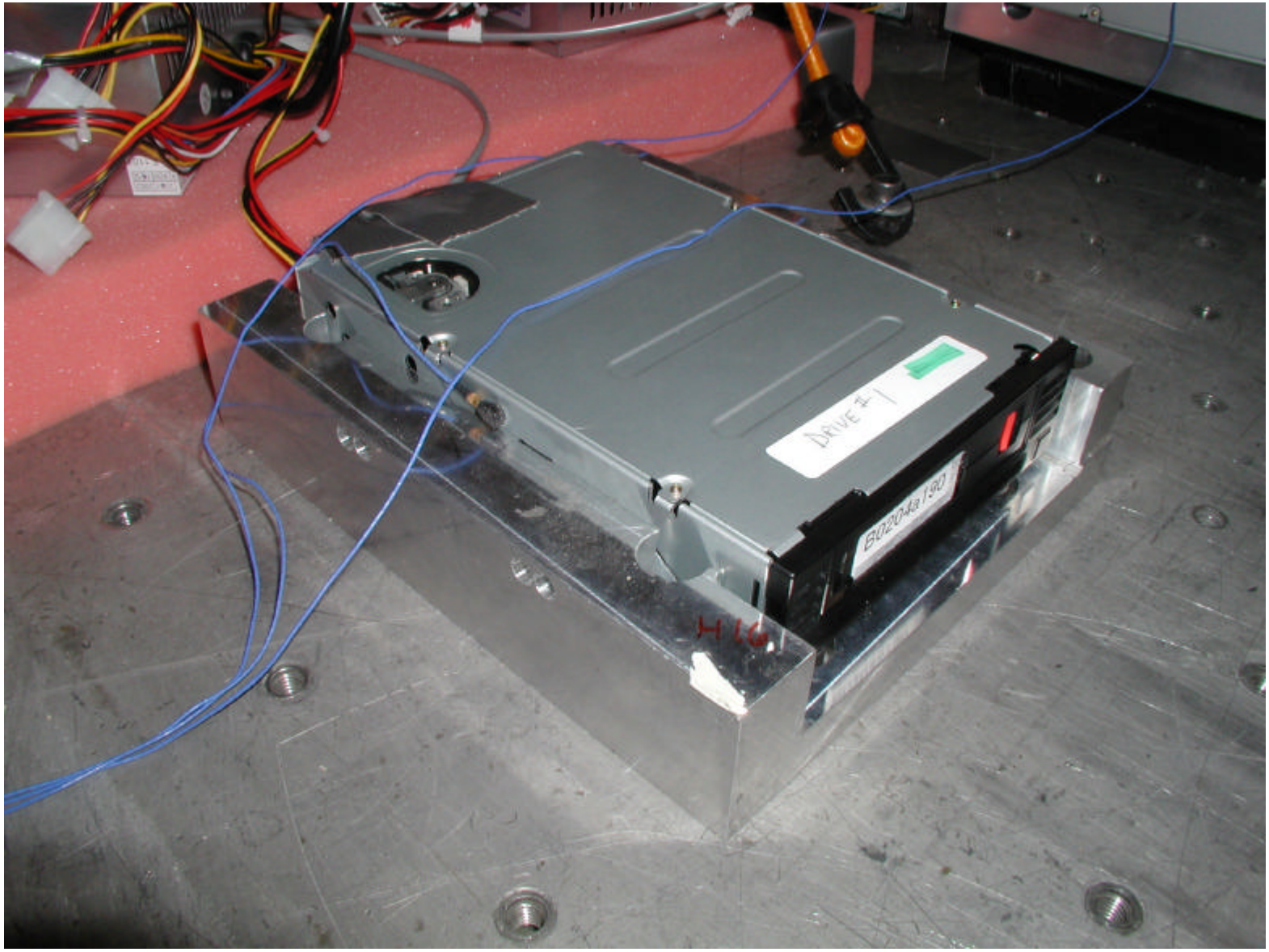
3 axis accelerometers used and displayed

Non- operational Standalone 90G/3ms ½ sine pulse positive Y axis



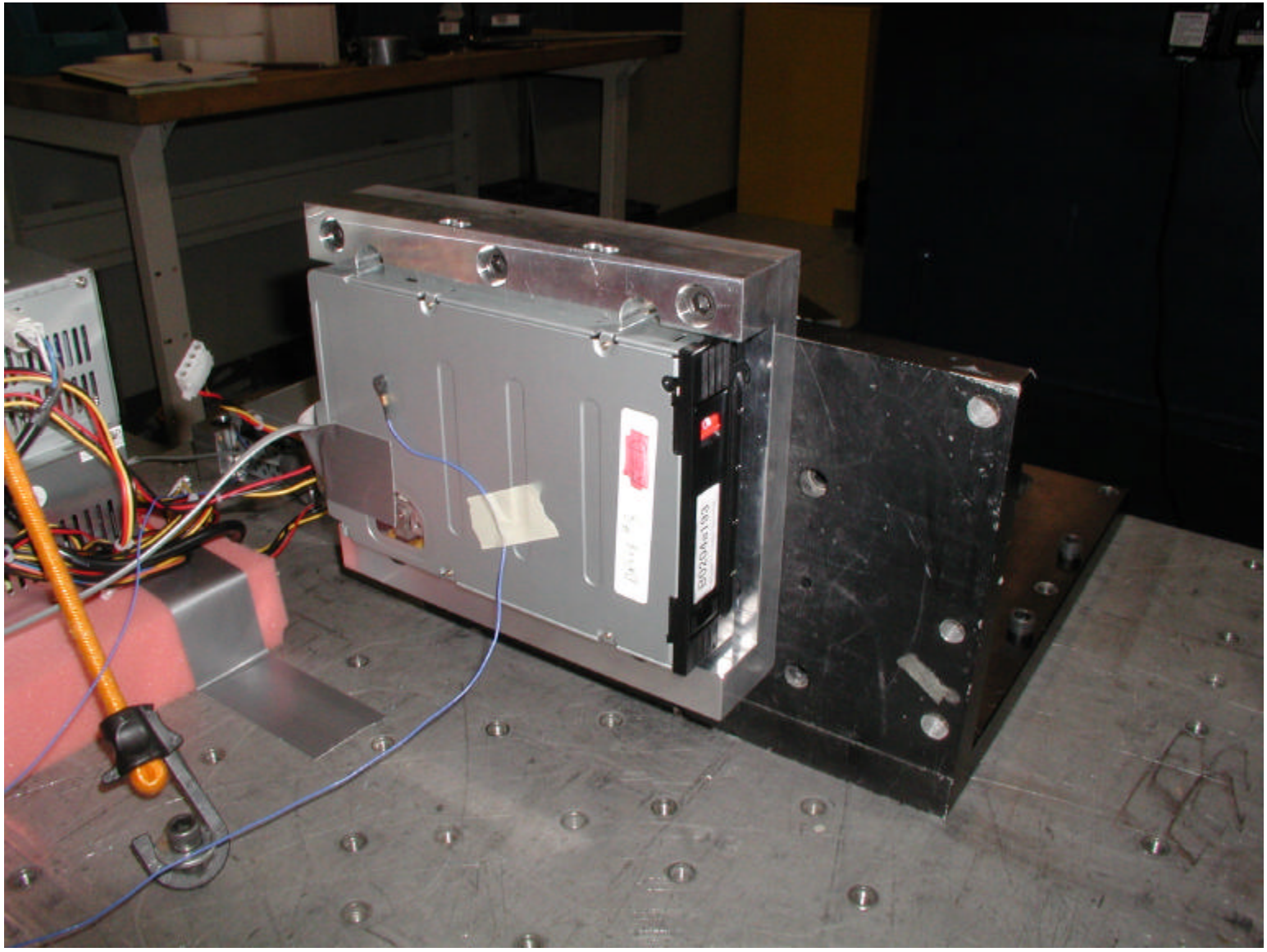
3 axis accelerometer used and displayed

Non- operational Standalone 90G/3ms ½ sine pulse negative Y axis



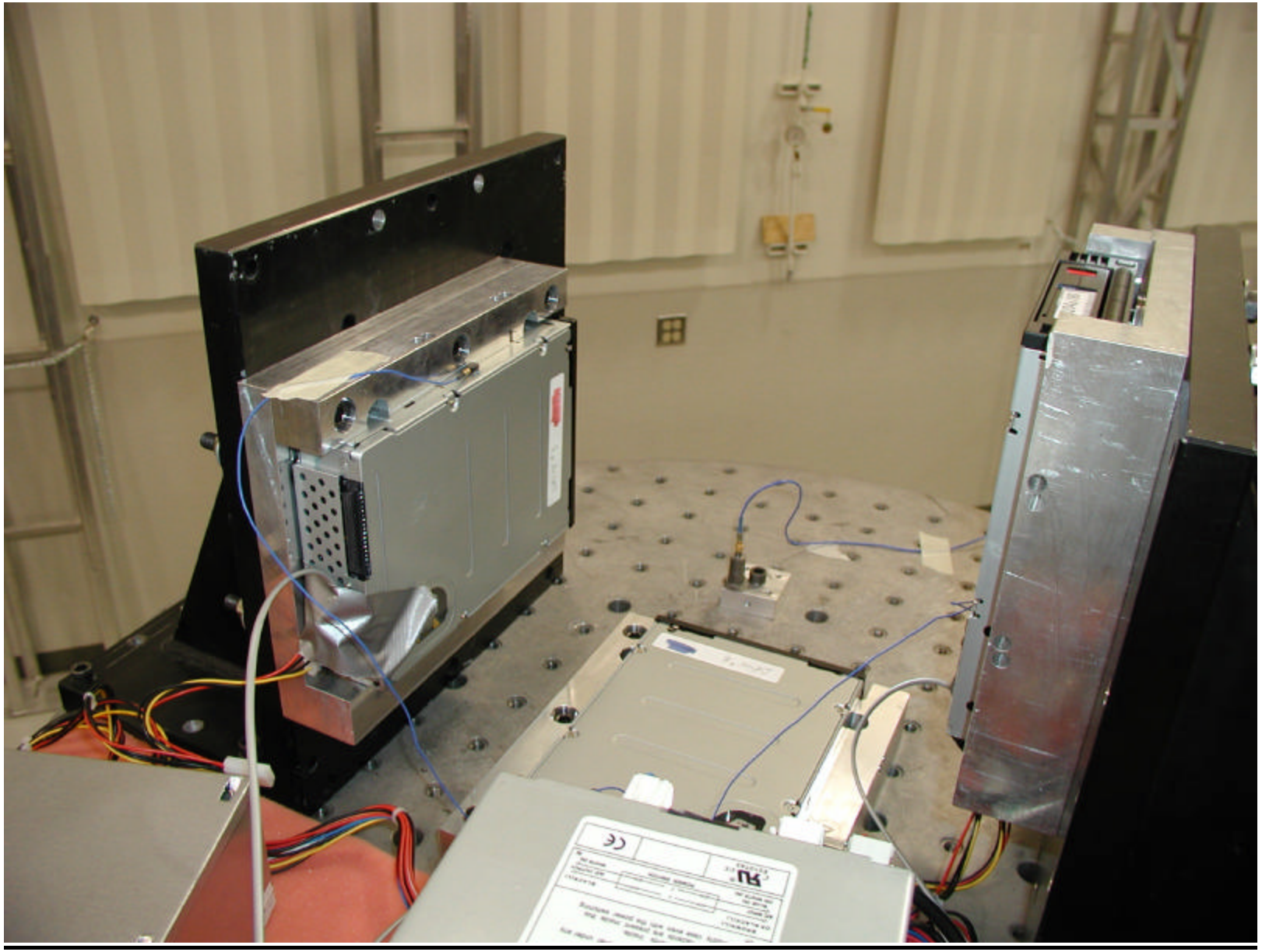
Drive mounted with accelerometer for X axis shock and vibe

Drive mounted with accelerometer for Y axis shock and vibe



Drive mounted with accelerometer for Z axis shock and vibe

Hydraulic shaker (vertical)



Drives set up in X, Z, and Y axes (from left to right) on hydraulic shaker

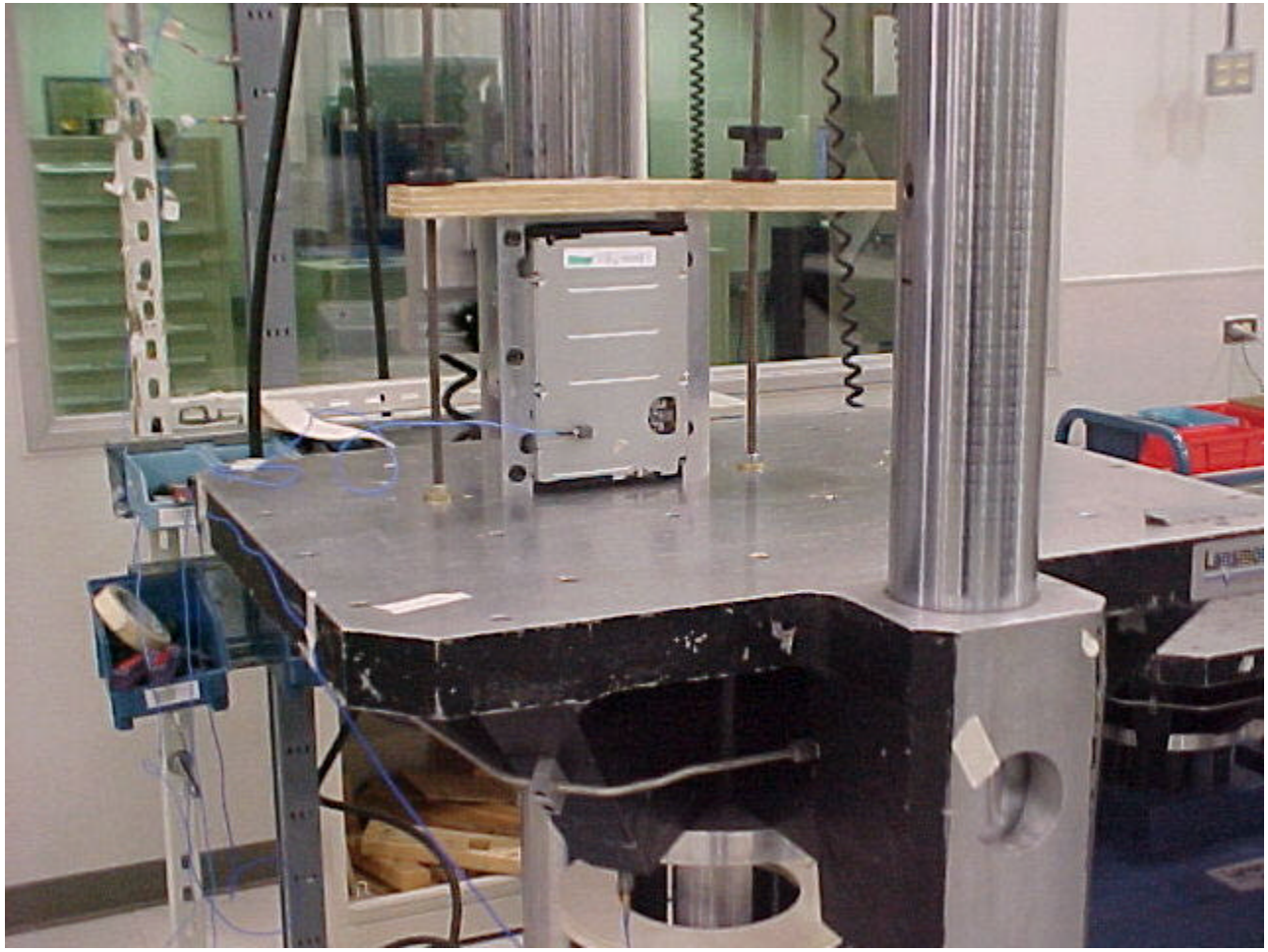
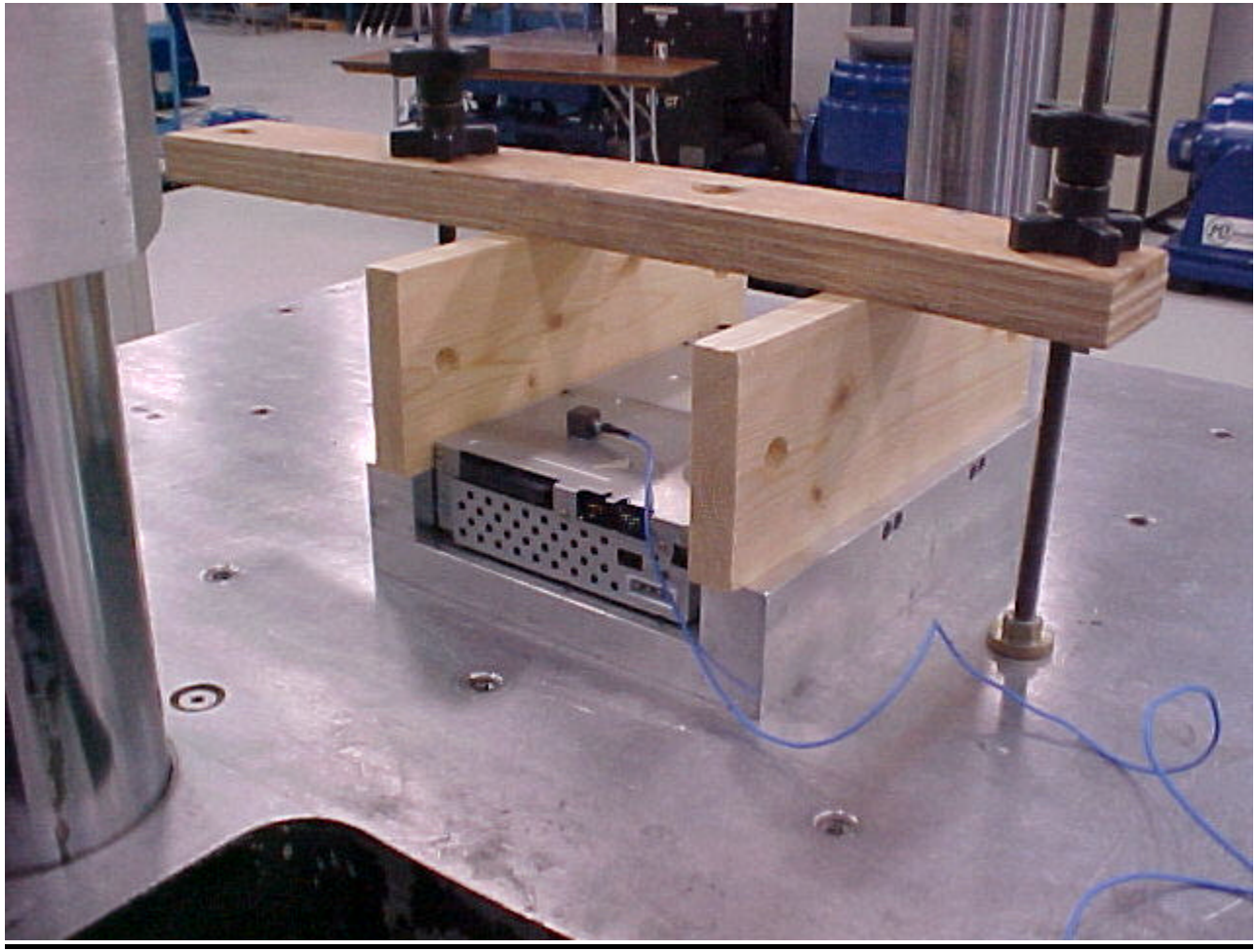
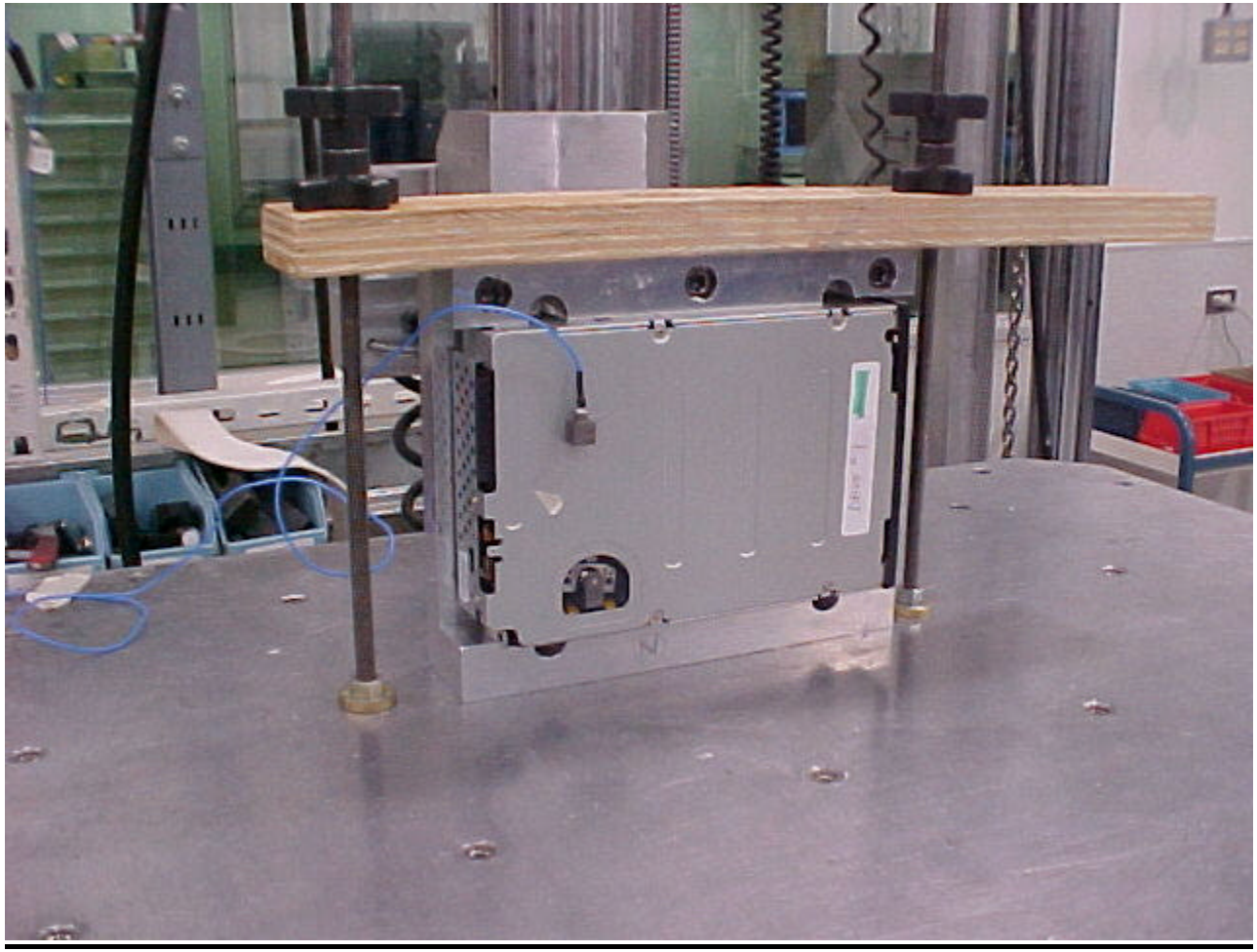


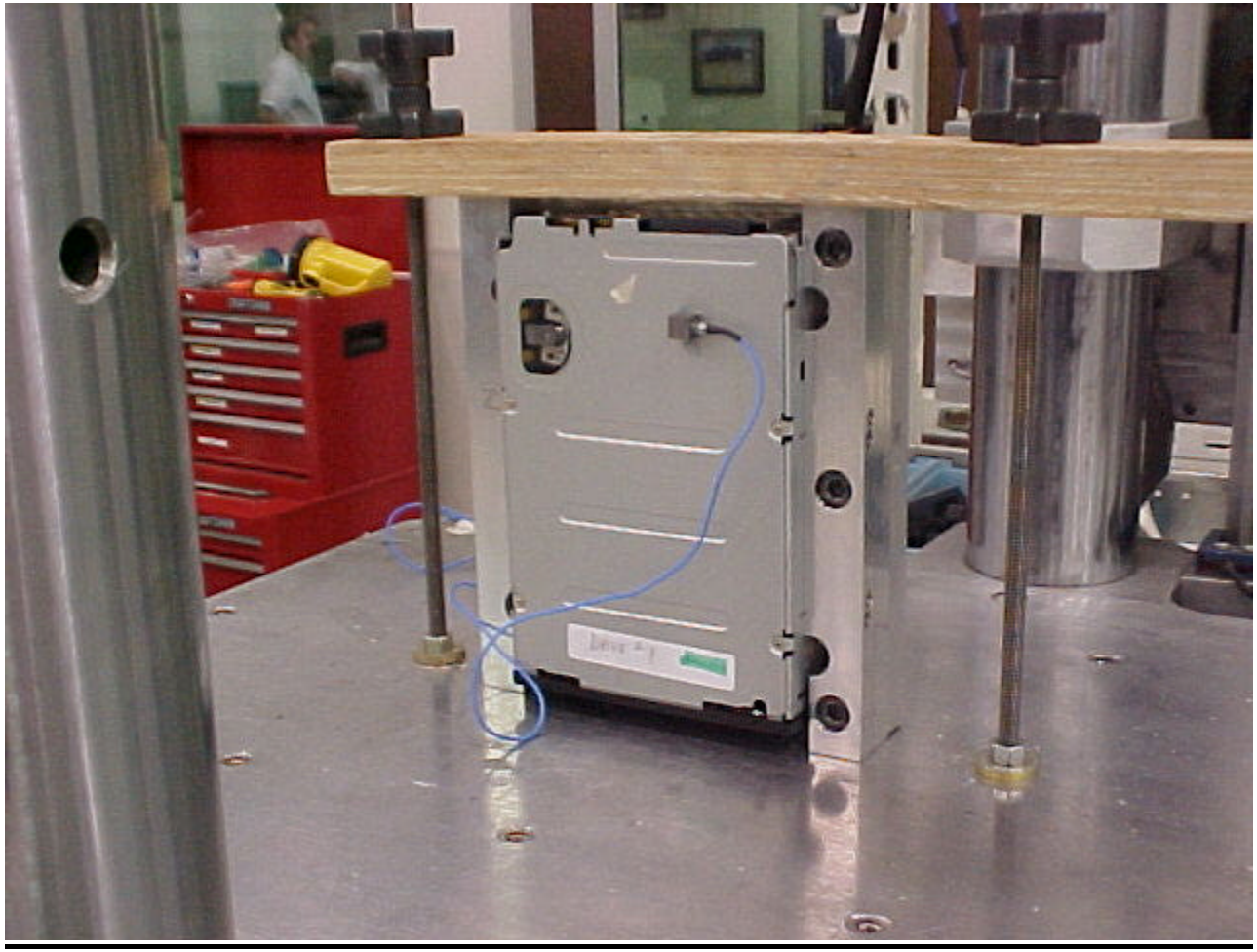
Table used for Non-operational shocks



Set up for Non-Operational Standalone shock – Z axis



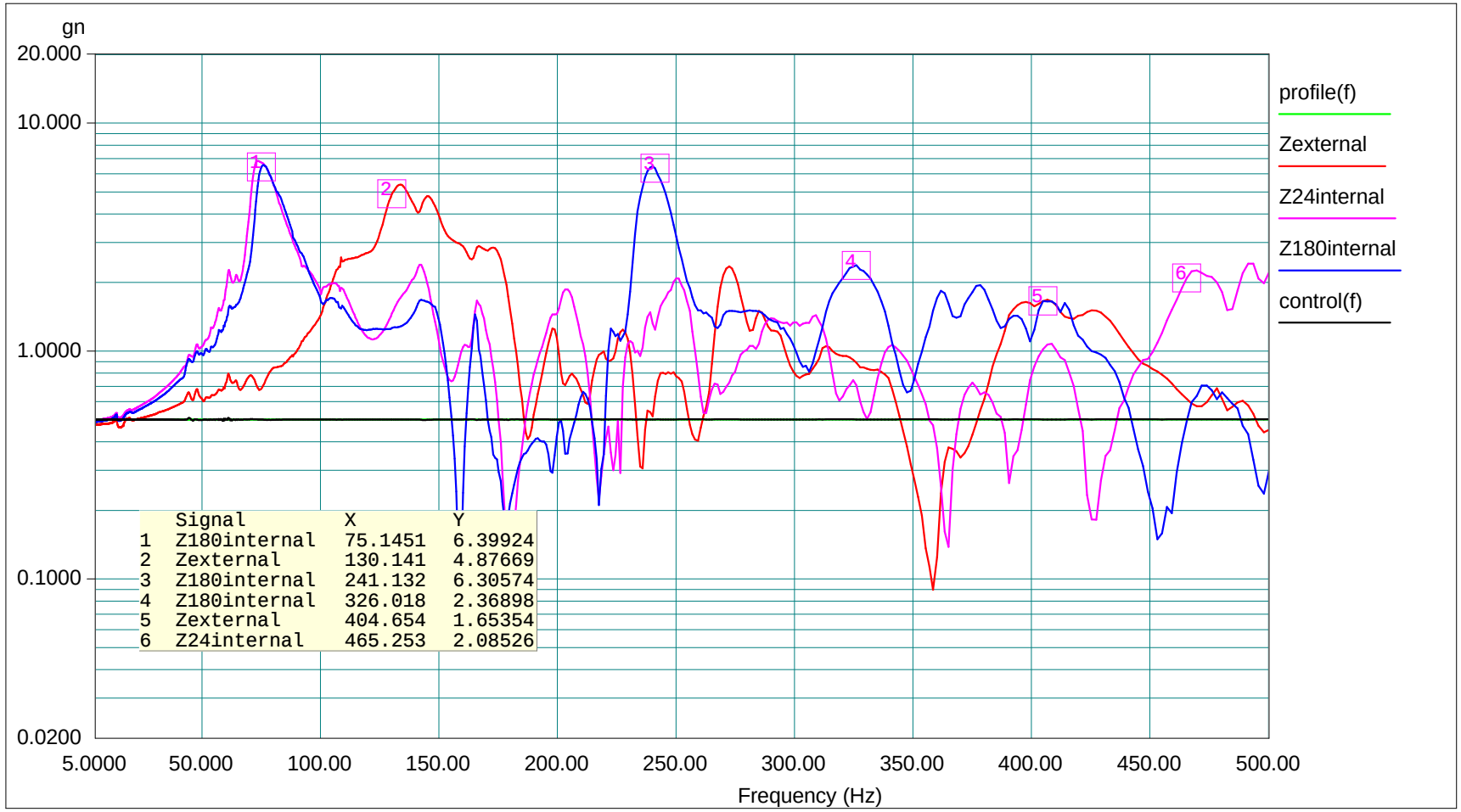
Set up for Non-Operational Standalone shock – X axis



Set up for Non-Operational Standalone shock – Y axis

External Graphs:

External VS160
180, 24 Z axis
Project File Name: OpSine.prj
Profile Name: 1.0G & 0.05In Pk-Pk. Test Type: Swept Sine Run Folder: .\02-10352 Jul 29,2002 14-04-31



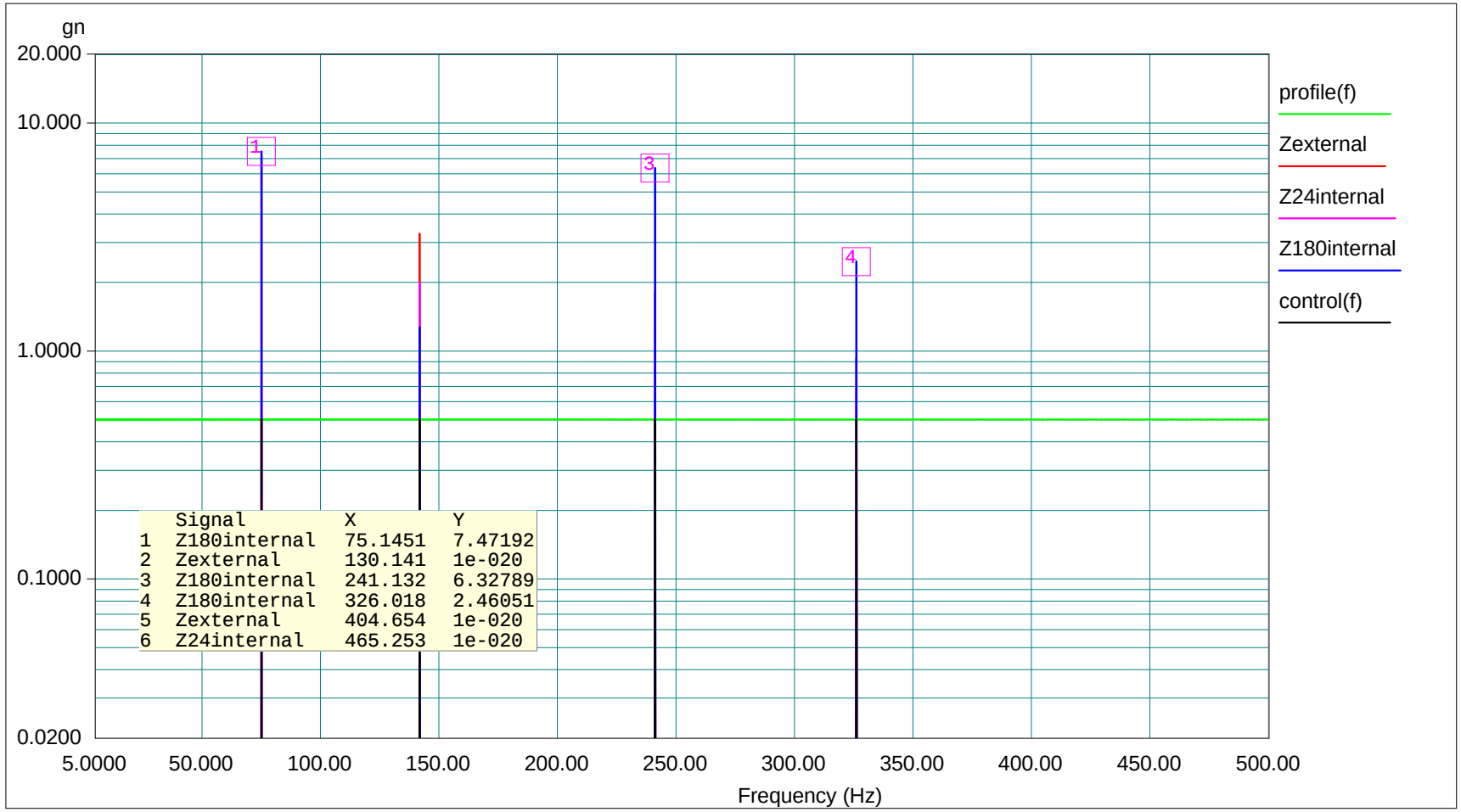
	Signal	X	Y
1	Z180internal	75.1451	6.39924
2	Zexternal	130.141	4.87669
3	Z180internal	241.132	6.30574
4	Z180internal	326.018	2.36898
5	Zexternal	404.654	1.65354
6	Z24internal	465.253	2.08526

Level:	100 %	Control Peak:	0.498280 gn	Full Level Time:	00:26:36	Sweep Type:	Logarithmic
Frequency:	5.000181 Hz	Demand Peak:	0.500000 gn	Time Remaining:	00:00:00	Sweep Rate:	0.5 Oct/Min

Data saved at 02:32:04 PM, Monday, July 29, 2002 Report created at 02:32:08 PM, Monday, July 29, 2002

Operational Sine Sweep 5 – 500 – 5 hz, 0.5G, Resonances highlighted

External VS160
180, 24 Z axis DWELL
Project File Name: OpSine.prj
Profile Name: 1.0G & 0.05In Pk-Pk. Test Type: Swept Sine Run Folder: .\02-10352 Jul 29,2002 14-38-03

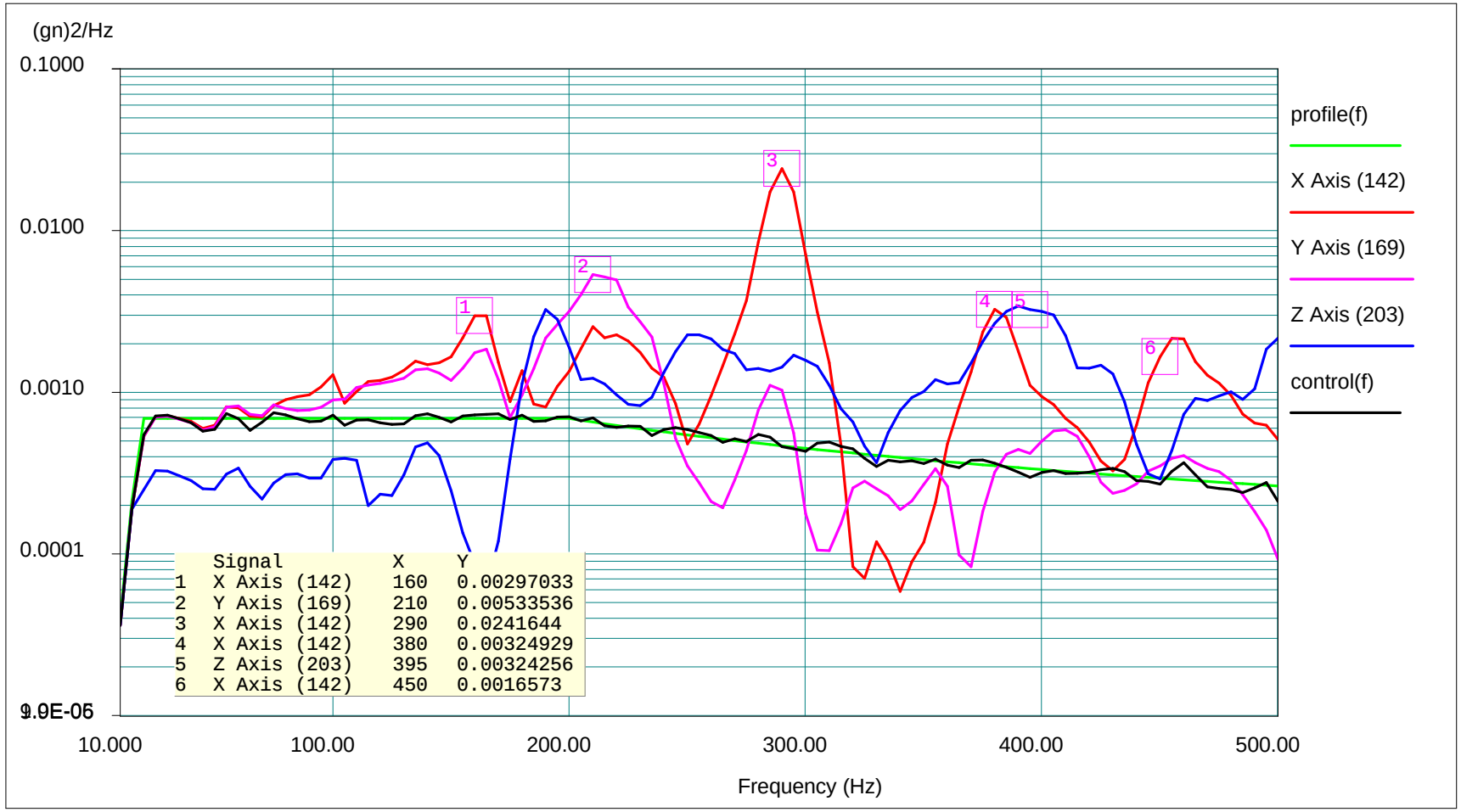


Level: 100 % Control Peak: 0.500055 gn Full Level Time: 00:52:21 Sweep Type: Logarithmic
Frequency: 326.000000 Hz Demand Peak: 0.500000 gn Time Remaining: 00:34:13 Sweep Rate: 1 Oct/Min
All drives are external configuration. Accelerometers are located on the drive itself on #24 and 180

Data saved at 03:30:34 PM, Monday, July 29, 2002 Report created at 03:30:35 PM, Monday, July 29, 2002

Operational Dwell at 0.5G at Resonant frequencies

BENCHMARK External DLT Drives
X Axis ; Y Axis ; Z Axis
Project File Name: Random.prj
Profile Name: Nav-Mat Test Type: Random Run Folder: .\APT# 02-10345 Sep 10,2002 15-24-38

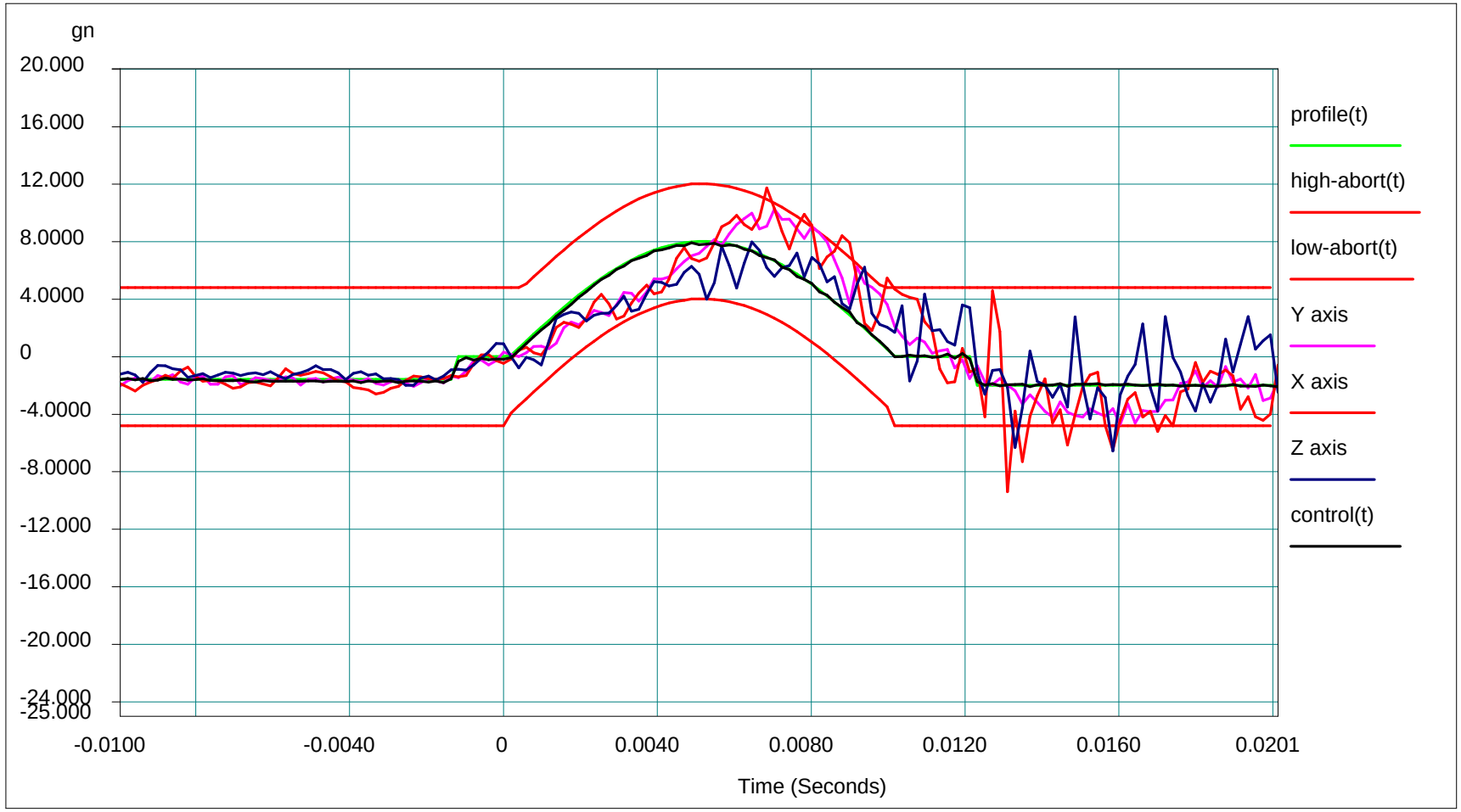


Level: 0 dB
Control RMS: 0.499477 gn Full Level Elapsed Time: 00:10:00 Lines: 225 Frame Time: 0.200000 Seconds
Demand RMS: 0.500595 gn Remaining Time: 00:00:00 DOF: 154 dF: 5.000000 Hz

Data saved at 03:42:29 PM, Tuesday, September 10, 2002 Report created at 03:42:30 PM, Tuesday, September 10, 2002

Operational Random Overstress 10 – 500 hz. 0.5Grms Resonances highlighted

External Drives
X, Y, Z
Project File Name: OPshock.prj
Profile Name: 8gn 10mSec Test Type: Classical Shock Run Folder: .\02-10345 Sep 10,2002 14-37-22

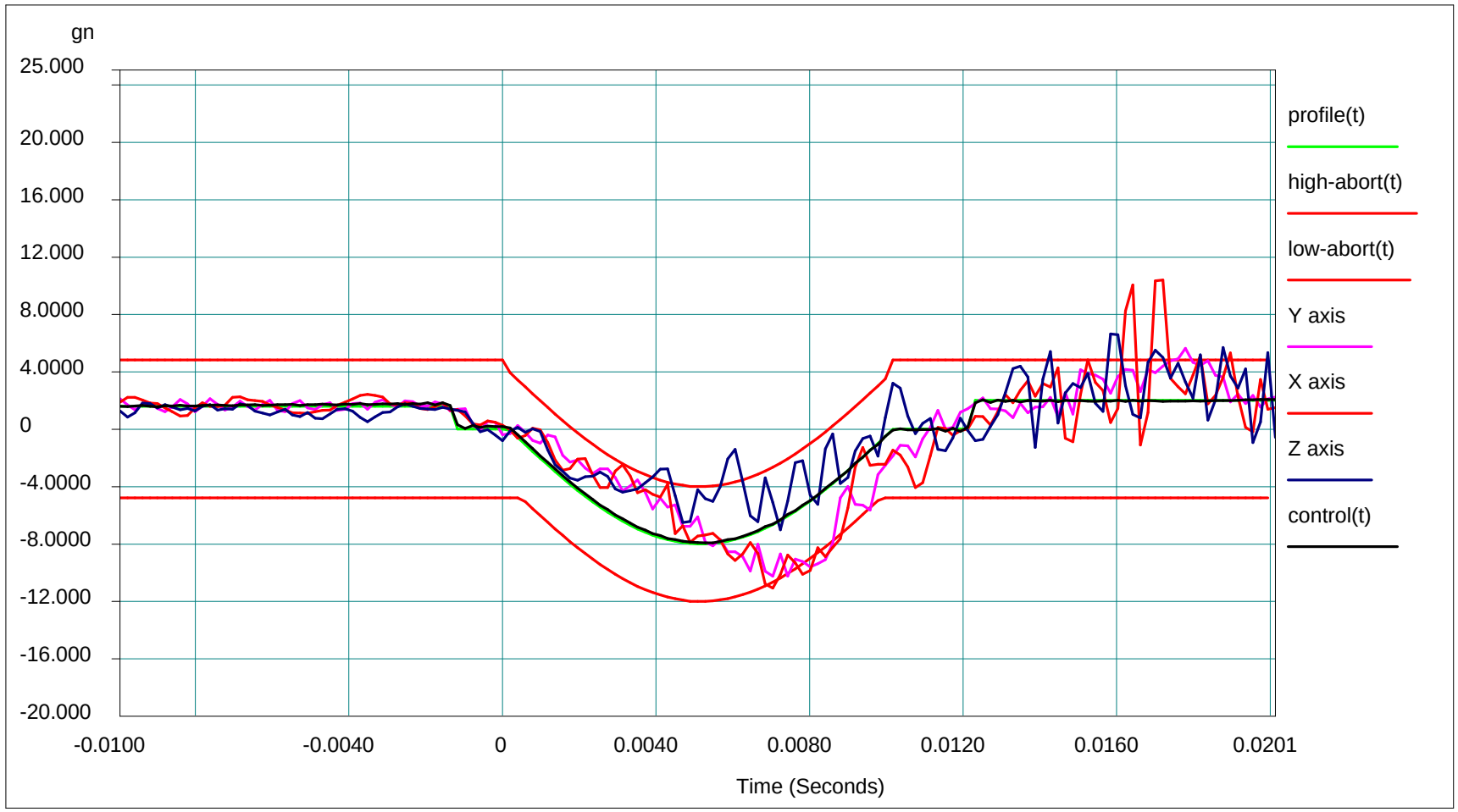


Level:	0 dB	Block Size:	1024	Elapsed Pulses:	10		
Frame Time:	0.200000 Seconds	Control Peak:	7.900659 gn	Control RMS:	1.507244 gn	Full Level Elapsed Pulses:	3
dT:	0.000195 Seconds	Demand Peak:	8.000000 gn	Demand RMS:	1.510639 gn	Remaining Pulses:	3
Pulse Type:	Half Sine	Amplitude:	8.000000 gn	Pulse Width:	10.000001 ms		

Data saved at 02:44:03 PM, Tuesday, September 10, 2002 Report created at 02:44:08 PM, Tuesday, September 10, 2002

Operational Shock, ½ sine 8G/10ms positive direction

External Drives
X, Y, Z
Project File Name: OPshock.prj
Profile Name: 8gn 10mSec Test Type: Classical Shock Run Folder: .\02-10345 Sep 10,2002 14-37-22

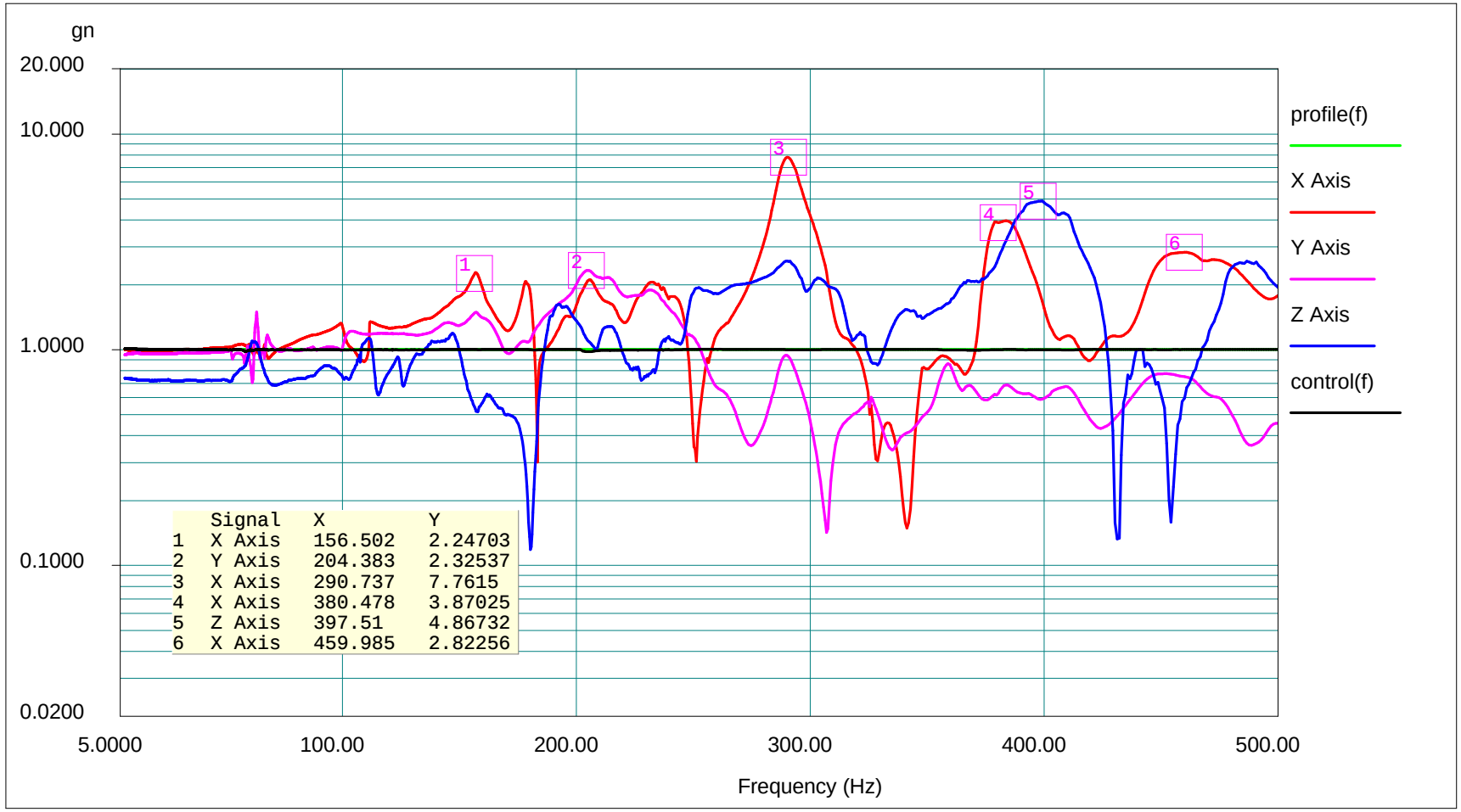


Level:	0 dB	Block Size:	1024	Elapsed Pulses:	13		
Frame Time:	0.200000 Seconds	Control Peak:	7.938482 gn	Control RMS:	1.505227 gn	Full Level Elapsed Pulses:	6
dT:	0.000195 Seconds	Demand Peak:	8.000000 gn	Demand RMS:	1.510639 gn	Remaining Pulses:	0
Pulse Type:	Half Sine	Amplitude:	8.000000 gn	Pulse Width:	10.000001 ms		

Data saved at 02:45:03 PM, Tuesday, September 10, 2002 Report created at 02:45:04 PM, Tuesday, September 10, 2002

Operational Shock, ½ sine 8G/10ms negative direction

BENCHMARK External DLT Drives
X axis ; Y Axis ; Z Axis
Project File Name: Sine.prj
Profile Name: 1.0G & 0.05In Pk-Pk. Test Type: Swept Sine Run Folder: .\APT# 02-10345 Sep 11,2002 10-00-25

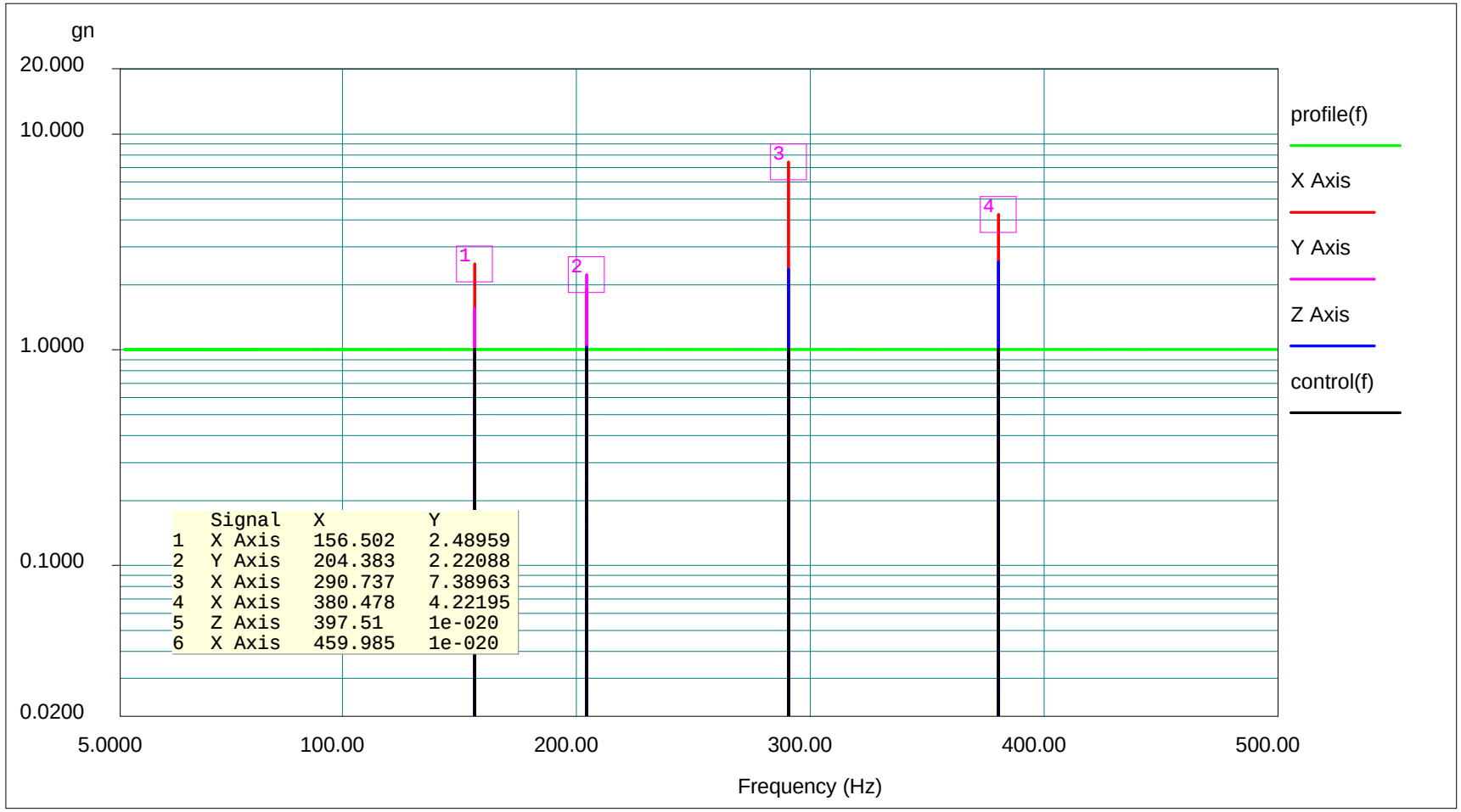


Level:	0 dB	Control Peak:	1.009813 gn	Full Level Time:	00:24:39	Sweep Type:	Logarithmic
Frequency:	7.000386 Hz	Demand Peak:	1.000000 gn	Time Remaining:	00:00:00	Sweep Rate:	0.5 Oct/Min

Data saved at 10:25:17 AM, Wednesday, September 11, 2002 Report created at 10:25:22 AM, Wednesday, September 11, 2002

Non-Op. Sine Sweep 5 –500 – 5 Hz. 1G

BENCHMARK External DLT Drives
X axis ; Y Axis ; Z Axis
Project File Name: Sine.prj
Profile Name: 1.0G & 0.05In Pk-Pk. Test Type: Swept Sine Run Folder: .\APT# 02-10345 Sep 11,2002 10-27-21

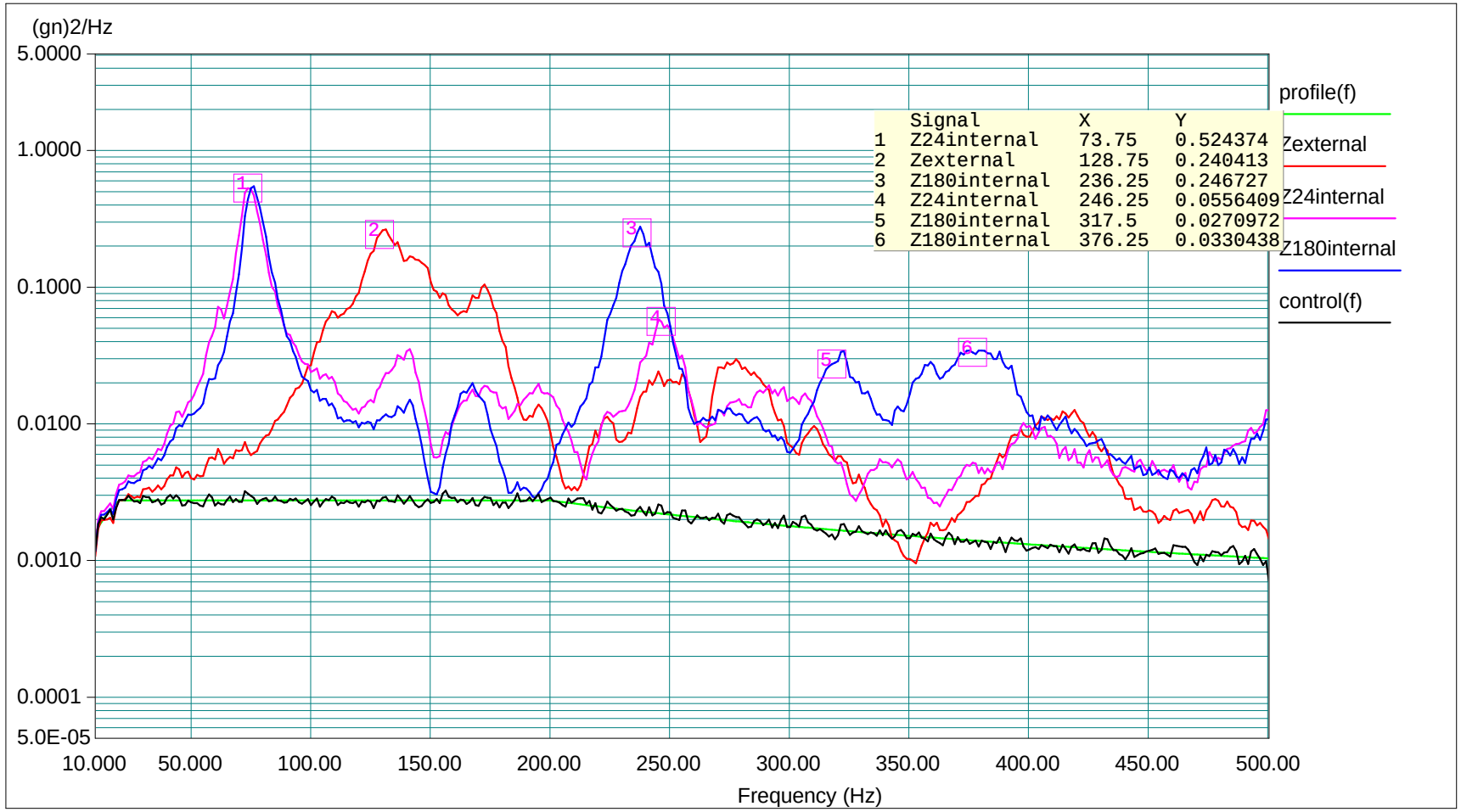


Level:	0 dB	Control Peak:	0.999637 gn	Full Level Time:	00:59:13	Sweep Type:	Logarithmic
Frequency:	380.500000 Hz	Demand Peak:	1.000000 gn	Time Remaining:	00:25:25	Sweep Rate:	1 Oct/Min

Data saved at 11:26:49 AM, Wednesday, September 11, 2002 Report created at 11:26:50 AM, Wednesday, September 11, 2002

Non-Op. Dwell at 1G

Z Axis 24, 180
Project File Name: OverRandom.prj
Profile Name: Nav-Mat Test Type: Random Run Folder: .\02-10352 Jul 29,2002 15-43-39

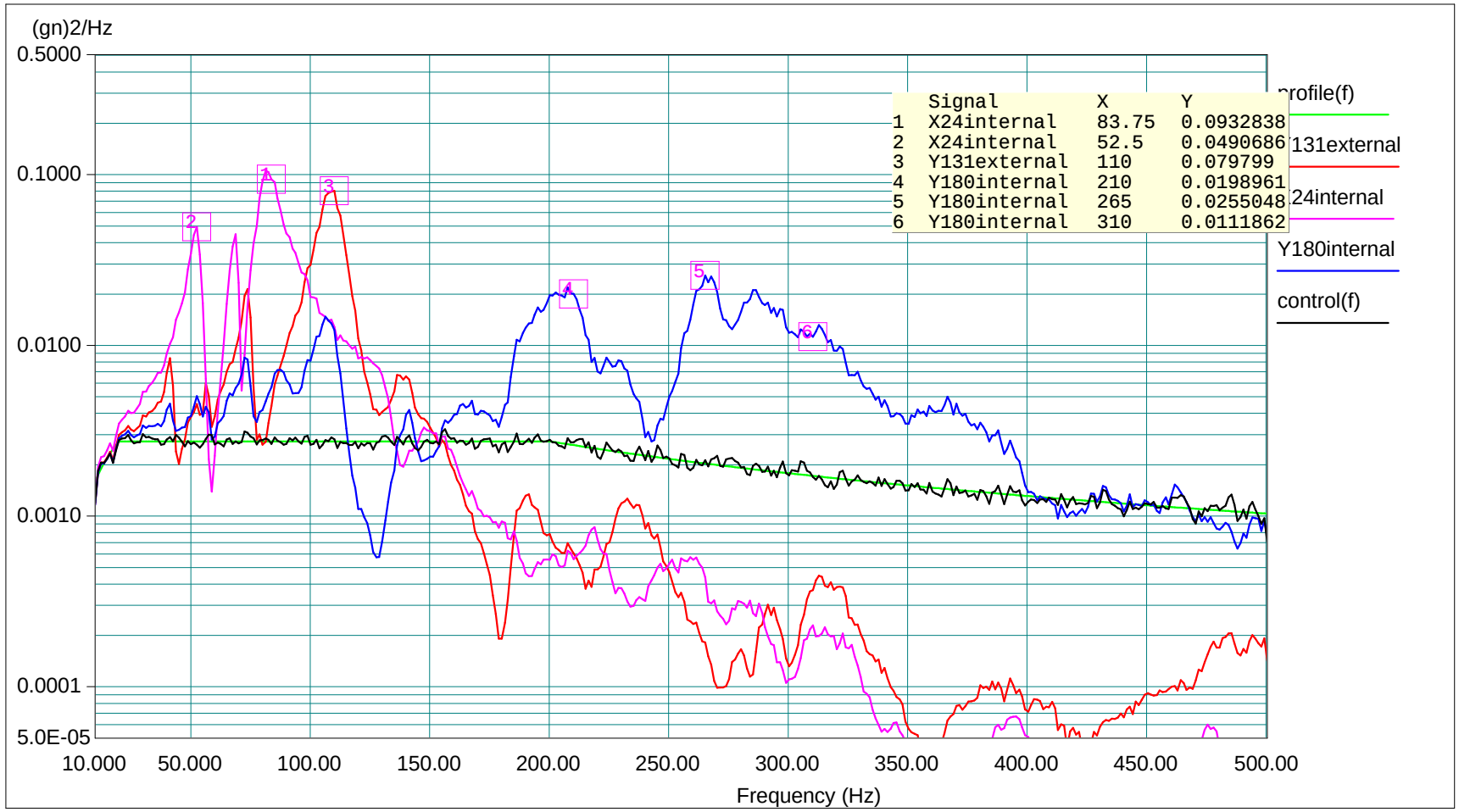


Level: 100 %
Control RMS: 1.001586 gn Full Level Elapsed Time: 00:30:00 Lines: 900 Frame Time: 0.800000 Seconds
Demand RMS: 1.000577 gn Remaining Time: 00:00:00 DOF: 154 dF: 1.250000 Hz
Drives in Z axis

Data saved at 04:17:07 PM, Monday, July 29, 2002 Report created at 04:17:09 PM, Monday, July 29, 2002

Non-Op. Random Overstress 10 – 500 hz. 1.0Grms Resonances highlighted

External VS160
Y131, X24, Y180
Project File Name: OverRandom.prj
Profile Name: Nav-Mat Test Type: Random Run Folder: .\02-10352 Jul 29,2002 12-25-34

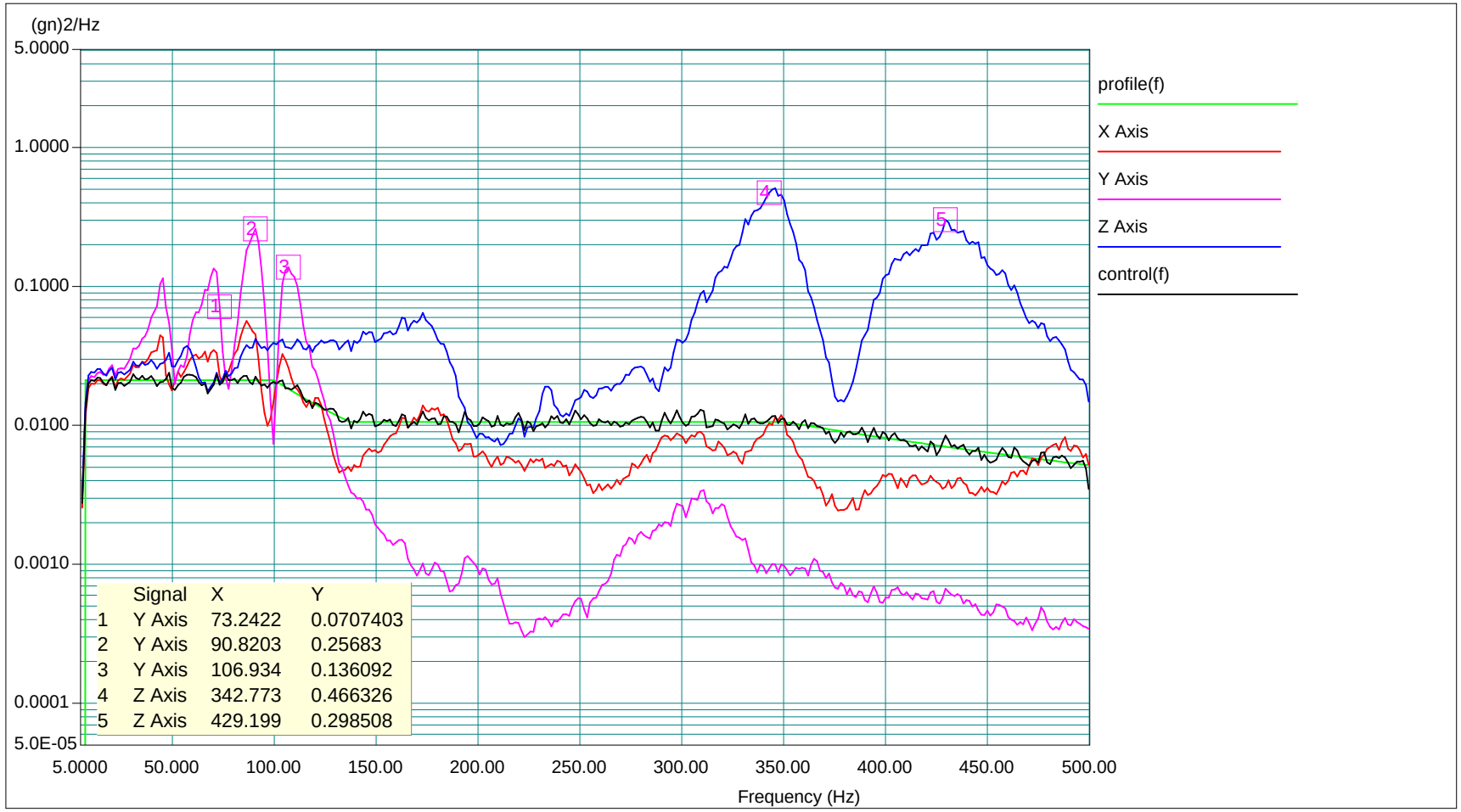


Level: 100 %
Control RMS: 1.001567 gn Full Level Elapsed Time: 00:30:00 Lines: 900 Frame Time: 0.800000 Seconds
Demand RMS: 1.000577 gn Remaining Time: 00:00:00 DOF: 154 dF: 1.250000 Hz

Two drives in Y axis and 1 in X axis

Non_Op. Random Overstress 10 – 500 hz. 1.0Grms Resonances highlighted

DLT External Drives
X axis, Y axis, Z axis
Project File Name: NonOpRandom.prj
Profile Name: Nav-Mat Test Type: Random Run Folder: .\Benchmark 02-10345 Sep 11,2002 13-47-18

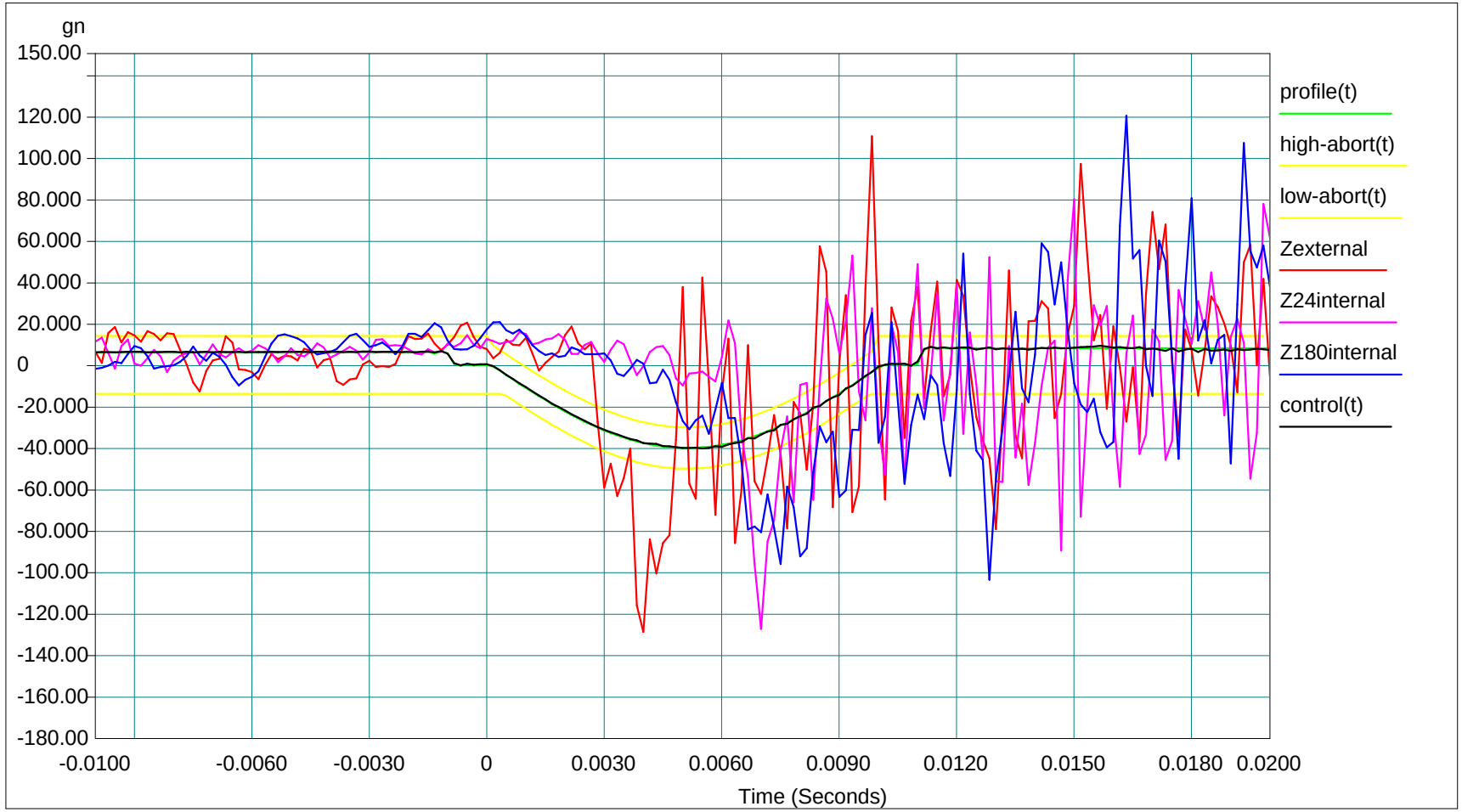


Level: 0 dB
Control RMS: 2.421876 gn Full Level Elapsed Time: 00:10:00 Lines: 1800 Frame Time: 0.682667 Seconds
Demand RMS: 2.422452 gn Remaining Time: 00:20:00 DOF: 154 dF: 1.464844 Hz

Data saved at 01:58:31 PM, Wednesday, September 11, 2002 Report created at 01:58:36 PM, Wednesday, September 11, 2002

Non_Op. Random Overstress 5 – 500 hz. 2.41Grms

External VS 160
Z24, Z180
Project File Name: OpShock.prj
Profile Name: 40gn 10mSec Test Type: Classical Shock Run Folder: .\APT# 02-10352 Jul 29,2002 17-02-10

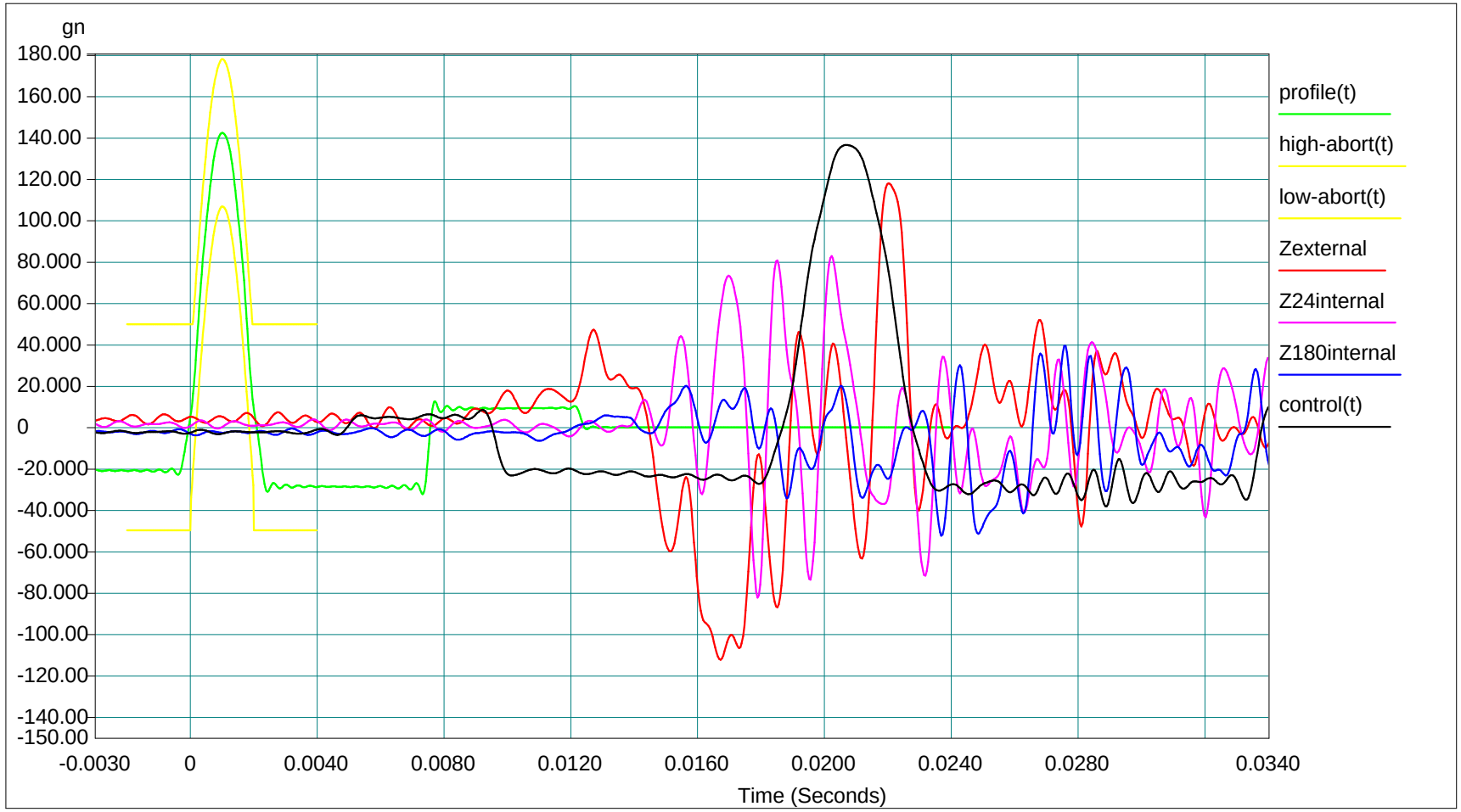


Level:	0 dB	Block Size:	2048	Elapsed Pulses:	13		
Frame Time:	0.341333 Seconds	Control Peak:	40.232193 gn	Control RMS:	5.620266 gn	Full Level Elapsed Pulses:	2
dT:	0.000167 Seconds	Demand Peak:	40.000000 gn	Demand RMS:	5.599281 gn	Remaining Pulses:	0
Pulse Type:	Half Sine	Amplitude:	40.000000 gn	Pulse Width:	10.000001 ms		

Data saved at 05:04:27 PM, Monday, July 29, 2002 Report created at 05:04:28 PM, Monday, July 29, 2002

Non-operational Standalone 40G/10ms square wave_positive

External VS 160
Z24, Z180
Project File Name: OpShock.prj
Profile Name: 142gn 2mSec Test Type: Classical Shock Run Folder: .\APT# 02-10352 Jul 29,2002 17-11-20

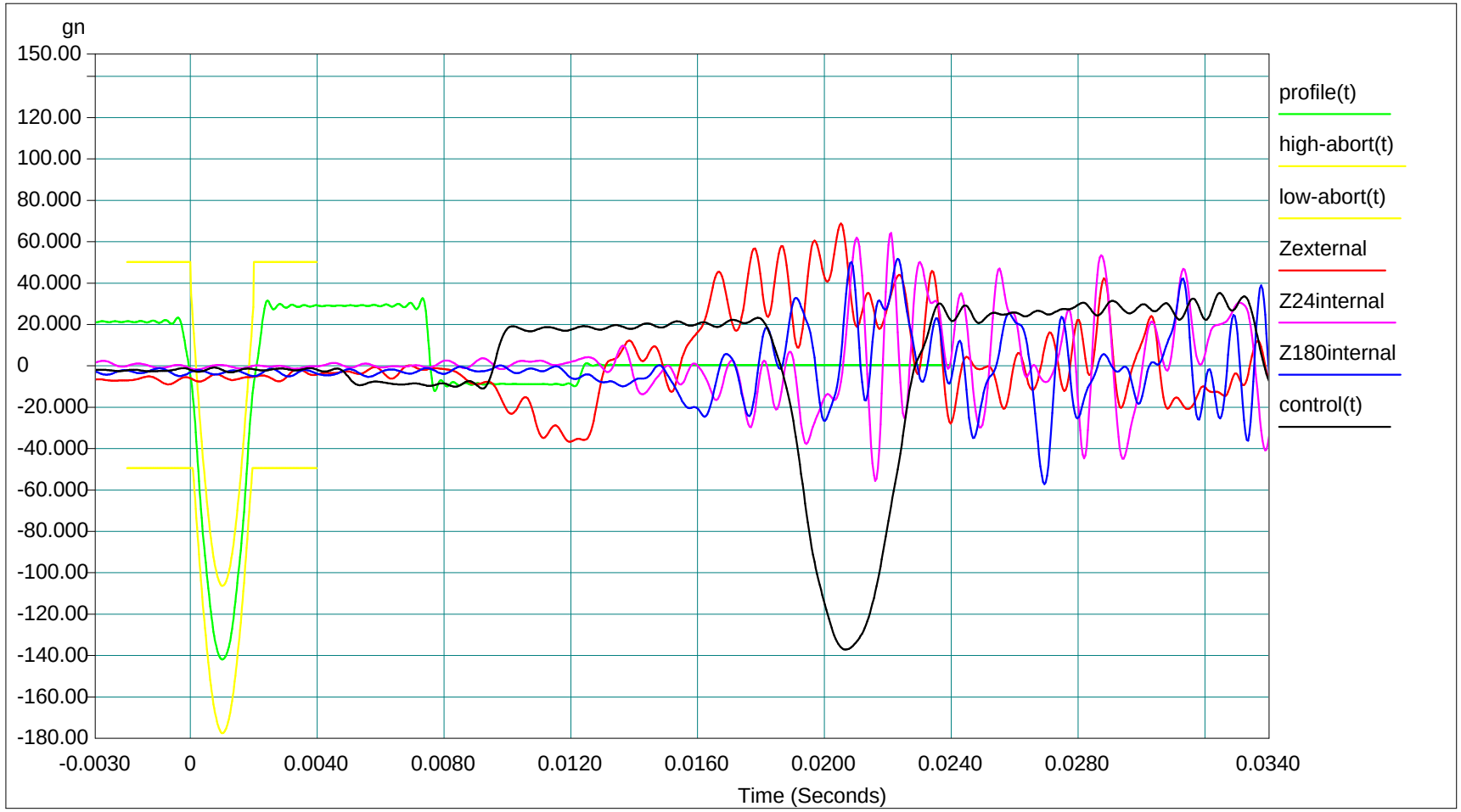


Level:	0 dB	Block Size:	2048	Elapsed Pulses:	11		
Frame Time:	0.042667 Seconds	Control Peak:	136.126282 gn	Control RMS:	24.670815 gn	Full Level Elapsed Pulses:	1
dT:	0.000021 Seconds	Demand Peak:	142.000000 gn	Demand RMS:	25.140757 gn	Remaining Pulses:	3
Pulse Type:	Half Sine	Amplitude:	142.000000 gn	Pulse Width:	2.000000 ms		

Data saved at 05:12:47 PM, Monday, July 29, 2002 Report created at 05:12:51 PM, Monday, July 29, 2002

Non-operational Standalone 142G/2ms square wave positive

External VS 160
Z24, Z180
Project File Name: OpShock.prj
Profile Name: 142gn 2mSec Test Type: Classical Shock Run Folder: .\APT# 02-10352 Jul 29,2002 17-11-20

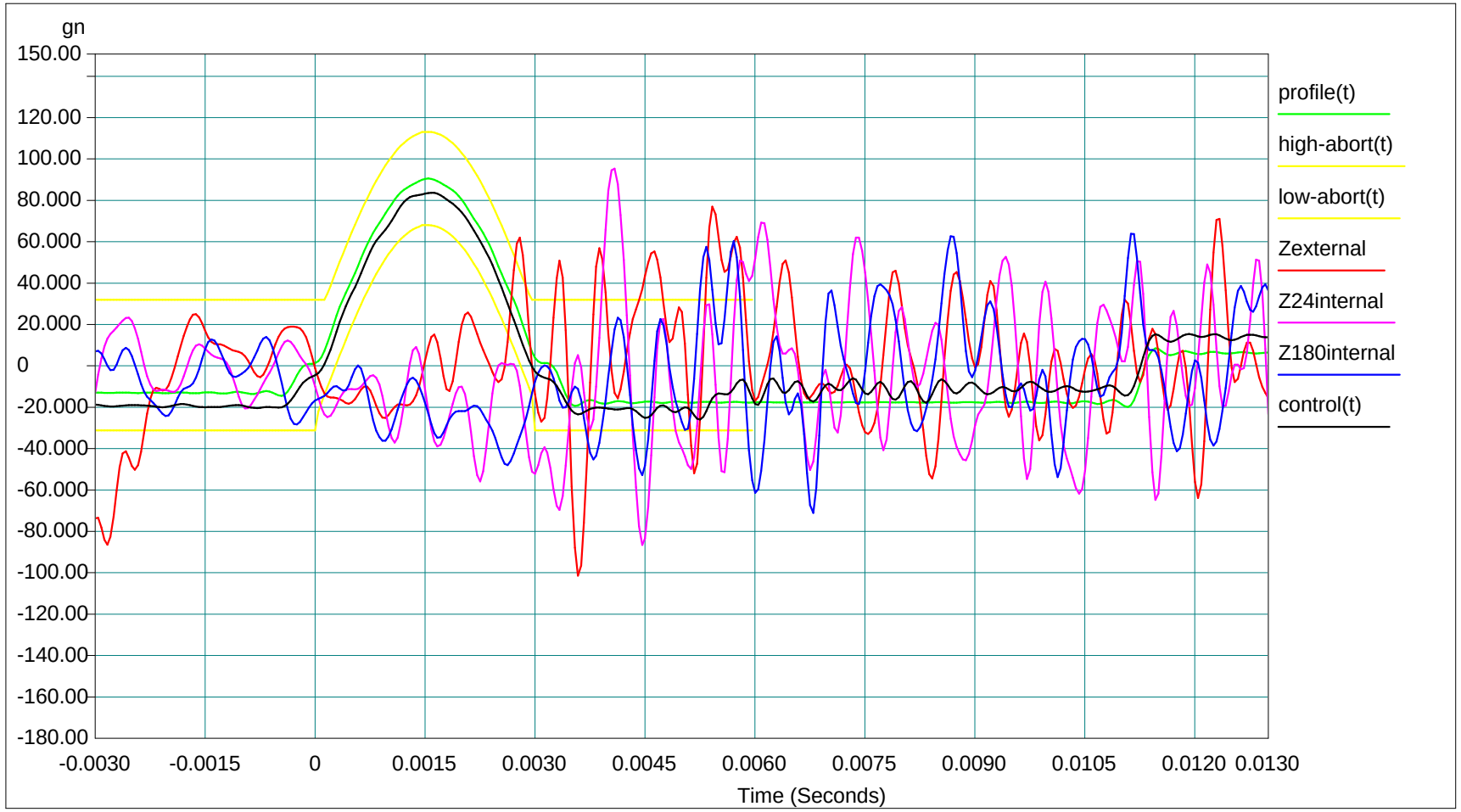


Level:	0 dB	Block Size:	2048	Elapsed Pulses:	14		
Frame Time:	0.042667 Seconds	Control Peak:	137.226868 gn	Control RMS:	24.530727 gn	Full Level Elapsed Pulses:	2
dT:	0.000021 Seconds	Demand Peak:	142.000000 gn	Demand RMS:	25.140757 gn	Remaining Pulses:	0
Pulse Type:	Half Sine	Amplitude:	142.000000 gn	Pulse Width:	2.000000 ms		

Data saved at 05:14:02 PM, Monday, July 29, 2002 Report created at 05:14:03 PM, Monday, July 29, 2002

Non-operational Standalone 142G/2ms square wave negative

External VS 160
Z24, Z180
Project File Name: OpShock.prj
Profile Name: 90gn 3mSec Test Type: Classical Shock Run Folder: .\APT# 02-10352 Jul 29,2002 17-07-44

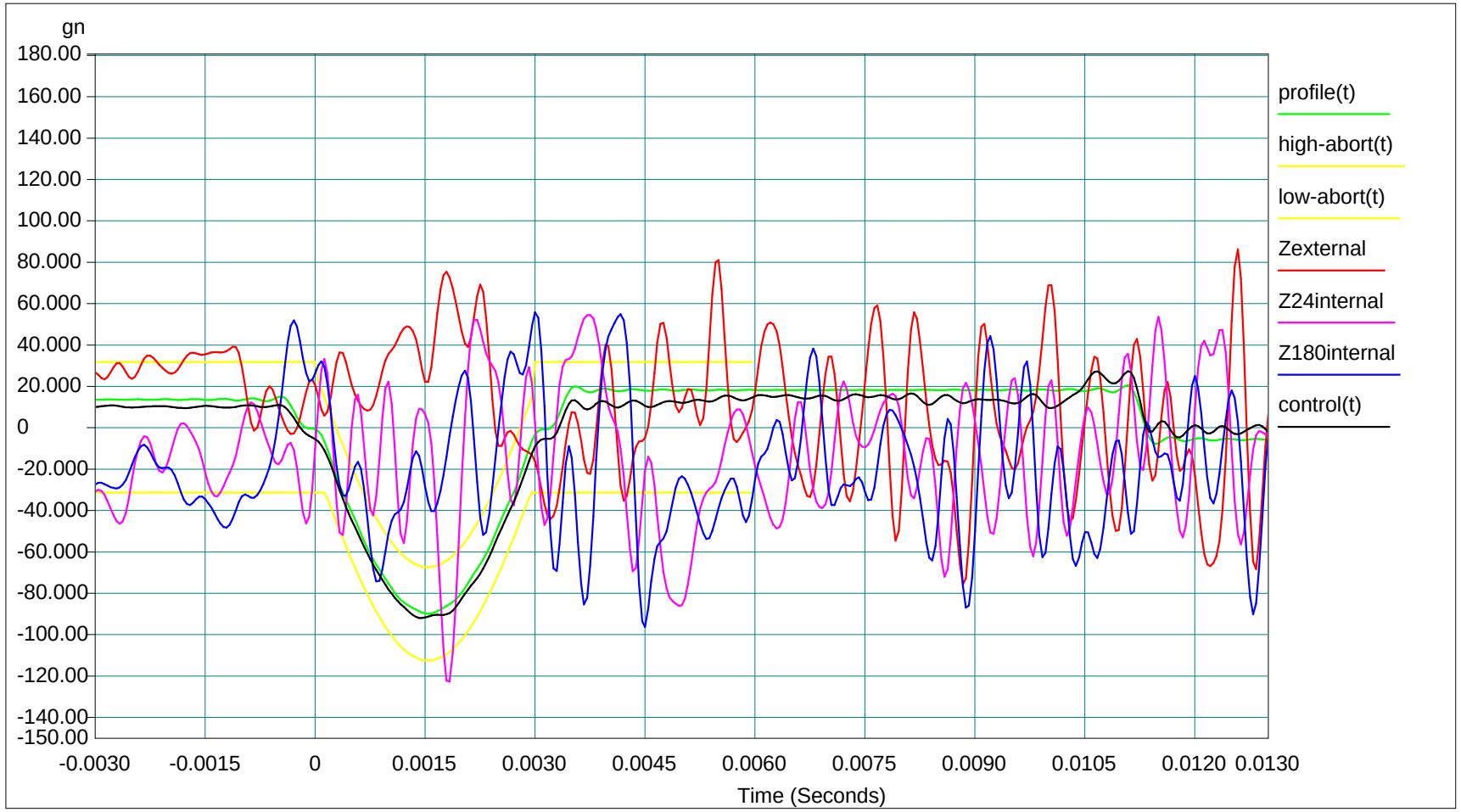


Level:	0 dB	Block Size:	2048	Elapsed Pulses:	10		
Frame Time:	0.085333 Seconds	Control Peak:	83.165825 gn	Control RMS:	14.262035 gn	Full Level Elapsed Pulses:	1
dT:	0.000042 Seconds	Demand Peak:	90.000000 gn	Demand RMS:	13.719540 gn	Remaining Pulses:	3
Pulse Type:	Half Sine	Amplitude:	90.000000 gn	Pulse Width:	3.000000 ms		

Data saved at 05:08:46 PM, Monday, July 29, 2002 Report created at 05:08:48 PM, Monday, July 29, 2002

Non-operational Standalone 90G/3ms square wave positive

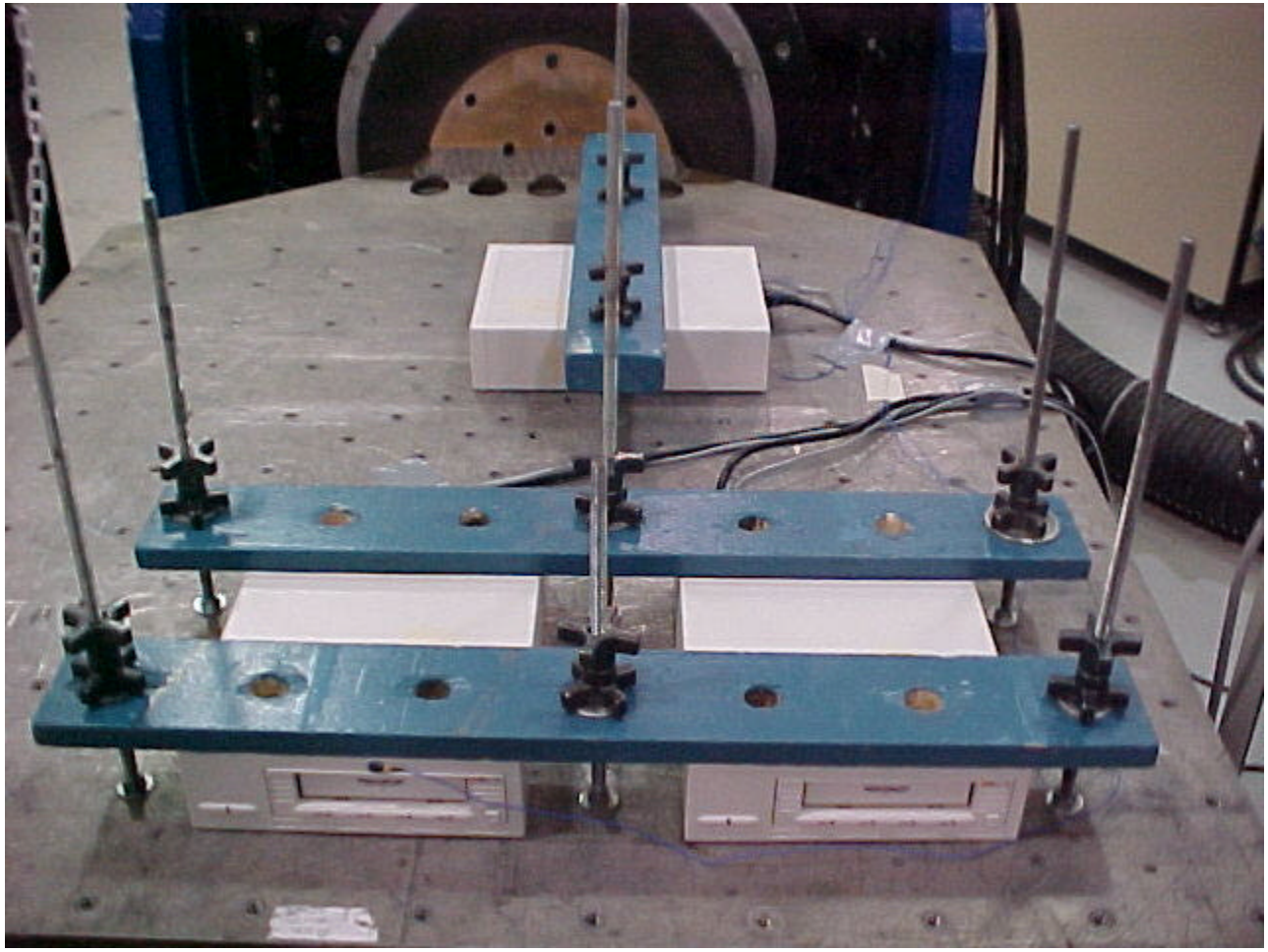
External VS 160
Z24, Z180
Project File Name: OpShock.prj
Profile Name: 90gn 3mSec Test Type: Classical Shock Run Folder: .\APT# 02-10352 Jul 29,2002 17-07-44



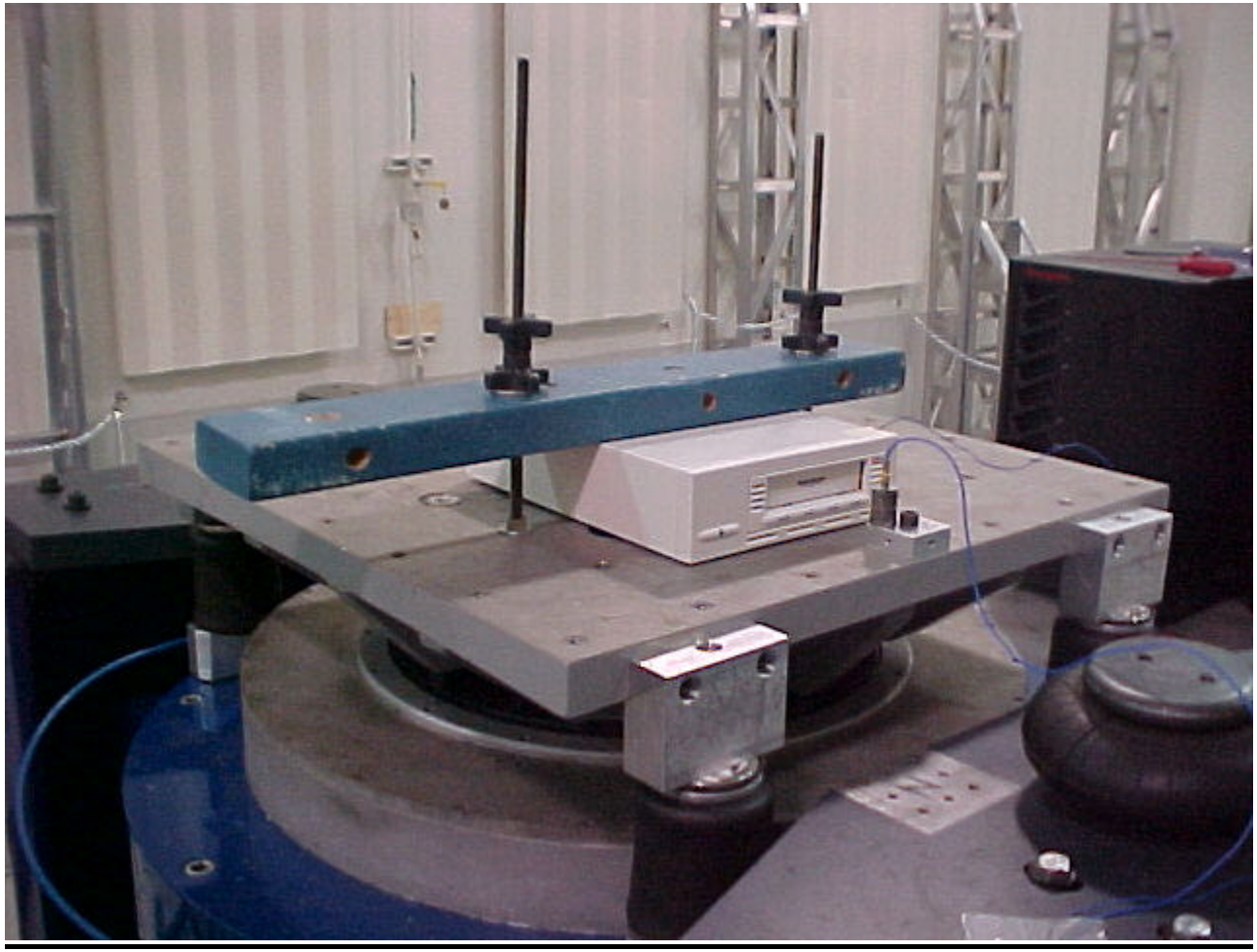
Level:	0 dB	Block Size:	2048	Elapsed Pulses:	13	
Frame Time:	0.085333 Seconds	Control Peak:	92.053551 gn	Control RMS:	14.213926 gn	Full Level Elapsed Pulses: 2
dT:	0.000042 Seconds	Demand Peak:	90.000000 gn	Demand RMS:	13.719540 gn	Remaining Pulses: 0
Pulse Type:	Half Sine	Amplitude:	90.000000 gn	Pulse Width:	3.000000 ms	

Data saved at 05:09:58 PM, Monday, July 29, 2002 Report created at 05:09:59 PM, Monday, July 29, 2002

Non-operational Standalone 90G/3ms square wave negative



External Testing (2 drives in Y axis and 1 in X)



External Testing (Z axis)

Addendum 9: DLT VS160e Acoustics Emissions Test Report

Benchmark Storage Innovations

VS160 External Tape Drive Acoustics Emissions Report

Percept Technology, Inc.
4735 Walnut St., #E
Boulder, Colorado 80301
303.444.7480
www.percept.com

Revision History:

Version	Date	Comments	Contributors
1.0	05/07/2002	Initial Release	C. Poore
1.1	05/08/2002	Restated power level as Unweighted Bels	C. Poore

Table of Contents

List of Tables

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1.0 Introduction

This Report covers acoustics testing that was performed on a prototype VS160e on 07 May 2002 at Maxtor Corporation's Acoustics Laboratory in Longmont, CO.

1.1 Overview

Acoustics testing is used to ensure that the acoustics emissions levels emitted by the equipment under test remain below a predetermined specification limit.

1.2 Assumptions

The VS160e supplied by Benchmark was a prototype unit and not representative of a volume manufacturing process.

1.3 Company Restricted Information

This document contains confidential and restrictive information. Reproduction of this document outside of Benchmark Storage Innovations or Percept Technology, Inc. is prohibited.

1.4 Reference Documents

1) ISO7779:1998-06-15
2) ANSI S12.10-1985
3) ISO9296

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2.0 Acoustics Tests

2.1 Testing Summary

The following test results apply only to the product tested under the test conditions specified.

Table 1: Summary of Acoustics Testing

Operating Mode Tested	Unweighted Sound Power Level	Weighted Sound Pressure Level	BSI: Weighted Sound Pressure Level Limit	Test Result
Idle / Unloaded Mode	5.87 B	45.6 dBA	54.0 dBA	PASS
Idle / Loaded Mode	5.63 B	43.7 dBA	54.0 dBA	PASS
Operating / Read – Write Mode	5.79 B	46.4 dBA	54.0 dBA	PASS
Operating / Streaming Mode	5.83 B	47.3 dBA	54.0 dBA	PASS

2.2 Test Location

Acoustics testing was performed at Maxtor Corporation's Acoustics Test Laboratory in Longmont, CO.

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2.3 General Test Requirements

Test Setup / Procedure

The test setup was according to ISO7779. (See Figure 1 and Figure 2)

An acoustic chamber meeting the requirements of the ISO standard was used. The product was placed into the center of the chamber on the floor. Ten calibrated microphones were placed at locations one meter from the center of the product.

Prior to operating the drive, the background noise level in the chamber was measured to ensure that it was within acceptable levels for test.

The support computer used to operate the drive was placed outside the chamber, and a SCSI cable was routed into the test chamber through a feed-through. The drives was placed in the center of the test area on the floor of the chamber, powered on and operated in four modes:

1. Idle with tape unloaded
2. Idle with tape loaded
3. Operating in write / read mode
4. Operating in streaming mode

The Sound Power Level and Sound Pressure Levels were measured and recorded for each mode. Each reported measurement is the average of the ten measurement locations.

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Figure 1: Acoustics Test Setup

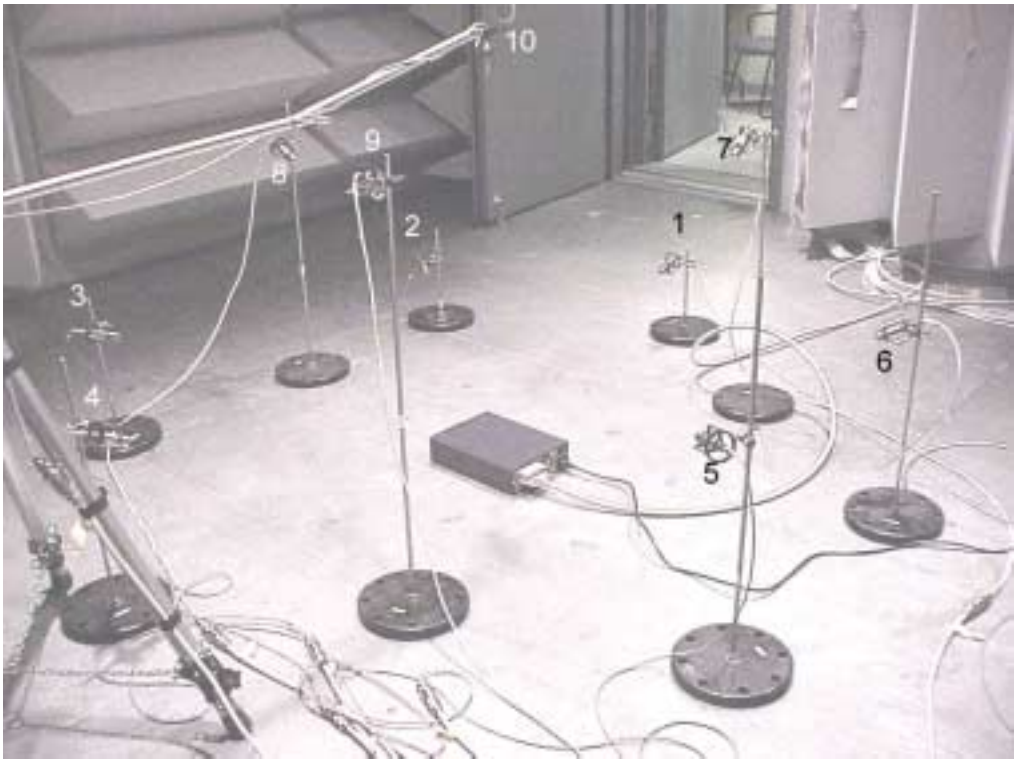
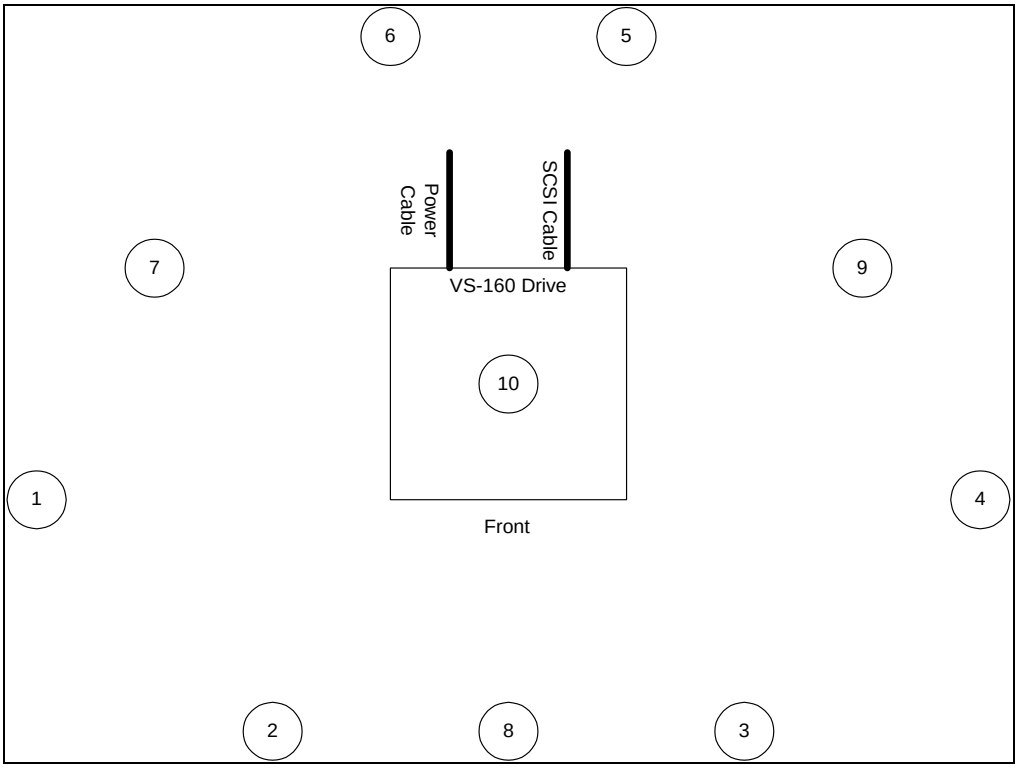


Figure 2: Microphone Locations



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2.4 Acoustic Test Data

2.4.1 Idle / Unloaded Mode

Date Tested:

07 May 2002

Test Engineer:

Chris Poore, Bob Foster

Exit Criteria:

Average weighted sound pressure level shall not exceed 54 dBA

Product Tested:

VS-160, Serial# DL2020550, uP Revision 5.2

Test Results:

The VS160e passed the acoustics emissions requirements in the Idle / Unloaded Mode.

Table 2: Sound Pressure levels, Idle / Unloaded Mode

Microphone Location	1	2	3	4	5	6	7	8	9	10	Average
Unweighted (dB)	50.6	45.5	46.2	50.1	51.2	50.9	51.0	47.5	51.0	51.6	50.0
Weighted (dBA)	45.8	41.1	41.2	45.5	47.9	47.5	46.0	42.6	46.1	46.5	**45.6**

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2.4.2 Idle / Loaded Mode

Date Tested:

07 May 2002

Test Engineer:

Chris Poore, Bob Foster

Exit Criteria:

Average weighted sound pressure level shall not exceed 54 dBA

Product Tested:

VS-160, Serial# DL2020550, uP Revision 5.2

Test Results:

The VS160e passed the acoustics emissions requirements in the Idle / Loaded Mode.

Table 3: Sound Pressure levels, Idle / Loaded Mode

Microphone Location	1	2	3	4	5	6	7	8	9	10	Average
Unweighted (dB)	48.1	42.5	42.9	47.4	49.5	49.2	48.7	44.3	48.5	48.7	47.6
Weighted (dBA)	43.7	38.6	38.2	43.3	46.8	46.4	43.9	39.7	43.9	43.8	**43.7**

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2.4.3 Operating / Read – Write Mode

Date Tested:

07 May 2002

Test Engineer:

Chris Poore, Bob Foster

Exit Criteria:

Average weighted sound pressure level shall not exceed 54 dBA

Product Tested:

VS-160, Serial# DL2020550, uP Revision 5.2

Test Results:

The VS160e passed the acoustics emissions requirements in the Operating / Read – Write Mode.

Table 4: Sound Pressure levels, Operating / Read – Write Mode

Microphone Location	1	2	3	4	5	6	7	8	9	10	Average
Unweighted (dB)	49.3	45.6	46.7	49.4	50.8	50.5	49.6	46.7	49.9	50.0	49.2
Weighted (dBA)	46.2	43.6	44.7	46.7	48.6	48.3	45.7	44.2	46.4	46.5	**46.4**

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2.4.4 Operating / Streaming Mode

Date Tested:

07 May 2002

Test Engineer:

Chris Poore, Bob Foster

Exit Criteria:

Average weighted sound pressure level shall not exceed 54 dBA

Product Tested:

VS-160, Serial# DL2020550, uP Revision 5.2

Test Results:

The VS160e passed the acoustics emissions requirements in the Operating / Streaming Mode.

Table 5: Sound Pressure levels, Operating / Streaming Mode

Microphone Location	1	2	3	4	5	6	7	8	9	10	Average
Unweighted (dB)	49.6	45.9	47.5	49.2	51.3	51.6	49.7	46.9	50.1	50.6	49.6
Weighted (dBA)	46.7	44.2	46.2	46.1	49.6	50.2	46.2	44.9	47.1	48.0	**47.3**

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Addendum 10: DLT VS160 CB Report and Certificate

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
COMMISSION ELECTROTECHNIQUE INTERNATIONALE (CEI)

Ref. Certif. No.
US/6152/UL

IEC SYSTEM FOR CONFORMITY TESTING AND CERTIFICATION OF ELECTRICAL EQUIPMENT (IECEE)
CB SCHEME

SYSTEME CEI D'ESSAIS DE CONFORMITE ET DE CERTIFICATION DES EQUIPEMENTS ELECTRIQUES (IECEE)
METHODE OC

CB TEST CERTIFICATE
CERTIFICAT D'ESSAI OC

Product
Produit

Component - Tape Drive

Name and address of the applicant
Nom et adresse du demandeur

Benchmark Storage Innovations, Inc.
3122 Sterling Circle
Boulder, CO 80301, USA

Name and address of the manufacturer
Nom et adresse du fabricant

Benchmark Storage Innovations, Inc.
3122 Sterling Circle
Boulder, CO 80301, USA

Name and address of the factory
Nom et adresse de l'usine

1. Benchmark Storage Innovations, Inc.
   3122 Sterling Circle, Boulder, CO 80301 USA
2. Mitsumi Philippines, Inc.
   Luzon Avenue, Bataan Economic Zone, Mariveles, Bataan, Philippines
3. Beyonics Mfg. Pte Ltd.
   25 Serangoon N. Ave 5, Singapore 554914, Singapore
4. Hewlett-Packard Singapore
   1 Jalan Kilang Timor, Pacific Tech Centre, #04-01/02/03/05, Singapore 159402

Rating and principal characteristics
Valeurs nominales et caractéristiques principales

Input: 5 V dc, 1.5 A / 12 V dc, 0.5 A

Trademark (if any)
Marque de fabrique (si elle existe)

BENCHMARK, Dell, HP, IBM, TANDBERG DATA

Model / Type Ref.
Ref. de type

Benchmark: DLT VS160; Dell: PowerVault 110T DLT VS160
HP: StorageWorks DLT-VS-160/320
IBM: 80/160GB Half-High DLTVS Tape Drive
Tandberg: DLT VS160 Internal Tape Drive

Additional information (if necessary)
Information complémentaire (si nécessaire)

The CB Test Report comprises 3 Enclosures.

A sample of the product was tested and found to be in conformity with
Un échantillon de ce produit a été essayé et a été considéré conforme à la

PUBLICATION **EDITION**

IEC 60950 (1991) Second Edition with Amdts. No. 1 (1992), 2 (1993), 3 (1995) and 4 (1996);
Additionally evaluated to EN60950 (1992) with Amdts. 1, 2, 3, 4, and 11 to include national Differences for European countries; other national differences as specified in the CB Test Report.

as shown in the Test Report Ref. No.
which forms part of this Certificate
comme indiqué dans le Rapport d'essais numéro de référence qui constitue partie de ce Certificat

E205786-V1-S3

This CB Test Certificate is issued by the National Certification Body
Ce Certificat d'essai OC est établi par l'Organisme National de Certification

Underwriters Laboratories Inc.®

Underwriters Laboratories Inc. / International Compliance Services
333 Pfingsten Road, Northbrook, IL 60062-2096
United States of America
TEL INT' 1-847-272-8800, Ext. 43008 FAX INT' 1-847-272-9562
email: jolanta.m.wroblewska@us.ul.com

Date: Issued: 19 July 2002

Signature:

Jolanta M. Wroblewska

Ref. No. E205786-V1-S3

July 12, 2002

COVER PAGE FOR TEST REPORT

IEC 950 (1991) Second Edition with Amdts. No. 1 (1992), No. 2 (1993), No. 3 (1995) and No. 4 (1996)

Equipment:	Component - Tape Drive
Model/Type:	Benchmark: DLT VS160 Dell: PowerVault 110T DLT VS160 HP: StorageWorks DLT-VS-160/320 IBM: 80/160GB Half-High DLTVS Tape Drive Tandberg: DLT VS160 Internal Tape Drive
Rated values from the marking plate:	5Vdc, 1.5 A / 12Vdc, 0.5 A
Applicant:	Benchmark Storage Innovations, Inc. 3122 Sterling Circle, Boulder, CO 80301 USA
Manufactured at:	Benchmark Storage Innovations, Inc. 3122 Sterling Circle Boulder, CO 80301 USA Mitsumi Philippines, Inc. Luzon Avenue, Bataan Economic Zone Mariveles, Bataan, PHILIPPINES Beyonics Mfg. Pte Ltd. 25 Serangoon N. Ave 5 Singapore 554914 Hewlett-Packard Singapore 1 Jalan Kilang Timor Pacific Tech Centre #04-01 / 02 / 03 / 05 Singapore 159402

This equipment has been tested according to standard IEC 950 (1991) Second Edition with Amdts. No. 1 (1992), No. 2 (1993), No. 3 (1995) and No. 4 (1996); EN60950 (1992) with Amdts. 1, 2, 3, 4 and 11.

All applicable tests according to the above specified standard(s) have been carried out.

Test results are valid only for the tested equipment.

This Test Report can be reproduced only in whole.

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This test report includes the following documents:

1. Cover and Comment Pages - 1 page
2. Test Report - 45 pages
3. National Deviations - Enclosure 1 - 33 pages
4. Photographs - Enclosure 2 - 5 pages
5. Additional Test Data - Enclosure 3 - 5 pages

TEST REPORT
IEC 950
Safety of information technology equipment

Report Reference No. ..... :	E205786-V1-S3
Compiled by (+ signature) ..... :	Richard Duran
Reviewed by (+ signature) ..... :	David Pedersen
Approved by (+ signature) ..... :	Nick Javelo
Date of issue ..... :	July 12, 2002

This report is based on a blank test report that was prepared by KEMA using information obtained from the TRF originator (see below).

Testing laboratory name ..... :	Underwriters Laboratories Inc.
Address ..... :	1655 Scott Boulevard, Santa Clara, CA 95050-4169, USA
Testing location ..... :	CBTL ☒ SMT ☐ TMP ☐
Address ..... :	1655 Scott Boulevard, Santa Clara, CA 95050-4169, USA
Client name ..... :	Benchmark Storage Innovations, Inc.
Address ..... :	3122 Sterling Circle, Boulder, CO 80301 USA
Standard ..... :	IEC 950:1991 + A1:1992 + A2:1993 + A3:1995 + A4:1996
Test procedure ..... :	CB Scheme
Procedure deviation ..... :	N/A
Non-standard test method ..... :	N/A
Test Report Form/blank test report	
Test Report Form No. ..... :	I950___D/97-06
TRF originator ..... :	FIMKO
Master TRF ..... :	reference No. I950 D, dated 97-02

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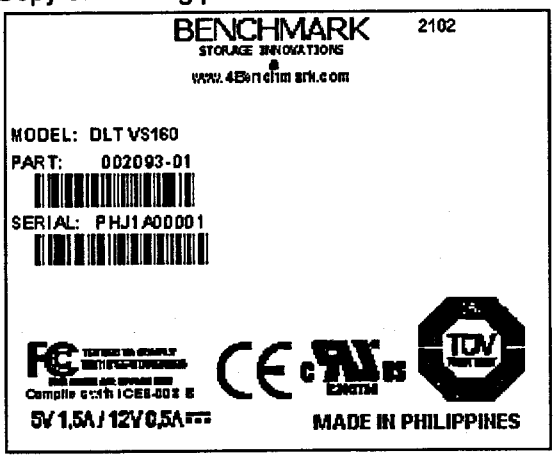
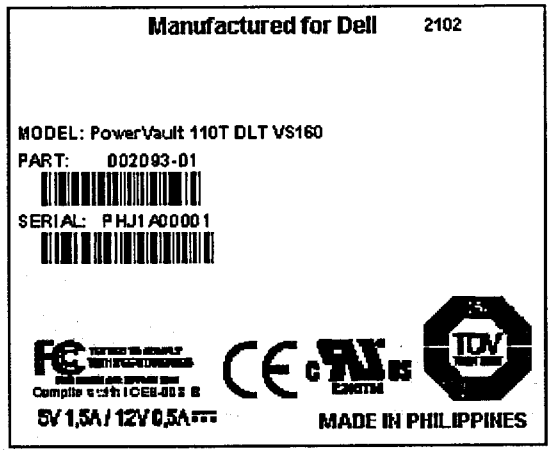
Test Item description ..... :	Component - Tape Drive
Trademark ..... :	Benchmark, Dell, HP, IBM and Tandberg
Model and/or type reference ..... :	Benchmark: DLT VS160 Dell: PowerVault 110T DLT VS160 HP: StorageWorks DLT-VS-160/320 IBM: 80/160GB Half-High DLTVS Tape Drive Tandberg: DLT VS160 Internal Tape Drive
Manufacturer ..... :	Benchmark Storage Innovations, Inc. 3122 Sterling Circle Boulder, CO 80301, USA
Rating(s) ..... :	5Vdc, 1.5 A / 12Vdc, 0.5 A

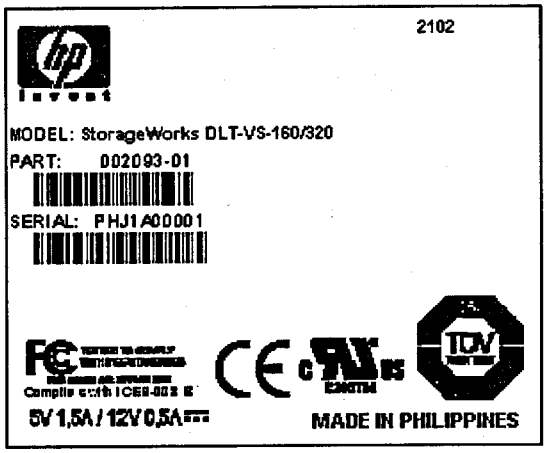
Copy of marking plate



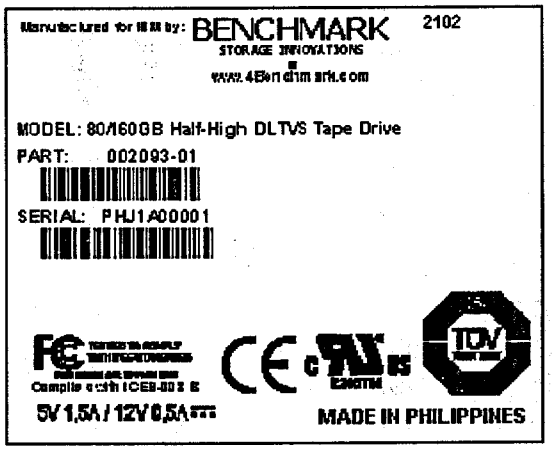
BM Internal



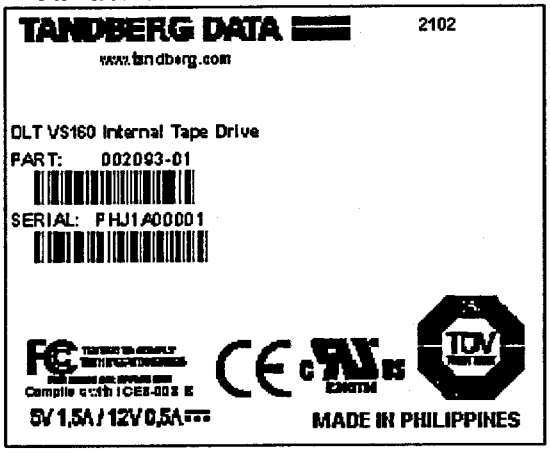
Dell Internal



HP Internal



IBM Internal



Tandberg Internal

Test item particulars:

Equipment mobility ..... : for building-in

Operating condition..... : continuous

Tested for IT power systems..... : No

IT testing, phase-phase voltage (V) ..... : N/A

Class of equipment..... : Class III (supplied by SELV).

Mass of equipment (kg)..... : < 18

Protection against ingress of water..... : IP20

Possible test case verdicts:

- test case does not apply to the test object ..... : N / A

- test object does meet the requirement ..... : Pass

- test object does not meet the requirement ..... : Fail

General remarks:

- "(see Enclosure #)" refers to additional information appended to the Report.
- "(see appended table)" refers to a table appended to the Report.
- Throughout this report a point is used as the decimal separator.

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
This report is not valid as a CB Test Report unless appended to a CB Test Certificate issued by a NCB in accordance with IECEE 02.

General product information:

This tape drive unit is designed to be installed inside an end-product.

This unit should be installed in an end-use product under the following Conditions of Acceptability:

1. The equipment is considered Class III (supplied by SELV).

2. A suitable overall enclosure should be provided when the unit is installed in the end-use product.

3. The unit employs a thermoplastic front bezel that was subjected to the tests per Annex A.1 and complies with the flammability requirements.

4. Spacings have not been evaluated as the unit is intended for connection to low-voltage secondary circuits only.

5. The terminals and connectors are suitable for factory wiring only.

Factory Locations:

Benchmark Storage Innovations, Inc.
3122 Sterling Circle
Boulder, CO 80301 USA

Mitsumi Philippines, Inc.
Luzon Avenue, Bataan Economic Zone
Mariveles, Bataan, PHILIPPINES

Beyonics Mfg. Pte Ltd.
25 Serangoon N. Ave 5
Singapore 554914

Hewlett-Packard Singapore
1 Jalan Kilang Timor
Pacific Tech Centre
#04-01 / 02 / 03 / 05
Singapore 159402

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
1	**GENERAL**		Pass
1.5	**Components**		Pass
1.5.1	Comply with IEC 950 or relevant component standard	(see appended table)	Pass
1.5.2	Evaluation and testing components	Certified components are used in accordance with their ratings, certifications and they comply with applicable parts of this Standard. Components, for which no relevant IEC-Standard exist, have been tested under the conditions occurring in the equipment, using applicable parts of IEC 950.	Pass
	Dimensions (mm) of mains plug for direct plug-in . :	Not direct plug-in equipment.	N/A
	Torque and pull test of mains plug for direct plug-in; torque (Nm); pull (N)		N/A
1.5.3	Transformers	No transformers in unit.	N/A
1.5.4	Flammability class of high voltage components (component; manufacturer; flammability) ..... :	No high-voltage components.	N/A
1.5.5	Interconnecting cables	This equipment is to be installed inside an end-use product.	N/A
1.5.6	Mains capacitors	Equipment is Class III.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
1.6	**Power interface**		Pass
1.6.1	Steady state input current	See enclosed test record. The steady state input current of the equipment did not exceed the RATED CURRENT by more than 10% under NORMAL LOAD.	Pass
	Current deviation during normal operating cycle	The current deviation during the normal operating cycle did not exceed the current rating.	Pass
1.6.2	Voltage limit of hand-held equipment	The unit is not a hand-held equipment.	N/A
1.6.3	Neutral conductor insulated from earth and body	No primary wiring provided.	N/A
1.6.4	Components in equipment intended for IT power system	Not intended for use on IT power systems.	N/A
1.6.5	Mains supply tolerance (V) ..... :	Equipment not evaluated for connection to a mains circuit. Tested at +5% and -5% of source.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

1.7	**Marking and instructions**		Pass
1.7.1	Rated voltage (V) ..... :	5 V dc, 12 V dc	Pass
	Symbol of nature of supply for d.c. ..... :	Provided on nameplate label.	Pass
	Rated frequency (Hz) ..... :	DC supply	N/A
	Rated current (A) ..... :	1.5 A for 5 V dc, 0.5 A for 12 V dc.	Pass
	Manufacturer ..... :	Benchmark Storage Innovations, Inc.	Pass
	Trademark ..... :	Benchmark, Dell, HP, IBM and Tandberg.	Pass
	Type/model ..... :	See page 1	Pass
	Symbol of Class II ..... :	Class III equipment	N/A
	Certification marks ..... :	UL, C-UL, and TUV PS	Pass
1.7.2	Safety instructions	Provided within the Installation and Operation Guide.	Pass
1.7.3	Short duty cycles	The equipment is intended for continuous operation.	N/A
1.7.4	Marking for voltage setting/frequency setting ..... :	DC only.	N/A
1.7.5	Marking at power outlets ..... :	No standard power outlets are provided.	N/A
1.7.6	Marking at fuseholders ..... :	No fuses are provided.	N/A
1.7.7.1	Protective earthing terminals	Class III equipment.	N/A
1.7.7.2	Terminal for external primary power supply conductors	No terminal for external primary conductors	N/A
1.7.8.1	Identification and location of switches and controls :	None provided.	N/A
1.7.8.2	Colours of controls and indicators ..... :	Only functional indicators use color.	Pass
1.7.8.3	Symbols according to IEC 417 ..... :	There are no switches in the equipment.	N/A
1.7.8.4	Figures used for marking ..... :	No figures are used.	N/A
1.7.8.5	Location of markings and indications for switches and controls ..... :	None provided.	N/A
1.7.9	Isolation of multiple power sources ..... :	Single power source.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.10	Instructions for installation to IT power system	Not intended for use on IT power systems.	N/A
1.7.11	Instructions when protection relies on building installation	Equipment is for building-in. Protection is part of the end product.	N/A
1.7.12	Marking when leakage current exceeds 3.5 mA	Class III product.	N/A
1.7.13	Indication at thermostats and regulating devices	No thermostats or similar regulating devices.	N/A
1.7.14	Language of safety markings/instructions	Reviewed only English markings/instructions.	Pass
	Language ..... :	May be provided in other languages upon request from the manufacturer.	—
1.7.15	Durability and legibility	Marking provided on UL Recognized Component labels suitable for surface they are applied upon and meet the durability test.	Pass
1.7.16	Removable parts	Marking not located in removable parts.	Pass
1.7.17	Warning text for replaceable lithium batteries	No lithium battery provided.	N/A
	Language ..... :	N/A	—
1.7.18	Operator access with a tool ..... :	To be evaluated in end-product. Unit is to be installed in an end-product.	N/A
1.7.19	Equipment for restricted access locations ..... :	Equipment not intended for installation in a RESTRICTED ACCESS LOCATION.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2	**PROTECTION FROM HAZARDS**		N/A
2.1	**Protection against electric shock and energy hazards**		N/A
2.1.1	Access to energized parts	Class III equipment	N/A
2.1.2	Protection against operator contact	Class III equipment	N/A
	Test by inspection ..... :	Class III equipment	N/A
	Test with test finger ..... :	Class III equipment	N/A
	Test with test pin ..... :	Class III equipment	N/A
2.1.3.1	Insulation of internal wiring in an ELV circuit accessible to operator	No internal wiring at ELV.	N/A
	Working voltage (V); distance (mm) through insulation ..... :	No internal wiring at ELV.	N/A
2.1.3.2	Operator accessible insulation of internal wiring at hazardous voltage	Class III equipment	N/A
2.1.4.1	Protection in service access areas	Class III equipment.	N/A
2.1.4.2	Protection in restricted access locations	Equipment not intended for installation in a RESTRICTED ACCESS LOCATION	N/A
2.1.5	Energy hazard in operator access area		N/A
2.1.6	Clearances behind conductive enclosures		N/A
2.1.7	Shafts of manual controls	The equipment does not contain any knobs, handles, levers, or the like.	N/A
2.1.8	Isolation of manual controls	The equipment does not contain any conductive knobs, handles, levers, or the like.	N/A
2.1.9	Conductive casings of capacitors	The equipment does not contain any capacitors with conductive casings which operate at ELV or hazardous voltage levels.	N/A
2.1.10	Risk of electric shock from stored charge on capacitors connected to mains circuit	Class III product	N/A
	Time-constant (s); measured voltage (V) ..... :	Class III product	—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.2	**Insulation**		N/A
2.2.1	Methods of insulation	This unit is designed to be located in an SELV circuit only.	N/A
2.2.2	Properties of insulating materials	Natural rubber, materials containing asbestos and hygroscopic materials are not used as insulation.	N/A
2.2.3	Humidity treatment	N/A	N/A
	Humidity (%) ..... :	N/A	—
	Temperature (°C) ..... :	N/A	—
2.2.4	Requirements for insulation	Required in clauses 2.9 and 5.3 were considered.	N/A
2.2.5	Insulation parameters	Requirements in clauses 2.2.6 and 2.2.7 were considered.	N/A
2.2.6	Categories of insulation	N/A	N/A
2.2.7.1	General rules for working voltages	Class III product.	N/A
2.2.7.2	Clearances in primary circuits	No primary circuits.	N/A
2.2.7.3	Clearances in secondary circuits		N/A
2.2.7.4	Creepage distances		N/A
2.2.7.5	Electric strength tests		N/A
2.2.8.1	Bridging capacitors ..... :	No bridging capacitors.	N/A
2.2.8.2	Bridging resistors	No bridging resistors.	N/A
2.2.8.3	Accessible parts		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.3	**Safety extra-low voltage (SELV) circuits**		Pass
2.3.1	Voltage (V) of SELV circuits under normal operating conditions and after a single fault ..... :	Compliance should be checked in the end-use product in the circuit supplying this unit.	—
2.3.2	Voltage (V) between any two conductors of SELV circuit(s) and for Class I equipment between any conductor of SELV circuit and equipment protective earthing terminal under normal operating conditions ..... :		Pass
2.3.3	Voltage (V) of SELV in the event of a single failure of basic or supplementary insulation or of a component ..... :	Less than 42.4 Vpk, 60 V d.c.	—
	Method used for separation ..... :	N/A	N/A
2.3.4	Additional constructional requirements	Requirement to be fulfilled in the end product.	N/A
2.3.5	Connection of SELV circuits to other circuits	Only connection is SELV to SELV.	N/A
2.4	**Limited current circuits**		N/A
2.4.2	Frequency (Hz) ..... :		—
	Measured current (mA) ..... :		N/A
2.4.3	Measured voltage (V) ..... :		—
	Measured capacitance (µF) ..... :		N/A
2.4.4	Measured voltage (V) ..... :		—
	Measured charge (µC) ..... :		N/A
2.4.5	Measured voltage (V) ..... :		—
	Measured energy (mJ) ..... :		N/A
2.4.6	Limited current circuit supplied from or connected to other circuits ..... :		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.5	**Provisions for earthing**		N/A
2.5.1	Class I equipment	Class III Equipment	N/A
	Warning label for service personnel		N/A
2.5.2	Protective earthing in Class II equipment		N/A
2.5.3	Switches/fuses in earthing conductors		N/A
2.5.4	Assured earthing connection for Class I equipment in systems comprising Class I and Class II equipment		N/A
2.5.5	Green/yellow insulation		N/A
2.5.6	Continuity of earth connections		N/A
2.5.7	Making and breaking of protective earthing connections		N/A
2.5.8	Disconnection protective earthing connections		N/A
2.5.9	Protective earthing terminals for fixed supply conductors or for non-detachable power supply cords		N/A
2.5.10	Corrosion resistance		N/A
2.5.11	Resistance (Ohm) of protective earthing conductors ≤ 0.1 Ohm		N/A
	Test current (A) ..... :		—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.6	**Disconnection from primary power**		N/A
2.6.1	General requirements	Isolation is to be determined in the end-use product.	N/A
2.6.2	Type of disconnect device ..... :		N/A
2.6.3	Disconnect device in permanently connected equipment		N/A
2.6.4	Parts of disconnect device which remain energized		N/A
2.6.5	Switches in flexible cords		N/A
2.6.6	Disconnection of both poles simultaneously for single-phase equipment		N/A
2.6.7	Disconnection of all phase conductors of supply in three-phase equipment		N/A
2.6.8	Marking of switch acting as disconnect device		N/A
2.6.9	Installation instructions if plug on power supply cord acts as disconnect device		N/A
	Language ..... :		—
2.6.11	Interconnected equipment		N/A
2.6.12	Multiple power sources		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.7	**Overcurrent and earth fault protection in primary circuits**		N/A
2.7.1	Basic requirements		N/A
2.7.2	Protection against faults not covered in 5.4		N/A
2.7.3	Short-circuit backup protection		N/A
2.7.4	Number and location of protective devices ..... :		N/A
2.7.5	Protection by several devices		N/A
2.7.6	Warning to service personnel		N/A
2.8	**Safety interlock**		N/A
2.8.2	Design		N/A
2.8.3	Protection against inadvertent reactivation		N/A
2.8.4	Reliability		N/A
2.8.5	Override an interlock		N/A
2.8.6.1	Contact gap (mm) ..... :		N/A
2.8.6.2	Switch performing 50 cycles		N/A
2.8.6.3	Electric strength test: test voltage (V) ..... :		N/A
2.8.7	Protection against overstress		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.9	**Clearances, creepage distances and distances through insulation**		Pass
	Nominal voltage (V) ..... :	Unit shall be located in an SELV circuit. Creepages and clearances were not measured. Item C of Clause 5.4.4 is applicable. Insulation is Class V-1 material.	—
	General		Pass
2.9.2	Clearances	Class III product - secondary circuits comply with Sub-clause 5.4.4.	Pass
2.9.2.1	Clearances in primary circuits		N/A
2.9.2.2	Clearances in secondary circuits	See 2.9.2	N/A
2.9.3	Creepage distances		N/A
	CTI tests ..... :		—
2.9.4.1	Minimum distances through insulation		N/A
2.9.4.2	Thin sheet material		N/A
	Number of layers (pcs) ..... :		N/A
	Electrical strength test: test voltage (V) ..... :		N/A
2.9.4.3	Printed boards		N/A
	Distance through insulation		N/A
	Electric strength test at voltage (V) for thin sheet insulating material		N/A
	Number of layers (pcs) ..... :		N/A
2.9.4.4	Wound components without interleaved insulation		N/A
	Number of layers (pcs) ..... :		N/A
	Two wires in contact inside component; angle between 45° and 90°		N/A
	Routine testing for finished component		N/A
2.9.5	Distances on coated printed boards		N/A
	Routine testing for electric strength		N/A
2.9.6	Enclosed and sealed parts		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
	Temperature T1 (°C) .....:		N/A
	Humidity % .....:		N/A
2.9.7	Spacings filled by insulating compound		N/A
	Temperature T1 (°C) .....:		N/A
	Humidity % .....:		N/A
2.9.8	Component external terminations		N/A
2.9.9	Insulation with varying dimensions		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.10	**Interconnection of equipment**		Pass
2.10.1	General requirements	SELV is only connected to SELV and Safety Earth.	Pass
2.10.2	Type of interconnection circuits ..... :	Interconnection circuits are SELV CIRCUITS.	Pass
2.10.3	ELV circuits as interconnection circuits		N/A
2.11	**Limited power source**		N/A
	Use of limited power source ..... :		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
3	**WIRING, CONNECTIONS AND SUPPLY**		Pass
3.1	**General**		Pass
3.1.1	Cross-sectional area of internal wiring/interconnecting cables	Secondary (SELV) wiring only. All conductors possess adequate cross-sectional areas for their intended application.	Pass
	Protection of internal wiring and interconnecting cables	Class III equipment (powered by SELV).	N/A
3.1.2	Wireways	The wires are well routed away from sharp edges, etc. and are adequately fixed to prevent excessive strain on wire and terminals.	Pass
3.1.3	Fixing of internal wiring	The wires are positioned in such a manner that prevents excessive strain, loosening of terminal connections and damage of conductor insulation.	Pass
3.1.4	Fixing of uninsulated conductors	The equipment does not have any uninsulated conductors.	N/A
3.1.5	Insulation of internal wiring	Insulation on internal conductors are considered to be of adequate quality and suitable for the application and the working voltages involved.	Pass
3.1.6	Wires coloured green/yellow only for protective earth connection	Class III product.	N/A
3.1.7	Fixing of beads and similar ceramic insulators	The equipment does not have any beads or similar insulators.	N/A
3.1.8	Required electrical contact pressure	The equipment does not have any screw-type connections.	N/A
3.1.9	Reliable electrical connections	The equipment does not have any electrical connections that rely on insulating material for adequate contact pressure.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
3.1.10	End of stranded conductor		N/A
3.1.11	Use of spaced thread screws/thread-cutting screws		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
3.2	**Connection to primary power**		N/A
3.2.1	Type of connection ..... :	Unit is not intended for direct connection to a mains supply.	N/A
	Design of product with more than one supply connection ..... :		N/A
3.2.2	Provision for permanent connection ..... :		N/A
	Size (mm) of cables and conduits ..... :		N/A
3.2.3	Appliance inlet		N/A
3.2.4	Type and cross-sectional area (mm^2) of power supply cord ..... :		N/A
3.2.5	Cord anchorage		N/A
	Test: 25 times; 1 s; pull (N) ..... :		—
	Longitudinal displacement ≤ 2 mm ..... :		N/A
3.2.6	Protection of power supply cord		N/A
3.2.7	Cord guard		N/A
	D (mm) ..... :		—
	Test: mass (g) ..... :		—
	Radius of curvature of the cord ≤ 1.5 D		N/A
3.2.8	Supply wiring space		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
3.3	**Wiring terminals for external power supply conductors**		N/A
3.3.1	Terminals		N/A
3.3.2	Special non-detachable cord		N/A
	Type of connection ..... :		—
	Pull test at 5 N		N/A
3.3.3	Screws and nuts		N/A
3.3.4	Fixing of conductors		N/A
3.3.5	Connection of connectors		N/A
3.3.6	Size of terminals		N/A
	Nominal thread diameter (mm) ..... :		N/A
3.3.7	Protection against damage of conductors		N/A
3.3.8	Terminal location		N/A
3.3.9	Test with 8 mm stranded wire		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4	**PHYSICAL REQUIREMENTS**		Pass
4.1	**Stability and mechanical hazards**		Pass
4.1.1	Stability tests		N/A
	Angle of 10°	Unit is intended for installation inside an end-product.	N/A
	Test: force (N) ..... :		N/A
4.1.2	Protection against personal injury	Hazardous moving parts of equipment are adequately enclosed and guarded.	Pass
4.1.3	Warning and means provided for stopping the moving part ..... :	The equipment does not have any hazardous moving parts.	N/A
4.1.4	Edges and corners	All edges and corners are judged to be sufficiently well rounded so as not to constitute a hazard.	Pass
4.1.5	Enclosure of a high pressure lamp		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4.2	**Mechanical strength and stress relief**		N/A
4.2.1	General		N/A
4.2.2	Internal enclosures 30 N ± 3 N; 5 s	Unit is intended for installation inside an end-product.	N/A
4.2.3	External enclosures 250 N ± 10 N; 5 s		N/A
4.2.4	Steel ball tests		N/A
	Fall test		N/A
	Swing test		N/A
4.2.5	Drop test		N/A
4.2.6	Heat test for enclosures of moulded or formed thermoplastic materials: 7 h; T (°C) ..... :		N/A
4.2.7	Compliance criteria		N/A
4.2.8	Mechanical strength of cathode ray tubes		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4.3	**Construction details**		Pass
4.3.1	Changing of setting for different power supply voltages		N/A
4.3.2	Adjustment of accessible control devices	The equipment does not have any operator accessible adjustable controls.	N/A
4.3.4	Prevention of dangerous concentration of dust, powder, liquid and gas	The equipment does not produce dust or employ powders, liquids or gases.	N/A
4.3.5	Fixing of knobs, grips, handles, levers		N/A
	Test: force (N) .....:		N/A
4.3.6	Driving belts/couplings shall not ensure electrical insulation	Electrical insulation does not rely upon driving belts or couplings.	N/A
4.3.7	Retaining of sleeves	Sleeving is not used as supplementary insulation.	N/A
4.3.9	Protection of loosening parts	No loosening of parts impairing creepage distances or clearances over supplementary or reinforced insulation is likely to occur.	N/A
4.3.11	Resistance to oil and grease	The insulation of the internal wiring is not exposed to oil, grease, etc.	N/A
4.3.12	Protection against harmful concentration of ionizing radiation, ultraviolet light, laser or flammable gases (for laser see IEC 825-1)	It is assumed that the visible LED indicators are Class I and operate at a wavelength in the 400-700 nm range. Specific data sheets for the LED may be available from the manufacturer.	Pass
4.3.13	Securing of screwed connections	Screwed connections are reliably secured.	Pass
4.3.15	Openings in the top of enclosure	Requirement to be fulfilled by the end product.	N/A
	Dimensions (mm) .....:	Requirement to be fulfilled by the end product.	—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.16	Openings in the sides of enclosure	Requirement to be fulfilled by the end product.	N/A
	Dimensions (mm) ..... :	Requirement to be fulfilled by the end product.	—
4.3.17	Interchangeable plugs and sockets	The equipment does not have any interchangeable plugs/sockets.	Pass
4.3.18	Torque test for direct plug-in equipment		N/A
	Additional torque (Nm) ..... :		N/A
4.3.19	Protection against excessive pressure	The equipment does not contain liquids.	N/A
4.3.20	Protection of heating elements in Class I equipment	The equipment does not have any heating elements.	N/A
4.3.21	Protection of lithium batteries		N/A
	Construction of protection circuit ..... :		N/A
4.3.22	Ageing of barrier/screen secured with adhesive		N/A
	Day 1: temperature (°C); time (weeks) ..... :		N/A
	Day 8/22/57: a) temperature (°C) for 1 h b) temperature (°C) for 4 h c) temperature (°C) over 8 h ..... :		N/A
	Day 9/23/58: a) relative humidity (%) for 72 h b) temperature (°C) for 1 h c) temperature (°C) for 4 h d) temperature (°C) over 8 h ..... :		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

4.4	**Resistance to fire**		Pass
4.4.1	Methods of achieving resistance to fire	Method 1: Selection and application of components and materials which minimize the possibility of ignition and spread of flame.	Pass
4.4.2	Minimizing the risk of ignition	See table 1.5.1 The maximum working temperature of electrical components used under NORMAL LOAD conditions is less than that necessary to cause ignition of their surroundings or of lubricating materials with which they are likely to come into contact.	Pass
	Printed board: manufacturer; type; flammability .... :	All printed wiring board materials have been tested for compliance under the Underwriters Laboratories Recognized Component program. All printed wiring boards have a minimum flammability rating of V-1.	Pass
4.4.3	Flammability of materials and components	Requirement to be fulfilled by the end product.	Pass
4.4.3.2	Material and component: manufacturer; type; flammability ..... :	All internal materials are rated V-2 or better or are mounted on a PWB rated V-1 or better	Pass
4.4.3.3	Exemptions ..... :		N/A
4.4.3.4	Wiring harnesses: manufacturer; flammability ..... :	Internal wiring is UL Recognized, marked VW-1 or FT-1 and strapped by individual cable ties (where needed).	Pass
4.4.3.5	Cord anchorage bushings: manufacturer; flammability ..... :	The equipment does not have a non-detachable power supply cord.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.3.6	Air filter assemblies: manufacturer; flammability ... :	The equipment does not have any air filters.	N/A
4.4.4	Enclosures and decorative parts: manufacturer; flammability ..... :	The unit is to be installed in an end-product. Fire enclosure to be provided in the end product.	N/A
4.4.5	Conditions for fire enclosures	The unit is to be installed in an end-product. Fire enclosure to be provided in the end product.	N/A
4.4.5.1	Components which require fire enclosure: manufacturer; flammability ..... :	The unit is to be installed in an end-product. Fire enclosure to be provided in the end product.	N/A
4.4.5.2	Components not requiring fire enclosure .....:		N/A
4.4.6	Fire enclosure construction	A suitable Fire Enclosure shall be provided in the end-use product. The front bezel is rated V-1 minimum.	N/A
4.4.7	Doors and covers in fire enclosures	To be evaluated in the end-use product.	N/A
4.4.8	Flammable liquids	The equipment does not use any flammable liquids.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
5	**THERMAL AND ELECTRICAL REQUIREMENTS**		Pass
5.1	**Heating**		Pass
	Heating tests	See enclosed test record.	Pass
5.2	**Earth leakage current**		N/A
5.2.1	General		N/A
5.2.2	Leakage current		N/A
	Test voltage (V) ..... :		—
	Measured current (mA) ..... :		—
	Max. allowed current (mA) ..... :		—
5.2.3	Single-phase equipment	The unit is to be installed in an end-product. Earth leakage to be determined in the end product.	N/A
	Test voltage (V) ..... :		—
	Measured current (mA) ..... :		—
	Max. allowed current (mA) ..... :		—
5.2.4	Three-phase equipment		N/A
	Test voltage (V) ..... :		—
	Measured current (mA) ..... :		—
	Max. allowed current (mA) ..... :		—
5.2.5	Equipment with earth leakage current exceeding 3.5 mA		N/A
	Test voltage (V) ..... :		—
	Measured current (mA) ..... :		—
	Max. allowed current (mA) ..... :		—
	Cross-sectional area (mm²) of internal protective earthing conductor ..... :		—
	Warning label		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
5.3	**Electric strength**		N/A
5.3.1	General		N/A
5.3.2	Test procedure		N/A
5.4	**Abnormal operating and fault conditions**		Pass
5.4.2	Motors	See enclosed test record.	Pass
5.4.3	Transformers		N/A
5.4.4	Compliance of operational insulation		Pass
	Method used ..... :	Item C of this clause is applicable. Insulation is Class V-1 material.	Pass
5.4.5	Electromechanical components in secondary circuits	The equipment does not have any electromechanical components in the secondary.	N/A
5.4.6	Other components and circuits	See enclosed test record.	Pass
5.4.7	Test in any expected condition and foreseeable misuse		N/A
5.4.8	Unattended use of equipment having thermostats, temperature limiters etc.		N/A
5.4.9	Compliance	All motors listed in the component table have been tested in accordance with the locked rotor requirements of Annex B7.	Pass
5.4.10	Ball-pressure test of thermoplastic parts; impression shall not exceed 2 mm		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
6	**CONNECTION TO TELECOMMUNICATION NETWORKS**		N/A
6.1	**General**		N/A
6.2	TNV circuits		N/A
6.2.1.1	Limits of the TNV circuits		N/A
6.2.1.1 a)	TNV-1 circuits		N/A
6.2.1.1 b)	TNV-2 and TNV-3 circuits		N/A
6.2.1.2	Separation from other circuits and from accessible parts		N/A
	Voltage (V) in SELV circuits, TNV-1 circuits and accessible conductive parts in event of single insulation fault or component failure ..... :		N/A
6.2.1.3	Operating voltages generated externally		N/A
	Voltage (V) in SELV circuit, TNV-1 circuit or accessible conductive part ..... :		N/A
6.2.1.4	Separation from hazardous voltages ..... :		N/A
	Insulation between TNV circuit and circuit at hazardous voltage		N/A
	Method used ..... :		N/A
6.2.1.5	Connection of TNV circuits to other circuits		N/A
	Insulation (mm) between TNV circuit supplied conductively from secondary circuit and hazardous voltage circuit ..... :		N/A
6.2.2.1	Protection against contact with bare conductive parts of TNV-2 and TNV-3 circuits		N/A
	Test with test finger		N/A
	Test with test probe		N/A
6.2.2.2	Battery compartments		N/A
	Marking next to door/on door		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
6.3	**Protection of telecommunication network service personnel, and users of other equipment connected to the telecommunication network, from hazards in the equipment**		N/A
6.3.1	Protection from hazardous voltages		N/A
6.3.2	Use of protective earthing		N/A
	Language of installation instructions ..... :		N/A
6.3.3.1	Insulation between TNV circuit and parts or circuitry that may be earthed		N/A
6.3.3.2	Exclusions ..... :		N/A
6.3.4.1	Limitation of leakage current (mA) to telecommunication network ..... :		N/A
6.3.4.2	Summation of leakage currents from telecommunication network ..... :		N/A
6.4	**Protection of the equipment user from voltages on the telecommunication network**		N/A
6.4.1	Separation requirements		N/A
6.4.2	Test procedure		N/A
6.4.2.1	Impulse test: separation between TNV-1 circuits/TNV-3 circuits and:		N/A
6.4.2.1 a)	unearthed conductive parts/non-conductive parts of the equipment which are held or touched during normal use; test at 2.5 kV		N/A
6.4.2.1 b)	parts and circuitry that can be touched by the test finger except contacts of connectors that cannot be touched by test probe; test at 1.5 kV		N/A
6.4.2.1 c)	circuitry which is provided for connection of other equipment; test at 1.5 kV		N/A
6.4.2.2	Electric strength test: separation between TNV-1 circuits/TNV-3 circuits and:		N/A
6.4.2.2 a)	unearthed conductive parts/non-conductive parts of the equipment which are held or touched during normal use; test at 1.5 kV		N/A
6.4.2.2 b)	parts and circuitry that can be touched by the test finger except contacts of connectors that cannot be touched by test probe; test at 1.0 kV		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
6.4.2.2 c)	circuitry which is provided for connection of other equipment; test at 1.0 kV		N/A
6.4.2.3	Compliance criteria		N/A
6.5	**Protection of telecommunication wiring system from overheating**		N/A
	Maximum continuous output current (A) ..... :		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
A	**ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE**		Pass
A.1	Flammability test for fire enclosures of moveable equipment having a total mass exceeding 18 kg, and of stationary equipment		Pass
A.2	Flammability test for fire enclosures of moveable equipment having a total mass not exceeding 18 kg, and for materials located within fire enclosures		N/A
A.3	High current arcing ignition test		N/A
A.3.6	Number of arcs .....:		N/A
A.4	Hot wire ignition test		N/A
A.4.6	Ignition time (s) .....:		N/A
A.5	Hot flaming oil test		N/A
A.6	Flammability test for classifying materials V-0, V-1 or V-2		N/A
A.7	Flammability test for classifying foamed materials HF-1, HF-2 or HBF		N/A
A.8	Flammability test for classifying materials HB		N/A
A.9	Flammability test for classifying materials 5V		N/A
A	Tested material		Pass
	Preconditioning: 7 days (168 h); temperature (°C) :	7 days @ 70°C.	—
	Mounting of samples during test ..... :	Normal use.	—
	Wall thickness ..... :	0.8mm.	—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
	Sample 1 burning time ..... :	(cool gray) - 1st app. - 0 sec., 2nd app. - 0 sec., 3rd app. - 2 sec., 4th app. - 0 sec., 5th app. - 2 sec. (natural) - 1st app. - 0 sec., 2nd app. - 0 sec., 3rd app. - 0 sec., 4th app. - 1 sec., 5th app. - 1 sec. (opal) - 1st app. - 0 sec., 2nd app. - 5 sec., 3rd app. - 0 sec., 4th app. - 5 sec., 5th app. - 0 sec. (black) - 1st app. - 0 sec., 2nd app. - 0 sec., 3rd app. - 4 sec., 4th app. - 4 sec., 5th app. - 0 sec.	Pass
	Sample 2 burning time ..... :	(cool gray) - 1st app. - 0 sec., 2nd app. - 0 sec., 3rd app. - 5 sec., 4th app. - 5 sec., 5th app. - 5 sec. (natural) - 1st app. - 4 sec., 2nd app. - 5 sec., 3rd app. - 0 sec., 4th app. - 1 sec., 5th app. - 4 sec. (opal) - 1st app. - 0 sec., 2nd app. - 5 sec., 3rd app. - 0 sec., 4th app. - 0 sec., 5th app. - 0 sec. (black) - 1st app. - 1 sec., 2nd app. - 0 sec., 3rd app. - 1 sec., 4th app. - 0 sec., 5th app. - 2 sec.	Pass

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
	Sample 3 burning time ..... :	(cool gray) - 1st app. - 0 sec., 2nd app. - 2 sec., 3rd app. - 0 sec., 4th app. - 0 sec., 5th app. - 0 sec. (natural) - 1st app. - 0 sec., 2nd app. - 3 sec., 3rd app. - 2 sec., 4th app. - 1 sec., 5th app. - 8 sec. (opal) - 1st app. - 0 sec., 2nd app. - 2 sec., 3rd app. - 0 sec., 4th app. - 0 sec., 5th app. - 0 sec. (black) - 1st app. - 0 sec., 2nd app. - 1 sec., 3rd app. - 1 sec., 4th app. - 2 sec., 5th app. - 6 sec.	Pass
	Material: compliance with the requirements	Material complies.	Pass
	Manufacturer of tested material ..... :	See critical components list.	—
	Type of tested material ..... :	See critical components list.	—
	Additional information ..... :	See critical components list.	—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

B	**ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS**		Pass
B.1	General requirements	DC Motors used in equipment.	N/A
	Position ..... :	The tests were carried out in the equipment.	—
	Manufacturer ..... :	(see appended Table 1.5.1). All motors included in the tabulation of components have been tested under locked-rotor conditions.	—
	Type ..... :	dc motors	—
	Rated voltage (V) or current (A) ..... :		—
B.2	Test conditions	See enclosed test record.	Pass
B.3	Maximum temperatures	See enclosed test record.	Pass
B.4	Running overload test		N/A
B.5	Locked-rotor overload test		N/A
	Test duration (days) ..... :		—
	Electric strength test: test voltage (V) ..... :		—
B.6	Running overload test for DC motor in secondary circuits	Electronic drive circuits maintain substantially constant drive current.	N/A
B.7	Locked-rotor overload test for DC motor in secondary circuits		Pass
B.7.2	Test time (h) ..... :		N/A
B.7.3	Test time (h) ..... :	The motors were operated with the rotor locked for 7 h.	Pass
B.8	Test for motors with capacitor		N/A
B.9	Test for three-phase motors		N/A
B.10	Test for series motors		N/A
	Test voltage (V) ..... :		—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

C	**ANNEX C, TRANSFORMERS**		N/A
	Position ..... :		—
	Manufacturer ..... :		—
	Type ..... :		—
	Rated values ..... :		—
	Temperatures		N/A
	Thermal cut-out		N/A
C.1	Overload test		N/A
	Conventional transformer		N/A
C.2	Insulation		N/A
	Precautions ..... :		N/A
	Retaining of end turns of all windings		N/A
	Earthing test at 25 A		N/A
C.3	Electric strength test		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
H	**ANNEX H, IONIZING RADIATION**		N/A
	Ionizing radiation		N/A
	Measured radiation ..... :	X-Radiation is not present.	—
	Measured high-voltage (kV) ..... :		—
	Measured focus voltage (kV) ..... :		—
	CRT markings ..... :		—
	Certified by ..... :		—
	Standard used ..... :		—
U	**ANNEX U, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION**		N/A
	See separate test report		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

1.5.1	**TABLE: list of critical components**				Pass
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
PTC	Littelfuse	1812L125	6 V dc, 1.25 A	UL 1434, IEC60730	UL, TUV Rheinland
Printed Wiring Board	Various	Various	V-1 minimum	UL 94	UL
Supply motor	Mitsumi	72 6528 A	12 V dc	IEC 60950 A4	-
Take Up Motor	Mitsumi	72 6542 A	12 V dc	IEC 60950 A4	-
Load/Unload Motor	Nidec Copal	LA14-371N	11 V dc	IEC 60950 A4	-
Internal Plastics	Various	Various	V-2 minimum	UL 94	UL
Front Bezel	Plastic World, Ltd. (Cho Ei)	CAP-NNNNNXXXM	0.8 mm thick (all colors) Tested per Clause A.1 (The four colors tested represent all colors)	UL 94, IEC 60950	UL
[1]) an asterisk indicates a mark which assures the agreed level of surveillance					

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

1.6	**TABLE: electrical data (in normal conditions)**					Pass
fuse #	I rated (A)	U (V)	P (W)	I (mA)	I fuse (mA)	condition/status

supplementary information:

See enclosed test record.

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

2.9.2 and 2.9.3	**TABLE: clearance and creepage distance measurements**					N/A
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
supplementary information:						

2.9.4.1	**TABLE: distance through insulation measurements**			N/A
distance through insulation di at/of:	U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
supplementary information:				

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

5.1	**TABLE: temperature rise measurements**		Pass
	test voltage (V) ..... :		—
	t1 (°C) ..... :		—
	t2 (°C) ..... :		—

temperature rise dT of part/at:	dT (K)	required dT (K)

temperature rise dT of winding:	R_1 (Ω)	R_2 (Ω)	dT (K)	required dT (K)	insulation class

supplementary information:

See enclosed test record.

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

5.3	**TABLE: electric strength measurements**		N/A
test voltage applied between:		test voltage (V)	breakdown
			Yes / No
supplementary information:			

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

5.4	**TABLE: fault condition tests**						Pass
	ambient temperature (°C) ..... :						—
	model/type of power supply ..... :					N/A	—
	manufacturer of power supply ..... :					N/A	—
	rated markings of power supply ..... :					N/A	—
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
supplementary information: See enclosed test record.							

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

5.4.10	**TABLE: ball pressure test of thermoplastics**			N/A
	required impression diameter (mm) ..... :	<= 2 mm		—
part		test temperature (°C)	impression diameter (mm)	
supplementary information:				

ENCLOSURE No. 1

NATIONAL DIFFERENCES TO IEC 950 (1991) SECOND EDITION
(including Amendments 1 to 4)

Argentina
Australia
Austria
Belgium (only Group differ.)
China
Czech Republic (only Group differ.)
Denmark
Finland
France
Germany
Greece (only Group differ.)
Group
Hungary (only Group differ.)
India (no differ. declared)
Ireland (only Group differ.)
Israel
Italy (only Group differ.)
Japan
Korea
Netherlands (only Group differ.)
Norway
Poland
Russia (no differ. declared)
Singapore
Slovakia (no differ. declared)
Slovenia (only Group differ.)
South Africa (no differ. declared)
Spain (only Group differ.)
Sweden
Switzerland
United Kingdom
Yugoslavia (no differ. declared)

(Total 33 Pages including this Cover Page)

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Argentinean Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
General	Household power supply sources are 220 V a.c., 50 Hz	DC supply.	N/A
1.5.2	Certified plug according to IRAM 2063 (two prong) or IRAM 2073 (three prong) are used in accordance with their ratings	DC supply.	N/A
1.7.2	Operating/safety instructions made available to the user in Spanish. Product information appears on the product..	Client has been informed of the requirement.	N/A
1.7.14	Language of safety markings/instructions is Spanish	Client has been informed of the requirement.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
Australian and New Zealand Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.2.12.2	Add: TT power systems are not permitted in Australia or New Zealand.	Not a TT power system.	N/A
1.2.12.3	Add: IT power systems are not permitted in Australia or New Zealand.	Not a IT power system.	N/A
1.5.1	Add to paragraph 1: "or the relevant Australian or New Zealand Standard".	Certified components are used in accordance with their ratings, certifications and they comply with applicable parts of this Standard. Components, for which no relevant IEC-Standard exist, have been tested under the conditions occurring in the equipment, using applicable parts of IEC 950.	Pass
1.5.2	Add to the first and third dashed items after the words "IEC Component Standard": "or the relevant Australian or New Zealand Standard".	Certified components are used in accordance with their ratings, certifications and they comply with applicable parts of this Standard. Components, for which no relevant IEC-Standard exist, have been tested under the conditions occurring in the equipment, using applicable parts of IEC 950.	Pass
1.7.14	Add to Paragraph 1: In Australia and New Zealand all safety instructions shall be in English.	All safety instructions are in English.	N/A
2	Add after Clause 2: For the limit of direct current from a.c. appliances, refer to AS/NZS Appendix 3.		N/A
2.3.7	Add "Australia" to Note 2.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
3.2.2	Substitute for Table 10: For sizes of cables and conduits in Australia, refer to AS 3000.		N/A
3.2.4	Substitute for Table 11: For sizes of conductors in power supply cords use the following Table 11: TABLE 11 **SIZES OF CONDUCTORS IN POWER SUPPLY CORDS** Rated current of Appliance [A] — Nominal cross-section area [mm^2] Over 0.2 up to and including 3 — 0.5* Over 3 up to and including 7.5 — 0.75 Over 7.5 up to and including 10 — 1 Over 10 up to and including 16 — 1.5 Over 16 up to and including 25 — 2.5 Over 25 up to and including 32 — 4 Over 32 up to and including 40 — 6 Over 40 up to and including 63 — 10 *This nominal cross-sectional area is only allowed for Class II appliances if the length of the power supply cord, measured between the point where the cord or cord guard, enters the appliance, and the entry to the plug, does not exceed 2 m (0.5 mm^2 three-core supply flexible cords are not permitted; see Note 2 to Table 2.17 of AS/NZS 3191).		N/A
4.4.1	Add after Clause 4.4.1: For an alternative resistance to fire test, refer to AS/NZS Appendix 2.		N/A
6.4.2	Replace the first paragraph of 6.4.2 by: In Australia, compliance with 6.4.1 is checked by the tests of both 6.4.2.1 and 6.4.2.2. Delete: The fourth paragraph "The choice of the tests..... manufacturer".		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
6.4.2.1	In Australia the following impulse test shall apply (replace clause 6.4.2.1): **Impulse test** The electrical separation is subjected to ten impulses of alternating polarity, using the impulse test generator of Annex N. The interval between successive impulses is 60 s and the initial voltage, Uc is: -in case (a) of 6.4.1: 7 kV for hand-held telephones and for headsets; and 2.5 kV for other equipment; and -in cases (b) and (c): 1.5 kV. **NOTES:** 1. The 7 kV impulse is to simulate lightning surges on typical Australian rural and semi-rural network lines. 2. The value of 2.5 kV for case (a) has been chosen primarily to ensure adequacy of the insulation concerned, and it does not necessarily simulate likely overvoltages.		N/A
6.4.2.2	In Australia the following electric strength test shall apply (replace clause 6.4.2.2): **Electric strength test** The electrical separation is subjected for 60s to a substantially sinusoidal voltage having a frequency of 50 Hz or 60 Hz, or to a d.c. voltage equal to the peak value of the prescribed a.c. voltage. The a.c. test voltage is: -in case (a) of 6.4.1: 3 kV -in cases (b) and (c): 1.5 kV The voltage is gradually raised from zero to the prescribed voltage and then held at that value for 60 s. **NOTES:** 1. Where there are capacitors across the insulation under test, it is recommended that d.c. test voltages are used. 2. The 3 kV and 1.5 kV values have been determined considering the low frequency induced voltages from the power supply distribution system.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
Annex A	Add after Annex title: For an alternative resistance to fire test, refer to AS/NZS, Appendix 2.		N/A
Appendix 2 X2.0	GENERAL. This test is an alternative to the tests in Annex A to allow approval of equipment which has inadequate documentation to verify having been tested to Annex A.		N/A
X2.1	Solid insulating materials and non-metallic enclosures.		N/A
X2.1.1	General Requirements. Parts of non-metallic material shall be resistant to ignition and spread of fire. This requirement does not apply to decorative trims, knobs wiring insulation and other parts not likely to be ignited or to propagate flames from inside the equipment. Compliance is checked by the tests of Clauses X2.1.2, X2.1.3 and X2.1.4 as applicable and if necessary by the test of Clause X2.2.		N/A
X2.1.2	**Non-metallic material.** Relevant parts of non-metallic material are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 550 °C. The 550 °C glow-wire test need not be carried out on parts which are made of material classified as FH 3-40 mm/min or better according to IEC 707. The sample of material submitted to the test of IEC 707 shall be no thicker than the relevant part. Insulating material of winding bobbins and formers are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 650 °C		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
X2.1.3	**Attended equipment.** For equipment which is operated while attended, parts of insulating material supporting, in contact with or in close proximity to current-carrying connections, other than those in safety extra-low voltage circuits are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 650 °C. However, parts of insulating material supporting, in contact with or in close proximity to screw connections which carry a current exceeding 0.5 A during normal operation and which are likely to be made or remade during installation, user maintenance or when replacing a supply cord assembled with the appliance by Type X attachment, are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 750 °C..		N/A
X2.1.4	**Unattended equipment.** For equipment which is operated while unattended, parts of insulating material supporting, in contact with or in close proximity to current-carrying connections, other than those in safety extra-low voltage circuits are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 750 °C. However, parts of insulating material supporting, in contact with or in close proximity to screw connections which carry a current exceeding 0.5 A during normal operation and which are likely to be made or remade during installation, user maintenance or when replacing a supply cord assembled with the appliance by Type X attachment, are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 850 °C.		N/A
X2.2	ADDITIONAL TEST REQUIREMENTS. If parts, other than enclosures, do not withstand the test of Clauses X2.1.3 or X2.1.4, by failure to extinguish within 30 s after removal of the glow-wire tip, the needle-flame test of AS/NZS 3350.1 is made on all parts of non-metallic material which are within a distance of 50 mm or which are likely to be impinged upon by flame during the test of Clauses X2.1.3 or X2.1.4. Parts shielded by a separate barrier which meets the needle-flame test are not tested.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
Appendix 3	D.C. COMPONENT FROM A.C. EQUIPMENT. Equipment shall be designed so that in normal use the value of any direct current in the equipment neutral will not contribute unduly to the failure of the installation earth electrode by corrosion. Any device such as an isolating transformer intended to prevent direct current in the supply shall be an integral part of the equipment.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Austrian Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
6.4.2.1	Equipment shall comply with Uc = 2.0 kV in cases b) and c).		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Chinese Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.4.5	The minimum supply tolerance is –10%, +10% according to Chinese situation. (GB4943 sub-clause 1.4.5)		N/A
1.5.2	IEC standard for plug is IEC 60083; The Chinese National standard for Plugs is GB1002-1996, which is not equivalent with IEC 60083		N/A
1.6.5	The minimum supply tolerance is –10%, +10% according to Chinese situation. (GB4943 sub-clause 1.65)		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Danish Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.2.4.1	Certain types of Class I appliances (see sub-clause 3.2.1) may be provided with a plug not establishing earthing continuity when inserted into Danish socket-outlets.		N/A
1.7.2	Supply cords of Class I equipment, which is delivered without a plug, must be provided with a visible tag with the following text: **"Vigtigt !** **Lederen med grøn/gul isolation må kun tilsluttes en klemme mærket** (IEC 417, No. 5019) **eller** (IEC 417, No. 5017)." If essential for the safety of the equipment, the tag must in addition be provided with a diagram, which shows the connection of the other conductors, or be provided with the following text: **"For tilslutning af de øvrige ledere, se medfølgende installationsvejledning".**		N/A
1.7.5 (a)	Socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a, when used on Class I equipment.		N/A
1.7.5 (b)	Class II equipment shall not be fitted with socket-outlets for providing power to other equipment.		N/A
1.7.17	Caution text concerning lithium batteries: ADVARSEL! Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage tilleverandøren. The size of the warning must be a minimum of 26 x 52 mm, the background shall be yellow color with black frame, and the text in black color. A white background is acceptable in the User's Instruction and in the Service Manual.		N/A
2.5.2	Add after the first paragraph: "The above exception is not acceptable in PLUGGABLE EQUIPMENT TYPE A."		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
3.2.1	Supply cord of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to the Heavy Current Regulations, Section 107-2-D1. Class I equipment provided with socket-outlets with earth contact or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a. If poly-phase equipment and single-phase equipment having a rated current exceeding 10 A is provided with a supply cord with a plug, this plug shall be in accordance with the Heavy Current Regulations, Section 107-1-D1 or EN 60309-2.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Finnish Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
6.2.1.4b	Method b) is permitted only for permanently connected equipment or for pluggable equipment Type B.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

French Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
2.3.3	Method 3 is not acceptable.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
German Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.7.14	Directions for use with rules to prevent certain hazards for (among others) maintenance of the technical labor equipment, also for imported technical labor equipment shall be written in the German language. NOTE: Of this requirement, rules for use even only by service personnel are not exempted.	Client has been informed of the requirement.	N/A
Annex H (a)	a) A license is required by those who operate an X-ray emission source		N/A
Annex H (b)	b) A license in accordance with Clause 1 is not required by those who operate an X-ray emission source on which the electron acceleration voltage does not exceed 20 kV if : 1) The local dose rate at a distance of 0.1 m from the surface does not exceed 1 µSv/h and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated and ii) the electron acceleration voltage must not e the manufacturer or importer		N/A
Annex H (c)	c) A license in accordance with Clause 1 is also not required by persons who operate an X-ray emission source on which the electron acceleration voltage exceeds 20 kV if: 1) The X-ray emission source has been granted a type approval and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated, ii) the device stipulated by the manufacturer or importer guarantees that the maximum permissible local dose rate in accordance with the type approval is not exceeded and iii) the electron acceleration voltage does not exceed the maximum value stipulated by the manufacturer or importer		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
Annex H (d)	d) Furthermore, a license in accordance with Clause 1 is also not required by persons who operate X-ray emission source on which the electron acceleration voltage does not exceed 30 kV if: 1) the X-rays are generated only intrinsically safety CRTs complying with Enclosure III, No. 6 2) the values stipulated in accordance with Enclosure III, No. 6.2 are limited by technical measured and specified in the device and 3) it is adequately indicated on the X-ray emission source that the X-rays generated are adequately screened by the intrinsically safe CRT.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Group/CENELEC Common Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.7.2	Delete Note 4.		N/A
2.3.3	Delete Method 4 and the line in Note 1 relating to this method.		N/A
2.3.6	Delete Note.		N/A
2.3.7	Replace text of this clause by: Void.		N/A
2.5.2	Delete the existing note - (refer to national deviations).		N/A
2.7.1	Replace the text of this Sub-Clause by: Basic requirements To protect against excessive current, short-circuits and earth faults in primary circuits, protective devices shall be included either as integral parts of the equipment or as a part of the building installation, subject to all of the following a), b),c) and d):		N/A
(a)	a). Except as detailed in b) and c), protective devices necessary to comply with the requirements of 5.4 shall be included as integral parts of the equipment.		N/A
(b)	b). For components in series with the mains input to the equipment such as the supply cord, appliance coupler, RFI-filter and switch, short-circuit and earth fault protection may be provided by protective devices in the building installation.		N/A
(c)	c). It is permitted for equipment with a RATED CURRENT exceeding 16 A, which is PLUGGABLE EQUIPMENT TYPE B or PERMANENTLY CONNECTED EQUIPMENT, to rely on dedicated overcurrent and short circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instruction.		N/A
(d)	d). If reliance is placed on protection in the building installation, the installation instructions shall comply with 1.7.11 except that for PLUGGABLE EQUIPMENT TYPE A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet and 1.7.11 does not apply.		N/A
2.7.2	Replace the text of this sub-clause by: "Void".		N/A
2.8.4	Delete note.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
2.9.4.1	Fourth dashed paragraph, replace "nominal" by "normal".		N/A
2.9.4.2	Amend the last line on page 117a as follows: "Solvent-based enamel coating on winding wire is not considered to be insulation in thin sheet material." Add a new sentence below the text on page 117a as follows: "Requirements for wound components are given in 2.9.4.4."		N/A
2.9.4.4	Modify the title as follows: **Wound components** "Unless one of the following situations applies, interleaved BASIC, SUPPLEMENTARY or REINFORCED INSULATION complying with 2.9.4.1 or 2.9.4.2 shall be provided between the windings BASIC, SUPPLEMENTARY, DOUBLE or REINFORCED INSULATION is permitted in a wound component without interleaved insulation using one of the following constructions: - the insulation on the winding wire complies with 2.9.4.1; or - the winding wire complies with annex U; or - the insulation between the windings is provided for separation between TNV circuits and other parts in compliance with 6.4.1. NOTE - Examples of insulation of winding wire complying with Annex U are polyamide and FEP.		N/A
2.11	Delete note 1, 2 and 3.		N/A
3.2.2	Delete the note and in Table 10, delete the values in parentheses.		N/A
3.2.4	Replace as follows: "245 IEC 53" by "H05 RR-F", "227 IEC 52" by "H03-VV-F or H03 VVH2-F" and "227 IEC 53" by "H05-VV-F or H05 VVH2-F". In Table 11, replace the first four lines by the following: Up to and including 6 0.75 Over 6 up to and including 10 1.0 (0.75)[2] Over 10 up to and including 16 1.5 (1.0)[3] In the conditions applicable to Table 11, delete the words "in some countries" in condition 1. Delete the second sentence in the Note.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
3.3.5	In Table 13, replace the fourth and the fifth lines by: Over 10 up to & including 16 1.5 to 2.5 1.5 to by 4.		N/A
4.4.4	Delete Note 2.		N/A
4.3.12	Protection against harmful concentration of ionizing radiation, ultraviolet light, laser or flammable gases (for LED's or laser see EN 60825-1). [EN 60950 Amendment. A11:1997]	The equipment does not generate ionizing radiation or contain flammable liquids or gases. It is assumed that the visible LED indicators are Class I and operate at a wavelength in the 400-700 nm range. Specific data sheets for the LED may be available from the manufacturer.	Pass
6.2.1.2 and 6.2.1.3	Add at the end of this sub-clause: This sub-clause only applies to TNV circuits normally operating in excess of the limits of SELV circuits.		N/A
6.2.1.4	Delete the notes - (refer to national deviations).		N/A
6.4.1	Delete note 2 - (refer to national deviations).		N/A
6.4.2.1	Delete note 2 - (refer to national deviations).		N/A
Annex J	Page 317, in table J.1, electrochemical potential between Zinc, zinc alloys and Magnesium, magnesium alloys, replace "0.05" by "0.5".		N/A
Annex N	Page 335, in the title between parentheses, replace "2.9.9" by "2.9.1".		N/A
Annex P	Replace the text of this annex by: See annex ZA		N/A
Annex Q	Add for IEC 529 NOTE: Harmonized as EN 60529:1991 (not modified). Add for IEC 707 NOTE: Harmonized as HD 441 S1:1983 (not modified). Add for IEC 1058-1 NOTE: Harmonized as EN 61058-1:1992 (not modified).		N/A
Annex V	Page 359, in the figure, replace "SLEV CIRCUIT" by "SELV CIRCUIT".		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Israelite Differences to IEC 950 Second Edition with Amendments 1, 2, 3 and 4			
General	The equipment should comply with the requirements of the relevant EMC standard (SI 961 part 6 - CISPR 22+24).	Client has been informed of requirement.	N/A
1.2.12.1	TN Power Distribution: The mains system in Israel is TN-S or TN-C or TN-C-S		N/A
1.7	Marking and Instructions: The package of the equipment shall be marked in Hebrew, and shall include: The name of the manufacturer, The country of production, The year of production, The name and the address of the importer. The marking shall be on a rectangular label (off at least 52mm X 24mm)). The letters height should be at least 2mm. The color of the label shall be in contrast to the color of the package.	Client has been informed of requirement.	N/A
1.7.14	All safety signs and warnings should be in the Hebrew language.	Instructions verified in English. Client has been informed of requirement.	N/A
3.2.2	Add additional note below Table 10: In Israel the diameter of the conduit shall comply with the Electricity Law.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Japanese Differences to IEC 950 Second Edition with Amendments 1,2, 3 and 4			
General	Japanese common household power supply sources are 100 V a.c., 50 or 60 Hz, therefore products should be designed to operate under dual frequencies. New buildings may be supplied from 200 V a.c., 50 or 60 Hz sources.		N/A
2.9.2.1	Delete entire column titled "Nominal mains supply voltage 150 V (Transient rating 1500 V)" in Table 3. Delete "> 150 V" from column titled "Nominal mains supply voltage > 150 V 300 V (Transient rating 2500 V)" in Table 3.		N/A
2.9.2.2	Delete entire column titled "Nominal mains supply voltage 150 V (Maximum transient in secondary circuit 800 V see condition 6)" in Table 5		N/A
2.9.4.4	Replace the text of this sub-clause: Wound components BASIC, SUPPLEMENTARY, DOUBLE or REINFORCED INSULATION is permitted in a wound component using one of the following a), b), or c) constructions or the wound component must use interleaved insulation which complies with 2.9.4.1 or 2.9.4.2:		N/A
	a) the winding wire is insulated with insulation complying with 2.9.4.1 other than solution based type enamel coatings		N/A
	b) the winding wire is insulated with extruded multi-layers or wrapped layers of tape (each layer can be tested for electric strength) which complies with 2.9.4.1 and complies with annex U		N/A
	c) the winding wire is insulated with extruded multi-layers or wrapped layers of tape (test can be only performed on finished winding wire) and complies with annex U		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
	Note 1 - See also 6.4.1. As to c), the number of constructional layers applied to the conductor to determine the grade of insulation of the winding wire shall not be less than as follows: - if BASIC INSULATION is required, a minimum of two layers or one extruded layer - if SUPPLEMENT INSULATION is required, a minimum of two layers or two extruded layers - if REINFORCED INSULATION is required, a minimum of three layers or three extruded layers As to b) and c), in case the CREEPAGE DISTANCES between wrapped layers of tape are less than Table 6 under Pollution degree 1, the distances between layers must be reliably cemented together with insulation compound complying with 2.9.7 and with the test voltage in annex U.2 (Type tests) increased to 1.6 times		N/A
	Note 2 - In case one layer of material is overlapped 50 % or more, it is considered as two layers		N/A
	Where two insulated wires or one bare wire and one insulated wire are contacted inside the component and cross each other at an angle between 45 ° and 90 °, physical separation shall be provided, for example in the form of insulating sleeving or sheet material, or by applying 2 times of the specified insulation layer(s), to relieve mechanical stress at the crossover point		N/A
	The finished component shall pass ROUTINE TESTING for electric strength using the values of test voltage in 5.3		N/A
	Compliance is checked by visual inspection and measurement, and as specified in annex U. However, the tests are not repeated if the material data sheets confirm compliance with annex U		N/A
5.1	Add to 5) as specified in "Conditions applicable to Table 16, parts 1 and 2": With regards to 1), insulating materials complying with Japanese requirement (refer to Japanese differences for current IEC 60335-1 (3rd Edition) in CB Bulletin 94B), can be taken of data for that material to determine the appropriate maximum temperature rise		Pass

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Annex U	Insulated winding wires for use without interleaved insulation (see 2.9.4.4).		N/A
U	This annex specifies winding wire whose insulation may be used to provide BASIC SUPPLEMENTARY or REINFORCED INSULATION in wound components without interleaved insulation. This annex applies to round winding wire whose diameter is between 0.2 mm and 1.00 mm. With regard to other size, refer to IEC 60851		N/A
U.1	Wire construction If the wire is insulated with two or more spirally wrapped layers of tape, the overlap of layers shall be adequate to ensure continued overlap during manufacture of the wound component. In order to maintain the overlap of layers, wire insulation layer of wrapped layers of tape must be adequately secured.		N/A
U.2	Type tests Unless it specifies, the wire shall pass the following six TYPE TESTS U.2.1 to U.2.4, carried out at a temperature between 15 °C and 35°C and a relative humidity between 45 % and 75 %. Refer to the IEC 60851 first edition		N/A
U.2.1	Electric strength Test 13 of IEC 60851-5 (1988), 4.3.1 (test for twisted wire pairs), with a test voltage 2 times of appropriate voltage in Table 18 of this standard or 6 kV r.m.s. whichever is the greater		N/A
U.2.2	Adherence and flexibility Test 8 of IEC 60851-3, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3 kV r.m.s. whichever is the greater		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
	Table U.2.2.2 - Mandrel Nominal diameter of conductor (mm) / Mandrel diameter (mm +/- 0.2 mm) 0.20 - 0.34 / 4.0 0.35 - 0.49 / 6.0 0.50 - 0.74 / 8.0 0.75 - 1.00 / 10.0 The tension of winding wire while wire is wrapped around the mandrel, should be calculated so that it is equivalent to 118 MPa +/ - 10 % (118 N/square mm +/- 10 %) from winding wire radial		N/A
U.2.3	Heat Shock Test 9 of IEC 60851-6, 3.1 and IEC 851-3, 5.1.1.1, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3 kV r.m.s. whichever is the greater. The temperature of oven is specified in the following Table U.2.3. Table U.2.2 shows and explains required mandrel diameter and tension. Test must be performed at room ambient after taking out from oven		N/A
	Table U.2.3 - Oven Temperature Class A (105) E (120) B (130) F (155) H (180) Oven 200 215 225 240 260 (Temperature in °C +/- 2 °C)		N/A
U.2.4	Retention of electric strength after bending Test 13 of IEC 60851-5 (1988), 4.6.1 c, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3 kV r.m.s. whichever is the greater. The required mandrel diameter and tension per Table U.2.2		N/A
U.3	Routine test Winding wire is subjected to electric strength test during the production in accordance with U.3.1 and U.3.2 by wire manufacturer.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
U.3.1	Full length test Winding wire is subjected to electric strength test during the production for full wire length, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3 kV r.m.s or 4.2 kV peak minimum.		N/A
U.3.2	Audit test Test must be carried out according to IEC 60851-5 (1988) for twisted wire pairs. Electric strength test, with a test voltage 2 times of appropriate voltage in Table 18 of this standard or 6 kV r.m.s or 8.4 kV peak minimum.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Korean Differences to IEC 950 Second Edition with Amendments 1,2,3 and 4			
General (a)	**Voltage rating** The national supply voltage has been increased to 220 V, an appliance rated 220 V only is to be allowed to obtain type approval in Korea. An appliance rated 110 V or 220 V/110 V is not allowed. When an appliance is supplied in Korea, it shall be set to and marked with 220 V. But free voltage appliance supplied by SMPS (Switching Mode Power Supply) is allowed and it shall be marked with "100 - 220 V".		N/A
(b)	**Frequency** Only appliances having supply frequency of 60 Hz or a frequency range including 60 Hz are accepted. When an appliance is supplied in Korea, it shall be set to and marked with 60 Hz.		N/A
(c)	**Instructions and Markings** Instruction manuals and appliance markings related to safety, including nameplate shall be in Korean or graphic symbols in IEC Publication 417.	Instructions were verified in English. Client has been informed of requirement.	N/A
1.5.101	Add: Plugs for the connection of the apparatus to the supply mains shall comply with the Korean requirement (KSC 8305).		N/A
7	Radio frequency interference. The apparatus shall comply with the relevant CISPR requirements. Note: As of January 1, 2000, both Radiated Immunity and Conducted Immunity based on IEC standards become mandatory.	Client has been informed of requirement.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Norwegian Differences to IEC 950 Second Edition with Amdts. 1, 2, 3 and 4			
1.6.4	Due to the IT power system used, capacitors are required to be rated for the applicable phase-to-phase voltage (230 V).		N/A
1.7.2	If separation between the mains and a communication system/network, other than public telecommunication networks, relies upon connection to safety earth, the equipment shall have a marking stating that it must be connected to an earthed mains socket-outlet. NOTE: For requirements for equipment to be connected to a public telecommunication network; see 6.2.1.4. The marking text is: **"Apparatet må kun tilkoples jordet stikkontakt" or "Jordet stikkontakt skal benyttes når apparatet tilkoples datanett".**		N/A
1.7.17	Caution text concerning lithium batteries: ADVARSEL Eksplosjonsfare ved feilaktig skifte av batteri. Benytt samme batteritype eller en tilsvarende type anbefait av apparatfabrikanten. Brukte batterier kasseres i henhold til fabrikantens instruksjoner. Danish or Swedish text can also be accepted. If the battery is placed in an area not accessible to the user even English text can be used.		N/A
2.3.5	Marking and installation requirements according to subclauses 1.7.2, Note 4 and 6.2.1.4, Note 2 apply.		N/A
2.3.9	Marking and installation requirements according to this annex, subclauses 1.7.2 and 6.2.1.4 apply.		N/A
2.5.2	Add after the first paragraph: "The above exception is not acceptable in PLUGGABLE EQUIPMENT TYPE A."		N/A
2.9.1	Due to the IT power systems used, mains supply voltage is considered to be equal to phase-to-phase voltage (230 V).		N/A
5.4.9	The electric strength test includes testing of basic insulation in Class I pluggable equipment Type B and permanently connected equipment..		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
6.2.1.2	Supplementary insulation for a primary circuit is required between any TNV circuit and any circuit that has a connection to a protective earthing terminals. This requirement does not apply to permanently connected equipment or to pluggable equipment Type B, installed in areas where equipotential bonding has been applied, e.g. a telecommunication Central Office.	No TNV Circuits	N/A
6.2.1.4	Add the following (Note 2): Method b) is not permitted. Insulation between parts conductively connected to the supply mains and parts connected to a public telecommunication network shall comply with the requirements for double or reinforced insulation.		N/A
6.2.1.5	Requirements in subclause 6.2.1.4 , Note 2 apply.		N/A
6.3.3	Clause 6.3.3 applicable for pluggable equipment Type A and B and for permanently connected equipment.		N/A
6.3.3.1	Requirements in subclauses 6.2.1.2 , National Difference, 6.2.1.4, Note 2, and 6.3.3.2, Note 1, apply.		N/A
6.3.3.2	Exclusions are applicable for permanently connected equipment and pluggable equipment Type B only (Note 1).		N/A
General	Compliance with the standard for radio interference suppression is required for the safety mark.	Client has been informed of requirement.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Polish Differences to IEC 950 Second Edition with Amendments 1,2,3 and 4			
1.7.14	Instruction Manual and Markings related to safety shall be in Polish.	Instructions verified in English. Client has been informed of requirement.	N/A
General	Radio Interference Emission: The product shall comply with the specifications of the Polish Post Office Authorities.	Client has been informed of this requirement.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Singapore - Differences to IEC 950 Second Edition with Amdts. 1,2,3 and 4			
General	IT Power Systems are not allowed in the Republic of Singapore and all clauses related to IT Power Systems are not applicable		N/A
2.2.3	(a) After the first paragraph, insert the following: Conditions described in IEC Publications 68-2-3 : Test Ca: Damp Heat, Steady State (temperature: 40 ± 2°C, relative humidity: 90 % to 95 %) apply to insulation to be used under tropical conditions. The duration of the humidity conditioning is 5 days (120h) under tropical conditions	Class III equipment designed to be installed inside an end-product.	N/A
	(b) At the end of the last paragraph add: NOTE. The additional requirement on humidity conditioning is according to Clause 10.2 of IEC60065 : 1985		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Swedish Differences to IEC 950 Second Edition with Amendments 1, 2, 3 and 4			
1.5.1	According to Ordinance SFS 1991:1290. Add the following: NOTE: Switches containing mercury such as thermostats, relays and level controllers are not allowed.		N/A
1.7.2	If the separation between the mains and a SELV terminal relies upon connection to safety earth, the apparatus shall have a marking stating that it must be connected to an earthed mains socket-outlet when a SELV circuit is connected to a network passing both unearthed and earthed electrical environment. The marking text shall be in Swedish and as follows: **"Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk".**		N/A
1.7.17	Caution text concerning lithium batteries: VARNING Eksplosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion. If the battery is placed in an area not accessible to the user even English text can be used.		N/A
6.2.1.2	Supplementary insulation for a primary circuit is required between any TNV circuit and any circuit that has a connection to a protective earthing terminals. This requirement does not apply to permanently connected equipment or to pluggable equipment Type B.		N/A
6.3.3.1	Requirements according to the annex ZB, subclause 6.2.1.2 apply.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

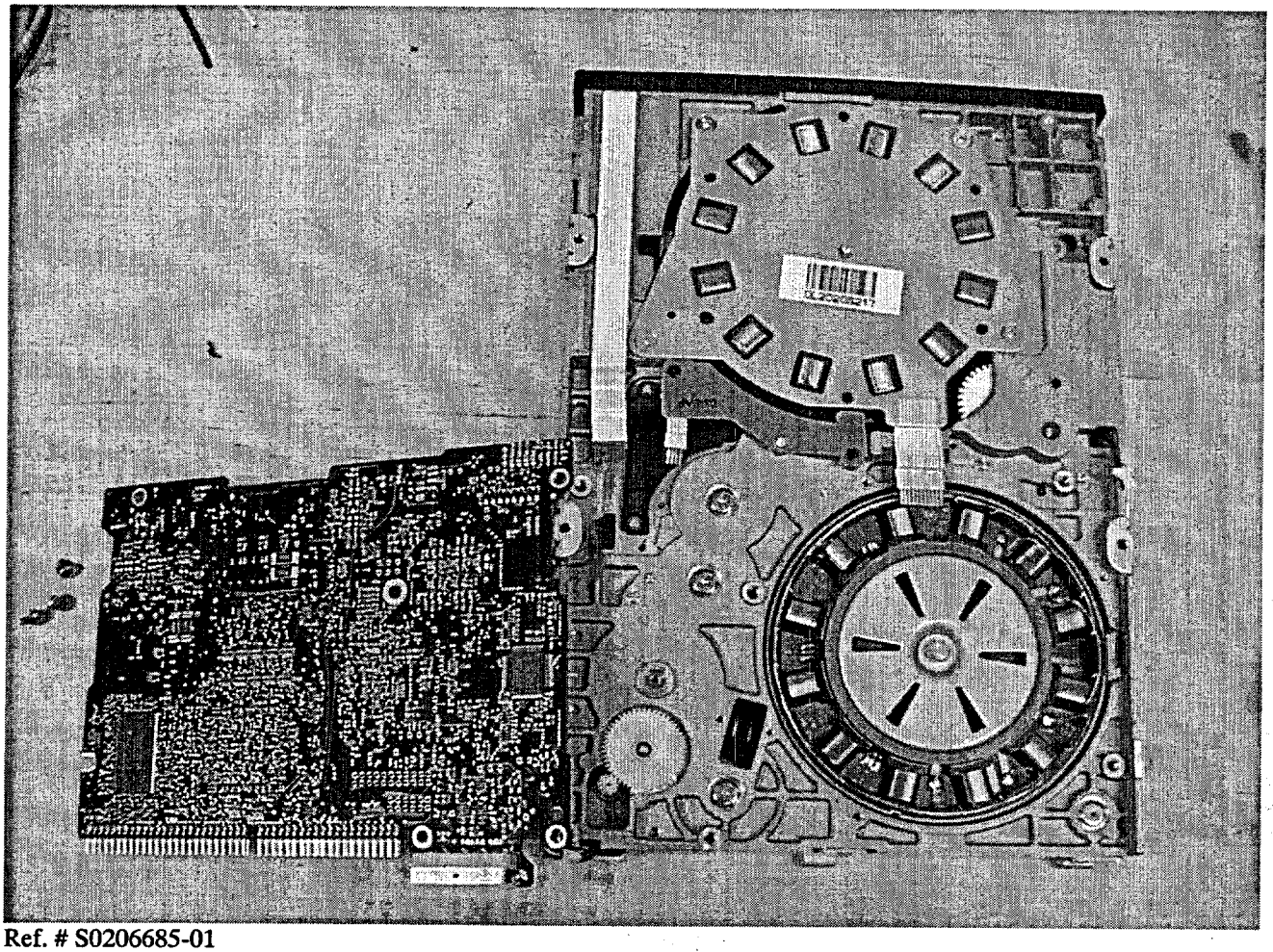
Swiss Differences to IEC 950 Second Edition with Amendments 1, 2, 3 and 4			
1.7.17	Annex 4.10 of SR 814.013 (Ordinance on environmentally hazardous substances) applies for batteries.		N/A
3.2.1	Supply cords of equipment having a rated current not exceeding 10 A shall be provided with a plug complying with SEV 1011 or IEC 884-1 and one of the following dimension sheets: SEV 6532-2.1991 Plug Type 15 3P+N+PE 250/400 V,10 A SEV 6533-2.1991 Plug Type 11 L+N 250 V,10 A SEV 6534-2.1991 Plug Type 12 L+N+PE 250 V,10 A EN 60309 applies for plugs for currents exceeding 10 A.		N/A
6.1	Protective means in the equipment shall not prevent transient surge protection in the telecommunication network from operating properly (d.c. spark-over voltage of the surge suppressor installed in the telecommunication network: approx. 245 V).		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
UK National Differences to IEC 950 Second Edition with Amdts. 1, 2, 3 and 4			
1.7.2	Power supply cords of Class I equipment must be provided with a label with the following text in legible characters: IMPORTANT The cores in this mains lead are colored in accordance with the following code: green and yellow: earth blue: neutral brown: live		N/A
3.2.1	Apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord and plug, shall be fitted with a "standard plug" in accordance with Stationary Instrument 1786: 1994 - The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations. NOTE: "Standard plug" is defined in SI 1786: 1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.		N/A
3.2.4	A power supply cord with conductor of 1.25 mm² is allowed for equipment with a rated current over 10A and up to and including 13A.		N/A
3.3.5	The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current of over 10A up to and including 13A is: 1.25 mm² to 1.5 mm² nominal cross-sectional area.		N/A
4.3.18	This test should be performed using an appropriate socket outlet with an earthing contact.		N/A

ENCLOSURE No. 2

Photographs

(Total 5 Pages including this Cover Page)



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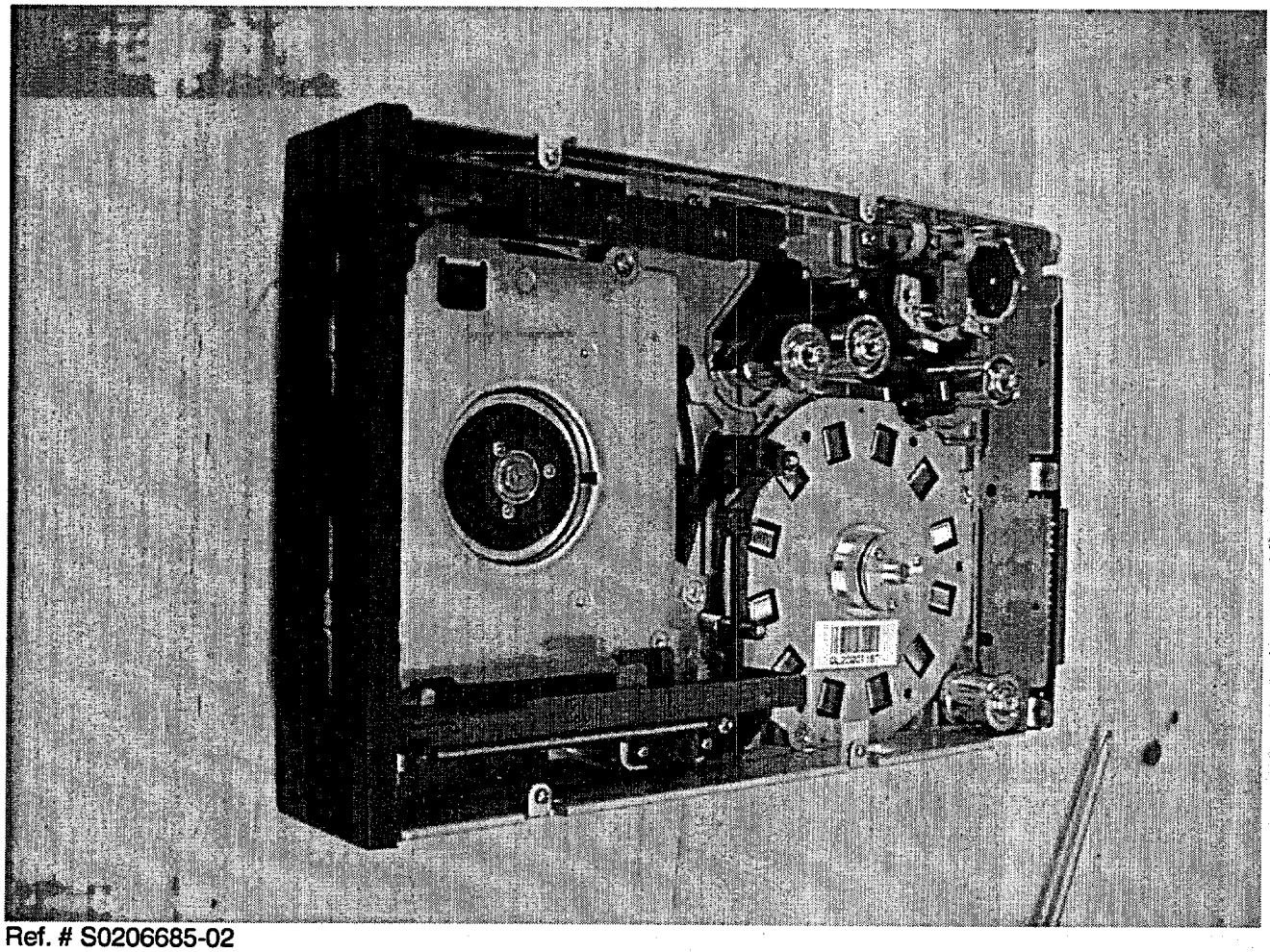

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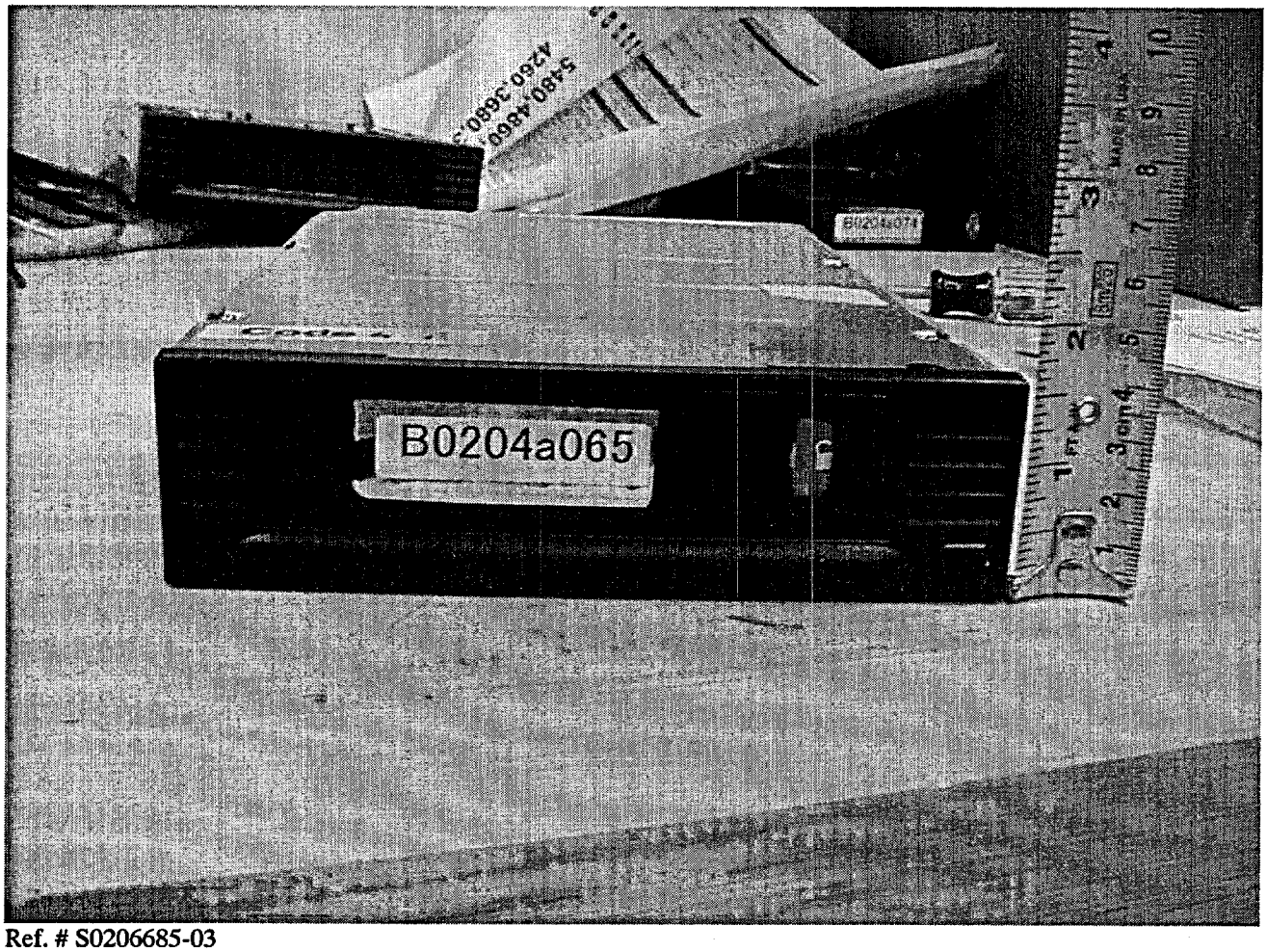

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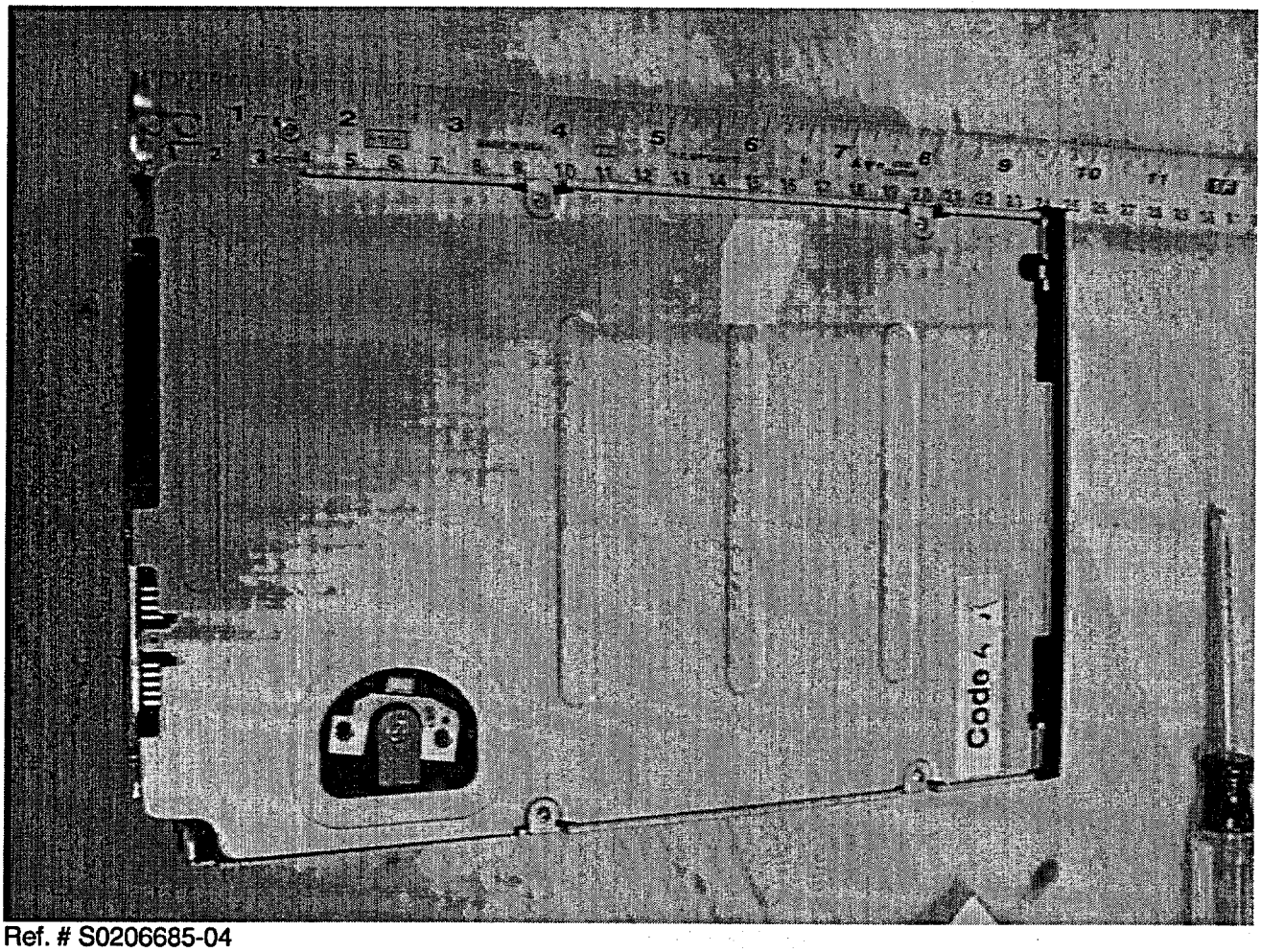


Ref. # S0206685-04

ENCLOSURE No. 3

Additional Test Data

(Total 5 Pages including this Cover Page)

TEST RECORD NO. 1

SAMPLES:

The manufacturer submitted a sample representing production of Internal Tape Drive, Model DLTVS 160.

The following tests were conducted in accordance with the Standard for Information Technology Equipment, UL 1950, Third Edition and CAN/CSA-C22.2, No. 950-93, and IEC 60950, Third Edition (1999), and EN60950 (2000).

Only the following tests were deemed necessary.

The test methods and results of the above tests have been reviewed and found to be in accordance with the requirements in the Standards noted above. Test results are valid only for the tested equipment.

"Maximum normal load" was defined as operation at continuous reading and writing.

The unit weighs approximately 1.8 kg and was considered building in with unexposed SELV circuits.

Maximum operating ambient 40°C.

1.6.1 - INPUT TEST:
SINGLE-PHASE

METHOD

The unit was connected to a variable voltage as indicated and then operated normally under the conditions noted below until well warmed. The input current and average power were measured.

RESULTS

	Input Condition		Input Current, A		Avg.
Operating Condition	Volts	Hz	Rated	Measured(peak)	Current
Read/Write	4.75/11.4	DC	-	1.59 /1.456	1.416/0.379
Read/Write	5/12	DC	1.5/0.5	1.584/1.432	1.515/0.427
Read/Write	5.25/12.6	DC	-	1.584/1.420	1.412/0.371

The steady-state input current did not exceed the rated current at the rated voltage by more than 10 percent under the maximum normal load.

5.1, 1.4.8, 3.3.2 - HEATING TEST

METHOD

The sample was connected to a source of supply as noted below and operated until temperatures became stable. Temperatures were measured using the thermocouple method.

The sample operated under normal load as follows: Continuous read/write mode until steady conditions were established.

Tmra was 40°C.

RESULTS

Test	Operating Condition	Input Conditions Volts	Hz	Duration
A	Read/Write	4.75/11.4	dc	4 hrs.
B	Read/Write	5/12	dc	4 hrs.
C	Read/Write	5.25/12.6	dc	4 hrs.

Thermocouple Locations	Maximum Temperature °C Test A	Test B	Test C
Ambient	23.4	24.4	24.6
Motor winding (top)	45.9	48.0	49.2
Motor winding (bottom)	46.1	47.7	49.7
Eject motor case	37.7	39.2	40.5
Stepper motor case	41.3	43.7	45.6
L1	50.8	53.3	55.9
L2	50.0	53.3	55.9

ANNEX A.1 - 130 MM FLAME TEST:

SAMPLES:

Three samples of the tape drive bezel, in each of the available colors, was submitted by the manufacturer. It was constructed as described in the preceding section of this Report.

1. Annex A.1 Flammability Test

The test methods and results of the above tests have been reviewed and found in accordance with the requirements in UL 1950, Third Edition.

ANNEX B.7 - LOCKED-ROTOR OVERLOAD TEST FOR DC MOTORS IN SECONDARY CIRCUITS:

METHOD

The Take-Up motor was connected to 12 Vdc and the rotor was locked for 7 hours or until steady state conditions were established; whichever was longer.

A thermocouple was applied on the Take-Up motor winding surface. The motor was placed on a tissue paper covered softwood surface and covered with a single-layer of cheesecloth of approximately 40 g/m^2.

The Load/Unload motor was connected to 11 Vdc and the rotor was locked for 7 hours or until steady state conditions were established; whichever was longer.

A thermocouple was applied on the Load/Unload motor case. The motor was placed on a tissue paper covered softwood surface and covered with a single-layer of cheesecloth of approximately 40 g/m^2.

Tmra was 40°C.

RESULTS

1. Motor Manufacturer: (Supply & Take-Up Motors) Mitsumi, Type 72 6528 & 72 6542. The testing was performed on the Take-Up motor. The Take-Up motor & Supply motors are identical except for model designation & other cosmetic differences.

The motor rotor was locked for 7 hours.

The temperature on the coil stabilized @ 102.5 °C. The tissue paper and cheesecloth did not ignite. Ambient temperature was 25.4 °C.

2. Motor Manufacturer: (Load/Unload Motor) Nidec Copal, Type LA14-371N

The motor rotor was locked for 7 hours.

The temperature on the coil stabilized @ 133.6 °C. The tissue paper and cheesecloth did not ignite. Ambient temperature was 22.0 °C.

Addendum 11: DLT VS160e CB Report and Certificate

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
COMMISSION ELECTROTECHNIQUE INTERNATIONALE (CEI)

Ref. Certif. No.
US/6153/UL

IEC SYSTEM FOR CONFORMITY TESTING AND CERTIFICATION OF ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

SYSTEME CEI D'ESSAIS DE CONFORMITE ET DE CERTIFICATION DES EQUIPEMENTS ELECTRIQUES (IECEE) METHODE OC

CB TEST CERTIFICATE
CERTIFICAT D'ESSAI OC

Product
Produit

Tape Drive

Name and address of the applicant
Nom et adresse du demandeur

Benchmark Storage Innovations, Inc.
3122 Sterling Circle
Boulder, CO 80301, USA

Name and address of the manufacturer
Nom et adresse du fabricant

Benchmark Storage Innovations, Inc.
3122 Sterling Circle
Boulder, CO 80301, USA

Name and address of the factory
Nom et adresse de l'usine

1. Benchmark Storage Innovations, Inc.
   3122 Sterling Circle, Boulder, CO 80301 USA
2. Mitsumi Philippines, Inc.
   Luzon Avenue, Bataan Economic Zone, Mariveles, Bataan, Philippines
3. Beyonics Mfg. Pte Ltd.
   25 Serangoon N. Ave 5, Singapore 554914, Singapore
4. Hewlett-Packard Singapore
   1 Jalan Kilang Timor, Pacific Tech Centre, #04-01/02/03/05, Singapore 159402

Rating and principal characteristics
Valeurs nominales et caractéristiques principales

Input: 100-240 V ac, 50/60 Hz, 0.9 A

Trademark (if any)
Marque de fabrique (si elle existe)

BENCHMARK, Dell, HP, TANDBERG DATA

Model / Type Ref.
Ref. de type

Benchmark: DLT VS160e
Dell: PowerVault 110T DLT VS160e
HP: StorageWorks DLT-VS-160/320 External
Tandberg: DLT VS160 Extrernal Tape Drive

Additional information (if necessary)
Information complémentaire (si nécessaire)

The CB Test Report comprises 4 Enclosures.

A sample of the product was tested and found to be in conformity with
Un échantillon de ce produit a été essayé et a été considéré conforme à la

PUBLICATION **EDITION**

IEC 60950 (1991) Second Edition with Amdts. No. 1 (1992), 2 (1993), 3 (1995) and 4 (1996);
Additionally evaluated to EN60950 (1992) with Amdts. 1, 2, 3, 4, and 11 to include national Differences for European countries; other national differences as specified in the CB Test Report.

as shown in the Test Report Ref. No.
which forms part of this Certificate
comme indiqué dans le Rapport d'essais numéro de référence qui constitue partie de ce Certificat

E205786-V2-S5

This CB Test Certificate is issued by the National Certification Body
Ce Certificat d'essai OC est établi par l'Organisme National de Certification

Underwriters Laboratories Inc.®

Underwriters Laboratories Inc. / International Compliance Services
333 Pfingsten Road, Northbrook, IL 60062-2096
United States of America
TEL INT* 1-847-272-8800, Ext. 43008 FAX INT* 1-847-272-9562
email: jolanta.m.wroblewska@us.ul.com

Date: Issued: 19 July 2002

Signature:

Jolanta M. Wroblewska

Ref. No. E205786-V2-S5

July 12, 2002

COVER PAGE FOR TEST REPORT

IEC 950 (1991) Second Edition with Amdts. No. 1 (1992), No. 2 (1993), No. 3 (1995) and No. 4 (1996)

Equipment:	Tape Drive
Model/Type:	Benchmark: DLT VS160e Dell: PowerVault 110T DLT VS160e HP: StorageWorks DLT-VS-160/320 External Tandberg: DLT VS160 External Tape Drive
Rated values from the marking plate:	100-240 V~, 50/60 Hz, 0.9 A
Applicant:	Benchmark Storage Innovations, Inc. 3122 Sterling Circle, Boulder, CO 80301 USA
Manufactured at:	Benchmark Storage Innovations, Inc. 3122 Sterling Circle Boulder, CO 80301 USA Mitsumi Philippines, Inc. Luzon Avenue, Bataan Economic Zone Mariveles, Bataan, PHILIPPINES Beyonics Mfg. Pte Ltd. 25 Serangoon N. Ave 5 Singapore 554914 Hewlett-Packard Singapore 1 Jalan Kilang Timor Pacific Tech Centre #04-01/02/03/05 Singapore 159402

This equipment has been tested according to standard IEC 950 (1991) Second Edition with Amdts. No. 1 (1992), No. 2 (1993), No. 3 (1995) and No. 4 (1996); EN60950 (1992) with Amdts. 1, 2, 3, 4 and 11.

All applicable tests according to the above specified standard(s) have been carried out.

Test results are valid only for the tested equipment.

This Test Report can be reproduced only in whole.

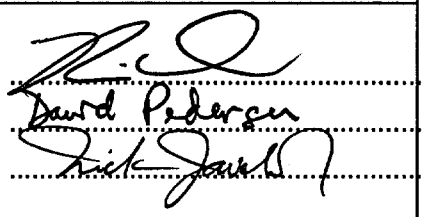
Written permission from Underwriters Laboratories Inc. is required if the test report is copied in part.

This test report includes the following documents:

1. Cover and Comment Pages - 1 page
2. Test Report - 42 pages
3. National Deviations - Enclosure 1 - 33 pages
4. Photographs - Enclosure 2 - 3 pages
5. Additional Test Data - Enclosure 3 - 10 pages
6. CB Report and Certificate of Power Supply - Enclosure 4 - 71 pages

TEST REPORT
IEC 950
Safety of information technology equipment

Report Reference No. ..... :	E205786-V2-S5
Compiled by (+ signature) ..... :	Richard Duran
Reviewed by (+ signature) ..... :	David Pedersen
Approved by (+ signature) ..... :	Nick Javelo
Date of issue ..... :	July 12, 2002



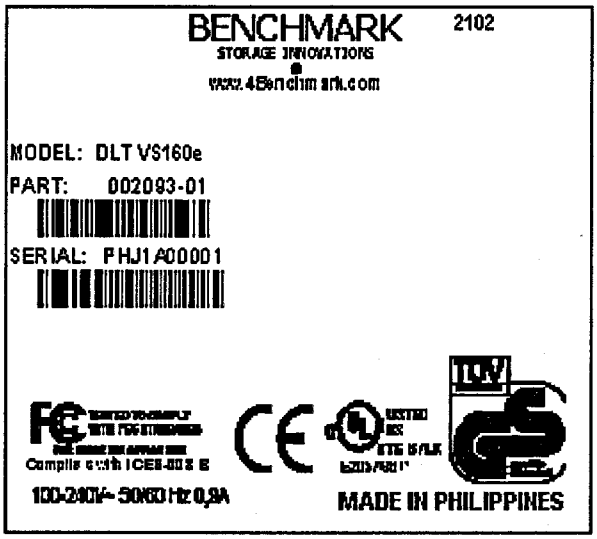
This report is based on a blank test report that was prepared by KEMA using information obtained from the TRF originator (see below).

Testing laboratory name ..... :	Underwriters Laboratories Inc.
Address ..... :	1655 Scott Boulevard, Santa Clara, CA 95050-4169, USA
Testing location ..... :	CBTL ☒ SMT ☐ TMP ☐
Address ..... :	1655 Scott Boulevard, Santa Clara, CA 95050-4169, USA
Client name ..... :	Benchmark Storage Innovations, Inc.
Address ..... :	3122 Sterling Circle, Boulder, CO 80301 USA
Standard ..... :	IEC 950:1991 + A1:1992 + A2:1993 + A3:1995 + A4:1996
Test procedure ..... :	CB Scheme
Procedure deviation ..... :	N/A
Non-standard test method ..... :	N/A
Test Report Form/blank test report	
Test Report Form No. ..... :	I950___D/97-06
TRF originator ..... :	FIMKO
Master TRF ..... :	reference No. I950 D, dated 97-02

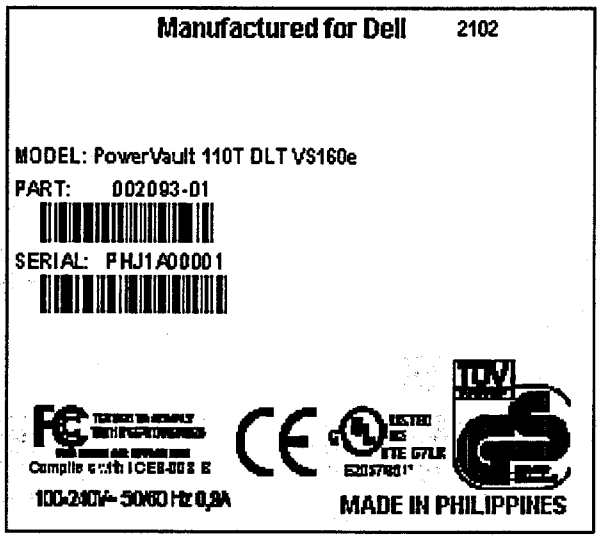
Copyright reserved to the bodies participating in the IECEE Schemes (CB and CB-FCS) and/or the bodies participating in the C.I.G (CCA-ENEC).

Test Item description ..... :	Tape Drive
Trademark ..... :	Benchmark, Dell, HP, Tandberg
Model and/or type reference ..... :	Benchmark: DLT VS160e Dell: PowerVault 110T DLT VS160e HP: StorageWorks DLT-VS-160/320 External Tandberg: DLT VS160 External Tape Drive
Manufacturer ..... :	Benchmark Storage Innovations, Inc. 3122 Sterling Circle Boulder, CO 80301 USA
Rating(s) ..... :	100-240 V~, 50/60 Hz, 0.9 A

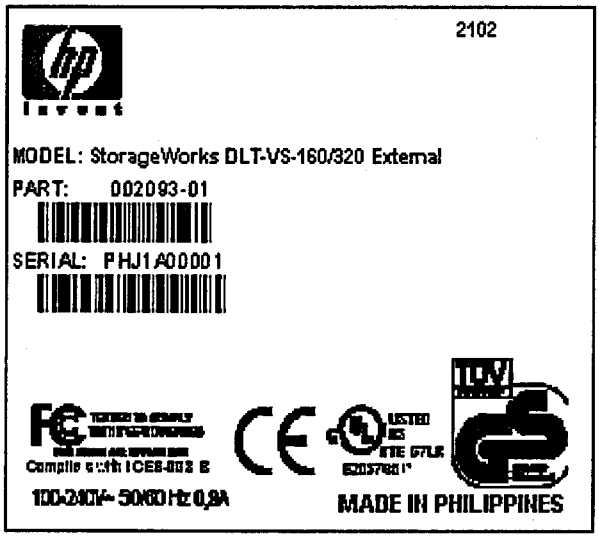
Copy of marking plate



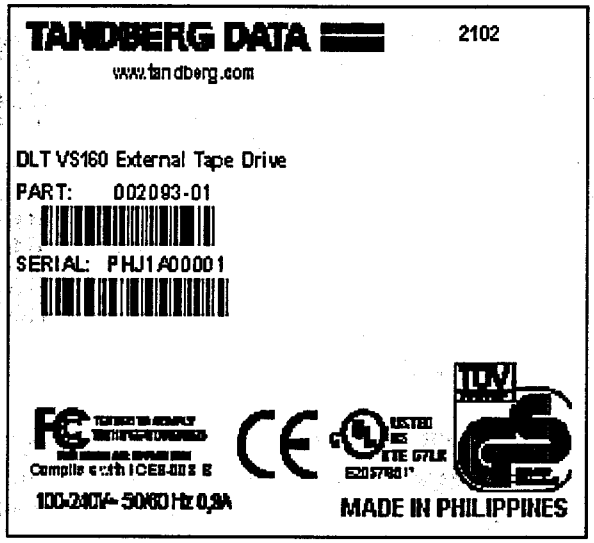
Benchmark External



Dell External



HP External



Tandberg External

Test item particulars:

Equipment mobility	: movable
Operating condition	: continuous
Tested for IT power systems	: Yes
IT testing, phase-phase voltage (V)	: 230
Class of equipment	: Class I (earthed).
Mass of equipment (kg)	: less than 18 kg.
Protection against ingress of water	: IP20

Possible test case verdicts:

- test case does not apply to the test object	: N / A
- test object does meet the requirement	: Pass
- test object does not meet the requirement	: Fail

General remarks:

- "(see Enclosure #)" refers to additional information appended to the Report.
- "(see appended table)" refers to a table appended to the Report.
- Throughout this report a point is used as the decimal separator.

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
This report is not valid as a CB Test Report unless appended to a CB Test Certificate issued by a NCB in accordance with IECEE 02.

General product information:

This product is an external cartidge tape drive that contains a switching power supply module and a component catridge tape drive. The unit is enclosed in metal.

Factory Locations:

Benchmark Storage Innovations, Inc.
3122 Sterling Circle
Boulder, CO 80301 USA

Mitsumi Philippines
Luzon Avenue, Bataan Economic Zone
Mariveles, Bataan, Philippines

Beyonics Mfg. Pte Ltd.
25 Serangoon N. Ave 5
Singapore 554914

Hewlett-Packard Singapore
1 Jalan Kilang Timor
Pacific Tech Centre
#04-01/02/03/05
Singapore 159402

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
1	**GENERAL**		Pass
1.5	**Components**		Pass
1.5.1	Comply with IEC 950 or relevant component standard	(see appended table)	Pass
1.5.2	Evaluation and testing components	Certified components are used in accordance with their ratings, certifications and they comply with applicable parts of this Standard.	Pass
	Dimensions (mm) of mains plug for direct plug-in . :	Not direct plug-in equipment.	N/A
	Torque and pull test of mains plug for direct plug-in; torque (Nm); pull (N)		N/A
1.5.3	Transformers	Evaluated as part of power supply.	Pass
1.5.4	Flammability class of high voltage components (component; manufacturer; flammability) ..... :	No high-voltage components.	N/A
1.5.5	Interconnecting cables	Interconnecting cables comply with the relevant requirements of this standard.	Pass
1.5.6	Mains capacitors	X capacitors are evaluated as part of the power supply.	Pass

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
1.6	**Power Interface**		Pass
1.6.1	Steady state input current	The steady state input current of the equipment did not exceed the RATED CURRENT by more than 10% under NORMAL LOAD.	Pass
	Current deviation during normal operating cycle	The measured input current did not exceed the rated current.	Pass
1.6.2	Voltage limit of hand-held equipment	The unit is not a hand-held equipment.	N/A
1.6.3	Neutral conductor insulated from earth and body	Neutral is insulated from earth with basic insulation.	Pass
1.6.4	Components in equipment intended for IT power system	Y capacitors are evaluated as part of the power supply.	Pass
1.6.5	Mains supply tolerance (V) ..... :	+10% / -10%.	Pass

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

1.7	**Marking and instructions**		Pass
1.7.1	Rated voltage (V) ..... :	100 - 240 V indicated on nameplate label.	Pass
	Symbol of nature of supply for d.c. ..... :		N/A
	Rated frequency (Hz) ..... :	50/60 Hz indicated on nameplate marking.	Pass
	Rated current (A) ..... :	0.9 A indicated on nameplate label.	Pass
	Manufacturer ..... :	"Benchmark Storage Innovations" indicated on nameplate label.	Pass
	Trademark ..... :	Trademark provided on nameplate label.	Pass
	Type/model ..... :	See page 1.	Pass
	Symbol of Class II ..... :	Class I equipment.	N/A
	Certification marks ..... :	UL, C-UL, TUV	Pass
1.7.2	Safety instructions	Installation and Operations Guide available to the user.	Pass
1.7.3	Short duty cycles	The equipment is intended for continuous operation.	N/A
1.7.4	Marking for voltage setting/frequency setting ..... :	Equipment is auto-ranging.	N/A
1.7.5	Marking at power outlets ..... :	No standard power outlets are provided.	N/A
1.7.6	Marking at fuseholders ..... :	"FUSE F2A, 250V" provided adjacent to fuse. Power supply board marked: "For continued protection against risk of fire, replace only with same type and rating of fuse."	Pass
1.7.7.1	Protective earthing terminals	The earth terminal is marked with the standard earth symbol (IEC 417, No. 5019) near the terminal.	Pass

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.7.2	Terminal for external primary power supply conductors	Equipment is cord-connected using detachable power supply.	N/A
1.7.8.1	Identification and location of switches and controls :	Power switch is obvious regardless of language. No controls affecting safety.	N/A
1.7.8.2	Colours of controls and indicators ..... :	Green LED used to indicate that the unit is energized.	Pass
1.7.8.3	Symbols according to IEC 417 ..... :	The mains switch is marked with the symbols: "0" and "I" (IEC 417, Nos. 5008 and 5007).	Pass
1.7.8.4	Figures used for marking ..... :	Other than power switch, no controls provided.	N/A
1.7.8.5	Location of markings and indications for switches and controls ..... :	Power switch markings located on the switch actuator.	Pass
1.7.9	Isolation of multiple power sources ..... :	One connection to power source.	N/A
1.7.10	Instructions for installation to IT power system	Suitable installation instructions are provided.	Pass
1.7.11	Instructions when protection relies on building installation	The equipment is Pluggable Type A.	N/A
1.7.12	Marking when leakage current exceeds 3.5 mA	Leakage current is less than 3.5 mA.	N/A
1.7.13	Indication at thermostats and regulating devices	No thermostats or similar regulating devices.	N/A
1.7.14	Language of safety markings/instructions	Reviewed only English markings and instructions.	Pass
	Language ..... :	English.	—
1.7.15	Durability and legibility	All markings provided on UL Recognized Component labels suitable for surface they are applied upon and meet the durability test.	Pass
1.7.16	Removable parts	No marking is located on (a) removable part(s).	Pass
1.7.17	Warning text for replaceable lithium batteries	There are no lithium batteries in the equipment.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
	Language ..... :		—
1.7.18	Operator access with a tool ..... :	A tool is not needed to gain access to an operator access area.	N/A
1.7.19	Equipment for restricted access locations ..... :	Equipment not intended for installation in a RESTRICTED ACCESS LOCATION.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2	**PROTECTION FROM HAZARDS**		Pass
2.1	**Protection against electric shock and energy hazards**		Pass
2.1.1	Access to energized parts	No operator access to energized parts.	Pass
2.1.2	Protection against operator contact	No parts of ELV or hazardous voltages are accessible. Only SELV signal voltages are accessible.	Pass
	Test by inspection ..... :		Pass
	Test with test finger ..... :	The test finger was unable to contact bare hazardous parts, basic insulation, or ELV circuits.	Pass
	Test with test pin ..... :	The test pin was unable to contact bare hazardous parts.	Pass
2.1.3.1	Insulation of internal wiring in an ELV circuit accessible to operator	Internal wiring in an ELV cicuits is not accessible to the operator.	N/A
	Working voltage (V); distance (mm) through insulation ..... :		N/A
2.1.3.2	Operator accessible insulation of internal wiring at hazardous voltage	No internal wiring accessible to the user.	N/A
2.1.4.1	Protection in service access areas	Bare parts operating at HAZARDOUS VOLTAGES are guarded and unintentional contact with such parts is unlikely during servicing operations involving other parts of the equipment.	Pass
2.1.4.2	Protection in restricted access locations	Not to be installed in restricted access locations.	N/A
2.1.5	Energy hazard in operator access area	Hazardous energy circuits are not accessible with the use of the test finger.	Pass
2.1.6	Clearances behind conductive enclosures	The power supply is provided with internal barrier that prevents reduction of clearance.	Pass

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.1.7	Shafts of manual controls	The equipment does not contain any knobs, handles, levers, or the like.	N/A
2.1.8	Isolation of manual controls	The equipment does not contain any conductive knobs, handles, levers, or the like.	N/A
2.1.9	Conductive casings of capacitors	Capacitors operating at ELV or hazardous voltages are properly separated from unearthed accessible metal parts.	Pass
2.1.10	Risk of electric shock from stored charge on capacitors connected to mains circuit	Capacitance Discharge Test was conducted.	Pass
	Time-constant (s); measured voltage (V) ..... :	See enclosed test record.	—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.2	**Insulation**		Pass
2.2.1	Methods of insulation	Adequate clearances through air, and creepages over the surface are provided.	Pass
2.2.2	Properties of insulating materials	Test was conducted during the power supply investigation. See enclosure.	Pass
2.2.3	Humidity treatment		Pass
	Humidity (%) ..... :		—
	Temperature (°C) ..... :		—
2.2.4	Requirements for insulation		Pass
2.2.5	Insulation parameters	Both application and working voltage were considered.	Pass
2.2.6	Categories of insulation	Reinforced between mains and SELV. Basic between mains and protective earth.	Pass
2.2.7.1	General rules for working voltages		Pass
2.2.7.2	Clearances in primary circuits	Evaluated during the power supply investigation.	Pass
2.2.7.3	Clearances in secondary circuits	Evaluated per Clause 5.4.4c.	Pass
2.2.7.4	Creepage distances	Evaluated during the power supply investigation.	Pass
2.2.7.5	Electric strength tests	See enclosed Test Record.	Pass
2.2.8.1	Bridging capacitors ..... :	Evaluated as part of the power supply.	N/A
2.2.8.2	Bridging resistors		N/A
2.2.8.3	Accessible parts		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.3	**Safety extra-low voltage (SELV) circuits**		Pass
2.3.1	Voltage (V) of SELV circuits under normal operating conditions and after a single fault ..... :		—
2.3.2	Voltage (V) between any two conductors of SELV circuit(s) and for Class I equipment between any conductor of SELV circuit and equipment protective earthing terminal under normal operating conditions ..... :	All accessible voltages are less than 42.4 Vp or 60 V dc and are classified as SELV.	Pass
2.3.3	Voltage (V) of SELV in the event of a single failure of basic or supplementary insulation or of a component ..... :	<= 42.4 Vpk, 60 V d.c.	—
	Method used for separation ..... :	Method 1.	Pass
2.3.4	Additional constructional requirements	The SELV circuit is adequately constructed in order to prevent reduction of distances, loosening of terminals, breaking of wiring at terminals, accidental shorting to hazardous voltages and the improper use of connectors.	Pass
2.3.5	Connection of SELV circuits to other circuits	The SELV circuits are not connected to other circuits other than protective earth.	Pass

2.4	**Limited current circuits**		N/A
2.4.2	Frequency (Hz) ..... :		—
	Measured current (mA) ..... :		N/A
2.4.3	Measured voltage (V) ..... :		—
	Measured capacitance (µF) ..... :		N/A
2.4.4	Measured voltage (V) ..... :		—
	Measured charge (µC) ..... :		N/A
2.4.5	Measured voltage (V) ..... :		—
	Measured energy (mJ) ..... :		N/A
2.4.6	Limited current circuit supplied from or connected to other circuits ..... :		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.5	**Provisions for earthing**		Pass
2.5.1	Class I equipment	Accessible parts are earthed.	Pass
	Warning label for service personnel		N/A
2.5.2	Protective earthing in Class II equipment		N/A
2.5.3	Switches/fuses in earthing conductors	No switch or fuse in earthing conductor.	Pass
2.5.4	Assured earthing connection for Class I equipment in systems comprising Class I and Class II equipment		N/A
2.5.5	Green/yellow insulation	Main earth conductor is green with yellow stripe.	Pass
2.5.6	Continuity of earth connections	Accessible non-current carrying metal parts are reliably connected to earth.	Pass
2.5.7	Making and breaking of protective earthing connections	It is not possible to disconnect earth without disconnecting mains.	Pass
2.5.8	Disconnection protective earthing connections	Connections to protective earthing cannot be removed unless hazardous voltage is removed from the part simultaneously.	Pass
2.5.9	Protective earthing terminals for fixed supply conductors or for non-detachable power supply cords	Using detachable power supply cord.	N/A
2.5.10	Corrosion resistance	The protective earthing terminal has adequate plating.	Pass
2.5.11	Resistance (Ohm) of protective earthing conductors ≤ 0.1 Ohm	The resistance from the earth terminal to the chassis is 0.00464 ohms. See enclosed test record.	Pass
	Test current (A) ..... :	30 A	—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

2.6	**Disconnection from primary power**		Pass
2.6.1	General requirements		Pass
2.6.2	Type of disconnect device ..... :	Appliance Coupler is the disconnect device.	Pass
2.6.3	Disconnect device in permanently connected equipment		N/A
2.6.4	Parts of disconnect device which remain energized	No accessible parts on the supply side of the disconnect device.	N/A
2.6.5	Switches in flexible cords		N/A
2.6.6	Disconnection of both poles simultaneously for single-phase equipment	Disconnect device disconnects all poles simultaneously.	Pass
2.6.7	Disconnection of all phase conductors of supply in three-phase equipment	Single-phase equipment.	N/A
2.6.8	Marking of switch acting as disconnect device	A switch is not considered the disconnect device.	N/A
2.6.9	Installation instructions if plug on power supply cord acts as disconnect device		N/A
	Language ..... :		—
2.6.11	Interconnected equipment	No interconnection of hazardous voltages.	N/A
2.6.12	Multiple power sources	The equipment only receives power from one source.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.7	**Overcurrent and earth fault protection in primary circuits**		Pass
2.7.1	Basic requirements	Protection provided as part of the building installation.	Pass
2.7.2	Protection against faults not covered in 5.4	Earth fault protection to be provided by building's installation.	Pass
2.7.3	Short-circuit backup protection	Pluggable Type A.	Pass
2.7.4	Number and location of protective devices ..... :	One fuse in the "LIVE" phase.	Pass
2.7.5	Protection by several devices	Only one protective device is provided.	N/A
2.7.6	Warning to service personnel	No protective device provided in the neutral conductor.	N/A
2.8	**Safety interlock**		N/A
2.8.2	Design		N/A
2.8.3	Protection against inadvertent reactivation		N/A
2.8.4	Reliability		N/A
2.8.5	Override an interlock		N/A
2.8.6.1	Contact gap (mm) ..... :		N/A
2.8.6.2	Switch performing 50 cycles		N/A
2.8.6.3	Electric strength test: test voltage (V) ..... :		N/A
2.8.7	Protection against overstress		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.9	**Clearances, creepage distances and distances through insulation**		Pass
	Nominal voltage (V) ..... :		—
	General		Pass
2.9.2	Clearances	Critical clearance distances are covered in power supply evaluation. (See appended table.)	Pass
2.9.2.1	Clearances in primary circuits	Evaluated as an element of power supply certification. (See appended table.)	Pass
2.9.2.2	Clearances in secondary circuits	See 5.4.4.	Pass
2.9.3	Creepage distances	All critical creepage distances are covered in power supply evaluation. See appended table.	Pass
	CTI tests ..... :		—
2.9.4.1	Minimum distances through insulation	All critical distances through insulation are covered in power supply evaluation.	Pass
2.9.4.2	Thin sheet material	All critical distances through insulation are covered in power supply evaluation.	Pass
	Number of layers (pcs) ..... :		Pass
	Electrical strength test: test voltage (V) ..... :		Pass
2.9.4.3	Printed boards		N/A
	Distance through insulation		N/A
	Electric strength test at voltage (V) for thin sheet insulating material		N/A
	Number of layers (pcs) ..... :		N/A
2.9.4.4	Wound components without interleaved insulation		N/A
	Number of layers (pcs) ..... :		N/A
	Two wires in contact inside component; angle between 45° and 90°		N/A
	Routine testing for finished component		N/A
2.9.5	Distances on coated printed boards		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
	Routine testing for electric strength		N/A
2.9.6	Enclosed and sealed parts		N/A
	Temperature T1 (°C) .....:		N/A
	Humidity % .....:		N/A
2.9.7	Spacings filled by insulating compound	Evaluated in the power supply. Certified optical isolator used in power supply.	Pass
	Temperature T1 (°C) .....:		N/A
	Humidity % .....:		N/A
2.9.8	Component external terminations	Evaluated in power supply.	Pass
2.9.9	Insulation with varying dimensions		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
2.10	**Interconnection of equipment**		Pass
2.10.1	General requirements	SELV is only connected to SELV and Safety Earth.	Pass
2.10.2	Type of interconnection circuits ..... :	Interconnection circuits are SELV CIRCUITS.	Pass
2.10.3	ELV circuits as interconnection circuits	This equipment is designed to be connected to a processing unit and the interconnection is by through SELV circuits.	Pass
2.11	**Limited power source**		Pass
	Use of limited power source ..... :	The output is inherently limited in compliance with the standard.	Pass

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
3	**WIRING, CONNECTIONS AND SUPPLY**		Pass
3.1	**General**		Pass
3.1.1	Cross-sectional area of internal wiring/interconnecting cables	All internal wiring is rated for the application.	Pass
	Protection of internal wiring and interconnecting cables	All internal wiring used in the distribution of primary power protected against overcurrent and short circuit by suitably rated protective devices.	Pass
3.1.2	Wireways	The wires are well routed away from sharp edges, etc. and are adequately fixed to prevent excessive strain on wire and terminals.	Pass
3.1.3	Fixing of internal wiring	The wires are positioned in such a manner that prevents excessive strain, loosening of terminal connections and damage of conductor insulation.	Pass
3.1.4	Fixing of uninsulated conductors		N/A
3.1.5	Insulation of internal wiring	Insulation on internal conductors are considered to be of adequate quality and suitable for the application and the working voltages involved.	Pass
3.1.6	Wires coloured green/yellow only for protective earth connection	Green/yellow conductors used only for safety earth.	Pass
3.1.7	Fixing of beads and similar ceramic insulators	The equipment does not have any beads or similar insulators.	N/A
3.1.8	Required electrical contact pressure		N/A
3.1.9	Reliable electrical connections		N/A
3.1.10	End of stranded conductor		N/A
3.1.11	Use of spaced thread screws/thread-cutting screws		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
3.2	**Connection to primary power**		Pass
3.2.1	Type of connection ..... :	The unit is provided with detachable power cord.	Pass
	Design of product with more than one supply connection ..... :	One supply connection.	N/A
3.2.2	Provision for permanent connection ..... :		N/A
	Size (mm) of cables and conduits ..... :	Not permanently connected.	N/A
3.2.3	Appliance inlet	The appliance inlet complies with IEC 320.	Pass
3.2.4	Type and cross-sectional area (mm^2) of power supply cord ..... :	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	Pass
3.2.5	Cord anchorage		N/A
	Test: 25 times; 1 s; pull (N) ..... :		—
	Longitudinal displacement ≤ 2 mm ..... :		N/A
3.2.6	Protection of power supply cord	Using a detachable power supply cord.	N/A
3.2.7	Cord guard		N/A
	D (mm) ..... :		—
	Test: mass (g) ..... :		—
	Radius of curvature of the cord ≤ 1.5 D		N/A
3.2.8	Supply wiring space	Using a detachable power supply cord.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
3.3	**Wiring terminals for external power supply conductors**		N/A
3.3.1	Terminals	Uses a detachable power supply cord.	N/A
3.3.2	Special non-detachable cord		N/A
	Type of connection ..... :		—
	Pull test at 5 N		N/A
3.3.3	Screws and nuts		N/A
3.3.4	Fixing of conductors		N/A
3.3.5	Connection of connectors		N/A
3.3.6	Size of terminals		N/A
	Nominal thread diameter (mm) ..... :		N/A
3.3.7	Protection against damage of conductors		N/A
3.3.8	Terminal location		N/A
3.3.9	Test with 8 mm stranded wire		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4	**PHYSICAL REQUIREMENTS**		Pass
4.1	**Stability and mechanical hazards**		Pass
4.1.1	Stability tests		Pass
	Angle of 10°	Based on construction, the test was deemed not necessary.	Pass
	Test: force (N) ..... :	Unit not specified for floor-standing use.	N/A
4.1.2	Protection against personal injury	Hazardous moving parts of equipment are adequately enclosed and guarded.	Pass
4.1.3	Warning and means provided for stopping the moving part ..... :		N/A
4.1.4	Edges and corners	All edges and corners are judged to be sufficiently well rounded so as not to constitute a hazard.	Pass
4.1.5	Enclosure of a high pressure lamp	No high pressure lamp.	N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4.2	**Mechanical strength and stress relief**		Pass
4.2.1	General		Pass
4.2.2	Internal enclosures 30 N ± 3 N; 5 s	No internal enclosure located in operator access area.	N/A
4.2.3	External enclosures 250 N ± 10 N; 5 s	No hazards as a result of the 250 N test. See enclosed test record.	Pass
4.2.4	Steel ball tests		Pass
	Fall test	See enclosed test record.	Pass
	Swing test		N/A
4.2.5	Drop test	Product is movable equipment.	N/A
4.2.6	Heat test for enclosures of moulded or formed thermoplastic materials: 7 h; T (°C) ..... :	The equipment has metal enclosure, test was waived	N/A
4.2.7	Compliance criteria	No hazards created after test. No reduction in creepage and clearance. No breakdown was recorded.	Pass
4.2.8	Mechanical strength of cathode ray tubes		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4.3	**Construction details**		Pass
4.3.1	Changing of setting for different power supply voltages	Power supply is autoranging	N/A
4.3.2	Adjustment of accessible control devices		N/A
4.3.4	Prevention of dangerous concentration of dust, powder, liquid and gas		N/A
4.3.5	Fixing of knobs, grips, handles, levers		N/A
	Test: force (N) ..... :		N/A
4.3.6	Driving belts/couplings shall not ensure electrical insulation		N/A
4.3.7	Retaining of sleeves		N/A
4.3.9	Protection of loosening parts	No loosening of parts impairing creepage distances or clearances over supplementary or reinforced insulation is likely to occur.	Pass
4.3.11	Resistance to oil and grease		N/A
4.3.12	Protection against harmful concentration of ionizing radiation, ultraviolet light, laser or flammable gases (for laser see IEC 825-1)	It is assumed that the visible LED indicators are Class I and operate at a wavelength in the 400-700 nm range. Specific data sheets for the LED may be available from the manufacturer.	Pass
4.3.13	Securing of screwed connections	Screwed connections are reliably secured.	Pass
4.3.15	Openings in the top of enclosure	No openings provided.	Pass
	Dimensions (mm) ..... :		—
4.3.16	Openings in the sides of enclosure	No openings provided.	Pass
	Dimensions (mm) ..... :		—
4.3.17	Interchangeable plugs and sockets	The equipment does not have any interchangeable plugs/sockets.	Pass
4.3.18	Torque test for direct plug-in equipment		N/A
	Additional torque (Nm) ..... :		N/A
4.3.19	Protection against excessive pressure		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.20	Protection of heating elements in Class I equipment		N/A
4.3.21	Protection of lithium batteries		N/A
	Construction of protection circuit ..... :	No lithium batteries.	N/A
4.3.22	Ageing of barrier/screen secured with adhesive		N/A
	Day 1: temperature (°C); time (weeks) ..... :		N/A
	Day 8/22/57: a) temperature (°C) for 1 h b) temperature (°C) for 4 h c) temperature (°C) over 8 h ..... :		N/A
	Day 9/23/58: a) relative humidity (%) for 72 h b) temperature (°C) for 1 h c) temperature (°C) for 4 h d) temperature (°C) over 8 h ..... :		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
4.4	**Resistance to fire**		Pass
4.4.1	Methods of achieving resistance to fire	Method 1: Selection and application of components and materials which minimize the possibility of ignition and spread of flame.	Pass
4.4.2	Minimizing the risk of ignition	Components rated at least 94V-2 are mounted on PWB rated at least 94V-1.	Pass
	Printed board: manufacturer; type; flammability .... :	rated minimum 94V-1.	Pass
4.4.3	Flammability of materials and components	The propagation of fire is minimized through the fire enclosure construction.	Pass
4.4.3.2	Material and component: manufacturer; type; flammability ..... :	All internal materials are rated V-2 or better or are mounted on a PWB rated V-1 or better	Pass
4.4.3.3	Exemptions ..... :	Integrated circuits, capacitors, etc. mounted on V-1 printed wiring boards.	Pass
4.4.3.4	Wiring harnesses: manufacturer; flammability ..... :	Wiring is PVC, TFE, PTFE, FEP or neoprene.	Pass
4.4.3.5	Cord anchorage bushings: manufacturer; flammability ..... :		N/A
4.4.3.6	Air filter assemblies: manufacturer; flammability ... :		N/A
4.4.4	Enclosures and decorative parts: manufacturer; flammability ..... :	Metal enclosure, front enclosure is rated V-1	Pass
4.4.5	Conditions for fire enclosures	All resistors, capacitors and inductors are located in a fire enclosure.	Pass
4.4.5.1	Components which require fire enclosure: manufacturer; flammability ..... :	A fire enclosure covers all parts.	Pass
4.4.5.2	Components not requiring fire enclosure .....:	Fire enclosure covers all parts.	Pass
4.4.6	Fire enclosure construction	No bottom openings	Pass
4.4.7	Doors and covers in fire enclosures	The equipment does not have any doors or covers.	N/A
4.4.8	Flammable liquids		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
5	**THERMAL AND ELECTRICAL REQUIREMENTS**		Pass
5.1	**Heating**		Pass
	Heating tests	See enclosed test record.	Pass
5.2	**Earth leakage current**		Pass
5.2.1	General	Equipment intended to be connected to IT, TT or TN POWER SYSTEMS.	Pass
5.2.2	Leakage current	See enclosed test record	Pass
	Test voltage (V) ..... :	264 V	—
	Measured current (mA) ..... :	See enclosed test record.	—
	Max. allowed current (mA) ..... :	3.5	—
5.2.3	Single-phase equipment	See 5.2.2	Pass
	Test voltage (V) ..... :		—
	Measured current (mA) ..... :		—
	Max. allowed current (mA) ..... :		—
5.2.4	Three-phase equipment		N/A
	Test voltage (V) ..... :		—
	Measured current (mA) ..... :		—
	Max. allowed current (mA) ..... :		—
5.2.5	Equipment with earth leakage current exceeding 3.5 mA		N/A
	Test voltage (V) ..... :		—
	Measured current (mA) ..... :		—
	Max. allowed current (mA) ..... :		—
	Cross-sectional area (mm^2) of internal protective earthing conductor ..... :		—
	Warning label		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
5.3	**Electric strength**		Pass
5.3.1	General	Based on the electric strength test the use of the insulating materials within the equipment is satisfactory.	Pass
5.3.2	Test procedure	2121 V dc applied for one minute between primary circuits and accessible parts.	Pass
5.4	**Abnormal operating and fault conditions**		Pass
5.4.2	Motors	All disk drive motors evaluated as part of component evaluation.	Pass
5.4.3	Transformers	Evaluated as part of power supply.	Pass
5.4.4	Compliance of operational insulation		Pass
	Method used ..... :	Method C. Conducted as part of the power supply investigation.	Pass
5.4.5	Electromechanical components in secondary circuits	The equipment does not have any electromechanical components in the secondary, except drives and fans.	N/A
5.4.6	Other components and circuits	See enclosed test record for tests done during this evaluation. Component fault tests were conducted during the power supply evaluation.	Pass
5.4.7	Test in any expected condition and foreseeable misuse	See enclosed test record.	Pass
5.4.8	Unattended use of equipment having thermostats, temperature limiters etc.		N/A
5.4.9	Compliance	No fire, emission of molten metal or deformation was noted during the tests.	Pass
5.4.10	Ball-pressure test of thermoplastic parts; impression shall not exceed 2 mm		Pass

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
6	**CONNECTION TO TELECOMMUNICATION NETWORKS**		N/A
6.1	**General**		N/A
6.2	TNV circuits		N/A
6.2.1.1	Limits of the TNV circuits		N/A
6.2.1.1 a)	TNV-1 circuits		N/A
6.2.1.1 b)	TNV-2 and TNV-3 circuits		N/A
6.2.1.2	Separation from other circuits and from accessible parts		N/A
	Voltage (V) in SELV circuits, TNV-1 circuits and accessible conductive parts in event of single insulation fault or component failure ..... :		N/A
6.2.1.3	Operating voltages generated externally		N/A
	Voltage (V) in SELV circuit, TNV-1 circuit or accessible conductive part ..... :		N/A
6.2.1.4	Separation from hazardous voltages ..... :		N/A
	Insulation between TNV circuit and circuit at hazardous voltage		N/A
	Method used ..... :		N/A
6.2.1.5	Connection of TNV circuits to other circuits		N/A
	Insulation (mm) between TNV circuit supplied conductively from secondary circuit and hazardous voltage circuit ..... :		N/A
6.2.2.1	Protection against contact with bare conductive parts of TNV-2 and TNV-3 circuits		N/A
	Test with test finger		N/A
	Test with test probe		N/A
6.2.2.2	Battery compartments		N/A
	Marking next to door/on door		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
6.3	**Protection of telecommunication network service personnel, and users of other equipment connected to the telecommunication network, from hazards in the equipment**		N/A
6.3.1	Protection from hazardous voltages		N/A
6.3.2	Use of protective earthing		N/A
	Language of installation instructions ..... :		N/A
6.3.3.1	Insulation between TNV circuit and parts or circuitry that may be earthed		N/A
6.3.3.2	Exclusions ..... :		N/A
6.3.4.1	Limitation of leakage current (mA) to telecommunication network ..... :		N/A
6.3.4.2	Summation of leakage currents from telecommunication network ..... :		N/A
6.4	**Protection of the equipment user from voltages on the telecommunication network**		N/A
6.4.1	Separation requirements		N/A
6.4.2	Test procedure		N/A
6.4.2.1	Impulse test: separation between TNV-1 circuits/TNV-3 circuits and:		N/A
6.4.2.1 a)	unearthed conductive parts/non-conductive parts of the equipment which are held or touched during normal use; test at 2.5 kV		N/A
6.4.2.1 b)	parts and circuitry that can be touched by the test finger except contacts of connectors that cannot be touched by test probe; test at 1.5 kV		N/A
6.4.2.1 c)	circuitry which is provided for connection of other equipment; test at 1.5 kV		N/A
6.4.2.2	Electric strength test: separation between TNV-1 circuits/TNV-3 circuits and:		N/A
6.4.2.2 a)	unearthed conductive parts/non-conductive parts of the equipment which are held or touched during normal use; test at 1.5 kV		N/A
6.4.2.2 b)	parts and circuitry that can be touched by the test finger except contacts of connectors that cannot be touched by test probe; test at 1.0 kV		N/A
6.4.2.2 c)	circuitry which is provided for connection of other equipment; test at 1.0 kV		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
6.4.2.3	Compliance criteria		N/A
6.5	**Protection of telecommunication wiring system from overheating**		N/A
	Maximum continuous output current (A) ..... :		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
A	**ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE**		N/A
A.1	Flammability test for fire enclosures of moveable equipment having a total mass exceeding 18 kg, and of stationary equipment		N/A
A.2	Flammability test for fire enclosures of moveable equipment having a total mass not exceeding 18 kg, and for materials located within fire enclosures		N/A
A.3	High current arcing ignition test		N/A
A.3.6	Number of arcs .....:		N/A
A.4	Hot wire ignition test		N/A
A.4.6	Ignition time (s) .....:		N/A
A.5	Hot flaming oil test		N/A
A.6	Flammability test for classifying materials V-0, V-1 or V-2		N/A
A.7	Flammability test for classifying foamed materials HF-1, HF-2 or HBF		N/A
A.8	Flammability test for classifying materials HB		N/A
A.9	Flammability test for classifying materials 5V		N/A
A	Tested material		N/A
	Preconditioning: 7 days (168 h); temperature (°C) :		—
	Mounting of samples during test ..... :		—
	Wall thickness ..... :		—
	Sample 1 burning time ..... :		N/A
	Sample 2 burning time ..... :		N/A
	Sample 3 burning time ..... :		N/A
	Material: compliance with the requirements		N/A
	Manufacturer of tested material ..... :		—
	Type of tested material ..... :		—
	Additional information ..... :		—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
B	**ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS**		Pass
B.1	General requirements	Motor tests were conducted during the component investigation.	Pass
	Position ..... :		—
	Manufacturer ..... :		—
	Type ..... :		—
	Rated voltage (V) or current (A) ..... :		—
B.2	Test conditions		N/A
B.3	Maximum temperatures		N/A
B.4	Running overload test		N/A
B.5	Locked-rotor overload test		N/A
	Test duration (days) ..... :		—
	Electric strength test: test voltage (V) ..... :		—
B.6	Running overload test for DC motor in secondary circuits		N/A
B.7	Locked-rotor overload test for DC motor in secondary circuits		N/A
B.7.2	Test time (h) ..... :		N/A
B.7.3	Test time (h) ..... :		N/A
B.8	Test for motors with capacitor		N/A
B.9	Test for three-phase motors		N/A
B.10	Test for series motors		N/A
	Test voltage (V) ..... :		—

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
C	**ANNEX C, TRANSFORMERS**		Pass
	Position ..... :	Located inside the power supply.	—
	Manufacturer ..... :		—
	Type ..... :		—
	Rated values ..... :		—
	Temperatures	Evaluated as an element of power supply certification.	Pass
	Thermal cut-out		N/A
C.1	Overload test		N/A
	Conventional transformer		N/A
C.2	Insulation		N/A
	Precautions ..... :		N/A
	Retaining of end turns of all windings		N/A
	Earthing test at 25 A		N/A
C.3	Electric strength test		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict
H	**ANNEX H, IONIZING RADIATION**		N/A
	Ionizing radiation		N/A
	Measured radiation ..... :		—
	Measured high-voltage (kV) ..... :		—
	Measured focus voltage (kV) ..... :		—
	CRT markings ..... :		—
	Certified by ..... :		—
	Standard used ..... :		—
U	**ANNEX U, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION**		N/A
	See separate test report		N/A

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

1.5.1	**TABLE: list of critical components**				Pass
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1])
Power Supply	Akii Technology	A40A1-02M	100-240 V~, 0.9A, 50/60 Hz	IEC 60950	UL, C-UL, TUV
AC Inlet/EMI Filter	Delta Electronics	01GENG3E-R	115/250 V, 50/60 Hz	IEC 60384-14	UL, CSA, TUV, SEV, Demko, Nemko, Semko
Front Bezel	Plastic World, Ltd. (Cho Ei)	CAP-NNNNNXXXM	1.6 mm, flame rating of 94V-1	UL 94	UL
Fan	Sunonwealth Electric Machine Industry Co., Ltd.	KD1206PTB1	12 V dc, 2.2 W	UL 508	UL, CSA, TUV
Tape Drive	Benchmark / Dell / HP / IBM / Tandberg	DLT VS160 / PowerVault 110T DLT VS160 / StorageWorks DLT-VS-160/320 / 80/160GB Half-High DLTVS Tape Drive / DLT VS160 Internal Tape Drive	5V, 1.5A /12V, 0.5A	IEC 60950	UL, C-UL
Power Switch	various	-	250 V, 6 A minimum, DPST, rocker type	UL 1054	UL, CSA, VDE
Conductive Coating on Front Bezel	Acheson Colloids	Electrodag 550	minimum thickness is 1.0 mils, maximum thickness is 2.0 mils	UL 746	UL
Alternate	Spraylat	599-B3755 or 599-Y2000	minimum thickness is 1.0 mils, maximum thickness is 2.0 mils	UL 746	UL
External SCSI Cable	various	various	CL-2, 28 AWG, 75 degrees C	UL 758	UL
Internal Plastics	various	various	V-2 minimum	-	UL
[1]) an asterisk indicates a mark which assures the agreed level of surveillance					

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

1.6	**TABLE: electrical data (in normal conditions)**					Pass
fuse #	I rated (A)	U (V)	P (W)	I (mA)	I fuse (mA)	condition/status
supplementary information: See enclosed test record.						

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

2.9.2 and 2.9.3	**TABLE: clearance and creepage distance measurements**					Pass
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
Primary to earth	340	240	2.0	greater than 2.0	2.5	greater than 2.5
Primary to secondary	340	240	4.0	greater than 4.0	5.0	greater than 5.0

2.9.4.1	**TABLE: distance through insulation measurements**			Pass
distance through insulation di at/of:	U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)
supplementary information: See enclosed power supply report.				

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

5.1	**TABLE: temperature rise measurements**				Pass
	test voltage (V) ..... :				—
	t1 (°C) ..... :				—
	t2 (°C) ..... :				—
temperature rise dT of part/at:		dT (K)		required dT (K)	
temperature rise dT of winding:	R_1 (Ω)	R_2 (Ω)	dT (K)	required dT (K)	insulation class
supplementary information: See enclosed test record.					

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

5.3	**TABLE: electric strength measurements**		Pass
test voltage applied between:		test voltage (V)	breakdown
			Yes / No
supplementary information: See enclosed test record.			

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

5.4	**TABLE: fault condition tests**		Pass
	ambient temperature (°C) ..... :		—
	model/type of power supply ..... :		—
	manufacturer of power supply ..... :		—
	rated markings of power supply ..... :		—

No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result

supplementary information:

See enclosed test record.

IEC 950			
Clause	Requirement + Test	Result - Remark	Verdict

5.4.10	**TABLE: ball pressure test of thermoplastics**		Pass
	required impression diameter (mm) ..... :	<= 2 mm	—
part		test temperature (°C)	impression diameter (mm)
supplementary information: See enclosed power supply report.			

ENCLOSURE No. 1

NATIONAL DIFFERENCES TO IEC 950 (1991) SECOND EDITION
(including Amendments 1 to 4)

Argentina
Australia
Austria
Belgium (only Group differ.)
China
Czech Republic (only Group differ.)
Denmark
Finland
France
Germany
Greece (only Group differ.)
Group
Hungary (only Group differ.)
India (no differ. declared)
Ireland (only Group differ.)
Israel
Italy (only Group differ.)
Japan
Korea
Netherlands (only Group differ.)
Norway
Poland
Russia (no differ. declared)
Singapore
Slovakia (no differ. declared)
Slovenia (only Group differ.)
South Africa (no differ. declared)
Spain (only Group differ.)
Sweden
Switzerland
United Kingdom
Yugoslavia (no differ. declared)

(Total 33 Pages including this Cover Page)

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Argentinean Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
General	Household power supply sources are 220 V a.c., 50 Hz	Product Rated 100-240 V	Pass
1.5.2	Certified plug according to IRAM 2063 (two prong) or IRAM 2073 (three prong) are used in accordance with their ratings	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
1.7.2	Operating/safety instructions made available to the user in Spanish. Product information appears on the product..	Instructions verified in English. Client has been informed of requirement	N/A
1.7.14	Language of safety markings/instructions is Spanish	Instructions verified in English. Client has been informed of requirement	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Australian and New Zealand Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.2.12.2	Add: TT power systems are not permitted in Australia or New Zealand.		N/A
1.2.12.3	Add: IT power systems are not permitted in Australia or New Zealand.		N/A
1.5.1	Add to paragraph 1: "or the relevant Australian or New Zealand Standard".		Pass
1.5.2	Add to the first and third dashed items after the words "IEC Component Standard": "or the relevant Australian or New Zealand Standard".		Pass
1.7.14	Add to Paragraph 1: In Australia and New Zealand all safety instructions shall be in English.		N/A
2	Add after Clause 2: For the limit of direct current from a.c. appliances, refer to AS/NZS Appendix 3.		N/A
2.3.7	Add "Australia" to Note 2.		N/A
3.2.2	Substitute for Table 10: For sizes of cables and conduits in Australia, refer to AS 3000.	Equipment uses detachable power supply cord.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
3.2.4	Substitute for Table 11: For sizes of conductors in power supply cords use the following Table 11: TABLE 11 **SIZES OF CONDUCTORS IN POWER SUPPLY CORDS** Rated current of Appliance [A] — Nominal cross-section area [mm^2] Over 0.2 up to and including 3 — 0.5* Over 3 up to and including 7.5 — 0.75 Over 7.5 up to and including 10 — 1 Over 10 up to and including 16 — 1.5 Over 16 up to and including 25 — 2.5 Over 25 up to and including 32 — 4 Over 32 up to and including 40 — 6 Over 40 up to and including 63 — 10 *This nominal cross-sectional area is only allowed for Class II appliances if the length of the power supply cord, measured between the point where the cord or cord guard, enters the appliance, and the entry to the plug, does not exceed 2 m (0.5 mm^2 three-core supply flexible cords are not permitted; see Note 2 to Table 2.17 of AS/NZS 3191).	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
4.4.1	Add after Clause 4.4.1: For an alternative resistance to fire test, refer to AS/NZS Appendix 2.		N/A
6.4.2	Replace the first paragraph of 6.4.2 by: In Australia, compliance with 6.4.1 is checked by the tests of both 6.4.2.1 and 6.4.2.2. Delete: The fourth paragraph "The choice of the tests..... manufacturer".		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
6.4.2.1	In Australia the following impulse test shall apply (replace clause 6.4.2.1): **Impulse test** The electrical separation is subjected to ten impulses of alternating polarity, using the impulse test generator of Annex N. The interval between successive impulses is 60 s and the initial voltage, Uc is: -in case (a) of 6.4.1: 7 kV for hand-held telephones and for headsets; and 2.5 kV for other equipment; and -in cases (b) and (c): 1.5 kV. **NOTES:** 1. The 7 kV impulse is to simulate lightning surges on typical Australian rural and semi-rural network lines. 2. The value of 2.5 kV for case (a) has been chosen primarily to ensure adequacy of the insulation concerned, and it does not necessarily simulate likely overvoltages.		N/A
6.4.2.2	In Australia the following electric strength test shall apply (replace clause 6.4.2.2): **Electric strength test** The electrical separation is subjected for 60s to a substantially sinusoidal voltage having a frequency of 50 Hz or 60 Hz, or to a d.c. voltage equal to the peak value of the prescribed a.c. voltage. The a.c. test voltage is: -in case (a) of 6.4.1: 3 kV -in cases (b) and (c): 1.5 kV The voltage is gradually raised from zero to the prescribed voltage and then held at that value for 60 s. **NOTES:** 1. Where there are capacitors across the insulation under test, it is recommended that d.c. test voltages are used. 2. The 3 kV and 1.5 kV values have been determined considering the low frequency induced voltages from the power supply distribution system.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
Annex A	Add after Annex title: For an alternative resistance to fire test, refer to AS/NZS, Appendix 2.		N/A
Appendix 2 X2.0	GENERAL. This test is an alternative to the tests in Annex A to allow approval of equipment which has inadequate documentation to verify having been tested to Annex A.		N/A
X2.1	Solid insulating materials and non-metallic enclosures.		N/A
X2.1.1	General Requirements. Parts of non-metallic material shall be resistant to ignition and spread of fire. This requirement does not apply to decorative trims, knobs wiring insulation and other parts not likely to be ignited or to propagate flames from inside the equipment. Compliance is checked by the tests of Clauses X2.1.2, X2.1.3 and X2.1.4 as applicable and if necessary by the test of Clause X2.2.		N/A
X2.1.2	**Non-metallic material.** Relevant parts of non-metallic material are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 550 °C. The 550 °C glow-wire test need not be carried out on parts which are made of material classified as FH 3-40 mm/min or better according to IEC 707. The sample of material submitted to the test of IEC 707 shall be no thicker than the relevant part. Insulating material of winding bobbins and formers are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 650 °C		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
X2.1.3	**Attended equipment.** For equipment which is operated while attended, parts of insulating material supporting, in contact with or in close proximity to current-carrying connections, other than those in safety extra-low voltage circuits are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 650 °C. However, parts of insulating material supporting, in contact with or in close proximity to screw connections which carry a current exceeding 0.5 A during normal operation and which are likely to be made or remade during installation, user maintenance or when replacing a supply cord assembled with the appliance by Type X attachment, are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 750 °C..		N/A
X2.1.4	**Unattended equipment.** For equipment which is operated while unattended, parts of insulating material supporting, in contact with or in close proximity to current-carrying connections, other than those in safety extra-low voltage circuits are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 750 °C. However, parts of insulating material supporting, in contact with or in close proximity to screw connections which carry a current exceeding 0.5 A during normal operation and which are likely to be made or remade during installation, user maintenance or when replacing a supply cord assembled with the appliance by Type X attachment, are subject to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 850 °C.		N/A
X2.2	ADDITIONAL TEST REQUIREMENTS. If parts, other than enclosures, do not withstand the test of Clauses X2.1.3 or X2.1.4, by failure to extinguish within 30 s after removal of the glow-wire tip, the needle-flame test of AS/NZS 3350.1 is made on all parts of non-metallic material which are within a distance of 50 mm or which are likely to be impinged upon by flame during the test of Clauses X2.1.3 or X2.1.4. Parts shielded by a separate barrier which meets the needle-flame test are not tested.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
Appendix 3	D.C. COMPONENT FROM A.C. EQUIPMENT. Equipment shall be designed so that in normal use the value of any direct current in the equipment neutral will not contribute unduly to the failure of the installation earth electrode by corrosion. Any device such as an isolating transformer intended to prevent direct current in the supply shall be an integral part of the equipment.	Full sine wave rectifier.	Pass

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Austrian Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
6.4.2.1	Equipment shall comply with Uc = 2.0 kV in cases b) and c).		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Chinese Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.4.5	The minimum supply tolerance is –10%, +10% according to Chinese situation. (GB4943 sub-clause 1.4.5)		Pass
1.5.2	IEC standard for plug is IEC 60083; The Chinese National standard for Plugs is GB1002-1996, which is not equivalent with IEC 60083	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
1.6.5	The minimum supply tolerance is –10%, +10% according to Chinese situation. (GB4943 sub-clause 1.65)		Pass

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Danish Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.2.4.1	Certain types of Class I appliances (see sub-clause 3.2.1) may be provided with a plug not establishing earthing continuity when inserted into Danish socket-outlets.	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
1.7.2	Supply cords of Class I equipment, which is delivered without a plug, must be provided with a visible tag with the following text: **"Vigtigt !** **Lederen med grøn/gul isolation må kun tilsluttes en klemme mærket** (IEC 417, No. 5019) **eller** (IEC 417, No. 5017)." If essential for the safety of the equipment, the tag must in addition be provided with a diagram, which shows the connection of the other conductors, or be provided with the following text: **"For tilslutning af de øvrige ledere, se medfølgende installationsvejledning".**	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
1.7.5 (a)	Socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a, when used on Class I equipment.	No socket-outlets in product.	N/A
1.7.5 (b)	Class II equipment shall not be fitted with socket-outlets for providing power to other equipment.	Not Class II equipment.	N/A
1.7.17	Caution text concerning lithium batteries: ADVARSEL! Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage tilleverandøren. The size of the warning must be a minimum of 26 x 52 mm, the background shall be yellow color with black frame, and the text in black color. A white background is acceptable in the User's Instruction and in the Service Manual.	No lithium battery	N/A
2.5.2	Add after the first paragraph: "The above exception is not acceptable in PLUGGABLE EQUIPMENT TYPE A."	Not Class II equipment.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
3.2.1	Supply cord of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to the Heavy Current Regulations, Section 107-2-D1. Class I equipment provided with socket-outlets with earth contact or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a. If poly-phase equipment and single-phase equipment having a rated current exceeding 10 A is provided with a supply cord with a plug, this plug shall be in accordance with the Heavy Current Regulations, Section 107-1-D1 or EN 60309-2.	Equipment provided with appliance inlet. Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Finnish Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
6.2.1.4b	Method b) is permitted only for permanently connected equipment or for pluggable equipment Type B.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

French Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
2.3.3	Method 3 is not acceptable.	Method 1 used.	Pass

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
German Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.7.14	Directions for use with rules to prevent certain hazards for (among others) maintenance of the technical labor equipment, also for imported technical labor equipment shall be written in the German language. NOTE: Of this requirement, rules for use even only by service personnel are not exempted.	Instructions verified in English. Client has been informed of requirement.	N/A
Annex H (a)	a) A license is required by those who operate an X-ray emission source		N/A
Annex H (b)	b) A license in accordance with Clause 1 is not required by those who operate an X-ray emission source on which the electron acceleration voltage does not exceed 20 kV if : 1) The local dose rate at a distance of 0.1 m from the surface does not exceed 1 µSv/h and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated and ii) the electron acceleration voltage must not e the manufacturer or importer		N/A
Annex H (c)	c) A license in accordance with Clause 1 is also not required by persons who operate an X-ray emission source on which the electron acceleration voltage exceeds 20 kV if: 1) The X-ray emission source has been granted a type approval and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated, ii) the device stipulated by the manufacturer or importer guarantees that the maximum permissible local dose rate in accordance with the type approval is not exceeded and iii) the electron acceleration voltage does not exceed the maximum value stipulated by the manufacturer or importer		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
Annex H (d)	d) Furthermore, a license in accordance with Clause 1 is also not required by persons who operate X-ray emission source on which the electron acceleration voltage does not exceed 30 kV if: 1) the X-rays are generated only intrinsically safety CRTs complying with Enclosure III, No. 6 2) the values stipulated in accordance with Enclosure III, No. 6.2 are limited by technical measured and specified in the device and 3) it is adequately indicated on the X-ray emission source that the X-rays generated are adequately screened by the intrinsically safe CRT.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Group/CENELEC Common Differences to IEC 950 Second Edition with Amendments 1 ,2, 3 and 4			
1.7.2	Delete Note 4.	No connection to TNV.	N/A
2.3.3	Delete Method 4 and the line in Note 1 relating to this method.		N/A
2.3.6	Delete Note.		N/A
2.3.7	Replace text of this clause by: Void.		N/A
2.5.2	Delete the existing note - (refer to national deviations).		N/A
2.7.1	Replace the text of this Sub-Clause by: Basic requirements To protect against excessive current, short-circuits and earth faults in primary circuits, protective devices shall be included either as integral parts of the equipment or as a part of the building installation, subject to all of the following a), b),c) and d):		Pass
(a)	a). Except as detailed in b) and c), protective devices necessary to comply with the requirements of 5.4 shall be included as integral parts of the equipment.	Integral to power supply module.	Pass
(b)	b). For components in series with the mains input to the equipment such as the supply cord, appliance coupler, RFI-filter and switch, short-circuit and earth fault protection may be provided by protective devices in the building installation.		Pass
(c)	c). It is permitted for equipment with a RATED CURRENT exceeding 16 A, which is PLUGGABLE EQUIPMENT TYPE B or PERMANENTLY CONNECTED EQUIPMENT, to rely on dedicated overcurrent and short circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instruction.	The current rating of the equipment is under 16A.	N/A
(d)	d). If reliance is placed on protection in the building installation, the installation instructions shall comply with 1.7.11 except that for PLUGGABLE EQUIPMENT TYPE A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet and 1.7.11 does not apply.	Pluggable Type A.	N/A
2.7.2	Replace the text of this sub-clause by: "Void".		N/A
2.8.4	Delete note.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
2.9.4.1	Fourth dashed paragraph, replace "nominal" by "normal".		Pass
2.9.4.2	Amend the last line on page 117a as follows: "Solvent-based enamel coating on winding wire is not considered to be insulation in thin sheet material." Add a new sentence below the text on page 117a as follows: "Requirements for wound components are given in 2.9.4.4."		N/A
2.9.4.4	Modify the title as follows: **Wound components** "Unless one of the following situations applies, interleaved BASIC, SUPPLEMENTARY or REINFORCED INSULATION complying with 2.9.4.1 or 2.9.4.2 shall be provided between the windings BASIC, SUPPLEMENTARY, DOUBLE or REINFORCED INSULATION is permitted in a wound component without interleaved insulation using one of the following constructions: - the insulation on the winding wire complies with 2.9.4.1; or - the winding wire complies with annex U; or - the insulation between the windings is provided for separation between TNV circuits and other parts in compliance with 6.4.1. NOTE - Examples of insulation of winding wire complying with Annex U are polyamide and FEP.		Pass
2.11	Delete note 1, 2 and 3.		Pass
3.2.2	Delete the note and in Table 10, delete the values in parentheses.	Cord-connected equipment.	N/A
3.2.4	Replace as follows: "245 IEC 53" by "H05 RR-F", "227 IEC 52" by "H03-VV-F or H03 VVH2-F" and "227 IEC 53" by "H05-VV-F or H05 VVH2-F". In Table 11, replace the first four lines by the following: Up to and including 6 0.75 Over 6 up to and including 10 1.0 (0.75)[2] Over 10 up to and including 16 1.5 (1.0)[3] In the conditions applicable to Table 11, delete the words "in some countries" in condition 1. Delete the second sentence in the Note.	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
3.3.5	In Table 13, replace the fourth and the fifth lines by: Over 10 up to & including 16 1.5 to 2.5 1.5 to by 4.		N/A
4.4.4	Delete Note 2.	Appliance inlet and switch comply with the requirements of the specific component standards.	Pass
4.3.12	Protection against harmful concentration of ionizing radiation, ultraviolet light, laser or flammable gases (for LED's or laser see EN 60825-1). [EN 60950 Amendment. A11:1997]	It is assumed that the visible LED indicators are Class I and operate at a wavelength in the 400-700 nm range. Specific data sheets for the LED may be available from the manufacturer.	Pass
6.2.1.2 and 6.2.1.3	Add at the end of this sub-clause: This sub-clause only applies to TNV circuits normally operating in excess of the limits of SELV circuits.		N/A
6.2.1.4	Delete the notes - (refer to national deviations).		N/A
6.4.1	Delete note 2 - (refer to national deviations).		N/A
6.4.2.1	Delete note 2 - (refer to national deviations).		N/A
Annex J	Page 317, in table J.1, electrochemical potential between Zinc, zinc alloys and Magnesium, magnesium alloys, replace "0.05" by "0.5".		N/A
Annex N	Page 335, in the title between parentheses, replace "2.9.9" by "2.9.1".		N/A
Annex P	Replace the text of this annex by: See annex ZA		N/A
Annex Q	Add for IEC 529 NOTE: Harmonized as EN 60529:1991 (not modified). Add for IEC 707 NOTE: Harmonized as HD 441 S1:1983 (not modified). Add for IEC 1058-1 NOTE: Harmonized as EN 61058-1:1992 (not modified).		N/A
Annex V	Page 359, in the figure, replace "SLEV CIRCUIT" by "SELV CIRCUIT".		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Israelite Differences to IEC 950 Second Edition with Amendments 1, 2, 3 and 4			
General	The equipment should comply with the requirements of the relevant EMC standard (SI 961 part 6 - CISPR 22+24).	Manufacturer informed of requirement.	N/A
1.2.12.1	TN Power Distribution: The mains system in Israel is TN-S or TN-C or TN-C-S		Pass
1.7	Marking and Instructions: The package of the equipment shall be marked in Hebrew, and shall include: The name of the manufacturer, The country of production, The year of production, The name and the address of the importer. The marking shall be on a rectangular label (off at least 52mm X 24mm)). The letters height should be at least 2mm. The color of the label shall be in contrast to the color of the package.	Client has been informed of requirement.	N/A
1.7.14	All safety signs and warnings should be in the Hebrew language.	Instructions verified in English. Client has been informed of requirement.	N/A
3.2.2	Add additional note below Table 10: In Israel the diameter of the conduit shall comply with the Electricity Law.	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Japanese Differences to IEC 950 Second Edition with Amendments 1,2, 3 and 4			
General	Japanese common household power supply sources are 100 V a.c., 50 or 60 Hz, therefore products should be designed to operate under dual frequencies. New buildings may be supplied from 200 V a.c., 50 or 60 Hz sources.	Equipment rated from 100 V ac to 240 V ac, 50/60 Hz.	Pass
2.9.2.1	Delete entire column titled "Nominal mains supply voltage 150 V (Transient rating 1500 V)" in Table 3. Delete "> 150 V" from column titled "Nominal mains supply voltage > 150 V 300 V (Transient rating 2500 V)" in Table 3.		Pass
2.9.2.2	Delete entire column titled "Nominal mains supply voltage 150 V (Maximum transient in secondary circuit 800 V see condition 6)" in Table 5		Pass
2.9.4.4	Replace the text of this sub-clause: Wound components BASIC, SUPPLEMENTARY, DOUBLE or REINFORCED INSULATION is permitted in a wound component using one of the following a), b), or c) constructions or the wound component must use interleaved insulation which complies with 2.9.4.1 or 2.9.4.2:	Evaluated in the power supply investigation.	N/A
	a) the winding wire is insulated with insulation complying with 2.9.4.1 other than solution based type enamel coatings		N/A
	b) the winding wire is insulated with extruded multi-layers or wrapped layers of tape (each layer can be tested for electric strength) which complies with 2.9.4.1 and complies with annex U		N/A
	c) the winding wire is insulated with extruded multi-layers or wrapped layers of tape (test can be only performed on finished winding wire) and complies with annex U		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
	Note 1 - See also 6.4.1. As to c), the number of constructional layers applied to the conductor to determine the grade of insulation of the winding wire shall not be less than as follows: - if BASIC INSULATION is required, a minimum of two layers or one extruded layer - if SUPPLEMENT INSULATION is required, a minimum of two layers or two extruded layers - if REINFORCED INSULATION is required, a minimum of three layers or three extruded layers As to b) and c), in case the CREEPAGE DISTANCES between wrapped layers of tape are less than Table 6 under Pollution degree 1, the distances between layers must be reliably cemented together with insulation compound complying with 2.9.7 and with the test voltage in annex U.2 (Type tests) increased to 1.6 times		N/A
	Note 2 - In case one layer of material is overlapped 50 % or more, it is considered as two layers		N/A
	Where two insulated wires or one bare wire and one insulated wire are contacted inside the component and cross each other at an angle between 45 ° and 90 °, physical separation shall be provided, for example in the form of insulating sleeving or sheet material, or by applying 2 times of the specified insulation layer(s), to relieve mechanical stress at the crossover point		N/A
	The finished component shall pass ROUTINE TESTING for electric strength using the values of test voltage in 5.3		N/A
	Compliance is checked by visual inspection and measurement, and as specified in annex U. However, the tests are not repeated if the material data sheets confirm compliance with annex U		N/A
5.1	Add to 5) as specified in "Conditions applicable to Table 16, parts 1 and 2": With regards to 1), insulating materials complying with Japanese requirement (refer to Japanese differences for current IEC 60335-1 (3rd Edition) in CB Bulletin 94B), can be taken of data for that material to determine the appropriate maximum temperature rise		Pass

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Annex U	Insulated winding wires for use without interleaved insulation (see 2.9.4.4).		N/A
U	This annex specifies winding wire whose insulation may be used to provide BASIC SUPPLEMENTARY or REINFORCED INSULATION in wound components without interleaved insulation. This annex applies to round winding wire whose diameter is between 0.2 mm and 1.00 mm. With regard to other size, refer to IEC 60851		N/A
U.1	Wire construction If the wire is insulated with two or more spirally wrapped layers of tape, the overlap of layers shall be adequate to ensure continued overlap during manufacture of the wound component. In order to maintain the overlap of layers, wire insulation layer of wrapped layers of tape must be adequately secured.		N/A
U.2	Type tests Unless it specifies, the wire shall pass the following six TYPE TESTS U.2.1 to U.2.4, carried out at a temperature between 15 °C and 35°C and a relative humidity between 45 % and 75 %. Refer to the IEC 60851 first edition		N/A
U.2.1	Electric strength Test 13 of IEC 60851-5 (1988), 4.3.1 (test for twisted wire pairs), with a test voltage 2 times of appropriate voltage in Table 18 of this standard or 6 kV r.m.s. whichever is the greater		N/A
U.2.2	Adherence and flexibility Test 8 of IEC 60851-3, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3 kV r.m.s. whichever is the greater		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
	Table U.2.2.2 - Mandrel Nominal diameter of conductor (mm) — Mandrel diameter (mm +/- 0.2 mm) 0.20 - 0.34 — 4.0 0.35 - 0.49 — 6.0 0.50 - 0.74 — 8.0 0.75 - 1.00 — 10.0 The tension of winding wire while wire is wrapped around the mandrel, should be calculated so that it is equivalent to 118 MPa +/ - 10 % (118 N/square mm +/- 10 %) from winding wire radial		N/A
U.2.3	Heat Shock Test 9 of IEC 60851-6, 3.1 and IEC 851-3, 5.1.1.1, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3 kV r.m.s. whichever is the greater. The temperature of oven is specified in the following Table U.2.3. Table U.2.2 shows and explains required mandrel diameter and tension. Test must be performed at room ambient after taking out from oven		N/A
	Table U.2.3 - Oven Temperature Class A (105) E (120) B (130) F (155) H (180) Oven 200 215 225 240 260 (Temperature in °C +/- 2 °C)		N/A
U.2.4	Retention of electric strength after bending Test 13 of IEC 60851-5 (1988), 4.6.1 c, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3 kV r.m.s. whichever is the greater. The required mandrel diameter and tension per Table U.2.2		N/A
U.3	Routine test Winding wire is subjected to electric strength test during the production in accordance with U.3.1 and U.3.2 by wire manufacturer.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
U.3.1	Full length test Winding wire is subjected to electric strength test during the production for full wire length, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3 kV r.m.s or 4.2 kV peak minimum.		N/A
U.3.2	Audit test Test must be carried out according to IEC 60851-5 (1988) for twisted wire pairs. Electric strength test, with a test voltage 2 times of appropriate voltage in Table 18 of this standard or 6 kV r.m.s or 8.4 kV peak minimum.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Korean Differences to IEC 950 Second Edition with Amendments 1,2,3 and 4			
General (a)	**Voltage rating** The national supply voltage has been increased to 220 V, an appliance rated 220 V only is to be allowed to obtain type approval in Korea. An appliance rated 110 V or 220 V/110 V is not allowed. When an appliance is supplied in Korea, it shall be set to and marked with 220 V. But free voltage appliance supplied by SMPS (Switching Mode Power Supply) is allowed and it shall be marked with "100 - 220 V".	Equipment is marked 100 - 240 V.	Pass
(b)	**Frequency** Only appliances having supply frequency of 60 Hz or a frequency range including 60 Hz are accepted. When an appliance is supplied in Korea, it shall be set to and marked with 60 Hz.	Frequency is 50/60 Hz.	Pass
(c)	**Instructions and Markings** Instruction manuals and appliance markings related to safety, including nameplate shall be in Korean or graphic symbols in IEC Publication 417.	Instructions verified in English. Client has been informed of requirement.	N/A
1.5.101	Add: Plugs for the connection of the apparatus to the supply mains shall comply with the Korean requirement (KSC 8305).	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
7	Radio frequency interference. The apparatus shall comply with the relevant CISPR requirements. Note: As of January 1, 2000, both Radiated Immunity and Conducted Immunity based on IEC standards become mandatory.	Manufacturer informed of requirement.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Norwegian Differences to IEC 950 Second Edition with Amdts. 1, 2, 3 and 4			
1.6.4	Due to the IT power system used, capacitors are required to be rated for the applicable phase-to-phase voltage (230 V).		Pass
1.7.2	If separation between the mains and a communication system/network, other than public telecommunication networks, relies upon connection to safety earth, the equipment shall have a marking stating that it must be connected to an earthed mains socket-outlet. NOTE: For requirements for equipment to be connected to a public telecommunication network; see 6.2.1.4. The marking text is: **"Apparatet må kun tilkoples jordet stikkontakt" or "Jordet stikkontakt skal benyttes når apparatet tilkoples datanett".**		N/A
1.7.17	Caution text concerning lithium batteries: ADVARSEL Eksplosjonsfare ved feilaktig skifte av batteri. Benytt samme batteritype eller en tilsvarende type anbefait av apparatfabrikanten. Brukte batterier kasseres i henhold til fabrikantens instruksjoner. Danish or Swedish text can also be accepted. If the battery is placed in an area not accessible to the user even English text can be used.	No lithium battery.	N/A
2.3.5	Marking and installation requirements according to subclauses 1.7.2, Note 4 and 6.2.1.4, Note 2 apply.		N/A
2.3.9	Marking and installation requirements according to this annex, subclauses 1.7.2 and 6.2.1.4 apply.		N/A
2.5.2	Add after the first paragraph: "The above exception is not acceptable in PLUGGABLE EQUIPMENT TYPE A."		N/A
2.9.1	Due to the IT power systems used, mains supply voltage is considered to be equal to phase-to-phase voltage (230 V).		N/A
5.4.9	The electric strength test includes testing of basic insulation in Class I pluggable equipment Type B and permanently connected equipment..	Pluggable Type A	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict
6.2.1.2	Supplementary insulation for a primary circuit is required between any TNV circuit and any circuit that has a connection to a protective earthing terminals. This requirement does not apply to permanently connected equipment or to pluggable equipment Type B, installed in areas where equipotential bonding has been applied, e.g. a telecommunication Central Office.		N/A
6.2.1.4	Add the following (Note 2): Method b) is not permitted. Insulation between parts conductively connected to the supply mains and parts connected to a public telecommunication network shall comply with the requirements for double or reinforced insulation.		N/A
6.2.1.5	Requirements in subclause 6.2.1.4 , Note 2 apply.		N/A
6.3.3	Clause 6.3.3 applicable for pluggable equipment Type A and B and for permanently connected equipment.		N/A
6.3.3.1	Requirements in subclauses 6.2.1.2 , National Difference, 6.2.1.4, Note 2, and 6.3.3.2, Note 1, apply.		N/A
6.3.3.2	Exclusions are applicable for permanently connected equipment and pluggable equipment Type B only (Note 1).		N/A
General	Compliance with the standard for radio interference suppression is required for the safety mark.	Manufacturer informed of requirement.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Polish Differences to IEC 950 Second Edition with Amendments 1,2,3 and 4			
1.7.14	Instruction Manual and Markings related to safety shall be in Polish.	Instructions verified in English. Client has been informed of requirement.	N/A
General	Radio Interference Emission: The product shall comply with the specifications of the Polish Post Office Authorities.	Manufacturer informed of requirement.	N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Singapore - Differences to IEC 950 Second Edition with Amdts. 1,2,3 and 4			
General	IT Power Systems are not allowed in the Republic of Singapore and all clauses related to IT Power Systems are not applicable	See enclosed power supply report.	Pass
2.2.3	(a) After the first paragraph, insert the following: Conditions described in IEC Publications 68-2-3 : Test Ca: Damp Heat, Steady State (temperature: 40 ± 2°C, relative humidity: 90 % to 95 %) apply to insulation to be used under tropical conditions. The duration of the humidity conditioning is 5 days (120h) under tropical conditions	See enclosed power supply report.	Pass
	(b) At the end of the last paragraph add: NOTE. The additional requirement on humidity conditioning is according to Clause 10.2 of IEC60065 : 1985	See enclosed power supply report.	Pass

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Swedish Differences to IEC 950 Second Edition with Amendments 1, 2, 3 and 4			
1.5.1	According to Ordinance SFS 1991:1290. Add the following: NOTE: Switches containing mercury such as thermostats, relays and level controllers are not allowed.		N/A
1.7.2	If the separation between the mains and a SELV terminal relies upon connection to safety earth, the apparatus shall have a marking stating that it must be connected to an earthed mains socket-outlet when a SELV circuit is connected to a network passing both unearthed and earthed electrical environment. The marking text shall be in Swedish and as follows: **"Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk".**		N/A
1.7.17	Caution text concerning lithium batteries: VARNING Eksplosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion. If the battery is placed in an area not accessible to the user even English text can be used.	No lithium battery	N/A
6.2.1.2	Supplementary insulation for a primary circuit is required between any TNV circuit and any circuit that has a connection to a protective earthing terminals. This requirement does not apply to permanently connected equipment or to pluggable equipment Type B.		N/A
6.3.3.1	Requirements according to the annex ZB, subclause 6.2.1.2 apply.		N/A

IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

Swiss Differences to IEC 950 Second Edition with Amendments 1, 2, 3 and 4			
1.7.17	Annex 4.10 of SR 814.013 (Ordinance on environmentally hazardous substances) applies for batteries.		N/A
3.2.1	Supply cords of equipment having a rated current not exceeding 10 A shall be provided with a plug complying with SEV 1011 or IEC 884-1 and one of the following dimension sheets: SEV 6532-2.1991 Plug Type 15 3P+N+PE 250/400 V,10 A SEV 6533-2.1991 Plug Type 11 L+N 250 V,10 A SEV 6534-2.1991 Plug Type 12 L+N+PE 250 V,10 A EN 60309 applies for plugs for currents exceeding 10 A.	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
6.1	Protective means in the equipment shall not prevent transient surge protection in the telecommunication network from operating properly (d.c. spark-over voltage of the surge suppressor installed in the telecommunication network: approx. 245 V).		N/A

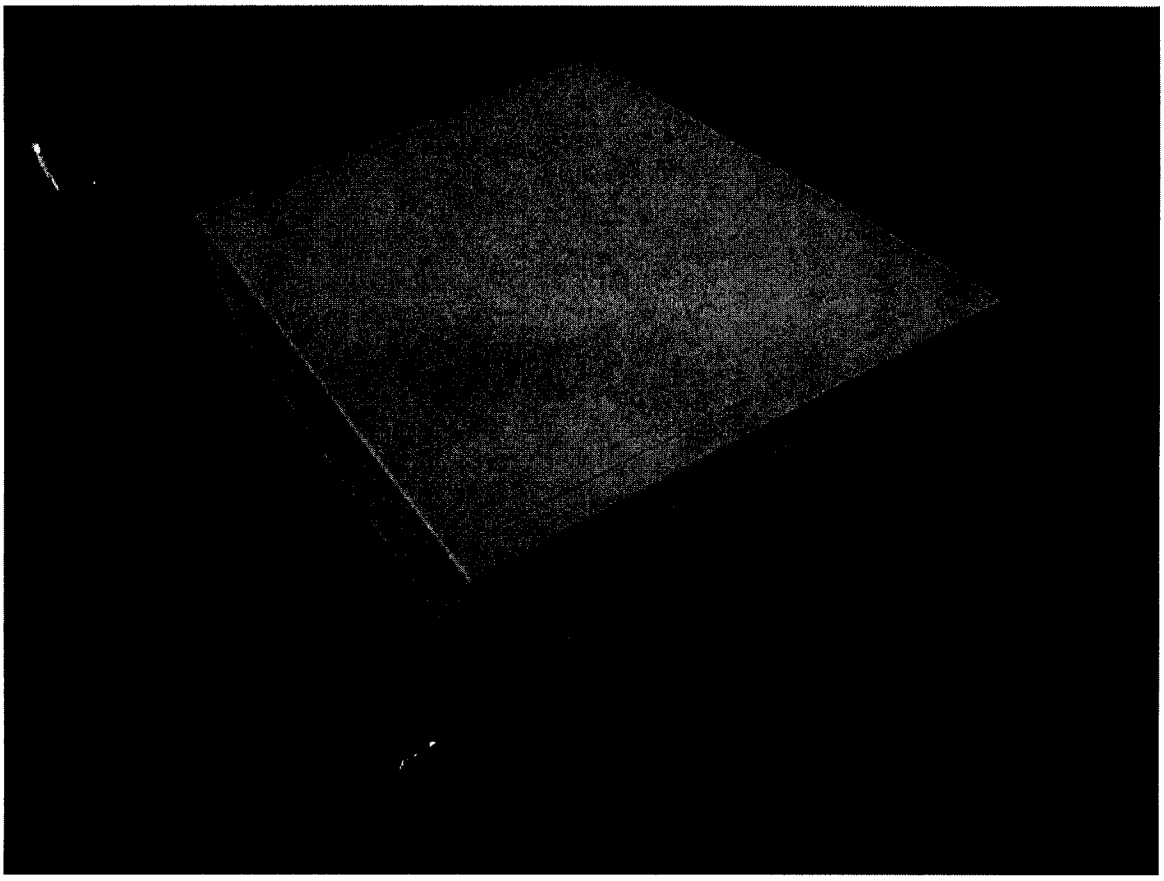
IEC 950 with Amendments 1 ,2, 3 and 4			
Sub-Clause	Difference + Test	Result - Remark	Verdict

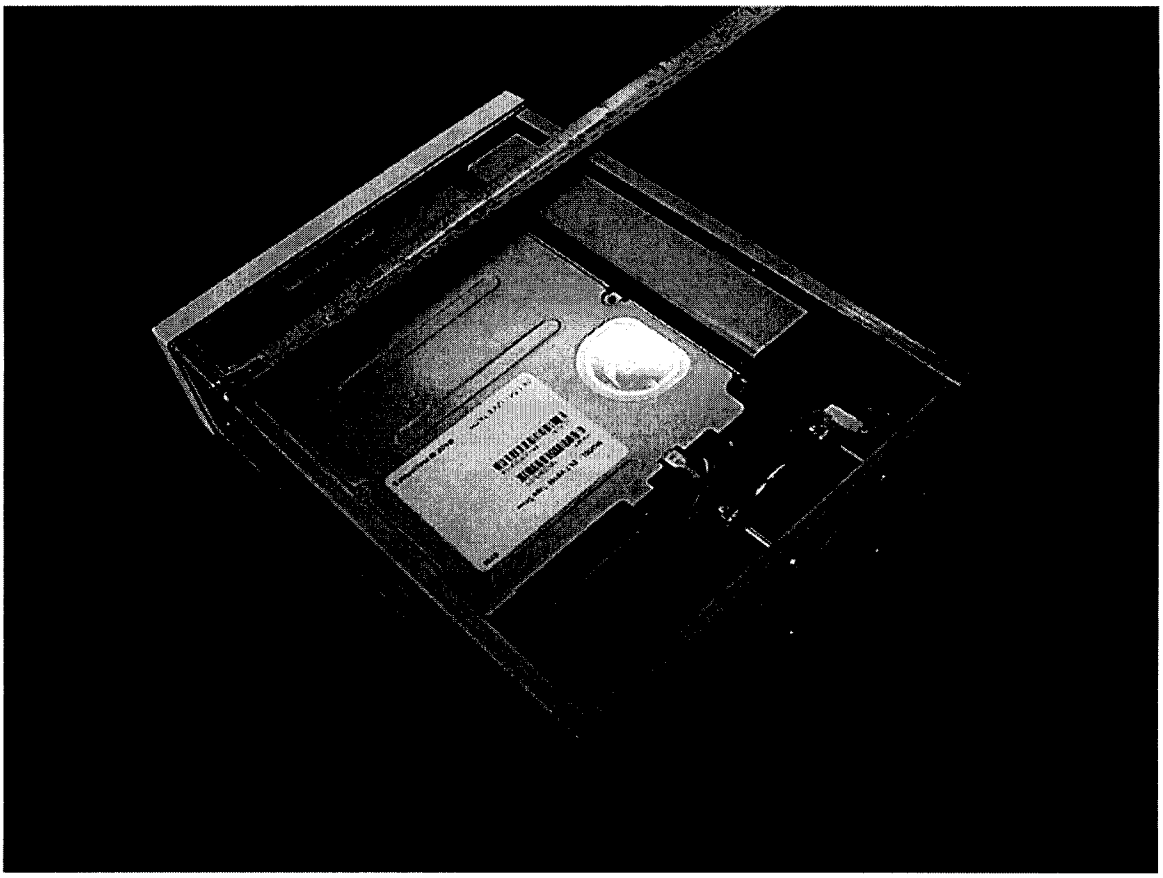
UK National Differences to IEC 950 Second Edition with Amdts. 1, 2, 3 and 4			
1.7.2	Power supply cords of Class I equipment must be provided with a label with the following text in legible characters: IMPORTANT The cores in this mains lead are colored in accordance with the following code: green and yellow: earth blue: neutral brown: live	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
3.2.1	Apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord and plug, shall be fitted with a "standard plug" in accordance with Stationary Instrument 1786: 1994 - The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations. NOTE: "Standard plug" is defined in SI 1786: 1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.	Power supply cord suitable for the application and subject to country's national code and regulations is to be provided by the manufacturer; to be determined by the country's local certification body.	N/A
3.2.4	A power supply cord with conductor of 1.25 mm² is allowed for equipment with a rated current over 10A and up to and including 13A.		N/A
3.3.5	The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current of over 10A up to and including 13A is: 1.25 mm² to 1.5 mm² nominal cross-sectional area.		N/A
4.3.18	This test should be performed using an appropriate socket outlet with an earthing contact.		N/A

ENCLOSURE No. 2

Photographs

(Total 3 Pages including this Cover Page)





ENCLOSURE No. 3

Additional Test Data

(Total 10 Pages including this Cover Page)

TEST RECORD NO. 1

SAMPLES:

The manufacturer submitted a sample representing production of Tape Drive, Model DLT VS160e.

The following tests were conducted in accordance with The Standard for Safety of Information Technology Equipment, CSA C22.2, No. 950 * UL 1950, Third Edition; IEC 950, Second Edition including Amendments 1 through 4: EN 60950: 1988 including National Deviations.

Only the following tests were deemed necessary.

The test methods and results of the above tests have been reviewed and found to be in accordance with the requirements in the Standards noted above. Test results are valid only for the tested equipment.

"Maximum normal load" was defined as continuous read and write loop.

The unit weighs approximately 1.8 Kg and was considered movable with unexposed SELV circuits.

Maximum operating ambient 40°C.

1.6.1 - INPUT TEST:
SINGLE-PHASE

METHOD

The unit was connected to a variable voltage as indicated and then operated normally under the conditions noted below until well warmed. The input current and average power were measured.

RESULTS

Operating Condition	Input Condition Volts	Hz	Input Current, A Rated	Measured	Avg. Power Watts
Continuous Read/Write	90	50/60	-	0.42	22
Continuous Read/Write	100	50/60	0.9	0.40	22
Continuous Read/Write	110	50/60	0.9	0.37	22
Continuous Read/Write	120	50/60	0.9	0.35	22
Continuous Read/Write	134	50/60	0.9	0.32	22
Continuous Read/Write	216	50/60	0.9	0.26	23
Continuous Read/Write	230	50/60	0.9	0.25	23
Continuous Read/Write	240	50/60	0.9	0.24	24
Continuous Read/Write	254	50/60	-	0.22	24
Continuous Read/Write	264	50/60	-	0.22	26

The steady state input current did not exceed the rated current at the rated voltage by more than 10 percent under the maximum normal load.

2.1.10 - CAPACITANCE DISCHARGE TEST:

METHOD

The unit was connected to 264 V ac, 50 Hz/dc. A storage oscilloscope was connected across the external point of disconnection of the mains supply. With all switches in the unit initially set to the "OFF" position, the unit was disconnected from the supply source. The voltage at the time of disconnection, V_o, and the voltage, V_{tc}, at 1.0 second were recorded.

RESULTS

Measurement Locations	Fuse In/Out	Switch Position	V_o (V pk)	37% V_o (V pk)	V_{tc} (V pk)
Line to Line	-	ON	370	137	0
Line to Ground	-	ON	370	137	0
Line to Line	-	OFF	370	137	0
Line to Ground	-	OFF	370	137	0

The voltage across-line capacitors did not decay to less than 37 percent of its original value in 1.0 second.

2.5.11 - EARTHING TEST:

METHOD

Using a maximum 12 V ac power source, a current of 30 A, was passed between the equipment earthing terminal and the accessible metal parts listed below for a period of 2 minutes. The resistance was measured.

RESULTS

Accessible Conductive Part	Current (Amps)	Voltage Drop (Volts)	Resistance (Ohms)
Fan grill	30	-	0.00464

The resistance did not exceed 0.1 ohm from any accessible conductive part and earth.

4.2.4, 4.2.7 - STEEL BALL TEST:

METHOD

The unit was placed on a solid supporting surface with the surface that was impacted positioned horizontally. One impact was imparted to the surface by a smooth steel sphere 50 mm (2 in.) in diameter and weighing 0.5 kg (1-3/16 lbs). The sphere was allowed to fall freely through a distance of 1.3 m (51-3/16 in.).

Following the impacts, the unit was subjected to an Electric Strength Test for one minute.

	Location		
	From	To	Potential Used (V)
A.	primary	earth	2121 dc

RESULTS

Material	Impact Area	Observations
Steel enclosure	Top	No damage
Steel enclosure	Side	No damage

It was not possible to access hazardous parts.

There was no indication of a dielectric breakdown.

5.1, 1.4.8, 3.3.2 - HEATING TEST:

METHOD

The sample was connected to a source of supply as noted below and operated until temperatures became stable. Temperatures were measured using the thermocouple method.

The sample operated under maximum normal load as follows: continuous read/write until steady conditions were established.

Tmra was 40°C.

RESULTS

		Input Conditions		
Test	Operating Condition	Volts	Hz	Duration
A	Continuous read/write	90	60	4hrs
B	Continuous read/write	90	50	4hrs
C	Continuous read/write	134	60	4hrs
D	Continuous read/write	254	50	4hrs
E	Continuous read/write	264	50	4hrs
F	Continuous read/write with front vents blocked	264	50	4hrs
G	Continuous read/write with cooling fans disconnected	264	50	4hrs

	Maximum Temperature °C			
Thermocouple Locations	Test A	Test B	Test C	Test D
1. T2 Coil	56.6	55.2	56.8	61.9
2. T1 Coil	47.2	45.1	42.6	40.4
3. C3 Body near DB1 (PS)	51.8	49.1	49.9	61.9
4. PWB near HS1 (PS)	44.6	42.5	45.4	45.2
5. L3 Coil (PS)	67.2	64.2	67.8	66.2
6. L2 Coil (PS)	55.4	52.4	56.1	54.3
7. Ambient	24.4	22.4	24.4	23.2

Thermocouple Locations	Test E	Test F	Test G
1. T2 Coil	65.3	72.2	94.2
2. T1 Coil	42.8	38.6	64.9
3. C3 Body near DB1 (PS)	64.1	57.0	87.2
4. PWB near HS1 (PS)	47.2	55.9	75.5
5. L3 Coil (PS)	67.7	74.5	101.2
6. L2 Coil (PS)	55.9	61.4	84.1
7. Ambient	24.4	24.6	24.5

5.2, ANNEX D - LEAKAGE CURRENT TEST:
(Single-Phase/Polyphase; TN/TT System)

METHOD

The unit was connected to 264 V ac, 60 Hz. The unit was placed on an insulating surface and all connections to external equipment were disconnected to prevent stray leakage paths.

For Class I equipment, the current between the supply conductors and equipment protective earth terminal was measured using the IEC leakage current meter, described in Annex D of UL 1950, Third Edition. Primary power switches (i.e., "ON/OFF" switches and voltage selector switches) which operated during normal use, were opened and closed in all possible combinations.

RESULTS

Primary Switch Condition	Measurement From	Measurement To	Polarity/ Phase Open	Leakage Current (mA)	Comments
ON	Line/Neutral	Chassis	Norm/Rev	0.44	
OFF	Line/Neutral	Chassis	Norm/Rev	0.27	
ON	L1/L2	Chassis	Norm/Rev	0.44	IT Leakage
OFF	L1/L2	Chassis	Norm/Rev	0.27	IT Leakage
ON	L3	Chassis	Norm/Rev	0.63	IT Leakage
OFF	L3	Chassis	Norm/Rev	0.48	IT Leakage

5.3.1 - ELECTRIC STRENGTH TEST:

METHOD

While the unit was in a well heated condition, an ac or dc potential was gradually increased from zero to the test potential given below. The voltage was applied and maintained for a period of one minute between the points indicated. All switches, relays, contactors, triacs or equivalent in the test circuit were closed or shunted.

From: Primary to Ground
Test Voltage: 2121 V dc

RESULTS

There was no indication of breakdown.

5.4.1 - 5.4.9 - ABNORMAL OPERATION TESTS:

METHOD

The unit was operated continuously under the abnormal condition(s) noted below. The unit was placed on a tissue paper covered softwood surface and covered with cheesecloth.

Test No.

1. Blocked Ventilation Openings
2. Disconnected fan

At the end of the test, an Electric Strength (ES) potential was applied, as indicated below, for one minute.

From: Primary to Ground
Test Voltage: 2121 Vdc

The following key and corresponding comments may be used to describe the final results.

Comments Key:

NC - Cheesecloth remained intact
YC - Cheesecloth charred or flamed
NT - Tissue paper remained intact
YT - Tissue paper charred or flamed
NB - No indication of dielectric breakdown

RESULTS

Test	Component	Abnormal Condition	Input V/Hz	Duration	Comments
1	Vents	Blocked	264/50 Hz	4 hours	NB, NT, NC
2	Fan	Disconnected	264/50 Hz	4 hours	NB, NT, NC

Comments: Refer to Tests F and G of Heating Test.

5.4.6 - OVERLOAD OF OPERATOR ACCESSIBLE CONNECTOR TEST:

METHOD

The sample was covered with one layer of cheesecloth and placed on a pinewood board covered with one layer of tissue paper. The sample had a complete enclosure.

The sample was connected to 264 V ac, 50 Hz.

The voltage potential was measured on the connector pins. Circuits that measured 0 V were not tested.

The impedance was measured between each accessible connector pin that had greater than 0 V and its power supply voltage source. Where there was 10,000 ohm or more of series impedance between the output connector pin and the power supply voltage source of 125 V or less, the circuit was not tested. Where there was 20,000 ohm or more of series impedance between the output connector pin and the power supply voltage source was greater than 125 V but not greater than 250 V, the circuit was not tested.

A suitable variable resistor was connected between the connector pin tested and ground. The maximum available current was measured at each pin. If the current was less than or equal to 12.5 mA, the circuit was not tested.

When the maximum available current was greater than 12.5 mA, the load was adjusted for maximum available current and maintained for one hour.

The maximum available current was considered to be the lower of (1) the short circuit current, (2) that current just below the trip point of any overcurrent or overtemperature protective device, or (3) that current that was just below the point at which the power supply circuitry limited the output current. The trip point of overcurrent protective devices was considered to be 110 percent of their current rating.

If a trace in a secondary circuit designed to intentionally open in a repeatable manner operated during the test, the test was repeated two time (three times total).

If after one hour there was no indication of an abnormal condition, but it appeared possible that a condition of risk would result, the test was continued for 7 hours.

At the end of the test, an Electric Strength (ES) potential was applied as indicated below for one minute.

ES Code	Location From	Location To	Potential Used (V)
A	Primary	Ground	2121 Vdc

The following key and corresponding comments may be used to describe the final results.

Comments Key:

NB - No indication of dielectric breakdown
YB - Dielectric breakdown (indicate time and location)
NC - Cheesecloth remained intact
YC - Cheesecloth charred or flamed
NT - Tissue paper remained intact
YT - Tissue paper charred or flamed
A - Circuit measures 10 Kohm or more series impedance
B - Circuit measures less than 12.5 mA
C - Circuit measures 0 Volts
D - Other. Please explain.

RESULTS

Connector	Pin #s	Open Circuit Voltage (Vdc)	Maximum Available Current (mA)	Length of Test	Comments
SCSI	1-12,14,21-34	1.2	-	-	B
	13,15,16,20, 47,49,50	0	-	-	C
	17,18,51,52	4.76	2300	1 hr	NB, NC, NT
	19,35-46,48,55	1.3	-	-	B
	53,54	0	-	-	C
	56-58	1.3	-	-	B

ENCLOSURE No. 4

CB Report and Certificate of Power Supply

(Total 71 Pages Including this Cover Page)

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
COMMISSION ELECTROTECHNIQUE INTERNATIONALE (CEI)

Ref. Certif. No.
JPTUV-002553

IEC SYSTEM FOR CONFORMITY TESTING AND CERTIFICATION OF ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

SYSTÈME CEI D'ESSAIS DE CONFORMITÉ ET DE CERTIFICATION DES EQUIPEMENTS ELECTRIQUE (IECEE) METHODE OC

CB TEST CERTIFICATE
CERTIFICAT D'ESSAI OC

Product
Produit

Open Frame Power Supply

Name and address of the applicant
Nom et adresse du demandeur

AKII Technology Co., Ltd.
3F, No.501-16, Chung-Cheng Rd., Hsin-Tien
Taipei Hsien 231, TAIWAN, R.O.C.

Name and address of the manufacturer
Nom et adresse du fabricant

AKII Technology Co., Ltd.
3F, No.501-16, Chung-Cheng Rd., Hsin-Tien
Taipei Hsien 231, TAIWAN, R.O.C.
(further factories may be listed on appendices to this certificate)

Name and address of the factory
Nom et adresse de l'usine

AKII Dongguan Manufacture Co., Ltd.
Xen Sing Road, Gan Bu Town,
Dongguan, Guandong, P.R. CHINA

Rating and principal characteristics
Valeurs nominales et caractéristiques principales

Input rating : AC 100-240V, 50-60Hz, 0.9A
Output rating : DC +5V,3A; +12V,2A
Protection class : I

Trade mark (if any)
Marque de fabrique (si elle existe)

Trade mark of AUTEK

...odel/type Ref.
Ref. de type

A40A1-02M

Additional information (if necessary)
Information complémentaire (si nécessaire)

A sample of the product was tested and found to be in conformity with
Un échantillon de ce produit a été essayé et a été considéré conforme à la

PUBLICATION	EDITION
IEC 60950:1991+A1+A2+A3+A4	
Inclusive CENELEC Common Modifications	
National differences: see test report	

as shown in the Test Report Ref. No.
which form part of this certificate
comme indiqué dans le Rapport d'essais numéro de référence
qui constitue une partie de ce certificat

E 2063423 E 01

This CB Test Certificate is issued by the National Certification Body
Ce Certificat d'essai OC est établi par l'Organisme National de Certification

TÜV

TÜV Rheinland Japan Ltd.
3-19-5 Shin-Yokohama
222-0033 Japan

Date 16.01.2001

Signature

Dipl.-Ing. V. Herlitschke

Issue 1998-09

TEST REPORT

IEC 60 950

Safety of information technology equipment

Report reference No. ..... :	E 2063423 E01
Compiled by (+ signature) ..... :	E. Otsuka
Approved by (+ signature) ..... :	R. Gratton
Date of issue ..... :	12.01.2001
Testing laboratory ..... :	TÜV Rheinland Japan Ltd., Yokohama Laboratories
Address ..... :	Festo Bldg. 5F, 1-26-10 Hayabuchi, Tsuzuki-Ku, Yokohama 224-0025, Japan
Testing location ..... :	TÜV Rheinland Japan Ltd., Yokohama Laboratories
Applicant ..... :	AKII Technology Co., Ltd.
Address ..... :	3F, No. 501-16, Chung Cheng Road, Hsin Tien City, Taipei Hsien 231, Taiwan R.O.C.
Standard ..... :	IEC 60950:1991+A1:1992 + A2:1993 + A3:1995 + A4:1996 EN 60950:1992+A1:1993+A2:1993+A3:1995+A4:1997+A11:1997 EMKO-TSE(74-SEC)207/94 UL 1950, C22.2 No. 950 3rd edition, AS 3260
Test Report Form No. ..... :	I950__D/97-06
TRF originator. ..... :	FIMKO
Master TRF ..... :	reference No. I950 D, dated 97-02
Copyright blank test report ..... :	the bodies participating in the Committee of Certification Bodies (CCB) and/or the CENELEC Certification Agreement (CCA). This report is based on a blank test report that was prepared by KEMA using information obtained from the TRF originator.
Test procedure ..... :	CB Scheme
Procedure deviation ..... :	Australia, Austria, Belgium, Canada, China, The Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Ireland, Israel, Italy, Japan, Rep. of Korea, The Netherlands, Norway, Poland, Russian Fed., Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, United Kingdom, USA, Yugoslavia
Non-standard test method ..... :	N.A.

This report is not valid as a CB Test Report unless appended to a CB Test Certificate issued by a NCB, in accordance with IECEE 02

Type of test object ..... :	Open Frame Power Supply
Trademark ..... :	AUTEK
Model/type reference ..... :	A40A1-02M
Manufacturer ..... :	same as applicant
Factory ..... :	AKII Dongguan Manufacture Co., Ltd. Xen Sing Road, Gan Bu Town, Dongguan, Guandong, P.R. China
Rating ..... :	I/p: AC 100-240V, 50-60Hz, 0.9A o/p: DC +5V/3A, +12V/2A; max. output power 39W

Test item particulars:

Equipment mobility	equipment for building-in
Operating condition	continuous
Tested for IT power systems	Yes
IT testing, phase-phase voltage (V)	IT, 230V for Norway
Class of equipment	Class I
Mass of equipment (kg)	0.5kg
Protection against ingress of water	IPX0

Possible test case verdicts:

- test case does not apply to the test object	N(.A.)
- test object does meet the requirement	P(ass)
- test object does not meet the requirement	F(ail)

General remarks:

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

The test results presented in this report relate only to the object tested.

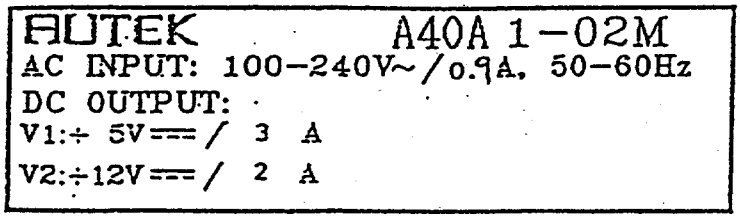
This report shall not be reproduced except in full without the written approval of the testing laboratory.

Comments:

Brief description of the test sample:

The equipment model A40A1-02M is switching power supply (built-in type) for the use in information technology equipment.

Copy of the marking plate :



IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
1	GENERAL		P
1.5	Components		P
1.5.1	Comply with IEC 60950 or relevant component standard	Components which were found to affect safety aspects comply with the requirements of this standard or within the safety aspects of the relevant IEC component standards. (see appended tables)	P
1.5.2	Evaluation and testing components	Components which are certified to IEC and /or national standards are used correctly within their ratings. Components not covered by IEC standards are tested under the conditions present in the equipment.	P
	Dimensions (mm) of mains plug for direct plug-in .....:	The equipment is not plug-in type.	N
	Torque and pull test of mains plug for direct plug-in; torque (Nm); pull (N)		N
1.5.3	Transformers	Transformer used are suitable for their intended application and comply with the relevant requirements of the standard and particularly Annex C.	P
1.5.4	High voltage components (component; manufacturer; flammability) .....:	No high voltage components used.	N
1.5.5	Interconnecting cables	No cable provided with the unit. Evaluation will be made with final system assembly.	N
1.5.6	Mains Capacitors	X2 capacitor according to IEC 60384-14:1993 with 21 days damp heat test or IEC 60384-14:1981 with 2.5kV pulse test (by SEV certificate).	P

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
1.6	Power interface		P
1.6.1	Steady state input current	Highest load according to 1.2.2.1 for this equipment is the operation with the max. specified DC-load. (results see appended table)	P
	Current deviation during normal operating cycle	>10%	P
1.6.2	Voltage limit of hand-held equipment	This appliance is not a hand-held equipment.	N
1.6.3	Neutral conductor insulated from earth and body	The neutral is not identified in the equipment. Basic insulation for rated voltage between earthed parts and primary phases.	P
1.6.4	Components in equipment intended for IT power system	Phase to earth designed in according to phase-to-phase working voltage. The Y2 type capacitor used between phase-to-earth..	P
1.6.5	Mains supply tolerance (V) .....:	+10%, -10% Documentation specifies a rating of AC 100-240V at 50-60Hz with tolerance of ± 10%. Relevant tests were done with the range of 90-264V at 50-60Hz.	P

1.7	Marking and instructions		P
1.7.1	Rated voltage (V) .....:	100-240V~	P
	Symbol of nature of supply for d.c. .....:	mains from AC source	N
	Rated frequency (Hz) .....:	50-60Hz	P
	Rated current (A) .....:	0.9A	P
	Manufacturer .....:	--	N
	Trademark .....:	Autek	P
	Type/model .....:	A40A1-02M	P
	Symbol of Class II .....:	Class I equipment	N
	Certification marks .....:	-	N

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
1.7.2	Safety instructions	Installation instruction with directions to maintain the requirements of IEC 60950 with installation in end system. Included are directions regarding the max. o/p, the max. ambient temperature and that the requirements of the IEC 60950 must be observed with the installation in the final system.	P
1.7.3	Short duty cycles	Equipment is designed for continuous operation.	N
1.7.4	Marking for voltage setting/frequency setting ...:	Full range design, no necessary adjustment.	N
1.7.5	Marking at power outlets .....:	No outlet.	N
1.7.6	Marking at fuseholders .....:	Fuse marking located on or near the fuse holder. FUSE: 2A, 250Vac	P
1.7.7.1	Protective earthing terminals	Open frame SWPS. No earth terminal.	N
1.7.7.2	Terminal for external primary power supply conductors	Open frame SWPS. No terminal.	N
1.7.8.1	Identification and location of switches and controls .....:	No switch or indicator.	N
1.7.8.2	Colours of controls and indicators .....:	No control or indicator.	N
1.7.8.3	Symbols according to IEC 60417 .....:		N
1.7.8.4	Figures used for marking .....:		N
1.7.8.5	Location of markings and indications for switches and controls .....:		N
1.7.9	Isolation of multiple power sources .....:	Only one supply from the mains.	N
1.7.10	Instructions for installation to IT power system	In the installation manual: The product is also designed for IT power system with phase-to-phase voltage 230V.	P
1.7.11	Instructions when protection relies on building installation	Not applicable as the equipment is for building in.	N

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
1.7.12	Marking when leakage current exceeds 3,5 mA	Leakage current does not exceed 3.5mA.	N
1.7.13	Indication at thermostats and regulating devices	No adjustable thermostats.	N
1.7.14	Language of safety markings/instructions	Installation instruction in English. Versions in other languages will be provided when national certificate approval.	P
	Language .....:	English	—
1.7.15	Durability and legibility	The label was subjected to the permanence of marking test. The label was rubbed with cloth for 15 sec. and then again for 15 sec. with the cloth soaked with petroleum spirit. After this test there was no damage to the label. The marking on the label did not fade. There was no curling nor lifting of the label edge.	P
1.7.16	Removable parts	No markings placed on removable parts.	P
1.7.17	Warning text for replaceable lithium batteries	No lithium battery provided.	N
	Language .....:		
1.7.18	Operator access with a tool .....:	Open frame SWPS is for building-in.	N
1.7.19	Equipment for restricted access locations .....:	No restricted access location.	N

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
2	PROTECTION FROM HAZARDS		P
2.1	Protection against electric shock and energy hazards		P
2.1.1	Access to energized parts	See below	N
2.1.2	Protection in operator access areas	The accessibility of hazardous or ELV voltages are prevented with the final system. The inspection with test pin and test finger should therefore be conducted with the approval of the end system. Installation instruction requires, that the requirements of the IEC 60 950 must be observed to the installation.	N
	Test by inspection .....:	dto	N
	Test with test finger .....:	dto	N
	Test with test pin .....:	dto	N
2.1.3.1	Insulation of internal wiring in an ELV circuit accessible to operator	No ELV wiring in operator accessible area.	N
	Working voltage (V); distance (mm) through insulation .....:		N
2.1.3.2	Operator accessible insulation of internal wiring at hazardous voltage	No hazardous voltage wiring in operator accessible area.	N
2.1.4.1	Protection in service access areas	No maintenance works in operation mode necessary.	N
2.1.4.2	Protection in restricted access locations	Open frame SWPS is not intended to be used in restricted locations.	N
2.1.5	Energy hazard in operator access area	Energy does not exceed 240VA between any two points in accessible parts (o/p) connector of secondary circuit.	P
2.1.6	Clearances behind conductive enclosures	Refer to 4.2.3.	N
2.1.7	Shafts of manual controls	Not applicable for building in.	N
2.1.8	Isolation of manual controls	None at ELV or hazardous voltage.	N

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
2.1.9	Conductive casings of capacitors	Casings of capacitors are considered as if directly connected to the respective circuitry. None at hazardous voltage accessible.	P
2.1.10	Risk of electric shock from stored charge on capacitors connected to mains circuit	No risk of electric shock, see below.	P
	Time-constant (s); measured voltage (V) .....:	Overall capacitance approx. (C1) 0.47µF, discharge resister (R1) 1MΩ. τ calculated (s) = 0.47s τ measured (s) = 0V after 0.2s	
2.1.10	TABLE: discharge test		P
2.2	Insulation		P
2.2.1	Methods of insulation	The insulation materials provided in the equipment with adequate thickness and adequate creepage distance over their surface and clearance distance through air.	P
2.2.2	Properties of insulating materials	Natural rubber, asbestos or hygroscopic materials are not used.	P
2.2.3	Humidity treatment	Total time elapsed: 48 hours	P
	Humidity (%) .....:	95% R.H.	
	Temperature (°C) .....:	25°C	
2.2.4	Requirements for insulation	Please refer to 5.3, 2.9 and 5.1.	P
2.2.5	Insulation parameters	Both parameters were considered.	P
2.2.6	Categories of insulation	The adequate levels of safety insulation is provided and maintained to comply with the requirements of this standard.	P

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
2.2.7	Determination of Working voltage	The rms and the peak voltage were measured on the power supply. The unit was connected to a 230V TN power system and secondary ground was maintained during measurement. Results (max. voltages listed) rms peak T2 281V 396V	P
2.2.7.1	General rules for working voltages	Considered	P
2.2.7.2	Clearances in primary circuits	Considered	P
2.2.7.3	Clearances in secondary circuits	Considered	P
2.2.7.4	Creepage distances	Considered	P
2.2.7.5	Electric strength tests	Considered	P
2.2.8	Double or reinforced insulation bridged by components	No component bridged reinforced or double insulation.	N
2.2.8.1	Bridging capacitors		N
2.2.8.2	Bridging resistors		N
2.2.8.3	Accessible parts		N
2.3	Safety extra-low voltage (SELV) circuits		P
2.3.1	Voltage (V) of SELV circuits under normal operating conditions and after a single fault .....:	42.4V peak or 60VDC are not exceeded in SELV circuit under normal operation or single fault condition.	
2.3.2	Voltage (V) between any two conductors of SELV circuit(s) and for Class I equipment between any conductor of SELV circuit and equipment protective earthing terminal under normal operating conditions .....:	Between any SELV circuits 42.4V peak or 60VDC are not exceeded.	P
2.3.3	Voltage (V) of SELV in the event of a single failure of basic or supplementary insulation or of a component .....:	Single fault did not cause excessive voltage in accessible SELV circuits. Limits of 71V peak and 120V DC were not exceed and SELV limits not for longer than 0.2 seconds, see abnormal results 5.4.6.	
	Method used for separation .....:	Method 1	P

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
2.3.4	Additional constructional requirements	In multiway connectors and other cable ties prevent contact to hazardous parts in case of loosening of connection or conductor breakage. IEC 60083 and IEC 60320 connectors are not used in SELV.	P
2.3.5	Connection of SELV circuits to other circuits	See 2.3.2 and 2.3.3. No direct connection between SELV and any primary circuits.	N

2.4	Limited current circuits		N
2.4.2	Frequency (Hz) .....:		—
	Measured current (mA) .....:		N
2.4.3	Measured voltage (V) .....:		—
	Measured capacitance (μF) .....:		N
2.4.4	Measured voltage (V) .....:		—
	Measured charge (μC) .....:		N
2.4.5	Measured voltage (V) .....:		—
	Measured energy (mJ) .....:		N
2.4.6	Limited current circuit supplied from or connected to other circuits .....:		N

2.5	Provisions for earthing *Approved in the final system*		P
2.5.1	Class I equipment	Basic insulated conductive parts touchable in operator area earthed reliably.	P
	Warning label for service personnel		N
2.5.2	Protective earthing in Class II equipment	Class I equipment	N
2.5.3	Switches/fuses in earthing conductors	No switches or fuses in earthing conductor.	P
2.5.4	Assured earthing connection for Class I equipment in systems comprising Class I and Class II equipment	The equipment does not comprise class I and class II.	P

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
2.5.5	Green/yellow insulation	Has to be approved in the final system.	N
2.5.6	Continuity of earth connections	Should be investigated in the final system assembly.	N
2.5.7	Making and breaking of protective earthing connections	Should be investigated in the final system assembly.	N
2.5.8	Disconnection protective earthing connections	Should be investigated in the final system assembly.	N
2.5.9	Protective earthing terminals for fixed supply conductors or for non-detachable power supply cords	Should be investigated in the final system assembly.	N
2.5.10	Corrosion resistance	All safety earthing connections in compliance with Annex J.	P
2.5.11	Resistance (Ω) of protective earthing conductors ≤ 0,1 Ω	Measured from PE terminal to: Pattern of C5: 69mΩ	P
	Test current (A) .....:	25A / 1min ; 30A / 2min	
2.6	Primary power isolation *Open frame SWPS should be investigated in the final system assembly.*		N
2.6.1	General requirements		N
2.6.2	Type of disconnect device .....:		N
2.6.3	Disconnect device in permanently connected equipment		N
2.6.4	Parts of disconnect device which remain energized		N
2.6.5	Switches in flexible cords		N
2.6.6	Disconnection of both poles simultaneously for single-phase equipment		N
2.6.7	Disconnection of all phase conductors of supply in three-phase equipment		N
2.6.8	Marking of switch acting as disconnect device		N
2.6.9	Installation instructions if plug on power supply cord acts as disconnect device		N
	Language .....:		
2.6.11	Interconnected equipment		N
2.6.12	Multiple power sources		N

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Clause	Requirement – Test	Result - Remark	Verdict
2.7	Overcurrent and earth fault protection in primary circuits		P
2.7.1	Basic requirements	Equipment relies on 16A rated fuse or circuit breaker of the wall outlet installation protection of the building installation in regard to L to N short circuit. Overcurrent protection is provided by the built-in device fuse.	P
2.7.2	Protection against faults not covered in 5.4	The protection devices are well dimensioned and mounted.	P
2.7.3	Short-circuit backup protection	The final system is considered to be pluggable equipment type A, the building installation is considered as providing short circuit protection.	P
2.7.4	Number and location of protective devices .....:	Overcurrent protection by one built-in fuse.	P
2.7.5	Protection by several devices	Only one fuse	N
2.7.6	Warning to service personnel	With reversible plug of the final system to the mains, hazardous voltage may be still presented in the equipment after the internal fuse opens. However, as it is considered that the plug to the mains will be disconnected during service work, no marking were requested.	P

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Clause	Requirement – Test	Result - Remark	Verdict
2.8	Safety interlock *No operator accessible areas which presents hazards in the meaning of this standard.*		N
2.8.2	Design		N
2.8.3	Protection against inadvertent reactivation		N
2.8.4	Reliability		N
2.8.5	Overriding an interlock		N
2.8.6.1	Contact gap (m) .....:		N
2.8.6.2	Switch performing 50 cycles		N
2.8.6.3	Electric strength test: test voltage (V) .....:		N
2.8.7	Protection against overstress		N
2.9	Clearances, creepage distances and distances through insulation		P
	Nominal voltage (V) .....:	AC 100-240V	
	General		P
2.9.2	Clearances	See below	P
2.9.2.1	Clearances in primary circuits	(see appended table 2.9.2 and 2.9.3)	P
2.9.2.2	Clearances in secondary circuits	(see appended table 2.9.2 and 2.9.3)	P
2.9.3	Creepage distances	(see appended table 2.9.2 and 2.9.3)	P
	CTI tests .....:	CTI rating for all materials of min. 100.	
2.9.4.1	Minimum distances through insulation	(see appended table 2.9.4)	P
2.9.4.2	Thin sheet material	The thin sheet materials of polyester tape used in transformer T1.	P
	Number of layers (pcs) .....:	3 layers	P
	Electrical strength test: test voltage (V) .....:	3000V ac applied on any combination of two layers	P
2.9.4.3	Printed boards	Not applied for.	N
	Distance through insulation .....:	(see appended table 2.9.4)	N
	Electric strength test at voltage (V) for thin sheet insulating material .....:	(see appended table 5.3)	N
	Number of layers (pcs) .....:		N

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Clause	Requirement – Test	Result - Remark	Verdict
2.9.4.4	Wound components without interleaved insulation	Not provided.	N
	Number of layers (pcs) .....:		N
	Two wires in contact inside component; angle between 45° and 90°		N
	Routine testing for finished component		N
2.9.5	Distances (mm) on coated printed boards .....:	No coated printed wiring boards. (see appended table 2.9.4)	N
	Routine testing for electric strength		N
2.9.6	Enclosed and sealed parts	No hermetically sealed component.	N
	Temperature T1 (°C) .....:		N
	Humidity % .....:		N
2.9.7	Spacings filled by insulating compound	Optocoupler is approved component. Other components not applied for. (see appended table 2.9.4 and 5.3)	P
	Temperature T1 (°C) .....:		N
	Humidity % .....:		N
2.9.8	Component external terminations	(see appended table 2.9.2 and 2.9.3)	P
2.9.9	Insulation with varying dimensions	Insulation kept homogenous. (see appended table 2.9.2, 2.9.3 and 2.9.4)	N
2.10	Interconnection of equipment		P
2.10.1	General requirements	This power supply is not considered for connection to TNV.	N
2.10.2	Type of interconnection circuits .....:	Interconnection circuits of SELV through the connector. No ELV interconnection circuits.	P
2.10.3	ELV circuits as interconnection circuits	No ELV interconnection.	N

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Clause	Requirement – Test	Result - Remark	Verdict
2.11	Limited power source		N
	Use of limited power source .....:	Supply from the mains. The testing whether the o/p complies with the requirements of the limited power source should be conducted with the approval of the end system.	N
3	WIRING, CONNECTIONS AND SUPPLY		P
3.1	General *No internal wires provided in this open frame SWPS.*		N
3.1.1	Cross-sectional area of internal wiring/interconnecting cables		N
	Protection of internal wiring and interconnecting cables		N
3.1.2	Wireways		N
3.1.3	Fixing of internal wiring		N
3.1.4	Fixing of uninsulated conductors		N
3.1.5	Insulation of internal wiring		N
3.1.6	Wires coloured green/yellow only for protective earth connection		N
3.1.7	Fixing of beads and similar ceramic insulators		N
3.1.8	Required electrical contact pressure		N
3.1.9	Reliable electrical connections		N
3.1.10	End of stranded conductor		N
3.1.11	Use of spaced thread screws/thread-cutting screws		N
3.2	Connection to primary power *Open frame SWPS should be investigated in the final system assembly.*		N
3.2.1	Type of connection .....:		N
	Design of product with more than one supply connection .....:		N

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Clause	Requirement – Test	Result - Remark	Verdict
3.2.2	Provision for permanent connection .....:		N
	Size (mm) of cables and conduits .....:		N
3.2.3	Appliance inlet		N
3.2.4	Type and cross-sectional area (mm²) of power supply cord .....:		N
3.2.5	Cord anchorage		N
	Test: 25 times; 1 s; pull (N) .....:		—
	Longitudinal displacement ≤ 2 mm .....:		N
3.2.6	Protection of power supply cord		N
3.2.7	Cord guard		N
	D (mm) .....:		—
	Test: mass (g) .....:		—
	Radius of curvature of the cord ≤ 1,5 D		N
3.2.8	Supply wiring space		N
3.3	Wiring terminals for external power supply conductors *Open frame SWPS should be investigated in the final system assembly.*		N
3.3.1	Terminals		N
3.3.2	Special non-detachable cord		N
	Type of connection .....:		—
	Pull test at 5 N		N
3.3.3	Screws and nuts		N
3.3.4	Fixing of conductors		N
3.3.5	Connection of connectors		N
3.3.6	Size of terminals		N
	Nominal thread diameter (mm) .....:		N
3.3.7	Protection against damage of conductors		N
3.3.8	Terminal location		N
3.3.9	Test with 8 mm stranded wire		N

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict
4	PHYSICAL REQUIREMENTS		P
4.1	Stability and mechanical hazards *The open frame SWPS is for built-in. Stability and mechanical hazards are to be evaluated in the final product.*		N
4.1.1	Stability tests		N
	Angle of 10°		N
	Test: force (N) .....:		N
4.1.2	Protection against personal injury		N
4.1.3	Warning and means provided for stopping the moving part .....:		N
4.1.4	Edges and corners		N
4.1.5	Enclosure of a high pressure lamp		N
4.2	Mechanical strength and stress relief *The open frame SWPS is for built-in. It has to be evaluated in the final product.*		N
4.2.1	General		N
4.2.2	Internal enclosures 30 N ± 3 N; 5 s		N
4.2.3	External enclosures 250 N ± 10 N; 5 s		N
4.2.4	Steel ball tests		N
	Fall test		N
	Swing test		N
4.2.5	Drop test		N
4.2.6	Heat test for enclosures of moulded or formed thermoplastic materials: 7 h; T (°C) .....:		N
4.2.7	Compliance criteria		N
4.2.8	Mechanical strength of cathode ray tubes		N
4.3	Construction details		P
4.3.1	Changing of setting for different power supply voltages	Full range design.	N
4.3.2	Adjustment of accessible control devices	No control.	N
4.3.4	Prevention of dangerous concentration of dust, powder, liquid and gas	Equipment in intended use not considered to be exposed to these.	N

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Clause	Requirement – Test	Result - Remark	Verdict
4.3.5	Fixing of knobs, grips, handles, levers		N
	Test: force (N) .....:		N
4.3.6	Driving belts/couplings shall not ensure electrical insulation	Not used for insulation.	N
4.3.7	Retaining of sleeves	No internal wiring provided.	N
4.3.9	Protection of loosening parts	Electrical and mechanical connections can be expected to withstand usual mechanical stress.	P
4.3.11	Resistance to oil and grease	Insulation not in contact with oil or grease.	N
4.3.12	Protection against harmful concentration of ionizing radiation, ultraviolet light, LED, laser or flammable gases (for LED and laser see IEC 60825-1)	No ionizing radiation, LED, laser or flammable liquids presents.	N
4.3.13	Securing of screwed connections	No connection likely to be exposed to mechanical stress is provided in unit.	P
4.3.15	Openings in the top of enclosure	Open frame built-in type.	N
	Dimensions (mm) .....:	-	
4.3.16	Openings in the sides of enclosure	Open frame built-in type.	N
	Dimensions (mm) .....:	-	
4.3.17	Interchangeable plugs and sockets		N
4.3.18	Torque test for direct plug-in equipment		N
	Additional torque (Nm) .....:		N
4.3.19	Protection against excessive pressure		N
4.3.20	Protection of heating elements in Class I equipment	No heating elements.	N
4.3.21	Protection of lithium batteries		N
	Construction of protection circuit .....:		N
4.3.22	Ageing of barrier/screen secured with adhesive		N
	Day 1: temperature (°C); time (weeks) .....:		N
	Day 8/22/57: a) temperature (°C) for 1 h b) temperature (°C) for 4 h c) temperature (°C) over 8 h .....:		N
	Day 9/23/58: a) relative humidity (%) for 72 h b) temperature (°C) for 1 h c) temperature (°C) for 4 h d) temperature (°C) over 8 h .....:		N

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Clause	Requirement – Test	Result - Remark	Verdict
4.4	Resistance to fire		P
4.4.1	Methods of achieving resistance to fire	Use of materials with the required flammability classes.	P
4.4.2	Minimizing the risk of ignition	Electrical parts are not likely to ignite nearby materials. Parts not protected against overheating under fault conditions. Temperatures see 5.1.	P
	Printed board: manufacturer; type; flammability :	See 1.5.1 appended table	P
4.4.3.2	Material and component: manufacturer; type; flammability .....:	Internal components except small parts are V-2, HF-2 or better.	P
4.4.3.3	Exemptions .....:	Considered.	P
4.4.3.4	Wiring harnesses: manufacturer; flammability ..:	No internal wiring provided.	N
4.4.3.5	Cord anchorage bushings: manufacturer; flammability .....:	No cord anchorage bushings.	N
4.4.3.6	Air filter assemblies: manufacturer; flammability :	No air filter assemblies	N
4.4.4	Enclosures and decorative parts: manufacturer; flammability .....:	Open frame built-in type.	N
4.4.5	Conditions for fire enclosures	With having the following components: ■ components with windings ■ wiring ■ semiconductor devices, transistors, diodes, integrated circuits ■ resistors, capacitors, inductors The fire enclosure is required. However, with this unit as a building-in component, the meeting of the requirements are to be observed with the approval of the end system.	N
4.4.5.1	Components which require fire enclosure: manufacturer; flammability .....:		N
4.4.5.2	Components not requiring fire enclosure .....:		N

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Clause	Requirement – Test	Result - Remark	Verdict
4.4.6	Fire enclosure construction		N
4.4.7	Doors and covers		N
4.4.8	Flammable liquids		N
5	THERMAL AND ELECTRICAL REQUIREMENTS		P
5.1	Heating		P
	Heating tests	(see appended table)	P
5.2	Earth leakage current		P
5.2.1	General	The leakage current was measured from primary to chassis.	P
5.2.2	Leakage current	See 5.2.3.	P
5.2.3	Single-phase equipment	(see attached table)	P
	Test voltage (V) .....:	(see attached table)	—
	Measured current (mA) .....:	(see attached table)	—
	Max. allowed current (mA) .....:	3.5mA	—
5.2.4	Three-phase equipment	Single phase equipment	N
	Test voltage (V) .....:		—
	Measured current (mA) .....:		—
	Max. allowed current (mA) .....:		—
5.2.5	Equipment with earth leakage current exceeding 3,5 mA	Leakage current does not exceed 3.5mA	N
	Test voltage (V) .....:		—
	Measured current (mA) .....:		—
	Max. allowed current (mA) .....:		—
	Cross-sectional area (mm²) of internal protective earthing conductor .....:		—
	Warning label		N

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Clause	Requirement – Test	Result - Remark	Verdict
5.3	Electric strength		P
5.3.1	General	All tests voltages were applied for 1minute in the chamber after the humidity test of 2.2.3 and in warm conditions after the heating test of 5.1. No isolation breakdown was observed (results see appended tables).	P
5.3.2	Test procedure	(see appended table)	P
5.4	Abnormal operating and fault conditions		P
5.4.2	Motors	No motors provided.	N
5.4.3	Transformers	With the shorted o/p of the transformer T1, the unit shut down immediately. There is no high temp. of the transformer are to be observed. Result of the short tests see 5.4.6 appended table and Annex C.	P
5.4.4	Compliance of operational insulation		P
	Method used .....:	Short Circuit tests Results see 5.4.6 appended table.	P
5.4.5	Electromechanical components in secondary circuits	No electromechanical components.	N
5.4.6	Other components and circuits	The power supply is protected by the following means: ■ Overcurrent fuse F1 ■ OCP protection though current sensing at R4 let the signal to pin 3 of IC1. Results see appended table.	P
5.4.7	Test in any expected condition and foreseeable misuse	Open frame SWPS.	N
5.4.8	Unattended use of equipment having thermostats, temperature limiters etc.	None of them are used.	N

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Clause	Requirement – Test	Result - Remark	Verdict
5.4.9	Compliance	No fire propagated beyond the equipment. No molten metal was emitted. Electric strength test primary → SELV and primary → ground were passed.	P
5.4.10	Ball-pressure test of thermoplastic parts; impression shall not exceed 2 mm	Results see 5.4.10 table.	P
6	CONNECTION TO TELECOMMUNICATION NETWORKS *The open frame SWPS is not intended be connected to TNV.*		N
6.1	General		N
6.2	TNV circuits		N
6.2.1.1	Limits of the TNV circuits		N
6.2.1.1 a)	TNV-1 circuits		N
6.2.1.1 b)	TNV-2 and TNV-3 circuits		N
6.2.1.2	Separation from other circuits and from accessible parts		N
	Voltage (V) in SELV circuits, TNV-1 circuits and accessible conductive parts in event of single insulation fault or component failure .....:		N
6.2.1.3	Operating voltages generated externally		N
	Voltage (V) in SELV circuit, TNV-1 circuit or accessible conductive part .....:		N
6.2.1.4	Separation from hazardous voltages .....:		N
	Insulation between TNV circuit and circuit at hazardous voltage		N
	Method used .....:		N
6.2.1.5	Connection of TNV circuits to other circuits		N
	TNV circuit supplied conductively from a secondary circuit .....:		N
6.2.2.1	Protection against contact with bare conductive parts of TNV-2 and TNV-3 circuits		N
	Test with test finger		N
	Test with test probe		N

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Clause	Requirement – Test	Result - Remark	Verdict
6.2.2.2	Batery compartments		N
	Marking next to door/on door		N
6.3	Protection of telecommunication network service personnel, and users of other equipment connected to the telecommunication network, from hazards in the equipment		N
6.3.1	Protection from hazardous voltages		N
6.3.2	Use of protective earthing		N
	Language of installation instructions .....:		N
6.3.3.1	Insulation between TNV circuit and parts or circuitry that may be earthed		N
6.3.3.2	Exclusions .....:		N
6.3.4.1	Limitation of leakage current (mA) to telecommunication network .....:		N
6.3.4.2	Summation of leakage currents from telecommunication network .....:		N
6.4	Protection of the equipment user from voltages on the telecommunication network		N
6.4.1	Separation requirements		N
6.4.2	Test procedure		N
6.4.2.1	Impulse test: separation between TNV-1 circuits/TNV-3 circuits and:		N
6.4.2.1 a)	unearthed conductive parts/non-conductive parts of the equipment expected to be held or touched during normal use; test at 2,5 kV		N
6.4.2.1 b)	parts and circuitry that can be touched by the test finger except contacts of connectors that cannot be touched by test probe; test at 1,5 kV		N
6.4.2.1 c)	circuitry which is provided for connection of other equipment; test at 1,5 kV		N
6.4.2.2	Electric strength test: separation between TNV-1 circuits/TNV-3 circuits and:		N
6.4.2.2 a)	unearthed conductive parts/non-conductive parts of the equipment expected to be held or touched during normal use; test at 1,5 kV		N
6.4.2.2 b)	parts and circuitry that can be touched by the test finger except contacts of connectors that cannot be touched by test probe; test at 1,0 kV		N
6.4.2.2 c)	circuitry which is provided for connection of other equipment; test at 1,0 kV		N

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Clause	Requirement – Test	Result - Remark	Verdict
6.4.2.3	Compliance criteria		N
6.5	Protection of telecommunication wiring system from overheating		N
	Maximum continuous output current (A) .....:		N
A	ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE *Open frame SWPS for built-in.*		N
A.1	Flammability test for fire enclosures of moveable equipment having a total mass exceeding 18 kg, and of stationary equipment		N
A.2	Flammability test for fire enclosures of moveable equipment having a total mass not exceeding 18 kg, and for materials located within fire enclosures		N
A.3	High current arcing ignition test		N
A.3.6	Number of arcs .....:		N
A.4	Hot wire ignition test		N
A.4.6	Ignition time (s) .....:		N
A.5	Hot flaming oil test		N
A.6	Flammability test for classifying materials V-0, V-1 or V-2		N
A.7	Flammability test for classifying foamed materials HF-1, HF-2 or HBF		N
A.8	Flammability test for classifying materials HB		N
A.9	Flammability test for classifying materials 5V		N
A	Tested material		N
	Preconditioning: 7 days (168 h); temperature (°C) .....:		
	Mounting of samples during test .....:		
	Wall thickness .....:		
	Sample 1 burning time .....:		N
	Sample 2 burning time .....:		N
	Sample 3 burning time .....:		N
	Material: compliance with the requirements		N
	Manufacturer of tested material .....:		
	Type of tested material .....:		
	Additional information .....:		

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Clause	Requirement – Test	Result - Remark	Verdict
B	ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS *No motors.*		N
B.1	General requirements		N
	Position .....:		—
	Manufacturer .....:		—
	Type .....:		—
	Rated voltage (V) or current (A) .....:		—
B.2	Test conditions		N
B.3	Maximum temperatures		N
B.4	Running overload test		N
B.5	Locked-rotor overload test		N
	Test duration (days) .....:		—
	Electric strength test: test voltage (V) .....:		—
B.6	Running overload test for DC motor in secondary circuits		N
B.7	Locked-rotor overload test for DC motor in secondary circuits		N
B.7.2	Test time (h) .....:		N
B.7.3	Test time (h) .....:		N
B.8	Test for motors with capacitors		N
B.9	Test for three-phase motors		N
B.10	Test for series motors		N
	Test voltage (V) .....:		—

C	ANNEX C, TRANSFORMERS		P
	Position .....:	T1	—
	Manufacturer .....:	Autek	—
	Type .....:	43540A11	—
	Rated values .....:	class A	—
	Temperatures	(see appended table 5.4)	P
	Thermal cut-out	No thermal cut-out.	N
C.1	Overload test	(see 5.4.3)	P
	Conventional transformer		N

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Clause	Requirement – Test	Result - Remark	Verdict
C.2	Insulation		P
	Precautions .....:	(see transformer construction check)	P
	Retaining of end turns of all windings	dto	P
	Earthing test at 25 A		N
C.3	Electric strength test	(see 5.3)	P

C.2	Safety isolation transformer		P
	Construction details:		
Transformer T1			
Mfr.: Autek			
Type : 43540A11			
Recurring peak voltage		396V 0-p	
Required clearance for reinforced			
insulation (from table 3 and 4)		4.0mm + 0.0mm	
Effective voltage rms		281V	
Required creepage for reinforced			
insulation (from table 6 with CTI II material)		6.0mm	
Measured min. creepages			
Location		inside (mm)	outside (mm)
prim-sec		6.4	>8
prim-core		3.2	>4
sec-core		3.2	>4
prim-prim		%	%
Measured min. clearances			
Location		inside (mm)	outside (mm)
prim-sec		6.4	>8
prim-core		3.2	>4
sec-core		3.2	>4
prim-prim		%	%

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Clause	Requirement – Test	Result - Remark	Verdict

Construction:	
Concentric windings on EI-30 type bobbin, three layers insulation between primary and secondary windings. Distance tape is 3.2mm on top and bottom side of transformer. Winding ends additionally fixed with tape, outer winding is primary. Tubing on winding ends is leaded above the distance tape.	
Pin numbers	
Prim.	1→2→3, 4→5
Sec.	10→6, 7→8, 9
Bobbin	
Material	Phenolic; type T373J
Thickness	min. 1.0mm
Electric strength test	
With AC 3000V after humidity treatment	
Result	pass

H	ANNEX H, IONIZING RADIATION		N
	Ionizing radiation		N
	Measured radiation .....:		
	Measured high-voltage (kV) .....:		
	Measured focus voltage (kV) .....:		
	CRT markings .....:		
	Certified by .....:		
	Standard used .....:		

U	ANNEX U, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION		N
	See separate test report		N

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Clause	Requirement – Test	Result - Remark	Verdict

1.5.1	TABLE: list of critical components				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1]
Input connector (CN1)	Long Chu	H3060 or H3060	7A, 250Vac	VDE 0470	TÜV, UL, CSA
	Taiwan King Pin	P-8800 or P-8800-1	5A, 250Vac	VDE 0470	TÜV, UL, CSA
Fuse (F1)	Conquer	GMA	2A, 250Vac	--	UL, CSA
	Triad	51NM	2A, 250Vac	--	UL, CSA
	Bel	5MFP	2A, 250Vac	--	UL, CSA
	Beswick	S.500	2A, 250Vac	IEC 60127	SEMKO, UL
Y-Capacitor (C2 and C5)	Murata	KC	max. 10000pF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
	TDK	CS	max. 10000pF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
	Matsushita	NS	max. 10000pF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
	Welson	KL	max. 10000pF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
X-capacitor (C1)	Iskra	KNB 152X/153X	max. 0.47µF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
	Philips	2222 320	max. 0.47µF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
	Roederstein	F1772	max. 0.47µF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
	Nitsuko	CFKC	max. 0.47µF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
	Eichhoff	MKT	max. 0.47µF, min. 250Vac	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
	Arcotronics	MKT	max. 0.47uF, 275V	IEC 60384-14/ 1981	VDE, SEV, S, FI, UL
Storage Capacitor (C3)	Various	Various	50µF, 400Vac, 85°C	--	--

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Clause	Requirement – Test	Result - Remark	Verdict

1.5.1	TABLE: list of critical components (continued)				P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity[1]
Bleeder Resistor (R1)	Various	Various	1MΩ, 1/4W	–	–
Photo Coupler PC1	Harris	H11AV1	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	VDE, UL, FIMKO
	Isocom	SFH601	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	VDE, UL FIMKO
	Liteon	LTV-817	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	VDE, UL FIMKO
	Motorola	H11AV1	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	VDE, UL FIMKO
	Quality	MCT2201Z	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	VDE, UL FIMKO
	Philips	CNX82A or CNX83A	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	TÜV, UL FIMKO
	Telefunken	CQY80NG Or CNY75G Or TCDT1101GC	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	TÜV, UL FIMKO
	Toshiba	TLP 731	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	TÜV, UL FIMKO
	Sharp	PC111	Isolation Thickness > 0.4mm	VDE 0884 IEC 60950	TÜV, UL FIMKO
Common Choke (L1)	Autek	43400580	Class 120°	–	–
Transformer (T1)	Autek	43540A11	Insulation Class B	applicable parts in IEC 60950 and evaluated acc. to IEC 60085	accepted by TÜV Rheinland
PCB	Various	Various	V-0 or better, min. 105°C	UL 94	UL

[1]) an asterisk indicates a mark which assures the agreed level of surveillance

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict

1.6	TABLE: electrical data (in normal conditions)					P
fuse #	Irated (A)	U (V)	P (W)	I (A)	Ifuse (A)	condition/status
FUSE	--	90V/50Hz	52.0W	0.878A	0.878A	See below
FUSE	--	90V/60Hz	52.2W	0.878A	0.878A	See below
FUSE	0.9A	100V/50Hz	51.0W	0.787A	0.787A	See below
FUSE	0.9A	100V/60Hz	51.0W	0.789A	0.789A	See below
FUSE	0.9A	240V/50Hz	51.7W	0.389A	0.389A	See below
FUSE	0.9A	240V/60Hz	51.6W	0.386A	0.386A	See below
FUSE	--	264V/50Hz	52.5W	0.368A	0.368A	See below
FUSE	--	264V/60Hz	52.4W	0.365A	0.365A	See below
Operation condition(s): Measured under full load with output, the input current did not exceed 110% of rating current.						

2.2.7	Table: working voltage measurement			P
Location	RMS Voltage (V)	Peak Voltage (V)	Comments	
T2	281	396	see below	
Input voltage: 240V, 60 Hz				
[1]) an asterisk indicates the highest measured working voltage.				

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict

2.9.2 and 2.9.3	TABLE: clearance and creepage distance measurements					P
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
All primary components (with 10N) → secondary components	<420	<250	4.0	>5.0	5.0	>5.0
All primary components (with 10N) → secondary components (with 10N)	<420	<250	4.0	>5.0	5.0	>5.0
Primary trace → earthed trace	<420	281	2.0		3.0	
Under T2 (via cap)				3.0		3.0
Under T2				4.0		4.0
Primary trace → secondary trace	<420	<250	4.0	↓	5.0	↓
Under C5				7.7		7.7
Under PC1				7.9		7.9
Primary trace → earth trace	<420	<250	2.0	↓	2.5	↓
Under C2				2.8		2.8
Under T1				2.8		2.8
Primary → earth (PE)	<420	<250	2.0	>2.0	2.5	>2.5

Note:

1) TL1 and ZD1 fixed in position by non-chemical bonding glue.

3) There is a mylar plate (0.2mm thick min.) provided on PCB type AK15.

2.9.4.1	TABLE: distance through insulation measurements				P
distance through insulation di at/of:	U r.m.s. (V)	test voltage (V)	required di (mm)	di (mm)	
photo coupler (reinforced insulation)	250	3000	0.4	approved comp.	

For distance through insulation, see appended table 1.5.1 for details.

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict

5.1	TABLE: temperature rise measurements		P
	test voltage (V) ..... :	100V-10%/240V+10%	—
	t1 (°C) ..... :	–	—
	t2 (°C) ..... :	–	—

temperature rise dT of part/at:	dT (K)	required dT (K)
T1 (coil)	58 / 15	80
T2 (coil) class B	61 / 50	70
T2 (core) class B	45 / 54	70
PC1 (body)	25 / 34	–
C3 (body)	24 / 22	50
Heat sink at primary side (surface)	40 / 60	–
IC1	34 / 35	–
TR1 (body)	33 / 17	–
Ambient	22°C / 24°C	–

temperature rise dT of winding:	R_1 (Ω)	R_2 (Ω)	dT (K)	required dT (K)	insulation class

Comments:

The temperatures were measured under worst case normal mode defined in 1.2.2.1 and as described in 1.6.1 at voltages as described in 1.6.5.

With a specified ambient temperature of 40°C, the max. temperature rise is calculated as follows:

Winding components:

- class B → dTmax = 95K - 10K - (40-25)K = 70K

Electrolyte capacitor or components with:

- max. absolute temp. of 85°C → dTmax = (85-40) K = 50K
- max. absolute temp. of 120°C → dTmax = (120-40) K = 80K

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict

5.2	TABLE: leakage current measurement			P
Condition		current L→PE (mA)	current N→PE (mA)	comments
Unit ON		0.95mA	0.0.43mA	
Input voltage	:	254V		
Input frequency	:	60Hz		
Overall capacity	:	C2=C5=10000pF		

5.3	TABLE: electric strength measurements		P
test voltage applied between:		test voltage (V)	breakdown
primary and secondary		DC 4242V	No
primary and ground (PE)		DC 2121V	No
T1 primary and secondary		AC 3000V	No
Tests were performed in normal condition, after heating test and abnormal tests.			

5.4	TABLE: fault condition tests							P
	ambient temperature (°C) ..... :					25°C		
	model/type of power supply ..... :					--		
	manufacturer of power supply ..... :					--		
	rated markings of power supply ..... :					AC 100-240V, 50-60Hz, 0.9A		
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result	
1.	SCR	S	240	<1s	Fuse	0	Unit shutdown immediately, no hazard.	
2.	T2 (pins 5-4)	S	240	30min	Fuse	0.17	Output ->0, temperature for T2=70°C, no hazard.	
3.	T2 (pins 9,10-7,8)	S	240	4min	Fuse	0.47	After 4min current ->0 Q1 broken, temperature for T2=77°C. Fuse open, no hazard.	
4.	T2 (pins 6-7,8)	S	240	10s	Fuse	0	Fuse opened, no hazard.	

IEC 60 950			
Clause	Requirement – Test	Result - Remark	Verdict

5.4	TABLE: fault condition tests (continued)							P
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result	
5.	R11	S	240	30min	Fuse	0.13	Output ->0, temperature for T2=70°C, no hazard.	
6.	C11	S	240	<1s	Fuse	0	Unit shut down immediately, no hazard.	
7.	IC1 (pins 7-8)	S	240	<1s	Fuse	0	Fuse opened immediately, no hazard.	
8.	DB1	S	240	<1s	Fuse	0	Fuse opened immediately, no hazard.	
9.	C3	S	240	<1s	Fuse	0	Fuse opened immediately, no hazard.	
10.	Q1	S	240	<1s	Fuse	0	Fuse opened immediately, no hazard.	
11.	Output +5V to GND	S	240	<1s	Fuse	0	Fuse opened immediately, no hazard.	
12.	Output +12V to GND	S	240	<1s	Fuse	0	Fuse opened immediately, no hazard.	
13	PC1 Diode	S	240	15min	Fuse	0.6	Diode D1 smoke. After 15min fuse opened, T2=105°C. No hazrad.	
In fault column, where S= Short								

5.4.10	TABLE: ball pressure test of thermoplastics		P
	required impression diameter (mm) .....:	≤ 2 mm	
part		test temperature (°C)	impression diameter (mm)
Bobbin material of line filter L1		125	<1mm
Bobbin material of transformer T2		125	<1mm

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict

APPENDIX	EN 60950:1992+A1:1993:+A2:1993 + A3:1995 + A4:1997 + A11:1997 TEST REPORT (IEC Publication 60950 2nd edition, 1991+Amd.1,1992+Amd.2, 1993 + Amd.3, 1995 + Amd.4, 1996) CENELEC common modification, Special National condition, Nation deviation and other information according to CB Bulletin No. 96A, March 2000		P
EXPLANATION FOR ABBREVIATIONS C=CENELEC common modification, S=Special National condition, D=National deviation, F=Other information, AT=Austria, GB=Great Britain, CH=Switzerland, DE=Germany, DK=Denmark, FI=Finland, FR=France, NO=Norway, SE=Sweden. P=Pass, F=Fail, N=Not applicable. place in the column to the right.			
1.2.4.1 S	(DK). Certain types of Class I appliances (see sub-clause 3.2.1) may be provided with a plug not establishing earthing continuity when inserted into Danish socket-outlets.	No power cord provided.	N
1.5.1 D	(SE). Add the following: NOTE: Switches containing mercury such as thermostats, relay and level controllers are not allowed.	No such switch.	N
1.6.4 S	(NO). Note 2: In Norway, due to the IT power system used, capacitors are required to be rated for the applicable phase-to-phase voltage (230V)	Considered, see report IEC 60950.	P
1.7.2 S	(NO). Note 4: In Norway, if separation between the mains and a communication system/network, other than public telecommunication networks, relies upon connection to safety earth, the equipment shall have a marking stating that is must be connected to an earthed mains socket-outlet. NOTE: For requirements to be connected to a public telecommunication network, see 6.2.1.4.	Must be evaluated with final system.	N
1.7.2 S	(SE). If the separation between the mains and a SELV terminal relies upon connection to the safety earth, the apparatus shall have a marking stating that it must be connected to an earthed mains socket-outlet when a SELV circuit is connected to network passing both unearthed and earthed electrical environment. The marking text shall be in Swedish and as follows: "Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk".	Must be evaluated with final system.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
1.7.2 D	(DK). Supply cords of Class I appliances, which are delivered without a plug, must be provided with a visible tag with the following text: "Vigtigt. Lederen med grøn/gul isolation må Kun tilsluttes en klemme mærket ⏚ eller ⏚". If essential for the safety of the appliance, the tag must in addition be provided with a diagram, which shows the connection of the other conductors, or be provided with the following text: "For tilslutning af de øvrige ledere, se medfølgende installationsvejledning".	Must be evaluated with final system.	N
1.7.2 C	Delete note 4.	Deleted	N
1.7.5 S	(DK). Socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a when used on Class I equipment.	No socket outlet.	N
1.7.5 D	(DK). Class II appliances shall not be fitted with socket-outlets for providing power to other appliances.	Class I equipment.	N
1.7.14 D	(DE). Directions for use with rules to prevent certain hazards for (among others) maintenance of the technical labor equipment, also for imported technical labor equipment shall be written in German language. NOTE: Of this requirement, rules for use even only by service personnel are not exempted.	Built in type SWPS, not a technical labor equipment.	N
1.7.17 D	(CH). (Ordinance on environmentally hazardous substances SR 814.013) Annex 4.10 of SR 814.013 applies for batteries.	No battery inside.	N
2.3.3 C	Delete Method 4 and the line in note 1 relating to this method	Deleted.	N
2.3.6 C	Delete the note.	Deleted.	N
2.3.5 S	(NO). In Norway, marking and insulation requirements according to subclause 1.7.2, Note 4, and 6.2.1.4, Note 2, apply.	No marking required.	N
2.3.6 S	(FR). Method 3 is not acceptable.	Method 3 is not used.	P
2.3.7 C	Replace the text of this sub-clause by: Void.	Replaced.	N
2.3.9 S	(NO). Marking and insulation requirements according to this annex, subclauses 1.7.02 and 6.2.01.4 b) apply.	No marking required.	N
2.5.2 S	(DK, NO) Add after the first paragraph: "The above exception is not acceptable in pluggable equipment type A "	Added, no exception applied.	N
2.5.2 C	Delete the note.	Deleted.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
2.7.1 C	Replace the text of this sub-clause by: Basic requirements To protect against excess current, short-circuits and earth faults in primary circuits, protective devices shall be included ether as integral parts of the equipment or as a part of the building installation, subject to all of the following a), b), c) and d): (a) Except as detailed in (b) and (c), protective devices necessary to comply with the requirements of Sub-clause 5.4 shall be included as integral parts of the equipment. (b) For components in series with the mains input to the equipment such as the supply cord, appliance coupler, RFI filter and switch, short circuit and earth fault protection may be provided with protective devices in the installation. (c) It is permitted for equipment with rated current exceeding 16A, which is pluggable equipment type B or permanently connected equipment, to rely on dedicated overcurrent and short circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breaker, is fully specified in the installation instruction (d) If reliance is placed on protection in the building installation, the installation instructions shall comply with Sub-clause 1.7.11 except that for pluggable equipment Type A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet and 1.7.11 does not apply.	Replaced.	P
2.7.2 C	Replace the text of this sub-clause by: Void.	Replaced.	N
2.8.4 C	Delete the note.	Deleted.	N
2.9.1 S	(NO). Note 3: In Norway, due to the IT power systems used, the mains supply voltage is considered to be equal to the phase-to-phase voltage.	Mains voltage as reference voltage.	P
2.9.4.2 C	Amend the last line on page 117a as follows – Solvent-based enamel coating on winding wire is not considered to be insulation in thin sheet material. Add a new sentence below the text on page 117a as follows – Requirements for wound components are given in 2.9.4.4.		N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
2.9.4.4 C	Modify the title as follows – 2.9.4.4 Wound components Replace the first paragraph and the two dashed paragraphs as follows – Unless one of the following situations applies, interleaved BASIC, SUPPLEMENTARY or REINFORCED INSULATION complying with 2.9.4.1 or 2.9.4.2 shall be provided between the windings. - the insulation on the winding wire complies with 2.9.4.1; or - the winding wire complies with annex U; or - the insulation between the windings is provided for separation between ZNV circuits and other parts in compliance with 6.4.1. Note – Examples of insulation of winding wire complying with annex U are polyamide and FEP.		N
2.11 C	Delete notes 1, 2 and 3.	Deleted.	N
3.2.1 S	(DK). Supply cords of single phase appliances having a rated current not exceeding 10A shall be provided with a plug according to the Heavy Current Regulations Section 107-2-D1. Class I equipment provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a. If poly-phase equipment and single-phase equipment having a rated current exceeding 10A is provided with a supply cord with a plug, this plug shall be in accordance with the Heavy Current Regulations Section 107-1-D1 or EN 60309-2.	No power cord provided.	N
3.2.1 S	(CH). Supply cords of equipment having a rated current not exceeding 10A shall be provided with a plug complying with SEV 1011 or IEC 60884-1 and one of the following dimension sheets SEV 6532-2,1991 Plug type 15 3P+N+PE 250/400V, 10A SEV 6533-2,1991 Plug type 11 L+N 250V, 10A SEV 6534-2,1991 Plug type 12 L+N+PE 250V, 10A EN 60 309 applies for plugs for currents exceeding 10A	No power cord provided.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
3.2.1 S	(GB). Apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS1363 by means of that flexible cable or cord and plug, shall be fitted with a "standard plug" in accordance with Statutory Instrument 1768:1994 - The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations. Note: "standard plug" is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.	No power cord provided.	N
3.2.2 C	Delete the note and in table 10, delete the values in parentheses.	Deleted.	N
3.2.4 S	(GB). A power supply cord with conductor of 1.25mm² is allowed for equipment with rated current over 10A and up to and including 13A.	Rated current below 10A.	N
3.2.4 C	Replace "60245 IEC 53" by "H05 RR-F", "60227 IEC 52" by "H03 VV-F or H03 VVH2-F" and "60227 IEC 53" by "H05 VV-F or H05 VVH2-F". In table 11, replace the first four lines by the following: Up to and including 6 0.75 [1] Over 6 up to and including 10 1.0 (0.75)[2] Over 10 up to and including 16 1.5 (1.0)[3] In the conditions applicable to table 11, delete the words "in some countries" in condition 1). In the Note delete the second sentence.	Replaced.	N
3.3.5 C	In table 13, replace the fourth and the fifth lines by: Over 10 up to and including 16 1.5 to 2.5 1.5 to by 4	Replaced.	N
3.3.5 S	(GB). The range of conductor sizes of flexible cords to be accepted by terminals for equipment with a rated current of over 10A and up to and including 13A is: 1.25mm² to 1.5mm² nominal cross-sectional area.	No power cord provided.	N
4.3.12 C	Amend the third compliance paragraph as follows: For equipment using LEDs or lasers, compliance is checked according to EN 60825-1. Add a note: NOTE: If equipment falling within the scope of EN 60950 is inherently a class 1 laser product i.e. it contains no embedded laser or LED of a higher class number, then a laser warning label or other laser warning statement is not required (see 1.1 of EN 60825-1)	See report IEC 60950.	N
4.3.18 S	(GB). This test should be performed using an appropriate socket-outlet with an earthing contact.	No direct plug-in equipment.	N

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National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
4.4.4 C	Delete note 2.	Deleted.	N
5.4.9 S	(NO). Note: In Norway, the electric strength test includes testing of basic insulation in Class I pluggable equipment type B and permanently connected equipment.	Considered.	P
6.1 S	(CH).Protective means in the equipment shall not prevent transient surge protection in the telecommunication network from operating properly (d.c. spark-over voltage of the surge suppressor installed in the telecommunication network: approx. 245V).	No TNV.	N
6.2.1.2 C 6.2.1.3 C	Add at the end of the sub-clause: This sub-clause only applies to TNV circuits normally operating in excess of the limits of SELV circuits.	No TNV.	N
6.2.1.2 S	(SE). Supplementary insulation for a primary circuit is required between any TNV circuit and any circuit that has a connection to a protective earthing terminal. In Sweden, this requirement does not apply to permanently connected equipment or pluggable equipment Type B.	No TNV.	N
6.2.1.2 S	(NO). In Norway, supplementary insulation for a primary circuits is required between any TNV circuit and any circuit that has a connection to a protective earthing terminal. This requirement does not apply to permanently connected equipment or to pluggable equipment type B, installed in areas where equipotential bonding has been applied, e.g. a telecommunication Central Office.	No TNV.	N
6.2.1.4 C	Delete the notes.	No TNV.	N
6.2.1.4 S	(NO). Note 2: In Norway, method b) is not permitted. Insulation between parts conductively connected to the supply mains and parts connected to a public telecommunication network shall comply with the requirements for double or reinforced insulation.	No TNV.	N
6.2.1.4b) S	(FI). Method b) is permitted only for permanently connected equipment or for pluggable equipment Type B.	No TNV.	N
6.2.1.5 S	(NO). Note 2: In Norway, requirements according to 6.2.1.4, Note 2, apply	No TNV.	N
6.3.3. S	(NO). In Norway, 6.3.3 is applicable for pluggable equipment type A and B and for permanently connected equipment.	No TNV.	N
6.3.3.1 S	(SE). In Sweden, requirements according to this annex ZB, subclause 6.2.1.2 apply.	No TNV.	N

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National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
6.3.3.1 S	(NO). In Norway, requirements according to subclause 6.2.1.2, national difference, 6.2.1.4, Note 2, and 6.3.3.2, Note 1, applied.	No TNV.	N
6.3.3.2 S	(NO). Note 1: In Norway, exclusions are applicable for permanently connected equipment and pluggable equipment Type B only.	No TNV.	N
6.4.1 C	Delete note 2.	No TNV.	N
6.4.2.1 C	Delete note 2.	No TNV.	N
6.4.2.1 D	(AT). Equipment shall comply with Uc = 2.0kV in cases b) and c).	No TNV.	N
Annex H. D	(DE) a) A license is required by those who operate an X-ray emission source. b) A license in accordance with clause 1 is not required by those who operate an X-ray emission source on which the electron acceleration voltage does not exceed 20 kV, if 1) the local dose rate at a distance of 0.1m from the surface does not exceed 1μSv/h and 2) it is adequately indicated on the X-ray emission source that i) X-rays are generated and ii) the electron acceleration voltage must not exceed the maximum value stipulated by the manufacturer or importer. c) A license in accordance with clause 1 is also not required by persons who operate an X-ray emission source on which the electron acceleration voltage exceeds 20 kV, if 1) the X-ray emission source has been granted a type approval and 2) it is adequately indicated on the X-ray emission source that i) X-ray are generated, ii) the device stipulated by the manufacturer or importer guarantees that the maximum permissible local does rate in accordance with the type approval is not exceeded and iii) the electron acceleration voltage must not exceed the maximum value stipulated by the manufacturer or importer.	No CRT.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
continued	d) Furthermore, a license in accordance with clause 1 is also not required by persons who operate X-ray emission sources on which the electron acceleration voltage does not exceed 30 kV, if 1) the X-rays are generated only by intrinsically safety CRTs complying with Enclosure III, No.6, 2) the values stipulated in accordance with Enclosure III, bi, 6.2 are limited by technical measures and specified in the device and 3) it is adequately indicated on the X-ray emission source that the X-rays generated are adequately screened by the intrinsically safe CRT.		
Annex P C	Replace the text of this annex by: See annex ZA.	Replaced.	N
Annex Q C	Add for IEC 60529: Note: Endorsed by EN 60529:1991 (not modified) Add for IEC 60707 Note: Endorsed by HD441:1983 (not modified) Add for IEC 61058-1: Note: Endorsed by EN 61058:1992 (not modified).	Added.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
APPENDIX	EMKO-TSE(74-SEC)207/94 TO EN 60950:1992+A1:1993+A2:1993+A3:1995+A4:1997+A11:1997 TEST REPORT (IEC Publication 60950 2nd edition, 1991 + Amd.1, 1992 + Amd.2, 1993 + Amd.3, 1995 + Amd.4, 1996) Nordic Explanations, and other information not covered by Appendix EN 60950:1992, + A1:1993 + A2:1993 + A3:1995 + A4:1997+A11:1997.		P
EXPLANATION FOR ABBREVIATIONS NF=Nordic Explanations and other information. DK=Denmark, FI=Finland, NO=Norway, SE=Sweden. P=Pass, F=Fail, N=Not applicable. Placed in the column to the right.			
1.2.02.01 NF	(DK,FI,NO,SE). The heating test of separate power supplies of personal computers is carried out according to their rated output values marked on the power supplies.	Not a separate power supply.	N
1.5.01 NF	(DK,FI,NO,SE). The following capacitors are accepted across the mains: 1) X1 capacitor which complies with Publication IEC 60 384-14. 2) X2 capacitor which complies with Publication IEC 60 384-14 and which has been subjected to a pulse test according to § 12.11.2, except the value of the voltage is reduced to 2.5 kV. 3) X2 capacitor which complies with Publication IEC 60 384-14 in case the endurance test of § 12.11.2 has been modified so that the resistor of 220Ω through which the voltage of 1000 V rms is applied to the capacitor under test, is short circuited. 4) Capacitor which complies with Publication HD 195 S6, § 14.2.	X2 capacitor comply with this clause (see report IEC 60950 report).	P
1.5.02 NF	(DK,FI,NO,SE). Transient protection components shall be installed in such a way that insulation for protection against electric shock will not be bridge. This means that transient protection components must not be connected to safety earthed parts in pluggable equipment or to other accessible parts.	No transient protection components connected to safety earthed parts.	P
	-3.2.3 (DK,FI,NO,SE). Interconnection couplers in accordance with EN 60 320-2-2 are accepted. Outlets of non-standard types are not accepted.	No outlet.	N
1.7.01 NF	-1st dash (DK). When supplied in Denmark the appliances shall be set to 230 V .	Included in the voltage range.	P
	-5th dash (DK). The equipment may instead be provided with a marking indicating name, trade-mark or identify of the responsible vendor.	Refer to CB report page 2.	P
2.1.04 NF	(DK,FI,NO,SE). For monitors, warning label is not required for repairing area, neither the partial shielding against contact although the voltage is> 42.4 V peak or > 60 V d.c.	Built in SWPS.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
2.5.11 NF	(DK,FI,NO,SE). Due to installation fuses of 16A, the earth resistance shall always be controlled at 25 A.	Earthing test conducted at 25A, see IEC 60950 report.	P
2.6.06 NF	(DK,FI,NO,SE). The plug is regarded to be a disconnect device and therefore a single pole mains switch is acceptable (TC 74-WG 8's recommendation).	Appliance inlet is considered as disconnect device.	N
2.6.11 NF	(DK,FI,NO). The warning label on an appliance with two or several supply connections shall be in the official language of the country in question.	Only one supply from the mains.	N
	(DK,FI,NO). UPS-appliances can be fitted with a signal lamp instead of a warning label, under the condition that the function and location of the signal lamp is correct. Audible signal is not acceptable as warning.	Equipment is not a UPS.	N
2.7.03 NF	(DK,FI,NO,SE). A single-pole protective device is acceptable.	Only one fuse on live phase.	P
2.9.01 NF	(DK,FI,NO,SE). Pollution Degree 3 is considered applicable for the following equipment which is within the scope of this standard: Document Shredder Machines.	Equipment is not a shredding machine	N
4.2.07 NF	(DK,FI,NO,SE). If there are visible cracks on the apparatus after the mechanical strength test, the apparatus is not rejected, if it still complies with the other requirements of subclause 4.2.7.	Metal enclosure.	N
4.4.04 NF	(DK,FI). Fire enclosure is required if the available power exceeds the values of a limited power source. The limited power source shall incorporate an isolating transformer and shall comply with the following: * The open-circuit voltage shall not exceed 42.4 V peak or d.c. and shall not generate voltages above the value and * The current which may be drawn for more than two minutes at any load, including short-circuit, shall not exceed 0.2 A.	Supplied from the mains.	N
	(NO). A fire enclosure is not required in spots of the equipment where the available power does not exceeded 50 VA and the available voltage 42.4 V (peak) or 60 V d.c.	Supplied from the mains.	N
5.4.06 NF	(DK,FI,NO,SE). Faults need not to be carried out in circuits which are supplied by an isolating transformer and which comply with the following: * The open-circuit voltage shall not exceed 42.4 V peak or d.c. and shall not generate voltages above the value and * The current which may be drawn for more than two minutes at any load, including short-circuit, shall not exceed 0.2 A.	Supplied from the mains.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
APPENDIX	Japanese National Differences according to CB Bulletin No. 96A, March 2000 REPORT (IEC Publication 60950 : 1991 + A1 + A2 + A3 + A4)		P
EXPLANATION FOR ABBREVIATIONS P=Pass, F=Fail, N=Not applicable. Placed in the column to the right.			
2.9.2.1	Delete entire column headed by [Nominal mains supply voltage ≤150V (Transient rating 1500V)] in Table 3. Delete ≤150V from column headed by [Nominal mains supply voltage >150V, ≤300V (Transient rating 2500V)] in Table 3.	Clearance distance from column 2 taken (≦300V)	P
2.9.2.2	Delete entire column headed by [Nominal mains supply voltage ≤150V (Maximum transient in secondary circuit 800V see condition 6)] in Table 5	Clearance distance from column 2 taken (≤300V)	P
2.9.4.4	Replacement: The following shall replace the entire existing paragraphs: Title: Wounded components BASIC, SUPPLEMENTARY, DOUBLE or REINFORCED INSULATION is permitted in a wounded component using one of the following a), b), or c) constructions or the wounded component must use interleaved insulation which complies with 2.9.4.1 or 2.9.4.2: a) the winding wire is insulated with insulation complying with 2.9.4.1 other than solution based type enamel coatings. b) the winding wire is insulated with extruded multi-layers or wrapped layers of tape (each layer can be tested for electric strength) which complies with 2.9.4.1 and complies with annex U. c) the winding wire is insulated with extruded multi-layers or wrapped layers of tape (test can be only performed on finished winding wire) and complies with annex U. Note 1 – see also 6.4.1. As to c), the number of constructional layers applied to the conductor to determine the grade of insulation of the winding wire shall not be less than as follows: - if BASIC INSULATION is required, a minimum of two layers or one extruded layer - if SUPPLEMENTARY INSULATION is required, a minimum of two layers or two extruded layers - if REINFORCED INSULATION is required, a minimum of three layers or three extruded layers	Different Japanese standard text considered.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
	As to b) and c), in case the CREEPAGE DISTANCES between wrapped layers of tape are less than Table 6 under Pollution degree 1, the distance between layers must be reliably cement together with insulation compound complying with 2.9.7 and with the test voltage in annex U.2 (Type tests) increased to 1.6 times. Note 2 – In case one layer of material is wrapped 50% or more, it is considered as two layers Where two insulated wires or one bare wire and one insulated wire are contacted inside the component and cross each other at an angle between 45° and 90°, physical separation shall be provided, for example in the form of insulating sleeving or sheet material, or by applying two times of the specified insulating layer(s), to relieve mechanical stress at the crossover point. The finished component shall pass ROUTINE TESTING for electric strength using the value of test voltage in 5.3. Compliance is checked by visual inspection and measurement, and as specified in annex U. However, the tests are not repeated if the material data sheets confirm compliance with annex U.		
5.1	Addition: Add the following to 5) as specified in Conditions applicable to table 16, parts 1 and 2 With regards to 1), insulating materials complying with Japanese requirement (Refer to Japanese difference for current IEC 60335-1 (3rd Edition) in CB Bulletin 94B), can be taken of data for that material to determine the appropriate maximum temperature rise.	For other than those complied with IEC standards, refer to added condition 8) below.	P
Annex U	Replacement: ANNEX U (normative) Insulated winding wires for use without interleaved insulation (see 2.9.4.4) This annex specifies winding wire whose insulation may be used to provide BASIC, SUPPLEMENTARY or REINFORCED INSULATION in wound components without interleaved insulation. This annex applies to round winding wire whose diameter is between 0.2mm and 1.00mm. With regard to other size, refer to IEC 60851.	Replaced.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
	U.1 Wire construction If the wire is insulated with two or more spirally wrapped layers of tape, the overlap of layers shall be adequate to ensure continued overlap during manufacture of the wound component. In order to maintain the overlap of layers, wire insulation layer of wrapped layers of tape must be adequately secured.		N
	U.2 Type tests Unless it specifies, the wire shall pass the following six TYPE TESTS U.2.1 to U.2.4, carried out at a temperature between 15°C and 35°C and a relative humidity between 45% and 75%. Refer to the IEC 60851 first edition.		N
	U.2.1 Electric strength Test 13 of IEC 60851-5 (1988), 4.3.1 (test for twisted wire pairs), with a test voltage 2 times of appropriate voltage in Table 18 of this standard or 6kVr.m.s. whichever is the greater.		N
	U.2.2 Adherence and flexibility Test 8 of IEC 60851-3, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3kVr.m.s. whichever is the greater. Table U.2.2.2 – Mandrel Nominal diameter of conductor (mm) / Mandrel diameter (mm±0.2mm) 0.20 – 0.34 4.0 0.35 – 0.49 6.0 0.50 – 0.74 8.0 0.75 – 1.00 10.0 The tension of winding wire while wire is wrapped around the mandrel, should be calculated so that it is equivalent to 118MPa±10% (118N/mm²±10%) from winding wire radial.		N
	U.2.3 Heat shock Test 9 of IEC 60851-6, 3.1 and IEC 60851-3, 5.1.1.1, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3kVr.m.s. whichever is the greater. The temperature of oven is specified in the following Table U.2.3. Table U.2.2 shows and explains required mandrel diameter and tension. Test must be performed at room ambient after taking out from oven.		N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
	Table U.2.3 – Oven Temperature Class A (105) E (120) B (130) F (155) H (180) Oven Temp. (°C±2°C) 200 215 225 240 260		
	U.2.4 Retention of electric strength after bending Test 13 of IEC 60851-5 (1988), 4.6.1 c, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3kVr.m.s. whichever is the greater. Table U.2.2 shows and explains required mandrel diameter and tension.		N
	U.3 Routine test Winding wire is subjected to electric strength test during the production in accordance with U.3.1 and U.3.2 by wire manufacturer.		N
	U.3.1 Full-length test Winding wire is subjected to electric strength test during the production for full wire length, with a test voltage not less than the appropriate voltage in Table 18 of this standard or 3kVr.m.s. or 4.2kV peak minimum.		N
	U.3.2 Audit test Test must be carried out according to IEC 60851-5 (1988) for twisted wire pairs. Electric strength test, with a test voltage 2 times of appropriate voltage in Table 18 of this standard or 6kVr.m.s. or 8.4kV peak minimum.		N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
APPENDIX	Korean National Differences according to CB Bulletin, No. 96A, March 2000 REPORT (IEC Publication 60950 2nd edition, 1991 + Amd.1, 1992 + Amd.2, 1993 + Amd.3, 1995 + Amd.4, 1996)		P
EXPLANATION FOR ABBREVIATIONS P=Pass, F=Fail, N=Not applicable. Placed in the column to the right.			
General	LIMITATIONS - Voltage ratings As national supply voltage is subject to be increased to 220V, an appliance rated 220V is to be allowed to obtain type approval in Korea. Either an appliance rated 110V or 220/110V is not allowed. When an appliance is supplied in Korea, it shall be set to and marked with 220V. But free voltage appliance by SMPS (Switching Mode Power Supply) is allowed and it shall be marked with "100-220V".	Rated AC100-240V	P
General	LIMITATIONS – Frequency Only appliances having supply frequency of 60Hz or a frequency range including 60Hz are accepted. When an appliance is supplied in Korea, it shall be set to and marked with 60Hz.	Certified in the 50-60Hz frequency range.	P
General	LIMITATIONS - Instruction Instruction manuals and appliance markings related to safety, including nameplate shall be in Korean or graphical symbols in IEC Publication 60417.	Instruction manual will be in Korean.	N
1.5.101	Addition: Plugs for the connection of the apparatus to the supply mains shall comply with the Korean requirements (KSC 8305).	No power plug provided.	N
7	Addition: Radio frequency interference The apparatus shall comply with the relevant CISPR requirements.	Power supply unit. The CISPR requirements have to be considered with the end product.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict

APPENDIX	Australian National Differences according to CB Bulletin No. 96A, March 2000 (AS/NZS 3260-1993) REPORT (IEC Publication 60950 2nd edition, 1991 + Amd.1, 1992 + Amd.2, 1993 + Amd.3, 1995 + Amd.4, 1996)		P
EXPLANATION FOR ABBREVIATIONS P=Pass, F=Fail, N=Not applicable. Placed in the column to the right.			
1.2.12.2	Add: "TT power systems are not permitted in Australia or New Zealand."	Added.	N
1.2.12.3	Add: "IT power systems are not permitted in Australia or New Zealand." Note: Australia and New Zealand principally use multiple-earthed neutral (MEN) systems but allow TN-C for installations using metal-sheathed cables.	Added.	N
1.5.1	Add to paragraph 1: "or the other relevant Australian or New Zealand Standard."	Added.	P
1.5.2	Add to the first and third dashed items after the words "IEC component standard": "or the other relevant Australian or New Zealand Standard."	Added.	P
1.6.4	Add: "IT power systems are not permitted in Australia or New Zealand."	Added.	N
1.7.14	Add to paragraph 1: "In Australia and New Zealand all safety instructions shall be in English."	Installation instruction is in English.	P
2	Add after clause 2: "For the limit of direct current from a.c. appliances, refer to AS/NZS Appendix 3."	See Appendix 3.	N
3.2.2	Substitute for table 10: "For sizes of cables and conduits in Australia, refer to AS 3000."	No power cord provided.	N
3.2.4	Substitute for table 11: "For sizes of conductors in power supply cords use following Table 11: **Table 11** **Sizes of conductors in power supply cords** Rated current (A) — Cross-section area (mm^2) > 0.2 ≤ 3 — 0.5* > 3 ≤ 7.5 — 0.75 > 7.5 ≤ 10 — 1 > 10 ≤ 16 — 1.5 > 16 ≤ 25 — 2.5 > 25 ≤ 32 — 4 > 32 ≤ 40 — 6 > 40 ≤ 63 — 10 * This nominal cross-section area is only allowed for class II appliances if the length of the power supply cord, measured between the point where the cord, or cord guard, enters the appliance, and the entry to the plug, does not exceed 2m (0.5mm^2 three-core supply flexible cords are not permitted; see Note 2 to table 2.17 of AS/NZS 3191).	No power cord provided.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
4.3.18	Replace Clause 4.3.18 by: "Direct plug-in equipment shall not impose undue strain on the socket outlet and shall comply with the relevant Clauses 2.8.1 and 2.14.6 of AS/NZS 3112. Compliance is checked by inspection, measurement and the appropriate tests as detailed in Clauses 2.8.4 and 2.14.6 of AS/NZS 3112 using the 10 amp gauge of Appendix A of AS/NZS 3112 and by inserting the pins of the appliance, as in normal use, into a socket outlet capable of accepting a 10 amp plug complying with Figure 2.1(A) of AS/NZS 3112. The socket outlet has a horizontal pivot at a distance of 8mm behind the engagement face of the socket outlet and in the plane of the lower intersection of the centre-lines of the contact apertures. The additional torque which has to be applied to the socket outlet to maintain the engagement face in the vertical plane shall not exceed 0.25N.m."	Building in open frame SWPS.	N
4.4.1	Add after Clause 4.4.1: "For the Australian and New Zealand alternative resistance to fire test, refer to AS/NZS Appendix 2."	Not applied for Appendix 2.	N
6.3.3.2	Add to the second dash point the following note: "NOTE: To satisfy the requirements of Clause 1.7.2 for equipment intended to be installed by service personnel, the equipment documentation or equipment warning label if equipment documentation is not supplied should contain the following or similar text: WARNING: THIS EQUIPMENT MUST ONLY BE INSTALLED AND MAINTAINED BY SERVICE PERSONNEL"	No TNV.	N
6.4.2	Replace the first paragraph by: "In Australia (this variation to IEC 60950 does not apply in New Zealand), compliance with 6.4.1 is checked by both the test of 6.4.2.1 and 6.4.2.2". Delete the fourth paragraph 'The choice of tests.....manufacturer'.	No TNV	N
6.4.2.1	Replace Clause 6.4.2.1 by: *Impulse test* The electrical separation is subjected to ten impulses of alternating polarity, using the impulse test generator of Annex N. The interval between successive impulses is 60s and the initial voltage U_c is: - in case (a) of 6.4.1, 7kV for hand-held telephones and for handsets; and 2.5kV for other equipment; and - in case (b) and (c) 1.5kV. Notes: 1 The seven kV impulse is to simulate measured lighting surges in typical Australian rural and semi rural network lines. 2 The value of 2.5kV has been chosen primarily to ensure adequacy of the insulation concerned, but not necessarily to simulate likely overvoltages.	No TNV	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
6.4.2.2	Replace Clause 6.4.2.2 by: *Electric strength test* The electrical separation is subjected for 60s to a substantially sinusoidal voltage having a frequency of 50Hz or 60Hz, or to a d.c. voltage equal to the peak value of the prescribed a.c. voltage. The a.c. test voltage is: - in case (a) of 6.4.1 3kV - in case (b) and (c) 1.5kV. The voltage is gradually raised from zero to the prescribed voltage and then held at that value for 60s. NOTE: 1. Where there are capacitors across the insulation under test, it is recommended that d.c. test voltages are used. 2. The 3 kV and 1.5kV values have been determined considering the low frequency induced voltages from the power supply distribution system.	No TNV	N
Annex A	Add. after Annex title: Alternative resistance to fire test-determination if ignitability and combustion propagation	Not applied for this Appendix	N
Appendix 2	Add. Appendix ALTERNATE RESISTANCE TO FIRE TEST DETERMINATION OF IGNITABILITY AND COMBUSTION PROPAGATION	Not applied for this Appendix	N
X2.0	GENERAL This test is an alternative to the testes in Annex A to allow approval of equipment which has inadequate documentation to verify having been tested to Annex A.		N
X2.1	SOLID INSULATION MATERIALS AND NON-METALLIC ENCLOSURES		N
X2.1.1	GENERAL REQUIREMENTS Parts of non metallic material shall be subjected to the glow wire test specified in X2.1.2, X2.1.3 and X2.1.4 and if necessary by the test of X2.2		N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
X2.1.2	NON-METALLIC MATERIAL Relevant parts of non-metallic material are subjected to the glow-wire test of AS/NZS 3350.1, the test being made at a temperature of 550°C. The 550°C glow-wire test need not be carried out on parts which are made of material classified as FH 3-40 mm/min or better according to IEC 60707. The sample of material submitted to the test of IEC 60707 shall be thicker than the relevant part. Insulating material of winding bobbins and formers are subject to the glow-wire test of AS/NZS 3350.1, the test being made a temperature of 650°C. Base material of printed circuit boards with any coating or encapsulation to the needle-flame test of AS/NZS 3350.1, however, flames shall have extinguished with 15s of removal of the test flame. The flame shall be applied to an edge of the board having the lowest heat sink effect, with the board orientated in its normal position of use and at a point, if possible, not less than 10mm from a corner. The needle-flame test is not carried out on base material which is made of material classified as FV-0 according to IEC 60707. The sample of material submitted to the test of IEC 60707 shall be no thicker than that of the relevant printed circuit board. Notes: 1. The test is not carried out on printed circuit boards contained in a metal enclosure that prevents flames or burning droplets from escaping. 2. If the printed circuit board is tested with components mounted and a component ignites during the test, this would not constitute a failure of the printed circuit board material unless it is ignited by the component.		N
X2.1.3	ATTENDED EQUIPMENT For equipment which is operated while attended, parts of insulating material supporting, in contact with or in close proximity to current carrying connections, other than those in SELV circuits are subject to the glow-wire test AS/NZS 3350.1, the test being made at a temperature of 650°C. However parts of insulating material supporting, in contact with or in close proximity to screw connections which carry a current exceeding 0.5A during normal operation and which are likely to be made or remade during installation, user maintenance or when replacing a supply cord assembled with the appliance by Type X attachment, are subject to the glow-wire test AS/NZS 3350.1, the test being made at a temperature of 750°C. Notes: 1. The test is not carried out on parts supporting welded connections. 2. 'In close proximity' is considered to be a distance not exceeding 3mm.		N

Australian National Differences according to CB Bulletin No. 96A, March 2000

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
X2.1.4	UNATTENDED EQUIPMENT For equipment which is operated while unattended, parts of insulating material supporting, in contact with or in close proximity to current carrying connections, other than those in SELV circuits are subject to the glow-wire test AS/NZS 3350.1, the test being made at a temperature of 750°C. However parts of insulating material supporting, in contact with or in close proximity to screw connections which carry a current exceeding 0.5A during normal operation and which are likely to be made or remade during installation, user maintenance or when replacing a supply cord assembled with the appliance by Type X attachment, are subject to the glow-wire test AS/NZS 3350.1, the test being made at a temperature of 850°C. Notes: 1. The test is not carried out on parts supporting welded connections. 2. 'In close proximity' is considered to be a distance not exceeding 3mm. During the application of glow-wire, the height and duration of flames are measured. In addition, for parts which withstand the glow-wire test but which flame during the application of the glow-wire, the surrounding parts are subject to the needle-flame test of AS/NZS 3350.1 for the measured duration of the flame after or 30s, whichever is the least if - a) They are positioned within a distance equal to the height of the flame; and b) they are likely to be impinged upon by the flame However, surrounding parts shielded by a separate barrier which meets the needle-flame test are not tested. The needle-flame test is not carried out on parts which are made of material classified as FV-0 or FV-1 according to IEC 60707. The sample of material submitted to the test of IEC 60707 shall be no thicker than the relevant part. Note: Parts likely to be impinged upon by the flame are considered to be those within the envelope of a vertical cycling having a radius of 10mm and a height equal to the height of flame, positioned above the point of the material supporting, in contact with or in close proximity to connections.		N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
X2.2	ADDITIONAL TEST REQUIREMENTS If parts, other than enclosures, do not withstand the test of clauses X2.1.3 or X2.1.4, by failure to extinguish within 30s after removal of the glow wire tip, the needle-flame test of AS/NZS 3350.1 is made on all parts of non-metallic material which are within a distance of 50mm or which are likely to be impinged upon by flame during the test of clauses X2.1.3 or X2.1.4. Parts shielded by a separate barrier which meets the flame-needle test are not tested. Notes: 1. If the enclosure does not withstand the glow-wire test the appliance is considered to have failed to meet the requirement of Appendix 2 without the need for consequential testing. 2. If other parts do not withstand the glow-wire test due to ignition of the tissue paper and if this indicates that burning or glowing particles can fall onto an external surface underneath the appliance, the appliance is considered to have failed to meet the requirement of Appendix 2 without the need for consequential testing. 3. Parts likely to be impinged upon by the flame are considered to be those within the envelope of a vertical cylinder having a radius of 10mm and a height equal to the height of the flame, positioned above the point of the material supporting, in contact with or in close proximity to connections. The needle-flame test need not be carried out on parts which are made of classified as FV-0 or FV-1 according to IEC 60707. The sample of material submitted to the test of IEC 60707 shall be no thicker than the relevant part.		N
Appendix 3	Add Appendix: D.C. COMPONENTS FROM A.C. EQUIPMENT Equipment shall be designed so that in normal use the value of any direct current in the equipment neutral will not contribute unduly to the failure of the installation earth electrode by corrosion. Any device such as isolating transformer intended to prevent direct current in the supply shall be an integral part of the equipment. Compliance is checked by inspection and by operating the equipment (a) at the rated voltage under the conditions specified in Clause 5.1; (b) on a supply free from any d.c. component; and (c) in the maximum d.c. producing mode, if any, but not exceeding normal load; and measuring the d.c. component in the supply neutral caused by the equipment as described below.	No D.C. current under normal operation condition.	P

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
	If it is evident from the design of the equipment that there will be no d.c. component, e.g. equipment provided with a full-wave mains power supply or a mains isolating transformer, this test is not conducted. The permissible direct current in the equipment neutral shall not exceed (i) for equipment considered as operating continuously ..... 5 mA; or (ii) for other than continuously operated equipment where t is the assessed daily average operating time, in hours .....(5*24)/t mA For equipment which is not continuously operated but includes a component or a device which is continuously energized, e.g. stand-by control or remote switching device, the summation of the product of the direct current from the control device over 24h and the direct current from the equipment for its assessed daily average operating time in hours shall not exceed 120mAh per day. The maximum value of direct current permitted in the neutral is 1.44A which could be applicable to equipment with an assessed average daily operating time of 5 min. or less. Notes: 1. When determining the assessed daily average operating time the approvals authority may accept evidence supplied by the manufacturer. 2. The d.c. peak value due to transient starting effects is ignored. The measuring system used to measure any direct current produced shall have a sufficiently high normal (series) mode rejection ratio, by the use of a low pass filter if necessary, to ensure that an overall uncertainty of less than 10% can be achieved.		

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict

APPENDIX	Canadian National Differences according to CB Bulletin No. 96A, March 2000 (IEC Publication 60950 2nd edition, 1991 + Amd.1, 1992 + Amd.2, 1993 + Amd.3, 1995 + Amd.4, 1996)	P
EXPLANATION FOR ABBREVIATIONS P=Pass, F=Fail, N=Not applicable. Placed in the column to the right.		
Special National Conditions		
1.1.1	All equipment installations are required to be in accordance with the Canadian Electrical Code (CEC). Part 1, CAN/CSA C22.1.	Complies. P
1.7.1	Equipment for use on supply systems with a neutral and more than one phase conductor (e.g. 120/240 V, 3-wire) require a special marking format for electrical ratings. A voltage rating that exceeds an attachment plug cap rating is only permitted if it does not exceed the extreme operating conditions in Table 2 of CAN/CSA C22.2 No. 235, and if it is part of a range that extended into the Table 2 "Normal Operating Conditions." Likewise, a voltage rating shall not be lower than specified "Normal Operating Condition," unless it is part of a range that extends into the "Normal Operating Conditions."	Single phase. N
2.5.9	Terminals for permanent wiring are required to be suitable for U.S./Canadian wire gauge sizes and be rated 125 percent of the equipment rating.	N
2.5.11	The capacity of the connection between the earthing terminal and parts required to be earthed is required to comply with CAN/CSA C22.2 No. 0.4.	Considered, see IEC 60950 report. P
2.6.2	Motor control devices are required for cord-connected equipment with a motor if the motor (a) has a nominal voltage rating greater than 120V, (b) in rated more than 12 A, or (c) is rated more than 1/3 hp (locked rotor current over 43 A).	Not motor control device. N
2.6.8	Vertically-mounted disconnect switches and circuit breakers are required to have the "on" position indicated by the handle in the up position.	No vertically mounted disconnect switch or circuit breaker. N
2.6.11	For computer room applications, equipment with battery systems capable of supplying 750 VA for five minutes are required to have a battery disconnect means that may be connected to the computer room remote power off circuit.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
2.7.1	Suitable NEC/CEC branch circuit protection is required for all standard supply outlets and medium-base or smaller lampholders if the supply branch circuit protection is not suitable. Power distribution transformers distributing power at 100 volts or more, and rated 10KVA or more, required transformer overcurrent protection. Panelboards provided as part of information technology equipment are required to have suitable overcurrent protection.	No power outlet.	N
2.7.6	Fuses provided in the earthed circuit conductor (neutral) are only permitted for equipment rated 125V, 15A.	No fuse in neutral or earth conductors.	N
3.1.12	For lengths exceeding 2 m, external interconnecting flexible cord and cable assemblies are required to be suitable cable type (e.g. DP, CL2) described in the NEC.		N
3.2	Wiring methods (terminals, leads, etc.) used for the connection of the equipment to the mains shall be in accordance with the NEC and CEC.		N
3.2.1	Power supply cords are required to have attachment plugs rated not less than 125 percent of the rated current of the equipment.	No power cord provided.	N
3.2.2	Permanent connection of equipment to the mains by a power supply cord is not permitted.	No power cord provided.	N
3.2.4	Power supply cords are required to be not longer than 4.5 m in length. Flexible power supply cords are required to be compatible with article 400 of the NEC and Table 12 of the CEC.	No power cord provided.	N
3.2.8	Permanently connected equipment is required to have a suitable wiring compartment and wiring bending space.	No power cord provided.	N
3.3	Wiring terminals and associated spacings for field wiring connections shall comply with CAN/CSA No. 0.	No wire binding screws used.	N
3.3.3	Wiring binding screws are not permitted to attach conductors larger than 10 AWG (5.3mm²).	No wire binding screws used.	N
4.3.12	Equipment with lasers is required to meet Code of Federal Regulations 21 CFR 1040 and Canadian Radiation Emitting Devices Act, REDR C 1370.	No Laser.	N
4.4.1	For computer room application, automated information storage systems with combustible media greater than 27 cubic feet are required to have a provision for connection of either automatic sprinklers or a gaseous agent extinguishing system with an extended discharge.		N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
4.2.9	Enclosures around C.R.T.'s having a diagonal dimension of 160 mm or more are required to reduce the risk of injury due to the implosion of the CRT.	No CRT.	N
4.3.18	Direct plug-in equipment is required to comply with UL 1310 or CAN/CSA C22.2 No. 223 mechanical assembly requirements.		N
6.2.1.1	The maximum acceptable TNV circuit levels for other than ringing signals are: normal condition- (Uac/42.4 + Udc/42.4 ≤1 for Udc ≤21.2 (Uac/32.8 + Udc/60) ≤ 1 for Udc >21.2 abnormal conditions- (Uac/70.7 + Udc/120) ≤1	No TNV.	N
6.4.3	Equipment connected to a telecommunications network and supplied with an earphone intended to be held against the ear is required to comply with special acoustic pressure tests.	No TNV.	N
6.4.4	Equipment intended to receive telecommunication ringing signals is required to comply with special leakage current measurement tests.	No TNV.	N
6.5	Equipment intended to provided power over the telecommunication wiring system is required to limit output current to values which will not damage the telecommunication wiring system.	No TNV.	N
6.6	Equipment intended for connection to telecommunication network outside plant cable is required to be protected against overvoltage.	No TNV.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
4.4.4	For computer room applications, enclosures with combustible material measuring greater than 0.9 m^2 or a single dimension greater than 1.8 m, are required to have flame spread rating of 50 or less. For other applications, enclosures with the same dimensions require a flame spread rating of 200 or less.		N
4.4.8	The maximum quantity of flammable liquid stored in equipment is required to meet NFPA 30.	No liquid.	N
	Other Differences		
1.5	Components of equipment must be suitable for the application, and must comply with the requirements of the equipment standard and the Canadian or U.S. components standards, as far as they may apply. The acceptance will be based on the following: A) A component certified by a Canadian or U.S. NCB to a Canadian or U.S. component standard will be checked for correct application and use in accordance with its specified rating. Where necessary, it will also be subjected to the applicable tests of the equipment standard. B) A component which has a CB Test Certificate for compliance with a relevant IEC component standard will be checked for correct application and use in accordance with its specified ratings. Where necessary, it will also be subjected to the applicable tests of the equipment standard, and to the applicable tests of the Canadian and U.S. component standard, under the conditions occurring in the equipment. C) A component which has no approval as in A) or B) above or which is used not in accordance its specified ratings, will be subjected to the applicable tests of the equipment standard, and to the applicable tests of the Canadian or U.S. component standard, under the conditions occurring in the equipment. D) Some components may require annual re-testing which may be carried out by the manufacturer, CSA or another laboratory.	Components are UL or CSA approved, see component list 1.5.1.	P
3.4	Equipment connected to a centralized d.c. power system is required to meet special earthing wiring and marking requirements.		N
4.1.6	Wall and ceiling mounted equipment is required to comply with special loading tests.		N
4.1.7	Equipment with handles is required to comply with special loading tests.		N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
APPENDIX	US National Differences according to CB Bulletin No. 96A, March 2000 for IEC 60950 (1991) 2nd Edition, Amendment No.1 (1992), Amendment No. 2 (1993), Amendment No. 3 (1995) and Amendment No. 4 (1996)		P
EXPLANATION FOR ABBREVIATIONS P=Pass, F=Fail, N=Not applicable. Placed in the column to the right.			
The following national differences are based on national regulatory requirements.			
1.1.1	All equipment installations are required to be in accordance with the National Electrical Code (NEC), ANSI/NFPA 70, and unless marked or otherwise identified, the Standard for the Protection Electronic Computer/Data-Processing Equipment, ANSI/NFPA 75.	Considered.	P
1.7.1	Equipment for use on supply systems with a neutral and more than one phase conductor (e.g. 120/240V, 3-wire) require a special marking format for electrical rating. A voltage rating that exceeds an attachment plug cap rating is only permitted if it does not exceed the extreme operating conditions in Table 2 of CAN/CSA C22.2 No. 235, and if it is part of a range that extends into the Table 2 "Normal Operating Conditions". Likewise, a voltage rating shall not be lower than the specified "Normal Operating Conditions", unless it is part of a range that extends into the "Normal Operating Conditions".	Single phase.	N
2.5.9	Terminals for permanent wiring are required to be suitable for U.S./Canadian wire gauge sizes and be rated 125 percent of the equipment rating.		N
2.5.11	The capacity of the connection between the earthing terminal and parts required to be earthed is required to comply with CAN/CSA C22.2 No. 0.4.		N
2.6.2	Motor control devices are required for cord-connected equipment with a motor if the motor (a) has a nominal voltage rating greater than 120V, (b) is rated more than 12A, or (c) is rated more than 1/3 hp (locked rotor current over 43A).	Not motor control device.	N
2.6.8	Vertically mounted disconnect switches and circuit breakers are required to have the "on" position indicated by the handle in the "up" position.	Not vertically mounted disconnect switch or circuit breaker.	N
2.6.11	For computer room applications, equipment with battery systems capable of supplying 750VA for five minutes are required to have a battery disconnect means that may be connected to the computer room remote power-off circuit.	No such battery.	N

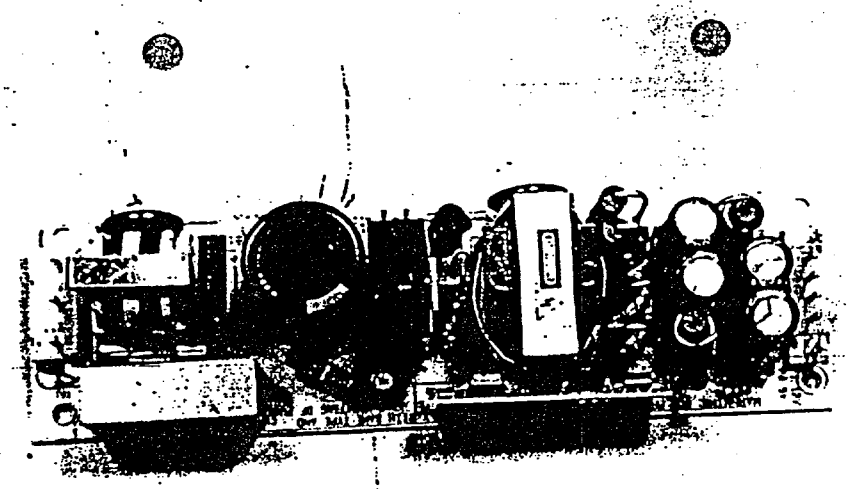
National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
2.7.1	Suitable NEC/CEC branch circuit protection is required for all standard supply outlets and medium-base or smaller lampholders if the supply branch circuit protection is not suitable. Power distribution transformers distributing power at 100 volts or more, and rated 10kVA or more, require transformer overcurrent protection. Panelboards provided as part of information technology equipment are required to have suitable overcurrent protection.		N
2.7.6	Fuses provided in the earthed circuit conductor (neutral) are only permitted for equipment rated 125V, 15A.	No fuse in earthing conductor.	N
2.11	Where a fuse is used to provide current limiting, it shall not be operator-accessible unless it is not interchangeable.	No limited power source applied for.	N
3.1.12	For lengths exceeding 3.05m, external interconnecting flexible cord and cable assemblies are required to be a suitable cable type (e.g. DP, CL2) described in the NEC. For length 3.05m or less, external interconnecting flexible cord and cable assemblies which are not types specified in the NEC are required to have special construction features and identical markings.	No power cord.	N
3.2	Wiring methods (terminals, leads, etc.) used for the connection of the equipment to the mains shall be in accordance with the NEC and CEC.		N
3.2.1	Power supply cords are required to have attachment plugs rated not less than 125 percent of the rated current of the equipment.		N
3.2.2	Permanent connection of equipment to the mains by a power supply cord is not permitted.		N
3.2.4	Power supply cords are required to be no longer than 4.5m in length. Flexible power supply cords are required to be compatible with Article 400 of the NEC and Table 12 of the CEC.		N
3.2.8	Permanently connected equipment is required to have a suitable wiring compartment and wiring bending space.		N
3.3	Wiring terminals and associated spacings for field wiring connections shall comply with CSA C22.2 No. 0.		N
3.3.3.	Wire binding screws are not permitted to attach supply conductors larger than 10 AWG (5.3mm²).		N
4.3.12	Equipment with lasers is required to meet Code of Federal Regulations 21CFR 1040 and Canadian Radiation Emitting Devices Act, REDR C1370.	No Laser.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
4.4.1	For computer room applications, automated information storage systems with combustible media greater than 27 cubic feet are required to have a provision for connection of either automatic sprinklers or a gaseous agent extinguishing system with an extended discharge.		N
4.4.4	For computer room applications, enclosures with combustible material measuring greater than 0.93mm³ or having a single dimension greater than 1.8m are required to have a flame spread rating of 50 or less. For other applications, enclosures with the same dimensions require a flame spread rating of 200 or less.		N
4.4.8	The maximum quantity of flammable liquid stored in equipment is required to meet NFPA 30.	No liquid.	N
The following national differences are based on requirements other than national regulatory requirements.			
1.5.1	Some components and materials associated with the risk of fire, electric shock, or personal injury are required to have component or material ratings in accordance with the applicable national (U.S. and Canadian) component or material requirements. These components include: attachment plugs, cathode ray tubes, circuit breakers, communication circuit accessories, cord sets and power supply cords, enclosures (outdoor), flexible cords and cables, fuses, fuseholders, ground-fault current interrupters, industrial control equipment, insulating tape, lampholders, limit controls, printed wiring, protectors for communication circuits, receptacles, solid state controls, supplementary protectors, surge suppressors, switches, thermal cutoffs, thermostats, tubing, wire connectors, and wire and cables.	Components are UL approved, see component list 1.5.1.	P
3.4	Equipment connected to a centralized d.c. power system is required to meet special earthing, wiring and marking requirements.		N
4.1.6	Wall and ceiling mounted equipment is required to comply with special loading tests.	Built in SPS.	N
4.1.7	Equipment with handles is required to comply with special loading tests.	Built in SPS.	N
4.2.9	Enclosures around CRT's with a face area of 160mm or more are required to reduce the risk of injury due to the implosion of the CRT.	No CRT.	N

National Deviation			
Clause	Requirement – Test	Result - Remark	Verdict
6.2.1.1	The maximum acceptable TNV circuit levels for other than ringing signals are: normal condition- (Uac/42.4 + Udc/42.4 ≤1 for Udc ≤21.2 (Uac/32.8 + Udc/60) ≤ 1 for Udc >21.2 abnormal conditions- (Uac/70.7 + Udc/120) ≤1	No TNV.	N
6.2.2.2	Access restrictions to TNV-2 and TNV-3 circuits in battery compartments also apply to TNV-1 circuits.	No TNV.	N
6.3.4.3	Equipment intended to receive telecommunication ringing signals is required to comply with special leakage current measurement test.	No TNV.	N
6.4.1	Enamel coating on winding wire are not considered electrical separation unless subjected to special investigation.	No TNV.	N
6.4.3	Equipment connected to a telecommunication network and supplied with an earphone intended to be held against the ear is required to comply with special acoustic pressure tests.	No TNV.	N
6.5	Equipment intended to provide power over the telecommunication wiring system is required to limit output current to values which will not damage the telecommunication wiring system.	No TNV.	N
6.6	Equipment intended for connection to telecommunication network outside plant cable is required to be protected against overvoltage.	No TNV.	N
M.2	Continuous ringing signals up to 16mA only are permitted if subjected to special installation and performance restriction.	No TNV.	N

Type Designation: A40A1-02M
Report Number: E 2063423 E01

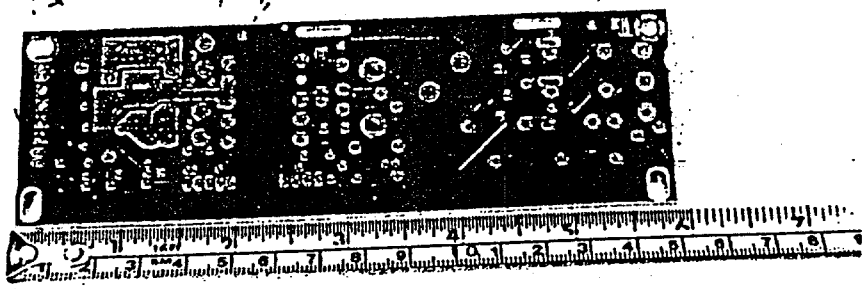
TÜV



A40A1-02M

Type Designation: A40A1-02M
Report Number: E 2063423 E01

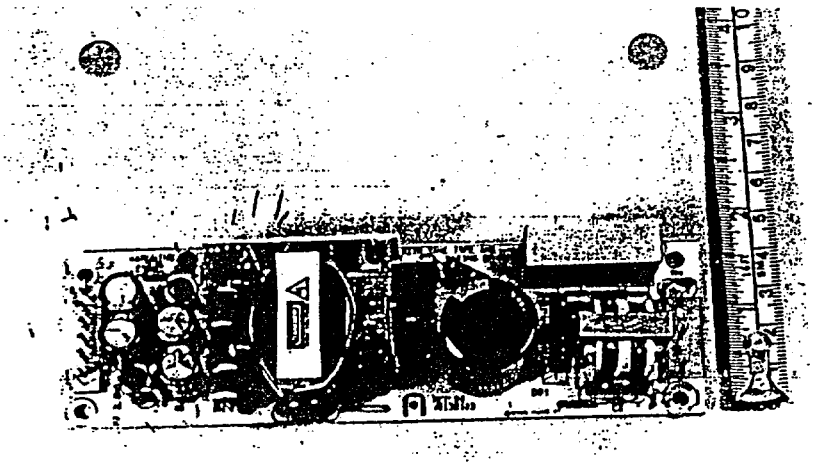
TÜV



A40A1-02M

Type Designation: A40A1-02M
Report Number: E 2063423 E01

TÜV



A40A1-02M

(5)

TEST REPORT FOR AN ADDITIONAL APPROVAL
IEC 60 950
Safety of information technology equipment

Report reference No. ..... :	02063423 002
Compiled by (+ signature) ..... :	E. Chow
Approved by (+ signature) ..... :	M. Kera
Date of issue ..... :	27 June, 2001
Contents ..... :	Total 4 pages
Testing laboratory ..... :	TÜV Rheinland Japan Ltd., Yokohama Laboratories
Address ..... :	Festo Bldg. 5F, 1-26-10 Hayabuchi, Tsuzuki-Ku, Yokohama 224-0025, Japan
Testing location ..... :	TÜV Rheinland Japan Ltd., Yokohama Laboratories
Applicant ..... :	AKII Technology Co., Ltd.
Address ..... :	3F, No. 501-16, Chung Cheng Road, Hsin Tien City, Taipei Hsien 231, Taiwan R.O.C.
Standard ..... :	IEC 60950:1991+A1:1992 + A2:1993 + A3:1995 + A4:1996 EN 60950:1992+A1:1993+A2:1993+A3:1995+A4:1997+A11:1997 EMKO-TBE(74-SEC)207/94 UL 1950, C22.2 No. 950 3rd edition, AS 3260
Test Report Form No. ..... :	Cbeddepp.doc
TRF originator ..... :	TÜV Rheinland
Test procedure ..... :	CB Scheme
Procedure deviation ..... :	Australia, Austria, Belgium, Canada, China, The Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Ireland, Israel, Italy, Japan, Rep. of Korea, The Netherlands, Norway, Poland, Russian Fed., Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, United Kingdom, USA, Yugoslavia
Non-standard test method ..... :	N.A.

This report is not valid as a CB Test Report unless appended to a CB Test Certificate issued by a NCB, in accordance with IECEE 02

Type of test object ..... :	Open Frame Power Supply
Trademark ..... :	AUTEK
Model/type reference ..... :	A40A1-02M
Manufacturer ..... :	same as applicant
Factory ..... :	AKII Dongguan Manufacture Co., Ltd. Xen Ging Road, Gan Bu Town, Dongguan, Guandong, P.R. China
Rating ..... :	I/p: AC 100-240V, 50-60Hz, 0.9A o/p: DC +5V/3A, +12V/2A; max. output power 39W

The construction of the open frame power supply model A40A1-02M was modified as follows:

1. Addition of national deviation Singapore.

For the above described modification the following testing was considered to be necessary:

Modification	Testing	Comments	Result
1.	■ Humidity test ■ Electric strength test	No safety impact. Results see appended clause 2.2.3 and table 5.3.	P

IEC 60 950			
Cl.	Requirement - Test	Result	Verdict
2.2.3	Humidity treatment	Total time elapsed: 120 hours	P
	Humidity (%) ..... :	95% R.H.	
	Temperature (°C) ..... :	40°C	

5.3	TABLE: electric strength measurements		P
test voltage applied between:		test voltage (V)	breakdown
primary and secondary		DC 4242V	No
primary and ground (PE)		DC 2121V	No
T1 primary and secondary		AC 3000V	No
Tests were performed in normal condition, after heating test and abnormal tests.			

National Deviations			
Clause	Requirement - Test	Result - Remark	Verdict
APPENDIX	Singapore National Differences according to CB Bulletin, No. 96A, March 2000 REPORT (IEC Publication 60950 2nd edition, 1991 + Amd.1, 1992 + Amd.2, 1993 + Amd.3, 1995 + Amd.4, 1996)		P
EXPLANATION FOR ABBREVIATIONS P=Pass, F=Fail, N=Not applicable. Placed in the column to the right.			
General	IT Power Systems are not allowed in the Republic of Singapore and all clauses related to IT Power Systems are not applicable.	The unit is not applied for IT Power System.	P
2.2.2	(a) After the first paragraph, insert the following: Conditions described in IEC Publication 60068-2-3: Test Ca: Damp Heat, Steady State (temperature: 40 ± 2°C, relative humidity: 90% to 95%) shall apply to insulation to be used under tropical conditions. (b) At the end of the last paragraph, insert the following note: NOTE: The additional requirement on humidity conditioning is drawn from Clause 10.2 of IEC 60065:1985.	See IEC 60950 report.	P

Addendum 12: DLT VS160 UL Follow-up Report

1655 Scott Boulevard
Santa Clara, CA 95050-4169
United States Country Code (1)
(408) 985-2400
FAX No. (408) 296-3256
http://www.ul.com

Underwriters Laboratories Inc.®

File E205786
Project 02SC06685

June 28, 2002

REPORT

ON

COMPONENT - INFORMATION TECHNOLOGY EQUIPMENT,
INCLUDING ELECTRICAL BUSINESS EQUIPMENT

Benchmark Storage Innovations Inc.
Boulder, Colorado

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dedicated to public safety and
committed to quality service

DESCRIPTION

PRODUCT COVERED:

Component - Information Technology Equipment, Including Electrical Business Equipment, Internal Tape Drive, Models DLT VS160, PowerVault 110T DLT VS160, StorageWorks DLT-VS-160/320, 80/160GB Half-High DLTVS Tape Drive, and DLT VS160 Internal Tape Drive.

ELECTRICAL RATINGS:

Model DLT VS160: 5 V dc/1.5 A, 12 V dc/0.5 A

ENGINEERING CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

Use - For use only in (or with) complete equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

USR/CNR indicates investigation to the U.S. and Canadian Bi-National Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment, CAN/CSA C22.2, No. 950-95 * UL 1950, Third Edition.

The front bezel made of Plastic World CAP-NNNNNXXXM was subjected to the tests per Annex A.1 and complies with the flammability requirements.

Conditions of Acceptability -

1. The equipment is considered Class III (supplied by SELV).

2. A suitable overall enclosure should be provided when the unit is installed in the end-use product.

3. The unit employs a thermoplastic front bezel that was subjected to the tests per Annex A.1 and complies with the flammability requirements.

4. Spacings have not been evaluated as the unit is intended for connection to low-voltage secondary circuits only.

5. The terminals and connectors are suitable for factory wiring only.

CONSTRUCTION DETAILS:

See Section General for additional details.

Nameplate Marking - Listee's name or file number, model number, and electrical ratings.

Printed Wiring Boards - (ZPMV2), rated minimum 94V-1, 105°C.

Model Differences - The models are identical, except for the type of interface, and overall PWB size.

MODEL DLT VS160 - FIG. 1

General - Fig. 1 represents an overall view of the unit.

1. Bezel - (QMFZ2), Plastic World, Ltd. (Cho Ei), Type CAP-NNNNNXXXM, 0.8 mm thick (all colors).

2. Supply Motor - (SELV) Mitsumi, 72 6528 A, rated 12 V dc.

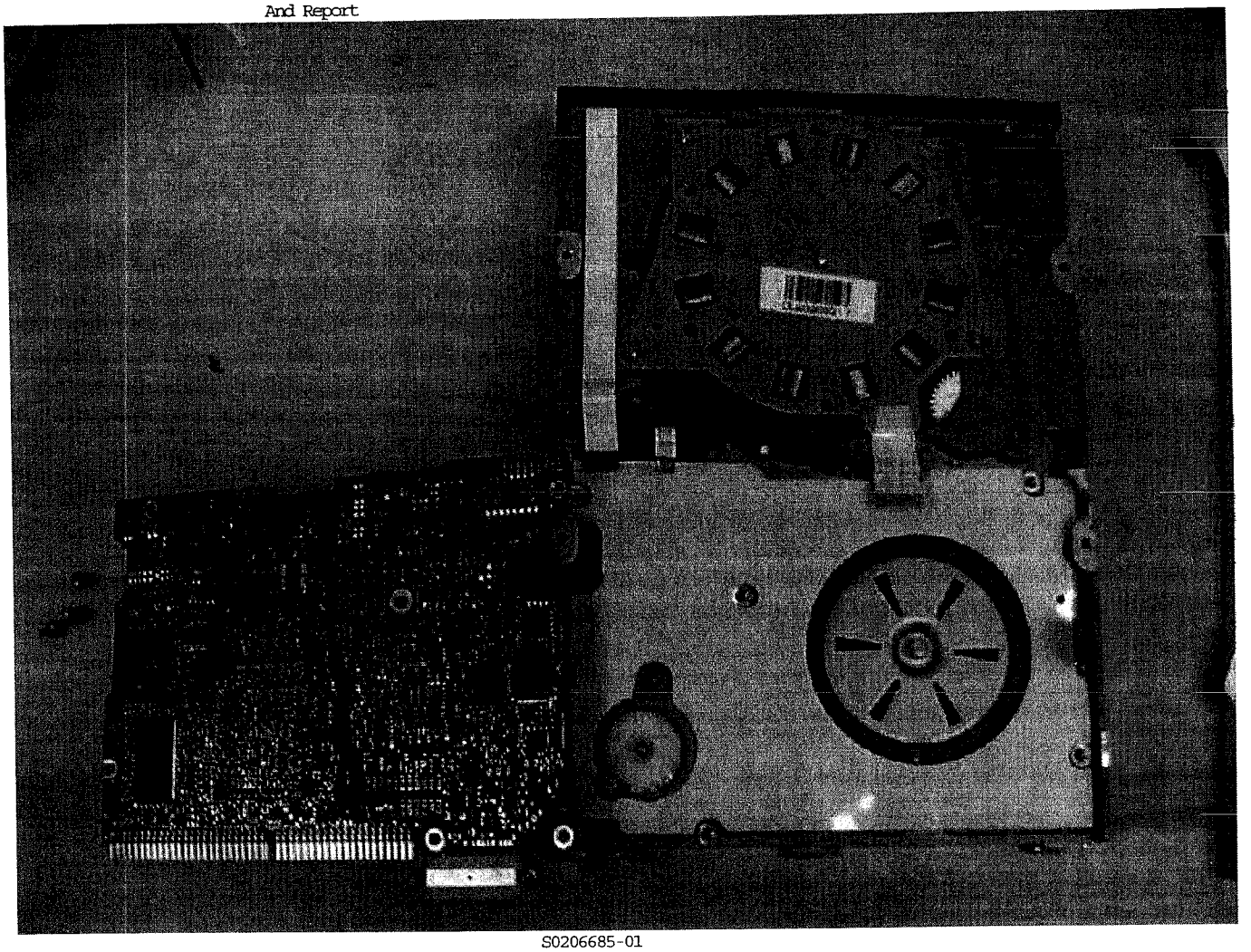
3. Take Up Motor - (SELV) Mitsumi, 72 6542 A, rated 12 V dc.

4. Stepper Motor - (SELV) Totally enclosed in metal. Mitsumi, 72 6436 A.

5. Load/Unload Motor - (SELV) Totally enclosed in metal. Nidec Copal, LA14-371N, rated 11 V dc.

6. Flexible Printed Wiring - (SELV) (ZPXK2), flammability rating minimum 94 V-2, 94 VTM-2 or FU-2 operating temperature minimum 60°C.

7. PTC - (XGPU2), Littelfuse, 1812L125, rated 6 V dc, 1.25 A.



S0206685-01

TEST RECORD NO. 1

SAMPLES:

The manufacturer submitted a sample representing production of Internal Tape Drive, Model DLTVS 160.

The following tests were conducted in accordance with the Standard for Safety of Information Technology Equipment, CSA C22.2, No. 950 * UL 1950, Third Edition.

Only the following tests were deemed necessary.

The test methods and results of the above tests have been reviewed and found to be in accordance with the requirements in the Standards noted above. Test results are valid only for the tested equipment.

"Maximum normal load" was defined as operation at continuous reading and writing.

The unit weighs approximately 1.8 kg and was considered building-in with unexposed (SELV) circuits.

Maximum operating ambient 40°C.

1.6.1 - INPUT TEST:
SINGLE-PHASE

METHOD

The unit was connected to a variable voltage as indicated and then operated normally under the conditions noted below until well-warmed. The input current and average power were measured.

RESULTS

Operating Condition	Input Condition		Input Current, A		Avg. Current
	Volts	Hz	Rated	Measured (peak)	
Read/Write	4.75/11.4	DC	-	1.59 /1.456	1.416/0.379
Read/Write	5/12	DC	2.2/0.7	1.584/1.432	1.515/0.427
Read/Write	5.25/12.6	DC	-	1.584/1.420	1.412/0.371

The steady-state input current did not exceed the rated current at the rated voltage by more than 10 percent under the "Maximum normal load".

5.1, 1.4.8, 3.3.2 - HEATING TEST

METHOD

The sample was connected to a source of supply as noted below and operated until temperatures became stable. Temperatures were measured using the thermocouple method.

The sample operated under normal load as follows: Continuous read/write mode until steady conditions were established.

Tmra was 40°C.

RESULTS

Test	Operating Condition	Input Conditions Volts	Hz	Duration
A	Read/Write	4.75/11.4	dc	4 hrs.
B	Read/Write	5/12	dc	4 hrs.
C	Read/Write	5.25/12.6	dc	4 hrs.

Thermocouple Locations	Maximum Temperature, °C Test A	Test B	Test C
Ambient	23.4	24.4	24.6
Motor winding (top)	45.9	48.0	49.2
Motor winding (bottom)	46.1	47.7	49.7
Eject motor case	37.7	39.2	40.5
Stepper motor case	41.3	43.7	45.6
L1	50.8	53.3	55.9
L2	50.0	53.3	55.9

ANNEX A.1 - 130 MM FLAME TEST:

SAMPLES:

Three samples of the tape drive bezel, in each of the available colors, was submitted by the manufacturer. It was constructed as described in the preceding section of this Report.

The following tests were conducted at the test facility of TUV PS, Boulder, Colorado, and witnessed by a member of the UL Engineering staff.

1. Annex A.1 Flammability Test

The test methods and results of the above tests have been reviewed and found in accordance with the requirements in UL 1950, Third Edition.

ANNEX B.7 - LOCKED-ROTOR OVERLOAD TEST FOR DC MOTORS IN SECONDARY CIRCUITS:

METHOD

The motor was connected to 12 V dc and the rotor was locked for 7 hours or until steady state conditions were established; whichever was longer.

A thermocouple was applied on the motor winding surface. The motor was placed on a tissue paper covered softwood surface and covered with a single-layer of cheesecloth of approximately 40 g/m^2.

Tmra was 40°C.

RESULTS

1. Motor Manufacturer: (Cartridge Reel Motor) Nidec, Type T20Z28

The motor rotor was locked for 7 hours.

The tissue paper and cheesecloth did not ignite.

The maximum winding temperature was 102.5°C. The ambient temperature was 25.4°C.

CONCLUSION

A sample of the product covered by this Report has been found to comply with the requirements covering the Class and the product is judged to be eligible for Component Recognition and Follow-Up Service. Under the service, the manufacturer is authorized to use the Recognized Marking described in the Follow-Up Service Procedure on such products which comply with said Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear the Recognized Marking are considered as Recognized Components by Underwriters Laboratories Inc.

Report by:

Richard Duran

RICHARD DURAN
Senior Engineering Associate
Boulder LES Office

Reviewed by:

Benjamin Mapes

BENJAMIN MAPES
Engineering Group Leader
Boulder LES Office

Addendum 13: DLT VS160e UL Follow-up Report

1655 Scott Boulevard
Santa Clara, CA 95050-4169
United States Country Code (1)
(408) 985-2400
FAX No. (408) 296-3256
http://www.ul.com

Underwriters Laboratories Inc.®

File E205786
Project 02SC06688

June 29, 2002

REPORT

ON

INFORMATION TECHNOLOGY EQUIPMENT,
INCLUDING ELECTRICAL BUSINESS EQUIPMENT

Benchmark Storage Innovations Inc.
Boulder, Colorado

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A not-for-profit organization
dedicated to public safety and
committed to quality service

DESCRIPTION

PRODUCT COVERED:

USL, CNL - Information Technology Equipment, Including Electrical Business Equipment, External Tape Drive, Models DLT VS160e, PowerVault 110T DLT VS160e, StorageWorks DLT-VS-160/320 External, and DLT VS160 External Tape Drive.

ELECTRICAL RATINGS:

100-240 V, 50/60 Hz, 0.9 A.

GENERAL:

USL/CNL indicates investigation to the U.S. and Canadian (Bi-National) Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment, CAN/CSA C22.2, No. 950-95, UL 1950, Third Edition.

Special Considerations - The following items are considerations that were used when evaluating this product.

The equipment is considered movable, Class I, pluggable Type A, uses detachable power cord, intended for use on TN power system.

Disconnect Device - The following component is considered the equipment-disconnect device: Appliance inlet.

The unit employs a thermoplastic front bezel rated 94V-1.

The unit weighs approximately 4.5 kg.

The manufacturer's recommended ambient is 40°C.

CONSTRUCTION DETAILS:

Nameplate Marking - Listee's name or File Number, model number, and electrical ratings.

Connectors - Unless otherwise noted, all connectors in secondary circuitry (SEC) consist of copper alloy with or without plating, pins housed in bodies of phenolic, melamine, polycarbonate, nylon, epoxy or diallyl phthalate resin.

Printed Wiring Boards - R/C (ZPMV2), rated minimum 94V-1, 105°C.

Model Differences - All models are identical, except for model designation.

MODEL DLTVS 160e - FIG. 1

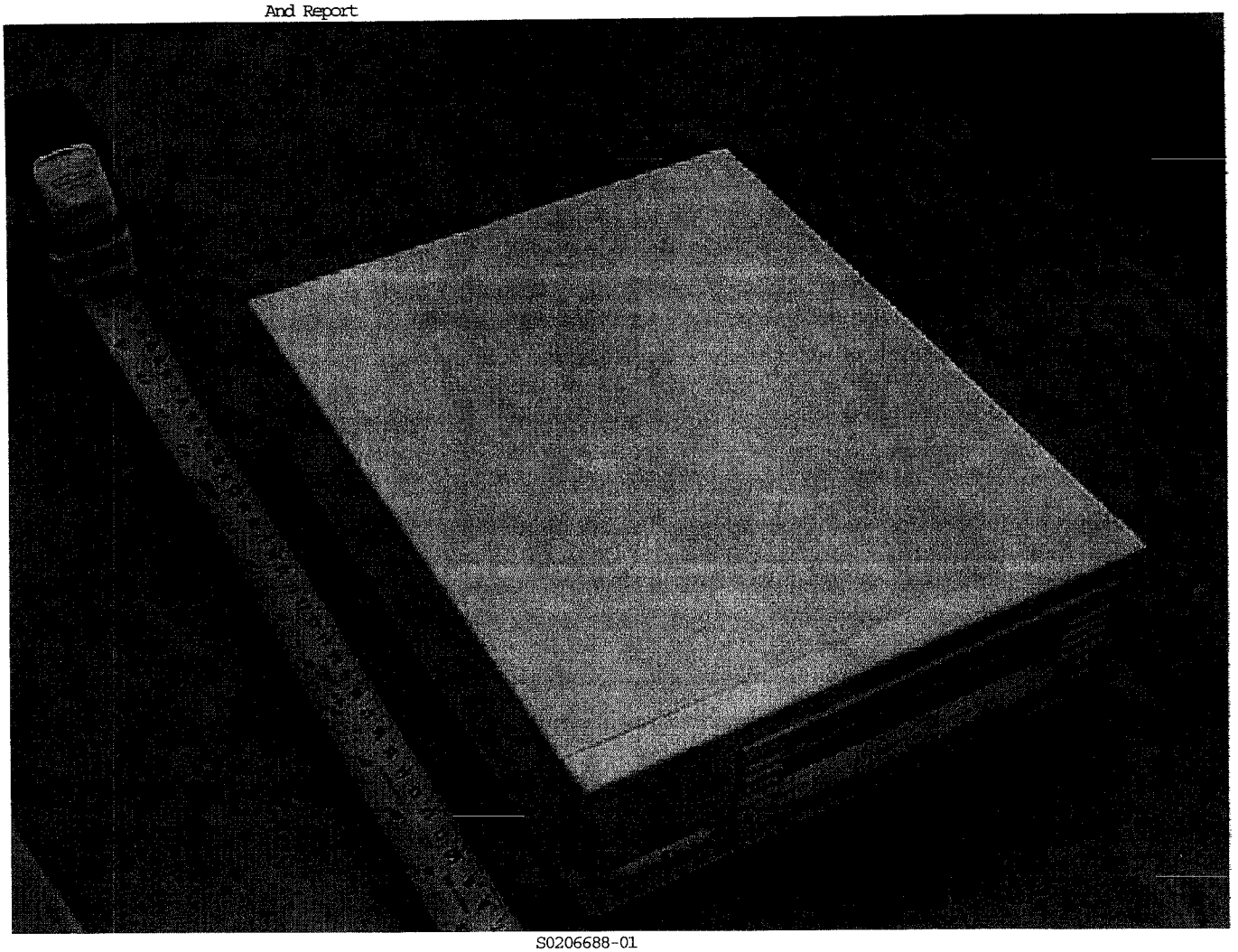
General - Fig. 1 represents an external view of the unit.

1. Front Bezel - (QMFZ2), Plastic World, Ltd. (Cho Ei), Type CAP-NNNNNXXXM, rated 94 V-1, minimum 1.6 mm thick.

2. Chassis - Sheet metal. Overall approximately 8.5 by 10.0 by 3.75 in.

3. Metallized Coating - (Not shown). (QMSS2) Spraylat, Type 599-B3755 or 599-Y2000, minimum 1.0 mils thick, maximum 2.0 mils thick.

   Alternate - Same as above, except Acheson Colloids, Type Electrodag 550.



S0206688-01

MODEL DLTVS 160e - FIG. 2

General - Fig. 2 represents an internal view of the unit.

1. Power Switch - (WOYR2), rated 125/250 V ac, minimum 10 A/5 A.

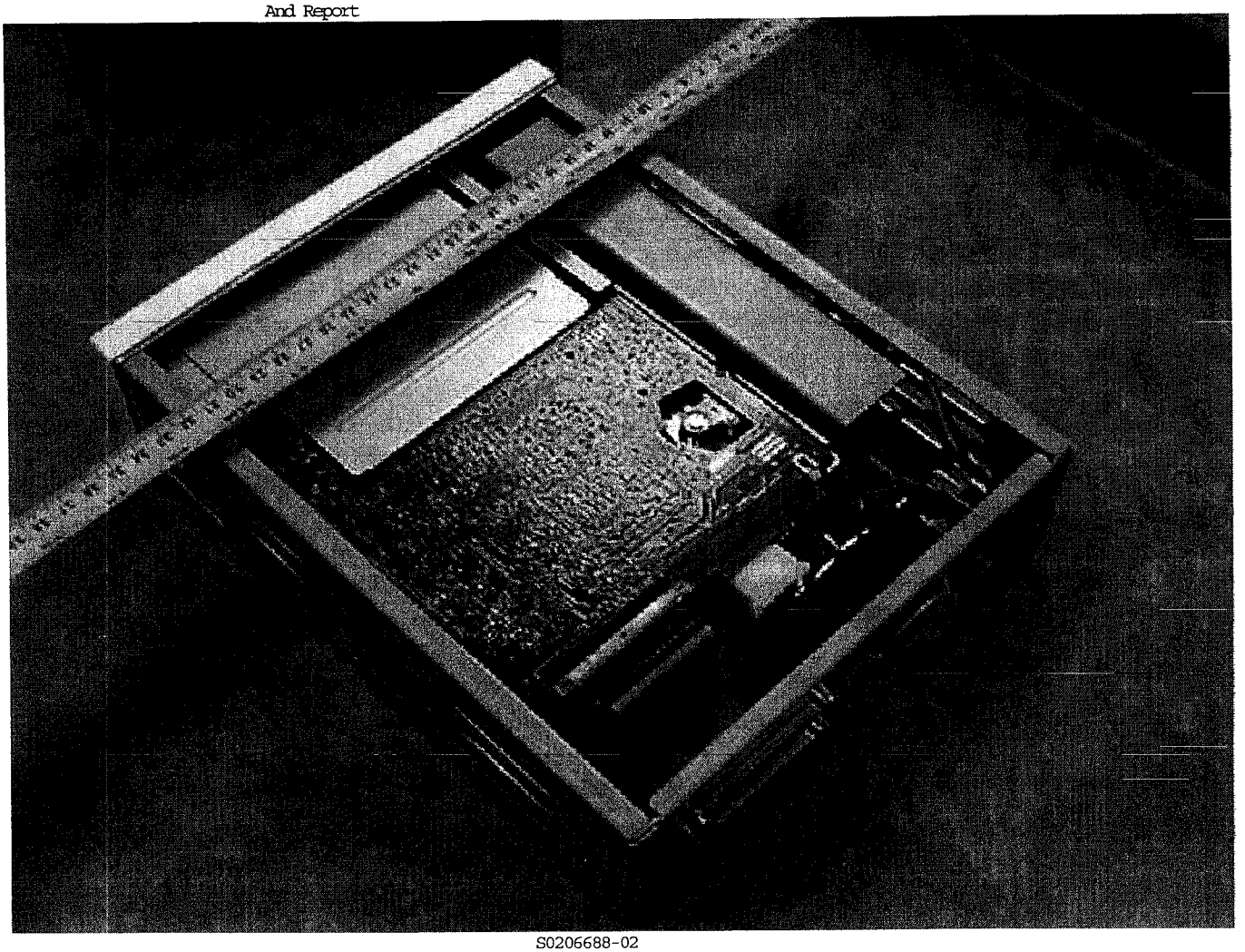
2. Tape Drive - (NWGQ2), Benchmark Storage Innovations, Inc., Model DLT VS160, rated 5.0/12.0 V dc, 1.5/0.5 A

3. Insulation Sheet - (Not shown). (QMFZ2), minimum thickness 0.025 mm, rated 94V-2 or 94VTM-2. Located between trace side of power supply PWB and enclosure.

4. Power Supply - (QQGQ2), Autec Electronics Co., Ltd., Akii Technology, Ltd. or MultiPower, Model A40A1-02M, rated 100-240 V ac, 0.9 A, 50-60 Hz.

5. Fan - (GPWV2), Sunonwealth Electric Machine Industry Co., Ltd., Model KD1206PTB1, rated 12 V dc, 2.2 W.

6. AC Input Module - (FOKY2), Delta Electronics, Type 01GENG3E-R, rated 250 V ac, minimum 1 A.



S0206688-02

TEST RECORD NO. 1

SAMPLES:

The manufacturer submitted a sample representing production of Tape Drive, Model DLT VS160e.

The following tests were conducted in accordance with The Standard for Safety of Information Technology Equipment, CSA C22.2, No. 950 * UL 1950, Third Edition; IEC 950, Second Edition, including Amendments 1 through 4: EN 60950: 1988, including National Deviations from all countries except Singapore.

Only the following tests were deemed necessary.

The test methods and results of the above tests have been reviewed and found to be in accordance with the requirements in the Standards noted above. Test results are valid only for the tested equipment.

"Maximum normal load" was defined as continuous read and write loop.

The unit weighs approximately 1.8 Kg and was considered movable with unexposed (SELV) circuits.

Maximum operating ambient 40°C.

1.6.1 - INPUT TEST:
SINGLE-PHASE

METHOD

The unit was connected to a variable voltage as indicated and then operated normally under the conditions noted below until well-warmed. The input current and average power were measured.

RESULTS

Operating Condition	Input Condition		Input Current, A		Avg. Power
	Volts	Hz	Rated	Measured	Watts
Continuous Read/Write	90	50/60	-	0.42	22
Continuous Read/Write	100	50/60	0.9	0.40	22
Continuous Read/Write	110	50/60	0.9	0.37	22
Continuous Read/Write	120	50/60	0.9	0.35	22
Continuous Read/Write	134	50/60	0.9	0.32	22
Continuous Read/Write	216	50/60	0.9	0.26	23
Continuous Read/Write	230	50/60	0.9	0.25	23
Continuous Read/Write	240	50/60	0.9	0.24	24
Continuous Read/Write	254	50/60	-	0.22	24
Continuous Read/Write	264	50/60	-	0.22	26

The steady state input current did not exceed the rated current at the rated voltage by more than 10 percent under the "Maximum normal load".

2.1.10 - CAPACITANCE DISCHARGE TEST:

METHOD

The unit was connected to 264 V ac, 50 Hz/dc. A storage oscilloscope was connected across the external point of disconnection of the mains supply. With all switches in the unit initially set to the "OFF" position, the unit was disconnected from the supply source. The voltage at the time of disconnection, V_o, and the voltage, V_{tc}, at 1.0 second were recorded.

RESULTS

Measurement Locations	Fuse In/Out	Switch Position	V_o (V pk)	37% V_o (V pk)	V_{tc} (V pk)
Line-to-Line	-	ON	370	137	0
Line-to-Ground	-	ON	370	137	0
Line-to-Line	-	OFF	370	137	0
Line-to-Ground	-	OFF	370	137	0

The voltage across-line capacitors did not decay to less than 37 percent of its original value in 1.0 second.

2.5.11 - EARTHING TEST:

METHOD

Using a maximum 12 V ac power source, a current of 30 A, was passed between the equipment earthing terminal and the accessible metal parts listed below for a period of two minutes. The resistance was measured.

RESULTS

Accessible Conductive Part	Current (Amps)	Voltage Drop (Volts)	Resistance (Ohms)
Fan Grill	30	-	0.00464

The resistance did not exceed 0.1 ohm from any accessible conductive part and earth.

4.2.4, 4.2.7 - STEEL BALL TEST:

METHOD

The unit was placed on a solid supporting surface with the surface that was impacted positioned horizontally. One impact was imparted to the surface by a smooth steel sphere 50 mm (2 in.) in diameter and weighing 0.5 kg (1-3/16 lbs.). The sphere was allowed to fall freely through a distance of 1.3 m (51-3/16 in.).

Following the impacts, the unit was subjected to an Electric Strength Test for one minute.

	Location		
	From	To	Potential Used (V)
A.	Primary	Earth	2121 dc

RESULTS

Material	Impact Area	Observations
Steel enclosure	Top	No damage
Steel enclosure	Side	No damage

It was not possible to access hazardous parts.

There was no indication of a dielectric breakdown.

5.1, 1.4.8, 3.3.2 - HEATING TEST:

METHOD

The sample was connected to a source of supply as noted below and operated until temperatures became stable. Temperatures were measured using the thermocouple method.

The sample operated under "Maximum normal load" as follows: Continuous read/write until steady conditions were established.

Tmra was 40°C.

RESULTS

Test	Operating Condition	Input Conditions Volts	Hz	Duration
A	Continuous read/write	90	60	4 hrs
B	Continuous read/write	90	50	4 hrs
C	Continuous read/write	134	60	4 hrs
D	Continuous read/write	254	50	4 hrs
E	Continuous read/write	264	50	4 hrs
F	Continuous read/write with front vents blocked	264	50	4 hrs
G	Continuous read/write with cooling fans disconnected	264	50	4 hrs

Thermocouple Locations	Maximum Temperature, °C Test A	Test B	Test C	Test D
1. T2 Coil	56.6	55.2	56.8	61.9
2. T1 Coil	47.2	45.1	42.6	40.4
3. C3 Body near DB1 (PS)	51.8	49.1	49.9	61.9
4. PWB near HS1 (PS)	44.6	42.5	45.4	45.2
5. L3 Coil (PS)	67.2	64.2	67.8	66.2
6. L2 Coil (PS)	55.4	52.4	56.1	54.3
7. Ambient	24.4	22.4	24.4	23.2

Thermocouple Locations	Test E	Test F	Test G
1. T2 Coil	65.3	72.2	94.2
2. T1 Coil	42.8	38.6	64.9
3. C3 Body near DB1 (PS)	64.1	57.0	87.2
4. PWB near HS1 (PS)	47.2	55.9	75.5
5. L3 Coil (PS)	67.7	74.5	101.2
6. L2 Coil (PS)	55.9	61.4	84.1
7. Ambient	24.4	24.6	24.5

5.2, ANNEX D - LEAKAGE CURRENT TEST:
(Single-Phase/Polyphase; TN/TT System)

METHOD

The unit was connected to 264 V ac, 60 Hz. The unit was placed on an insulating surface and all connections to external equipment were disconnected to prevent stray leakage paths.

For Class I equipment, the current between the supply conductors and equipment protective earth terminal was measured using the IEC leakage current meter, described in Annex D of UL 1950, Third Edition. Primary power switches (i.e., "ON/OFF" switches and voltage selector switches) which operated during normal use, were opened and closed in all possible combinations.

RESULTS

Primary Switch Condition	Measurement From	Measurement To	Polarity/ Phase Open	Leakage Current (mA)	Comments
ON	Line/Neutral	Chassis	Norm/Rev	0.44	
OFF	Line/Neutral	Chassis	Norm/Rev	0.27	
ON	L1/L2	Chassis	Norm/Rev	0.44	IT Leakage
OFF	L1/L2	Chassis	Norm/Rev	0.27	IT Leakage
ON	L3	Chassis	Norm/Rev	0.63	IT Leakage
OFF	L3	Chassis	Norm/Rev	0.48	IT Leakage

5.3.1 - ELECTRIC STRENGTH TEST:

METHOD

While the unit was in a well-heated condition, an ac or dc potential was gradually increased from zero to the test potential given below. The voltage was applied and maintained for a period of one minute between the points indicated. All switches, relays, contactors, triacs or equivalent in the test circuit were closed or shunted.

From: Primary-to-Ground
Test Voltage: 2121 V dc

RESULTS

There was no indication of breakdown.

5.4.1 - 5.4.9 - ABNORMAL OPERATION TESTS:

METHOD

The unit was operated continuously under the abnormal condition(s) noted below. The unit was placed on a tissue paper covered softwood surface and covered with cheesecloth.

Test No.

1. Blocked Ventilation Openings
2. Disconnected fan

At the end of the test, an Electric Strength (ES) potential was applied, as indicated below, for one minute.

From: Primary-to-Ground
Test Voltage: 2121 V dc

The following key and corresponding comments may be used to describe the final results.

Comments Key:

NC - Cheesecloth remained intact
YC - Cheesecloth charred or flamed
NT - Tissue paper remained intact
YT - Tissue paper charred or flamed
NB - No indication of dielectric breakdown

RESULTS

Test	Component	Abnormal Condition	Input V/Hz	Duration	Comments
1	Vents	Blocked	264/50 Hz	4 hours	NB, NT, NC
2	Fan	Disconnected	264/50 Hz	4 hours	NB, NT, NC

Comments: Refer to Tests F and G of Heating Test.

5.4.6 - OVERLOAD OF OPERATOR ACCESSIBLE CONNECTOR TEST:

METHOD

The sample was covered with one layer of cheesecloth and placed on a pinewood board covered with one layer of tissue paper. The sample had a complete enclosure.

The sample was connected to 264 V ac, 50 Hz.

The voltage potential was measured on the connector pins. Circuits that measured 0 V were not tested.

The impedance was measured between each accessible connector pin that had greater than 0 V and its power supply voltage source. Where there was 10,000 ohm or more of series impedance between the output connector pin and the power supply voltage source of 125 V or less, the circuit was not tested. Where there was 20,000 ohm or more of series impedance between the output connector pin and the power supply voltage source was greater than 125 V but not greater than 250 V, the circuit was not tested.

A suitable variable resistor was connected between the connector pin tested and ground. The maximum available current was measured at each pin. If the current was less than or equal to 12.5 mA, the circuit was not tested.

When the maximum available current was greater than 12.5 mA, the load was adjusted for maximum available current and maintained for one hour.

The maximum available current was considered to be the lower of (1) the short circuit current, (2) that current just below the trip point of any overcurrent or overtemperature protective device, or (3) that current that was just below the point at which the power supply circuitry limited the output current. The trip point of overcurrent protective devices was considered to be 110 percent of their current rating.

If a trace in a secondary circuit designed to intentionally open in a repeatable manner operated during the test, the test was repeated two time (three times total).

If after one hour there was no indication of an abnormal condition, but it appeared possible that a condition of risk would result, the test was continued for 7 hours.

At the end of the test, an Electric Strength (ES) potential was applied as indicated below for one minute.

ES Code	Location From	Location To	Potential Used (V)
A	Primary	Ground	2121 V dc

The following key and corresponding comments may be used to describe the final results.

Comments Key:

NB - No indication of dielectric breakdown
YB - Dielectric breakdown (indicate time and location)
NC - Cheesecloth remained intact
YC - Cheesecloth charred or flamed
NT - Tissue paper remained intact
YT - Tissue paper charred or flamed
A - Circuit measures 10 kilohm or more series impedance
B - Circuit measures less than 12.5 mA
C - Circuit measures 0 V
D - Other. Please explain.

RESULTS

Connector	Pin #s	Open Circuit Voltage (V dc)	Maximum Available Current (mA)	Length of Test	Comments
SCSI	1-12,14,21-34	1.2	-	-	B
	13,15,16,20, 47,49,50	0	-	-	C
	17,18,51,52	4.76	2300	1 hr	NB, NC, NT
	19,35-46,48,55	1.3	-	-	B
	53,54	0	-	-	C
	56-58	1.3	-	-	B

CONCLUSION

A sample of the product covered by this Report has been found to comply with the requirements covering the Class and the product is judged to be eligible for Listing and Follow-Up Service. The manufacturer is authorized to use the Laboratories' Mark on such products which comply with the Follow-Up Service Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear the Laboratories' Mark are considered as Listed by Underwriters Laboratories Inc.

Report by:

Richard Duran

RICHARD DURAN
Senior Engineering Associate
Boulder LES Office

Reviewed by:

Benjamin Mapes

BENJAMIN MAPES
Engineering Group Leader
Boulder LES Office

Addendum 14: DLT VS160 EMC Emissions Test Report (110, 230 VAC)

EMC EMISSIONS - TEST REPORT (Full)

Test Report No.	**BC204750** Issue Date: **Tue 17/Sep/2002**
Model / Serial No.	**DLT VS160 (Benchmark), PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP), 80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg) / SN: PHJ2F00101, DL2020702**
Product Type	**Internal Tape Drive**
Client	**Benchmark Storage Innovations**
Manufacturer	**Benchmark Storage Innovations**
License holder	**Benchmark Storage Innovations**
Address	**3122 Sterling Circle**
	Boulder, Co 80301
Test Criteria Applied	**CISPR 22 Class B**
Test Result	**PASS**
Test Project Number	**BC204750**
References	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
Total Pages Including Appendices:	**40**

Reviewed By : Todd Seeley

Approved By : Robert Cresswell

TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 17025 and EN 45001.

TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.

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NVLAP Lab code 100271-1

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DIRECTORY

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty for Conducted Emissions in the frequency range of 150kHz – 30MHz is calculated to be ±2.30dB and for Radiated Emissions is calculated to be ±3.60dB in the frequency range of 30MHz – 200MHz and ±3.38dB in the frequency range of 200MHz – 1000MHz.

EUT Received Date: 10-Sep-2002

Testing Start Date: 10-Sep-2002

Testing End Date: 10-Sep-2002

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The tests were performed according to following regulations :

1. EMC Directive 89/336/EEC
2. CISPR22:1997 *Class B
3. VCCI *Class B
4. FCC *Class B

Emission Test Results:

Conducted Emissions, Powerline -

Test Result

Minimum limit margin	-11.2	dB	at	.180 MHz
Maximum limit exceeding		dB	at	MHz

Remarks: _____

Conducted Emissions, Data I/O (Ethernet, RJ11, etc.) - N/A

Test Result

Minimum limit margin		dB	at	MHz
Maximum limit exceeding		dB	at	MHz

Remarks: _____

Radiated Emissions (Electric Field) -

Test Result

Minimum limit margin	-2.7	dB	at	765 MHz
Maximum limit exceeding		dB	at	MHz

Remarks: _____

GENERAL REMARKS:

Radiated emissions testing was performed at an antenna to EUT distance of ten (10) meters.

Modifications required to pass:

Test Specification Deviations: Additions to or Exclusions from:

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Test-setup photo(s):
Conducted Emissions

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Test-setup photo(s):
Conducted Emissions

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Test-setup photo(s):
Radiated Emissions

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Test-setup photo(s):
Radiated Emissions

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Appendix A

Test Data Sheets

and

Test Equipment Used

TÜV PRODUCT SERVICE INC. 5541 Central Avenue Boulder, Colorado 80301 Voice: 303 786 7999 Fax: 303 449 3004

Conducted Electromagnetic Emissions

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 Cond	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	66	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	1 of 1	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / LISN / ATTEN (dB)	FINAL (dBuV)	TEST POINT	DELTA1 (dB) EN55022 B Avg	DELTA2 (dB) EN55022 B QP
0.180	39.7 Qp	0.1 / 0.0 / -10.0	49.8	Neutral	N/A	-14.7
0.180	33.2 Av	0.1 / 0.0 / -10.0	43.3	Neutral	-11.2	N/A
0.204	36.0 Qp	0.1 / 0.0 / -10.0	46.1	Neutral	N/A	-17.3
0.204	31.0 Av	0.1 / 0.0 / -10.0	41.1	Neutral	-12.3	N/A
16.26	19.3 Pk	0.8 / 0.0 / -10.0	30.1	Neutral	-19.9	-29.9
16.26	19.4 Av	0.8 / 0.0 / -10.0	30.2	Neutral	-19.8	N/A
16.60	34.9 Qp	0.8 / 0.0 / -10.0	45.7	Neutral	N/A	-14.3
16.60	28.0 Av	0.8 / 0.0 / -10.0	38.8	Neutral	-11.2	N/A
24.89	18.9 Qp	1.0 / 0.0 / -10.0	29.9	Neutral	N/A	-30.1
24.89	13.7 Av	1.0 / 0.0 / -10.0	24.7	Neutral	-25.3	N/A
30.00	6.3 Qp	1.2 / 0.0 / -10.0	17.5	Neutral	N/A	-42.5
30.00	-1.0 Av	1.2 / 0.0 / -10.0	10.2	Neutral	-39.8	N/A
0.181	39.4 Qp	0.1 / 0.0 / -10.0	49.5	Line 1	N/A	-14.9
0.181	32.8 Av	0.1 / 0.0 / -10.0	42.9	Line 1	-11.5	N/A
0.204	35.9 Qp	0.1 / 0.0 / -10.0	46.0	Line 1	N/A	-17.4
0.204	30.7 Av	0.1 / 0.0 / -10.0	40.8	Line 1	-12.6	N/A
16.26	18.4 Qp	0.8 / 0.0 / -10.0	29.2	Line 1	N/A	-30.8
16.26	17.3 Av	0.8 / 0.0 / -10.0	28.1	Line 1	-21.9	N/A
16.60	34.8 Qp	0.8 / 0.0 / -10.0	45.6	Line 1	N/A	-14.4
16.60	27.4 Av	0.8 / 0.0 / -10.0	38.2	Line 1	-11.8	N/A
24.89	19.9 Qp	1.0 / 0.0 / -10.0	30.9	Line 1	N/A	-29.1
24.89	14.8 Av	1.0 / 0.0 / -10.0	25.8	Line 1	-24.2	N/A
30.00	5.7 Qp	1.2 / 0.0 / -10.0	16.9	Line 1	N/A	-43.1
30.00	-1.4 Av	1.2 / 0.0 / -10.0	9.8	Line 1	-40.2	N/A
8.30	9.9 Qp	0.6 / 0.0 / -10.0	20.5	Line 1	N/A	-39.5
8.30	7.0 Av	0.6 / 0.0 / -10.0	17.7	Line 1	-32.3	N/A

Tested by: Dan Dillon

Printed

Signature

Reviewed by: Todd Seeley

Printed

Signature

TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Conducted Electromagnetic Emissions

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 Cond	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	66	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	3 of 3	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / LISN / ATTEN (dB)	FINAL (dBuV)	TEST POINT	DELTA1 (dB) EN55022 B Avg	DELTA2 (dB) EN55022 B QP
********** **Measurement Summary** **********						
0.180	33.2 Av	0.1 / 0.0 / -10.0	43.3	Neutral	-11.2	N/A
16.60	28.0 Av	0.8 / 0.0 / -10.0	38.8	Neutral	-11.2	N/A
0.204	31.0 Av	0.1 / 0.0 / -10.0	41.1	Neutral	-12.3	N/A
16.26	19.4 Av	0.8 / 0.0 / -10.0	30.2	Neutral	-19.8	N/A
24.89	14.8 Av	1.0 / 0.0 / -10.0	25.8	Line 1	-24.2	N/A
8.30	7.0 Av	0.6 / 0.0 / -10.0	17.7	Line 1	-32.3	N/A
30.00	-1.0 Av	1.2 / 0.0 / -10.0	10.2	Neutral	-39.8	N/A

Tested by: Dan Dillon — Printed — Signature

Reviewed by: Todd Seeley — Printed — Signature

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Conducted Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 Cond	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	66	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	1 of 1	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / LISN / ATTEN (dB)	FINAL (dBuV)	TEST POINT	DELTA1 (dB) EN55022 B Avg	DELTA2 (dB) EN55022 B QP
0.182	38.1 Qp	0.0 / 0.0 / -10.0	48.1	Neutral	N/A	-16.3
0.182	31.0 Av	0.0 / 0.0 / -10.0	41.0	Neutral	-13.4	N/A
0.207	35.5 Qp	0.0 / 0.0 / -10.0	45.5	Neutral	N/A	-17.8
0.207	29.7 Av	0.0 / 0.0 / -10.0	39.7	Neutral	-13.6	N/A
15.65	17.9 Qp	0.0 / 0.0 / -10.0	27.9	Neutral	N/A	-32.1
15.65	14.8 Av	0.0 / 0.0 / -10.0	24.8	Neutral	-25.2	N/A
16.58	29.3 Qp	0.0 / 0.0 / -10.0	39.3	Neutral	N/A	-20.7
16.58	27.7 Av	0.0 / 0.0 / -10.0	37.7	Neutral	-12.3	N/A
17.80	10.5 Qp	0.0 / 0.0 / -10.0	20.5	Neutral	N/A	-39.5
17.80	9.7 Av	0.0 / 0.0 / -10.0	19.7	Neutral	-30.3	N/A
29.00	12.5 Qp	0.0 / 0.0 / -10.0	22.5	Neutral	N/A	-37.5
29.00	8.9 Av	0.0 / 0.0 / -10.0	18.9	Neutral	-31.1	N/A
0.182	39.7 Qp	0.0 / 0.0 / -10.0	49.7	Line 1	N/A	-14.7
0.182	33.1 Av	0.0 / 0.0 / -10.0	43.1	Line 1	-11.3	N/A
0.207	37.2 Qp	0.0 / 0.0 / -10.0	47.2	Line 1	N/A	-16.1
0.207	31.6 Av	0.0 / 0.0 / -10.0	41.6	Line 1	-11.7	N/A
15.65	14.8 Qp	0.0 / 0.0 / -10.0	24.8	Line 1	N/A	-35.2
15.65	12.7 Av	0.0 / 0.0 / -10.0	22.7	Line 1	-27.3	N/A
16.58	22.9 Qp	0.0 / 0.0 / -10.0	32.9	Line 1	N/A	-27.1
16.58	21.7 Av	0.0 / 0.0 / -10.0	31.7	Line 1	-18.3	N/A
17.80	6.5 Qp	0.0 / 0.0 / -10.0	16.5	Line 1	N/A	-43.5
17.80	0.3 Av	0.0 / 0.0 / -10.0	10.3	Line 1	-39.7	N/A
29.10	11.7 Qp	0.0 / 0.0 / -10.0	21.7	Line 1	N/A	-38.3

Tested by: Dan Dillion — Printed

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Conducted Electromagnetic Emissions

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 Cond	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	66	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	2 of 2	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / LISN / ATTEN (dB)	FINAL (dBuV)	TEST POINT	DELTA1 (dB) EN55022 B Avg	DELTA2 (dB) EN55022 B QP
********** **Measurement Summary** **********						
0.182	33.1 Av	0.0 / 0.0 / -10.0	43.1	Line 1	-11.3	N/A
0.207	31.6 Av	0.0 / 0.0 / -10.0	41.6	Line 1	-11.7	N/A
16.58	27.7 Av	0.0 / 0.0 / -10.0	37.7	Neutral	-12.3	N/A
15.65	14.8 Av	0.0 / 0.0 / -10.0	24.8	Neutral	-25.2	N/A
17.80	9.7 Av	0.0 / 0.0 / -10.0	19.7	Neutral	-30.3	N/A
29.00	8.9 Av	0.0 / 0.0 / -10.0	18.9	Neutral	-31.1	N/A
29.10	11.7 Qp	0.0 / 0.0 / -10.0	21.7	Line 1	N/A	-38.3

Tested by: Dan Dillion — Printed

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 02**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	1 of 1	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
The following was maximized						
765.00	36.9 Qp	5.0 / 21.6 / 29.2	34.3	V / 3.6 / 15.0	-2.7	N/A
960.00	26.9 Qp	5.8 / 25.7 / 26.6	31.8	V / 1.4 / 352.0	-5.2	N/A
264.56	21.7 Qp	2.8 / 14.2 / 28.1	10.7	V / 1.0 / 0.0	-26.3	N/A
265.27	21.9 Qp	2.8 / 14.2 / 28.1	10.8	V / 1.0 / 0.0	-26.2	N/A
297.61	21.4 Qp	3.1 / 14.4 / 28.1	10.8	V / 1.0 / 0.0	-26.2	N/A
298.41	21.8 Qp	3.1 / 14.4 / 28.1	11.2	V / 1.0 / 0.0	-25.8	N/A
360.00	20.4 Qp	3.3 / 14.8 / 27.9	10.6	V / 1.0 / 0.0	-26.4	N/A
396.82	28.6 Qp	3.5 / 17.4 / 27.9	21.7	V / 1.0 / 0.0	-15.3	N/A
397.90	27.5 Qp	3.5 / 17.6 / 27.9	20.7	V / 1.0 / 0.0	-16.3	N/A
400.00	18.5 Qp	3.5 / 17.8 / 27.9	12.0	V / 1.0 / 0.0	-25.0	N/A
529.08	25.4 Qp	4.0 / 18.0 / 27.9	19.5	V / 1.0 / 0.0	-17.5	N/A
530.56	24.1 Qp	4.0 / 18.1 / 27.9	18.3	V / 1.0 / 0.0	-18.7	N/A
661.34	22.4 Qp	4.5 / 21.0 / 30.7	17.2	V / 1.0 / 0.0	-19.8	N/A
680.01	16.3 Qp	4.6 / 20.9 / 31.4	10.5	V / 1.0 / 0.0	-26.5	N/A
694.39	16.6 Qp	4.7 / 20.8 / 31.9	10.2	V / 1.0 / 0.0	-26.8	N/A
696.38	16.5 Qp	4.7 / 20.8 / 32.0	10.0	V / 1.0 / 0.0	-27.0	N/A
704.01	18.0 Qp	4.7 / 20.8 / 32.0	11.5	V / 1.0 / 0.0	-25.5	N/A
720.00	20.3 Qp	4.8 / 20.9 / 31.2	14.7	V / 1.0 / 0.0	-22.3	N/A
727.43	17.2 Qp	4.8 / 20.9 / 30.9	12.1	V / 1.0 / 0.0	-24.9	N/A
729.59	16.8 Qp	4.8 / 21.0 / 30.8	11.8	V / 1.0 / 0.0	-25.2	N/A
748.23	19.4 Qp	4.9 / 21.3 / 30.0	15.6	V / 1.0 / 0.0	-21.4	N/A
765.00	28.9 Qp	5.0 / 21.6 / 29.2	26.3	V / 1.0 / 0.0	-10.7	N/A
793.57	19.5 Qp	5.1 / 22.0 / 27.9	18.7	V / 1.0 / 0.0	-18.3	N/A

Tested by: Dan Dillon

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Reviewed by: Todd Seeley

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 02**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	2 of 2	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
795.86	18.9 Qp	5.1 / 22.1 / 27.8	18.3	V / 1.0 / 0.0	-18.7	N/A
900.01	29.5 Qp	5.6 / 24.3 / 26.8	32.5	V / 1.0 / 0.0	-4.5	N/A
928.54	21.3 Qp	5.7 / 25.2 / 26.7	25.4	V / 1.0 / 0.0	-11.6	N/A
960.00	23.1 Qp	5.8 / 25.7 / 26.6	28.0	V / 1.0 / 0.0	-9.0	N/A
968.00	20.0 Qp	5.9 / 25.8 / 26.6	25.1	V / 1.0 / 0.0	-11.9	N/A
990.00	21.2 Qp	6.0 / 25.5 / 26.5	26.2	V / 1.0 / 0.0	-10.8	N/A
1000.00	24.2 Qp	6.0 / 25.3 / 26.4	29.0	V / 1.0 / 0.0	-8.0	N/A
265.27	21.7 Qp	2.8 / 14.2 / 28.1	10.7	V / 1.0 / 90.0	-26.3	N/A
360.00	21.0 Qp	3.3 / 14.8 / 27.9	11.2	V / 1.0 / 90.0	-25.8	N/A
661.34	31.7 Qp	4.5 / 21.0 / 30.7	26.6	V / 1.0 / 90.0	-10.4	N/A
680.01	16.5 Qp	4.6 / 20.9 / 31.4	10.6	V / 1.0 / 90.0	-26.4	N/A
704.01	18.7 Qp	4.7 / 20.8 / 32.0	12.2	V / 1.0 / 90.0	-24.8	N/A
529.08	27.4 Qp	4.0 / 18.0 / 27.9	21.5	V / 1.0 / 180.0	-15.5	N/A
530.56	25.6 Qp	4.0 / 18.1 / 27.9	19.7	V / 1.0 / 180.0	-17.3	N/A
704.01	20.4 Qp	4.7 / 20.8 / 32.0	14.0	V / 1.0 / 180.0	-23.0	N/A
748.23	24.3 Qp	4.9 / 21.3 / 30.0	20.5	V / 1.0 / 180.0	-16.5	N/A
928.54	27.6 Qp	5.7 / 25.2 / 26.7	31.7	V / 1.0 / 180.0	-5.3	N/A
264.56	28.1 Qp	2.8 / 14.2 / 28.1	17.1	V / 1.0 / 270.0	-19.9	N/A
265.27	27.2 Qp	2.8 / 14.2 / 28.1	16.2	V / 1.0 / 270.0	-20.8	N/A
297.61	25.6 Qp	3.1 / 14.4 / 28.1	15.0	V / 1.0 / 270.0	-22.0	N/A
298.41	25.5 Qp	3.1 / 14.4 / 28.1	14.9	V / 1.0 / 270.0	-22.1	N/A
360.00	21.7 Qp	3.3 / 14.8 / 27.9	11.9	V / 1.0 / 270.0	-25.1	N/A
529.08	29.8 Qp	4.0 / 18.0 / 27.9	23.9	V / 1.0 / 270.0	-13.1	N/A
530.56	28.5 Qp	4.0 / 18.1 / 27.9	22.7	V / 1.0 / 270.0	-14.3	N/A
680.01	18.4 Qp	4.6 / 20.9 / 31.4	12.5	V / 1.0 / 270.0	-24.5	N/A

Tested by: Dan Dillon

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Reviewed by: Todd Seeley

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 02**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	3 of 3	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
793.57	20.2 Qp	5.1 / 22.0 / 27.9	19.4	V / 1.0 / 270.0	-17.6	N/A
The following were maximized between 200 and 1000 MHz, vertical						
928.54	28.6 Qp	5.7 / 25.2 / 26.7	32.7	V / 1.6 / 189.0	-4.3	N/A
1000.00	27.0 Qp	6.0 / 25.3 / 26.4	31.8	V / 1.2 / 17.0	-5.2	N/A
900.01	30.6 Qp	5.6 / 24.3 / 26.8	33.6	V / 1.6 / 17.0	-3.4	N/A
360.00	31.2 Qp	3.3 / 14.8 / 27.9	21.4	H / 2.5 / 0.0	-15.6	N/A
400.00	20.4 Qp	3.5 / 17.8 / 27.9	13.8	H / 2.5 / 0.0	-23.2	N/A
696.38	17.2 Qp	4.7 / 20.8 / 32.0	10.7	H / 2.5 / 0.0	-26.3	N/A
727.43	19.4 Qp	4.8 / 20.9 / 30.9	14.2	H / 2.5 / 0.0	-22.8	N/A
729.59	17.9 Qp	4.8 / 21.0 / 30.8	12.9	H / 2.5 / 0.0	-24.1	N/A
748.23	25.7 Qp	4.9 / 21.3 / 30.0	21.9	H / 2.5 / 0.0	-15.1	N/A
661.34	29.6 Qp	4.5 / 21.0 / 30.7	24.4	H / 1.6 / 0.0	-12.6	N/A
680.01	18.7 Qp	4.6 / 20.9 / 31.4	12.8	H / 1.6 / 0.0	-24.2	N/A
694.39	17.9 Qp	4.7 / 20.8 / 31.9	11.5	H / 1.6 / 0.0	-25.5	N/A
748.23	32.4 Qp	4.9 / 21.3 / 30.0	28.6	H / 1.6 / 0.0	-8.4	N/A
793.57	26.4 Qp	5.1 / 22.0 / 27.9	25.6	H / 1.6 / 0.0	-11.4	N/A
795.86	25.4 Qp	5.1 / 22.1 / 27.8	24.8	H / 1.6 / 0.0	-12.2	N/A
694.39	18.2 Qp	4.7 / 20.8 / 31.9	11.7	H / 1.6 / 90.0	-25.3	N/A
696.38	17.6 Qp	4.7 / 20.8 / 32.0	11.1	H / 1.6 / 90.0	-25.9	N/A
529.08	27.7 Qp	4.0 / 18.0 / 27.9	21.8	H / 1.6 / 180.0	-15.2	N/A
530.56	26.4 Qp	4.0 / 18.1 / 27.9	20.6	H / 1.6 / 180.0	-16.4	N/A
680.01	19.0 Qp	4.6 / 20.9 / 31.4	13.1	H / 1.6 / 180.0	-23.9	N/A
694.39	20.1 Qp	4.7 / 20.8 / 31.9	13.7	H / 1.6 / 180.0	-23.3	N/A

Tested by: Dan Dillon

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Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 02**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	4 of 4	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
696.38	19.7 Qp	4.7 / 20.8 / 32.0	13.2	H / 1.6 / 180.0	-23.8	N/A
704.01	20.2 Qp	4.7 / 20.8 / 32.0	13.7	H / 1.6 / 180.0	-23.3	N/A
529.08	29.3 Qp	4.0 / 18.0 / 27.9	23.4	H / 2.5 / 270.0	-13.6	N/A
The following were maximized between 200 and 1000 MHz, horizontal						
748.23	34.1 Qp	4.9 / 21.3 / 30.0	30.3	H / 1.4 / 2.0	-6.7	N/A
30.00	24.5 Qp	0.9 / 13.7 / 22.4	16.7	V / 1.0 / 0.0	-13.3	N/A
74.70	29.6 Qp	1.3 / 8.4 / 21.9	17.4	V / 1.0 / 0.0	-12.6	N/A
75.02	26.2 Qp	1.4 / 8.4 / 21.9	14.0	V / 1.0 / 0.0	-16.0	N/A
114.05	26.8 Qp	1.7 / 11.1 / 23.3	16.3	V / 1.0 / 0.0	-13.7	N/A
74.70	32.5 Qp	1.3 / 8.4 / 21.9	20.4	V / 1.0 / 90.0	-9.6	N/A
75.02	28.1 Qp	1.4 / 8.4 / 21.9	15.9	V / 1.0 / 90.0	-14.1	N/A
30.00	24.3 Qp	0.9 / 13.7 / 22.4	16.5	V / 1.0 / 180.0	-13.5	N/A
74.70	32.8 Qp	1.3 / 8.4 / 21.9	20.7	V / 1.0 / 180.0	-9.3	N/A
30.00	24.6 Qp	0.9 / 13.7 / 22.4	16.8	V / 1.0 / 270.0	-13.2	N/A
74.70	34.0 Qp	1.3 / 8.4 / 21.9	21.8	V / 1.0 / 270.0	-8.2	N/A
The following were maximized between 30 and 200 MHz, vertical						
74.70	35.1 Qp	1.3 / 8.4 / 21.9	22.9	V / 2.0 / 254.0	-7.1	N/A
74.70	27.5 Qp	1.3 / 8.4 / 21.9	15.3	H / 2.5 / 0.0	-14.7	N/A

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 02**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	5 of 5	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
74.70	31.9 Qp	1.3 / 8.4 / 21.9	19.8	H / 2.5 / 90.0	-10.2	N/A
No higher emissions found: 180 Deg, horizontal						
74.70	31.2 Qp	1.3 / 8.4 / 21.9	19.0	H / 2.5 / 270.0	-11.0	N/A
The following was maximized between 30 and 200 MHz, horizontal						
74.70	34.0 Qp	1.3 / 8.4 / 21.9	21.8	H / 4.0 / 120.0	-8.2	N/A

Tested by: Dan Dillon — Printed

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 02**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	6 of 6	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) EN55022 B	DELTA2 (dB) N/A
********** **Measurement Summary** **********						
765.00	36.9 Qp	5.0 / 21.6 / 29.2	34.3	V / 3.6 / 15.0	-2.7	N/A
900.01	30.6 Qp	5.6 / 24.3 / 26.8	33.6	V / 1.6 / 17.0	-3.4	N/A
928.54	28.6 Qp	5.7 / 25.2 / 26.7	32.7	V / 1.6 / 189.0	-4.3	N/A
960.00	26.9 Qp	5.8 / 25.7 / 26.6	31.8	V / 1.4 / 352.0	-5.2	N/A
1000.00	27.0 Qp	6.0 / 25.3 / 26.4	31.8	V / 1.2 / 17.0	-5.2	N/A
748.23	34.1 Qp	4.9 / 21.3 / 30.0	30.3	H / 1.4 / 2.0	-6.7	N/A
74.70	35.1 Qp	1.3 / 8.4 / 21.9	22.9	V / 2.0 / 254.0	-7.1	N/A
661.34	31.7 Qp	4.5 / 21.0 / 30.7	26.6	V / 1.0 / 90.0	-10.4	N/A
990.00	21.2 Qp	6.0 / 25.5 / 26.5	26.2	V / 1.0 / 0.0	-10.8	N/A
793.57	26.4 Qp	5.1 / 22.0 / 27.9	25.6	H / 1.6 / 0.0	-11.4	N/A
968.00	20.0 Qp	5.9 / 25.8 / 26.6	25.1	V / 1.0 / 0.0	-11.9	N/A
795.86	25.4 Qp	5.1 / 22.1 / 27.8	24.8	H / 1.6 / 0.0	-12.2	N/A
529.08	29.8 Qp	4.0 / 18.0 / 27.9	23.9	V / 1.0 / 270.0	-13.1	N/A
30.00	24.6 Qp	0.9 / 13.7 / 22.4	16.8	V / 1.0 / 270.0	-13.2	N/A
114.05	26.8 Qp	1.7 / 11.1 / 23.3	16.3	V / 1.0 / 0.0	-13.7	N/A
75.02	28.1 Qp	1.4 / 8.4 / 21.9	15.9	V / 1.0 / 90.0	-14.1	N/A
530.56	28.5 Qp	4.0 / 18.1 / 27.9	22.7	V / 1.0 / 270.0	-14.3	N/A
396.82	28.6 Qp	3.5 / 17.4 / 27.9	21.7	V / 1.0 / 0.0	-15.3	N/A
360.00	31.2 Qp	3.3 / 14.8 / 27.9	21.4	H / 2.5 / 0.0	-15.6	N/A
397.90	27.5 Qp	3.5 / 17.6 / 27.9	20.7	V / 1.0 / 0.0	-16.3	N/A
264.56	28.1 Qp	2.8 / 14.2 / 28.1	17.1	V / 1.0 / 270.0	-19.9	N/A
265.27	27.2 Qp	2.8 / 14.2 / 28.1	16.2	V / 1.0 / 270.0	-20.8	N/A
297.61	25.6 Qp	3.1 / 14.4 / 28.1	15.0	V / 1.0 / 270.0	-22.0	N/A
298.41	25.5 Qp	3.1 / 14.4 / 28.1	14.9	V / 1.0 / 270.0	-22.1	N/A
720.00	20.3 Qp	4.8 / 20.9 / 31.2	14.7	V / 1.0 / 0.0	-22.3	N/A
727.43	19.4 Qp	4.8 / 20.9 / 30.9	14.2	H / 2.5 / 0.0	-22.8	N/A

Tested by: Dan Dillon — Printed — Signature

Reviewed by: Todd Seeley — Printed — Signature

TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

Test Report #:	**BC204750 Run 02**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	110 VAC 60 Hz	Air Pressure:	81	kPa
EUT Serial #:	PHJ2F00101			Page:	7 of 7	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
704.01	20.4 Qp	4.7 / 20.8 / 32.0	14.0	V / 1.0 / 180.0	-23.0	N/A
400.00	20.4 Qp	3.5 / 17.8 / 27.9	13.8	H / 2.5 / 0.0	-23.2	N/A
694.39	20.1 Qp	4.7 / 20.8 / 31.9	13.7	H / 1.6 / 180.0	-23.3	N/A
696.38	19.7 Qp	4.7 / 20.8 / 32.0	13.2	H / 1.6 / 180.0	-23.8	N/A
680.01	19.0 Qp	4.6 / 20.9 / 31.4	13.1	H / 1.6 / 180.0	-23.9	N/A
729.59	17.9 Qp	4.8 / 21.0 / 30.8	12.9	H / 2.5 / 0.0	-24.1	N/A

Tested by: Dan Dillon

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Reviewed by: Todd Seeley

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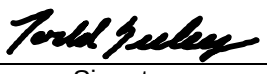

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Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	DL2020702			Page:	1 of 1	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
Maximized the following between 200 and 1000 MHz, vertical						
765.00	36.1 Qp	5.0 / 21.6 / 29.2	33.5	V / 3.5 / 355.0	-3.5	N/A
1000.00	23.3 Qp	6.0 / 25.3 / 26.4	28.2	V / 1.4 / 355.0	-8.8	N/A
795.86	25.2 Qp	5.1 / 22.1 / 27.8	24.5	V / 2.2 / 0.0	-12.5	N/A
720.00	31.4 Qp	4.8 / 20.9 / 31.2	25.8	V / 1.8 / 349.0	-11.2	N/A
960.00	25.5 Qp	5.8 / 25.7 / 26.6	30.4	V / 1.5 / 15.0	-6.6	N/A
900.01	22.3 Qp	5.6 / 24.3 / 26.8	25.3	V / 1.6 / 352.0	-11.7	N/A
704.01	20.4 Qp	4.7 / 20.8 / 32.0	13.9	V / 1.4 / 0.0	-23.1	N/A
638.00	18.1 Qp	4.5 / 21.0 / 29.8	13.7	V / 2.6 / 0.0	-23.3	N/A
990.00	18.9 Qp	6.0 / 25.5 / 26.5	23.9	V / 1.3 / 15.0	-13.1	N/A
Maximized the following between 200 and 1000 MHz, horizontal						
765.00	23.2 Qp	5.0 / 21.6 / 29.2	20.6	H / 1.6 / 0.0	-16.4	N/A
1000.00	18.8 Qp	6.0 / 25.3 / 26.4	23.7	H / 4.0 / 202.0	-13.3	N/A
795.86	30.3 Qp	5.1 / 22.1 / 27.8	29.6	H / 1.3 / 314.0	-7.4	N/A
720.00	23.3 Qp	4.8 / 20.9 / 31.2	17.7	H / 1.1 / 157.0	-19.3	N/A
960.00	20.9 Qp	5.8 / 25.7 / 26.6	25.8	H / 3.2 / 15.0	-11.2	N/A
900.01	18.8 Qp	5.6 / 24.3 / 26.8	21.8	H / 1.0 / 15.0	-15.2	N/A
968.00	17.6 Qp	5.9 / 25.8 / 26.6	22.7	H / 1.0 / 15.0	-14.3	N/A
704.01	19.7 Qp	4.7 / 20.8 / 32.0	13.3	H / 1.0 / 226.0	-23.7	N/A
638.00	16.6 Qp	4.5 / 21.0 / 29.8	12.3	H / 1.0 / 108.0	-24.7	N/A
990.00	16.8 Qp	6.0 / 25.5 / 26.5	21.8	H / 1.3 / 323.0	-15.2	N/A
264.56	21.0 Qp	2.8 / 14.2 / 28.1	10.0	H / 2.5 / 0.0	-27.0	N/A
265.27	20.4 Qp	2.8 / 14.2 / 28.1	9.4	H / 2.5 / 0.0	-27.6	N/A

Tested by: Dan Dillon — Printed

Daniel M. Dillon — Signature

Reviewed by: Todd Seeley — Printed

Todd Seeley — Signature

TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	DL2020702			Page:	2 of 2	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
286.00	23.4 Qp	3.0 / 14.2 / 28.1	12.6	H / 2.5 / 0.0	-24.4	N/A
297.61	21.9 Qp	3.1 / 14.4 / 28.1	11.3	H / 2.5 / 0.0	-25.7	N/A
298.41	21.7 Qp	3.1 / 14.4 / 28.1	11.1	H / 2.5 / 0.0	-25.9	N/A
360.00	25.9 Qp	3.3 / 14.8 / 27.9	16.2	H / 2.5 / 0.0	-20.8	N/A
400.00	21.9 Qp	3.5 / 17.8 / 27.8	15.3	H / 2.5 / 0.0	-21.7	N/A
529.08	27.0 Qp	4.0 / 18.0 / 27.9	21.1	H / 1.6 / 0.0	-15.9	N/A
530.56	25.5 Qp	4.0 / 18.1 / 27.9	19.7	H / 1.6 / 0.0	-17.3	N/A
661.34	22.1 Qp	4.5 / 21.0 / 30.7	16.9	H / 1.6 / 0.0	-20.1	N/A
680.01	19.1 Qp	4.6 / 20.9 / 31.4	13.2	H / 1.6 / 0.0	-23.8	N/A
694.39	19.2 Qp	4.7 / 20.8 / 31.9	12.8	H / 1.6 / 0.0	-24.2	N/A
696.38	18.5 Qp	4.7 / 20.8 / 32.0	12.0	H / 1.6 / 0.0	-25.0	N/A
727.43	22.8 Qp	4.8 / 20.9 / 30.9	17.6	H / 1.6 / 0.0	-19.4	N/A
729.59	21.3 Qp	4.8 / 21.0 / 30.8	16.3	H / 1.6 / 0.0	-20.7	N/A
748.23	32.4 Qp	4.9 / 21.3 / 30.0	28.6	H / 1.6 / 0.0	-8.4	N/A
793.57	28.8 Qp	5.1 / 22.0 / 27.9	28.0	H / 1.6 / 0.0	-9.0	N/A
795.85	27.7 Qp	5.1 / 22.1 / 27.8	27.0	H / 1.6 / 0.0	-10.0	N/A
925.83	27.0 Qp	5.7 / 25.1 / 26.7	31.0	H / 1.6 / 0.0	-6.0	N/A
928.54	25.5 Qp	5.7 / 25.2 / 26.7	29.6	H / 1.6 / 0.0	-7.4	N/A
529.08	30.1 Qp	4.0 / 18.0 / 27.9	24.2	H / 2.5 / 90.0	-12.8	N/A
530.56	28.9 Qp	4.0 / 18.1 / 27.9	23.1	H / 2.5 / 90.0	-13.9	N/A
661.34	28.4 Qp	4.5 / 21.0 / 30.7	23.2	H / 2.5 / 90.0	-13.8	N/A
529.08	33.6 Qp	4.0 / 18.0 / 27.9	27.7	H / 1.6 / 90.0	-9.3	N/A
530.56	32.3 Qp	4.0 / 18.1 / 27.9	26.5	H / 1.6 / 90.0	-10.5	N/A
661.34	29.2 Qp	4.5 / 21.0 / 30.7	24.1	H / 1.6 / 90.0	-12.9	N/A
264.56	22.2 Qp	2.8 / 14.2 / 28.1	11.1	H / 2.5 / 180.0	-25.9	N/A
265.27	21.5 Qp	2.8 / 14.2 / 28.1	10.4	H / 2.5 / 180.0	-26.6	N/A

Tested by: Dan Dillon

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Reviewed by: Todd Seeley

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	DL2020702			Page:	3 of 3	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
360.00	28.2 Qp	3.3 / 14.8 / 27.9	18.4	H / 2.5 / 180.0	-18.6	N/A
530.56	33.6 Qp	4.0 / 18.1 / 27.9	27.8	H / 1.6 / 180.0	-9.2	N/A
661.34	33.6 Qp	4.5 / 21.0 / 30.7	28.4	H / 1.6 / 180.0	-8.6	N/A
694.39	25.5 Qp	4.7 / 20.8 / 31.9	19.0	H / 1.6 / 180.0	-18.0	N/A
696.38	25.1 Qp	4.7 / 20.8 / 32.0	18.6	H / 1.6 / 180.0	-18.4	N/A
925.83	27.6 Qp	5.7 / 25.1 / 26.7	31.6	H / 2.5 / 270.0	-5.4	N/A
661.34	34.8 Qp	4.5 / 21.0 / 30.7	29.6	H / 1.6 / 270.0	-7.4	N/A
The following were maximized between 200 and 1000 MHz, horizontal						
765.00	29.7 Qp	5.0 / 21.6 / 29.2	27.0	V / 1.0 / 0.0	-10.0	N/A
960.00	24.6 Qp	5.8 / 25.7 / 26.6	29.6	V / 1.0 / 0.0	-7.4	N/A
396.82	31.2 Qp	3.5 / 17.4 / 27.9	24.3	V / 1.0 / 0.0	-12.7	N/A
397.90	30.2 Qp	3.5 / 17.6 / 27.9	23.4	V / 1.0 / 0.0	-13.6	N/A
661.34	32.3 Qp	4.5 / 21.0 / 30.7	27.1	V / 1.0 / 90.0	-9.9	N/A
529.08	34.4 Qp	4.0 / 18.0 / 27.9	28.5	V / 1.0 / 180.0	-8.5	N/A
264.56	26.8 Qp	2.8 / 14.2 / 28.1	15.8	V / 1.0 / 270.0	-21.2	N/A
265.27	25.9 Qp	2.8 / 14.2 / 28.1	14.9	V / 1.0 / 270.0	-22.1	N/A
286.00	24.8 Qp	3.0 / 14.2 / 28.1	13.9	V / 1.0 / 270.0	-23.1	N/A
297.61	22.6 Qp	3.1 / 14.4 / 28.1	12.0	V / 1.0 / 270.0	-25.0	N/A
298.41	22.4 Qp	3.1 / 14.4 / 28.1	11.8	V / 1.0 / 270.0	-25.2	N/A

Tested by: Dan Dillon

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	DL2020702			Page:	4 of 4	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
The following were maximized between 200 and 1000 MHz, vertical						
529.08	34.3 Qp	4.0 / 18.0 / 27.9	28.4	V / 2.5 / 330.0	-8.6	N/A
925.83 did not change level with drive powered off.						
925.83 MHz was from the PC and was deleted from the summary.						
30.00	26.8 Qp	0.9 / 13.7 / 22.4	18.9	V / 1.0 / 0.0	-11.1	N/A
65.34	27.4 Qp	1.3 / 8.8 / 21.9	15.6	V / 1.0 / 0.0	-14.4	N/A
75.02	28.8 Qp	1.4 / 8.4 / 21.9	16.6	V / 1.0 / 0.0	-13.4	N/A
114.05	26.3 Qp	1.7 / 11.1 / 23.3	15.8	V / 1.0 / 0.0	-14.2	N/A
65.34	29.7 Qp	1.3 / 8.8 / 21.9	17.9	V / 1.0 / 90.0	-12.1	N/A
75.02	31.2 Qp	1.4 / 8.4 / 21.9	19.0	V / 1.0 / 90.0	-11.0	N/A
No higher emissions found: 180 Deg, vertical						
68.29	27.8 Qp	1.3 / 9.0 / 21.9	16.2	V / 1.0 / 270.0	-13.8	N/A
No emissions found within 10 dB of the limit, nothing maximized						
30 - 200 MHz, vertical						
74.70	29.7 Qp	1.3 / 8.4 / 21.9	17.6	H / 2.5 / 0.0	-12.4	N/A
74.70	33.8 Qp	1.3 / 8.4 / 21.9	21.7	H / 2.5 / 90.0	-8.3	N/A
No higher emissions found: 180 Deg, horizontal						

Tested by: Dan Dillon — Printed

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Reviewed by: Todd Seeley — Printed

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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	DL2020702			Page:	5 of 5	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
74.70	34.0 Qp	1.3 / 8.4 / 21.9	21.9	H / 2.5 / 270.0	-8.1	N/A
The following were maximized between 30 and 200 MHz, horizontal						
74.70	36.1 Qp	1.3 / 8.4 / 21.9	23.9	H / 4.0 / 308.0	-6.1	N/A

Tested by: Dan Dillon — Printed


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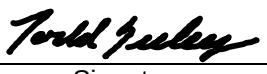
Reviewed by: Todd Seeley — Printed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TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	DL2020702			Page:	6 of 6	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
********** **Measurement Summary** **********						
765.00	36.1 Qp	5.0 / 21.6 / 29.2	33.5	V / 3.5 / 355.0	-3.5	N/A
74.70	36.1 Qp	1.3 / 8.4 / 21.9	23.9	H / 4.0 / 308.0	-6.1	N/A
960.00	25.5 Qp	5.8 / 25.7 / 26.6	30.4	V / 1.5 / 15.0	-6.6	N/A
661.34	34.8 Qp	4.5 / 21.0 / 30.7	29.6	H / 1.6 / 270.0	-7.4	N/A
795.86	30.3 Qp	5.1 / 22.1 / 27.8	29.6	H / 1.3 / 314.0	-7.4	N/A
928.54	25.5 Qp	5.7 / 25.2 / 26.7	29.6	H / 1.6 / 0.0	-7.4	N/A
748.23	32.4 Qp	4.9 / 21.3 / 30.0	28.6	H / 1.6 / 0.0	-8.4	N/A
529.08	34.4 Qp	4.0 / 18.0 / 27.9	28.5	V / 1.0 / 180.0	-8.5	N/A
1000.00	23.3 Qp	6.0 / 25.3 / 26.4	28.2	V / 1.4 / 355.0	-8.8	N/A
793.57	28.8 Qp	5.1 / 22.0 / 27.9	28.0	H / 1.6 / 0.0	-9.0	N/A
530.56	33.6 Qp	4.0 / 18.1 / 27.9	27.8	H / 1.6 / 180.0	-9.2	N/A
75.02	31.2 Qp	1.4 / 8.4 / 21.9	19.0	V / 1.0 / 90.0	-11.0	N/A
30.00	26.8 Qp	0.9 / 13.7 / 22.4	18.9	V / 1.0 / 0.0	-11.1	N/A
720.00	31.4 Qp	4.8 / 20.9 / 31.2	25.8	V / 1.8 / 349.0	-11.2	N/A
900.01	22.3 Qp	5.6 / 24.3 / 26.8	25.3	V / 1.6 / 352.0	-11.7	N/A
65.34	29.7 Qp	1.3 / 8.8 / 21.9	17.9	V / 1.0 / 90.0	-12.1	N/A
396.82	31.2 Qp	3.5 / 17.4 / 27.9	24.3	V / 1.0 / 0.0	-12.7	N/A
990.00	18.9 Qp	6.0 / 25.5 / 26.5	23.9	V / 1.3 / 15.0	-13.1	N/A
397.90	30.2 Qp	3.5 / 17.6 / 27.9	23.4	V / 1.0 / 0.0	-13.6	N/A
68.29	27.8 Qp	1.3 / 9.0 / 21.9	16.2	V / 1.0 / 270.0	-13.8	N/A
114.05	26.3 Qp	1.7 / 11.1 / 23.3	15.8	V / 1.0 / 0.0	-14.2	N/A
968.00	17.6 Qp	5.9 / 25.8 / 26.6	22.7	H / 1.0 / 15.0	-14.3	N/A
694.39	25.5 Qp	4.7 / 20.8 / 31.9	19.0	H / 1.6 / 180.0	-18.0	N/A
696.38	25.1 Qp	4.7 / 20.8 / 32.0	18.6	H / 1.6 / 180.0	-18.4	N/A
360.00	28.2 Qp	3.3 / 14.8 / 27.9	18.4	H / 2.5 / 180.0	-18.6	N/A
727.43	22.8 Qp	4.8 / 20.9 / 30.9	17.6	H / 1.6 / 0.0	-19.4	N/A

Tested by: Dan Dillon

Printed

Signature

Reviewed by: Todd Seeley

Printed

Signature

TÜV PRODUCT SERVICE INC 5541 Central Avenue Boulder, Colorado 80301 Tel: 303 786 7999 Fax: 303 449 3004 Rev.No 1.0

Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

Test Report #:	**BC204750 Run 01**	Test Area:	Pinewood Site 1 (10m)	Temperature:	18	°C
Test Method:	EN55022	Test Date:	10-Sep-2002	Relative Humidity:	65	%
EUT Model #:	DLT VS160 (Benchmark)	EUT Power:	230 VAC 50 Hz	Air Pressure:	81	kPa
EUT Serial #:	DL2020702			Page:	7 of 7	
Manufacturer:	Benchmark Storage Innovations, Inc.					
EUT Description:	Internal Tape Drive					

Notes: M#'s: PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-vs-160/320 (HP), 80/160GB Half-High DLTVs Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	N/A
729.59	21.3 Qp	4.8 / 21.0 / 30.8	16.3	H / 1.6 / 0.0	-20.7	N/A
264.56	26.8 Qp	2.8 / 14.2 / 28.1	15.8	V / 1.0 / 270.0	-21.2	N/A
400.00	21.9 Qp	3.5 / 17.8 / 27.8	15.3	H / 2.5 / 0.0	-21.7	N/A
265.27	25.9 Qp	2.8 / 14.2 / 28.1	14.9	V / 1.0 / 270.0	-22.1	N/A
286.00	24.8 Qp	3.0 / 14.2 / 28.1	13.9	V / 1.0 / 270.0	-23.1	N/A
704.01	20.4 Qp	4.7 / 20.8 / 32.0	13.9	V / 1.4 / 0.0	-23.1	N/A
638.00	18.1 Qp	4.5 / 21.0 / 29.8	13.7	V / 2.6 / 0.0	-23.3	N/A
680.01	19.1 Qp	4.6 / 20.9 / 31.4	13.2	H / 1.6 / 0.0	-23.8	N/A
297.61	22.6 Qp	3.1 / 14.4 / 28.1	12.0	V / 1.0 / 270.0	-25.0	N/A
298.41	22.4 Qp	3.1 / 14.4 / 28.1	11.8	V / 1.0 / 270.0	-25.2	N/A

Tested by: Dan Dillon — Printed — Signature

Reviewed by: Todd Seeley — Printed — Signature

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Equipment Report

7-Sep-2002

Project Number: BC204750 **Project Date:** 7-Sep-2002

Company Name: Benchmark

Equip ID	Manufacturer	Model Number	Serial Number	Description	Calibration Date	Interval	Due	Cal Code
Test Performed c		Conducted Emissions						
8184	RHODE & SCHWARZ	ESH2-Z5	830364/002	LISN 50 ohm/50uH 3 line (1kHz - 30 MHz)	23-Apr-2002	12	23-Apr-2003	B
7508	SOLAR	8028-50-TS-24-BNC	8305121	LISN	08-May-2002	12	08-May-2003	B
7509	SOLAR	8028-50-TS-24-BNC	8305122	LISN (10 kHz - 30 MHz)	08-May-2002	12	08-May-2003	B
8191	RHODE & SCHWARTZ	ESHS 30	842806/001	EMI Test Receiver	21-Mar-2002	12	21-Mar-2003	G
8257	HP	11947A	3107A01984	Transient Limiter	09-Sep-2002	12	09-Sep-2003	B
Test Performed r		Radiated Emissions						
7514	A.H.SYSTEMS	SAS-200/512	104	Log Periodic Antenna (200-1500 MHz)	26-Sep-2001	12	26-Sep-2002	G
7637	MITEQ	AM-2A-000110-N	848495	Amplifier		0		Y
8040	HEWLETT PACKARD	8594E	3223A00145	Spectrum Analyzer	31-Jan-2002	12	31-Jan-2003	G
8252	EMC TEST SYSTEMS	3109	3142	Biconical Antenna	31-Jan-2002	12	31-Jan-2003	Y

Cal Code Legend: G=Out Source, Y=No Cal required, R=Out of Service, B=In-House Verification Required ***1 of 1***

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Appendix B

Test Plan

and

Constructional Data Form

TÜV PRODUCT SERVICE INC. 5541 Central Avenue Boulder, Colorado 80301 Voice: 303 786 7999 Fax: 303 449 3004

Form

EMC Test Plan and Constructional Data Form

PRODUCT SERVICE

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- ***NOTE: This information will be input into your test report as shown below.***
Press the F1 key at any time to get HELP for the current field selected.

Company:	Benchmark Storage Innovations, Inc.		
Address:	3122 Sterling Circle		
	Boulder, CO 80301		
Contact:	Dennis King	Position:	Compliance Engineer
Phone:	303-444-7480 x-109	Fax:	303-444-1565
E-mail Address:	dennisk@percept.com		

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description	Internal Tape Drive		
EUT Name	Internal Tape Drive		
Model No.:	DLT VS160 (Benchmark), PowerVault 110T DLT VS160 (Dell), StorageWorks DLT-VS-160/320 (HP), 80/160GB Half-High DLTVS Tape Drive (IBM), DLT VS160 Internal Tape Drive (Tandberg)	Serial No.:	unit 1: DL2020702 (tested at 230 VAC 50 Hz) unit 2: PHJ2F00101 (tested at 110 VAC 60 Hz)
Product Options:	None		
Configurations to be tested:	Tape drive installed in a Compaq server drive bay		

Test Objective

☐	EMC Directive 89/336/EEC (EMC)	☒	FCC:	Class	☐ A	☒ B	Part	
	Std:	☒	VCCI:	Class	☐ A	☒ B		
☐	Machinery Directive 89/392/EEC (EMC	☒	BCIQ:	Class	☐ A	☒ B		
	Std:	☒	Canada:	Class	☐ A	☒ B		
☐	Medical Device Directive 93/42/EEC (EMC)	☒	Australia:	Class	☐ A	☒ B		
	Std:	☐	Other:					
☐	Vehicle Directive 72/245/EEC (EMC) Std:							
☐	FDA Reviewers Guidance for Premarket Notification Submissions (EMC)							

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

TÜV Product Service Certification Requested

☐ Attestation of Conformity (AoC) ☐ International EMC Mark (IEM)

☐ Certificate of Conformity (CoC) ☐ Compliance Document

Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III

(Press **F1** when field is selected to show additional information on Protection Class.)

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - *Complete this section if testing will not be attended by the customer.*

If a failure occurs, TUV Product Service should:

☒ Call contact listed above, if not available then stop testing. (After hrs phone): _____

☐ Continue testing to complete test series.

☐ Continue testing to define corrective action.

☐ Stop testing.

EUT Specifications and Requirements

Length: 8.7" Width: 5.8" Height: 1.6" Weight: 3 lbs

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: +5, +12 VDC (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): 1.2 A, 0.5 A Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

Home/consumer, office

EMC Test Plan and Constructional Data Form

EUT Power Cable				
☐ Permanent	OR	☐ Removable	Length (in meters):	
☐ Shielded	OR	☐ Unshielded		
☒ Not Applicable				

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EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

EUT Interface Ports and Cables

Interface: Type	Analog	Digital	Qty	Shielding: Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
Keyboard cable	☐	☒	1	☒	☐	Foil		DIN		2	☐	☒
Monitor cable	☐	☒	1	☒	☐	Foil over braid		VGA		1	☐	☒
Mouse cable	☐	☒	1	☒	☐	Foil		Serial		2	☐	☒
Parallel Printer	☐	☒	1	☒	☐	Braid		Centronix		2	☒	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
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	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐

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EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

EUT Software.

Revision Level: Ver. 1.0

Description: Benchmark proprietary test software: "Test.exe"

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing.
Consult with your TÜV Product Service Representative if additional assistance is required.

1. Datastreaming; 32kB blocks

2.

3.

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

Description	*Model #*	*Serial #*	*FCC ID #*
Compaq Server	ML370	R150FRT10006	FCC Logo / BSMI 3902Q003
Dell VGA Monitor	M990	TW-04512R-47800-04J-B0DAES	FCC Logo/ BSMI 4882A072
Dell Keyboard	RT7D5JTW	37171-059-7125	AQ-67DK15/BSMI 3882A694
Logitech Mouse	M-S34	L7N02317723	DZL211029 / BSMI 4862A011
HP Parallel Printer	C4562C	CN9231K1XG	B94C2164X / BSMI DoC 98-HTC-3264

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
22 MHz			Write Drivers
40 MHz			
45 MHz			
60 MHz			
80 MHz			sDRAM
100 MHz			DRAM

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

(PLEASE INSERT "**ELECTRONIC SIGNATURE**" BELOW IF POSSIBLE)

Authorization Signatures

Dennis King	9/9/02
Customer authorization to perform tests according to this test plan.	Date
Dennis King	9/9/02
Test Plan/CDF Prepared By (please print)	Date
Todd Tuckey	9/16/02
Reviewed by TÜV Product Service Associate	Date

Appendix C

Measurement Protocol

And

Test Procedures

TÜV PRODUCT SERVICE INC. 5541 Central Avenue Boulder, Colorado 80301 Voice: 303 786 7999 Fax: 303 449 3004

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Conducted and radiated emission testing is performed according to the procedures in ANSI C63.4 & CNS13438.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

CONDUCTED EMISSIONS

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the applicable limit.

To convert between dBµV and µV, the following conversions apply:

- dBµV = 20(log µV)
- µV = Inverse log(dBµV/20)

RADIATED EMISSIONS

The final level, expressed in dBµV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the applicable limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example: At a Test Frequency of 30 MHz, with a peak reading on the spectrum analyzer or measuring receiver of 14 dBmV:

Measured Level	+	Transducer & Cable Loss factor	=	Corrected Reading	Specification Limit	-	Corrected Reading	=	Delta Specification
(dBµV)		(dB)		(dBµV/m)	(dBµV/m)		(dBµV/m)		
14.0		**14.9**		**28.9**	**40.0**		**28.9**		**-11.1**

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DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 µH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 22GHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

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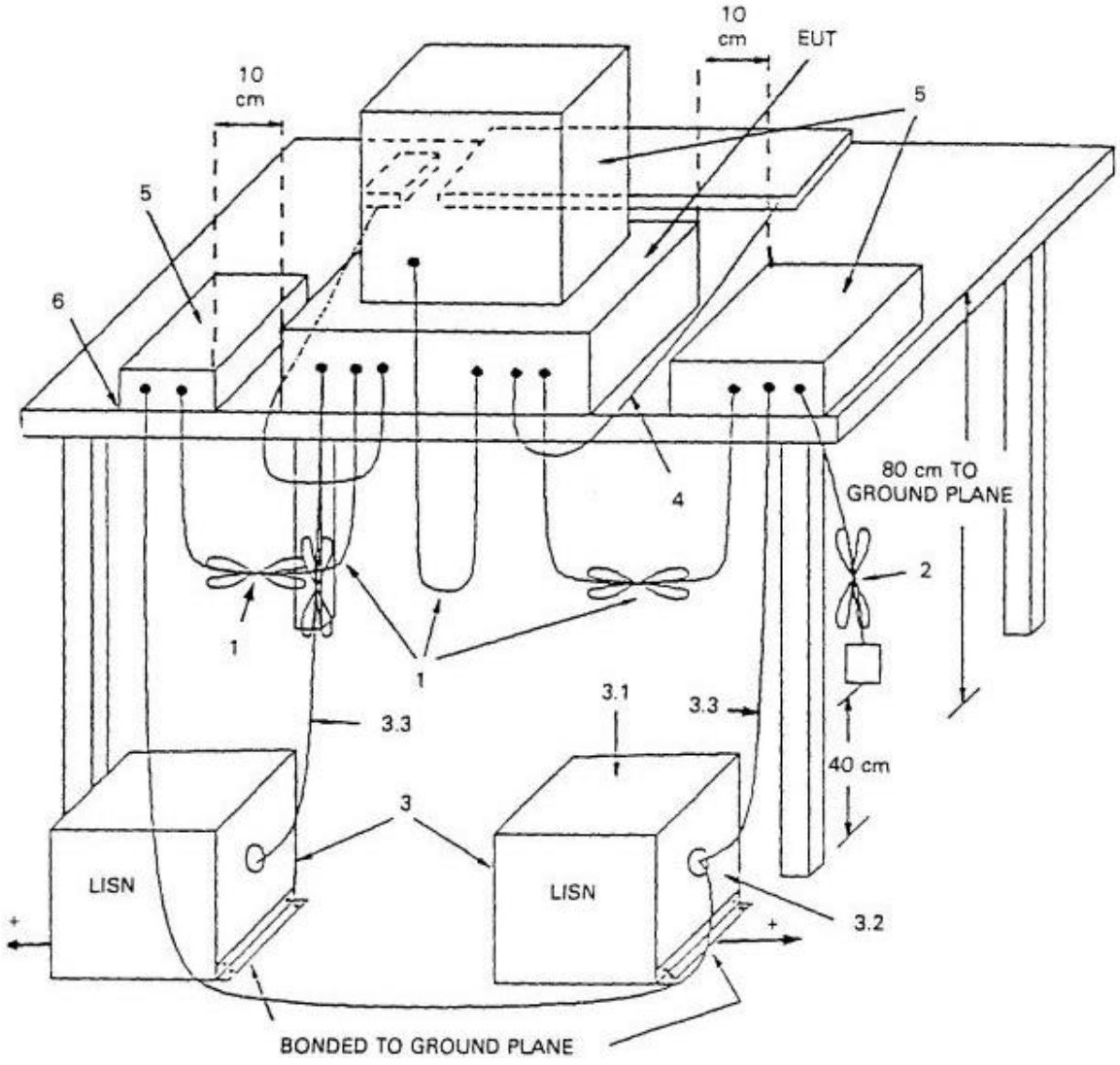
Conducted Emissions Diagram:



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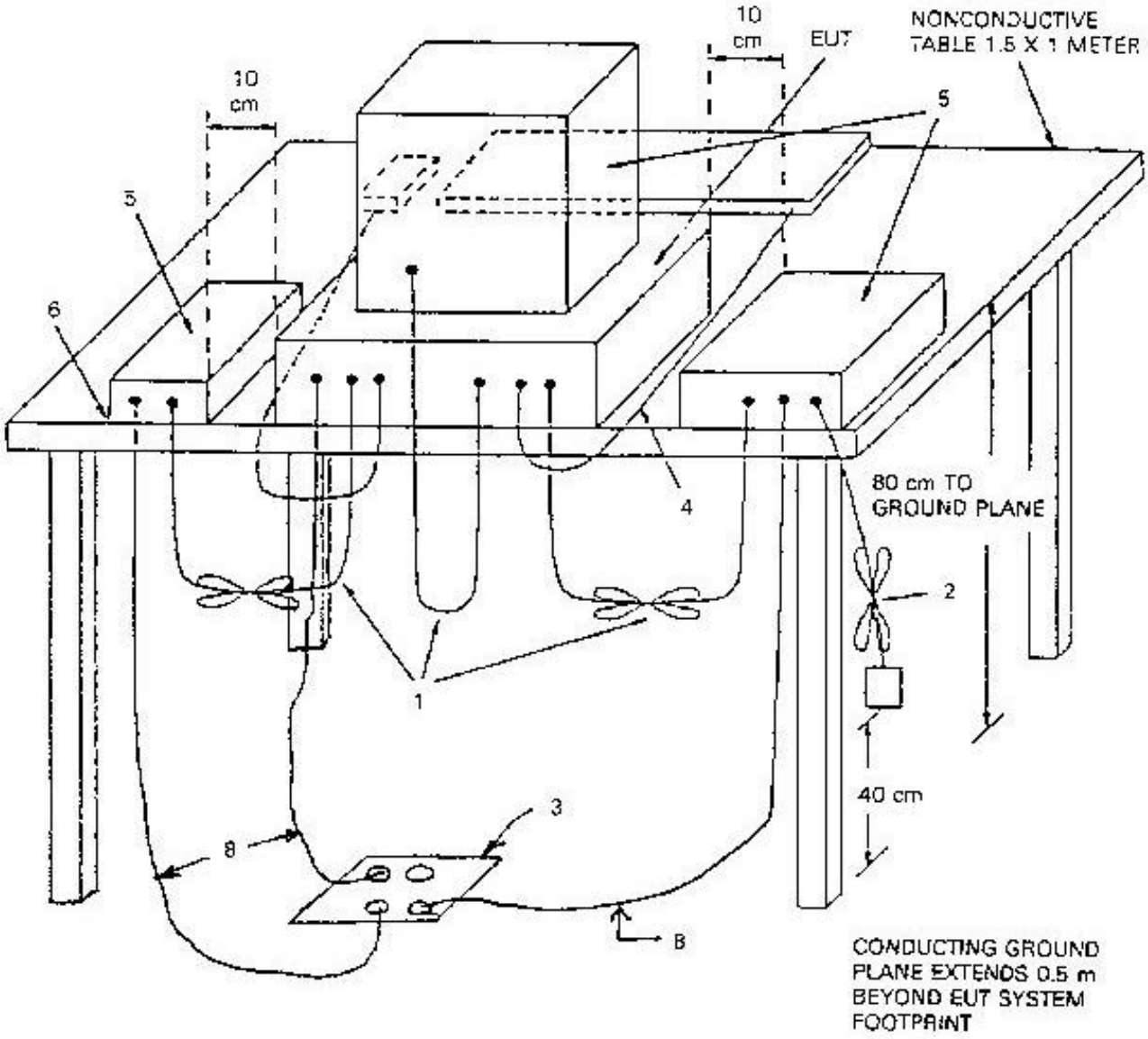
Radiated Emissions Diagram:



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Addendum 15: DLT VS160e FCC DoC

Declaration of Conformity

Manufacturer's Name:	Benchmark Storage Innovations, Inc.
Manufacturer's Address:	3122 Sterling Circle Boulder, Colorado 80301 USA

The manufacturer hereby declares that the product

Product Name:	External Tape Drive
Model Numbers:	Benchmark: DLT VS160e Dell: PowerVault 110T DLT VS160e HP: StorageWorks DLT-VS-160/320 External Tandberg: DLT VS160 External Tape Drive

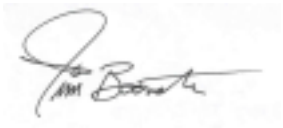
Complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including that may cause undesired operation.

I have determined and warrant that above described device has been shown to comply with the requirements of the FCC Part 15, subpart B, class B, by having a device tested at Hewlett Packard Fort Collins Hardware Test Center, which is accredited by A2LA (accreditation No. 0905-01). Each unit marketed is identical to the device tested. Compliance assumes no unauthorized changes will be made to the equipment and it will be maintained and operated properly. A test report will be maintained for a period at least 2 years after manufacturing ceases. It is also understood that any changes to the device which could adversely affect the emission characteristics of this equipment will require retesting.

Supplementary Information:

American Agent:



Signature:	_____
Name:	Tim Boonstra
Position:	Quality Manager
Date:	August 30, 2002
Place:	Boulder, Colorado, USA

Addendum 16: DLT VS160 FCC DoC

Declaration of Conformity

Manufacturer's Name:	Benchmark Storage Innovations, Inc.
Manufacturer's Address:	3122 Sterling Circle Boulder, Colorado 80301 USA

The manufacturer hereby declares that the product

Product Name:	Internal Tape Drive
Model Numbers:	Benchmark: DLT VS160 Dell: PowerVault 110T DLT VS160 IBM: 80/160GB Half-High DLTVS Tape Drive Tandberg: DLT VS160 Internal Tape Drive

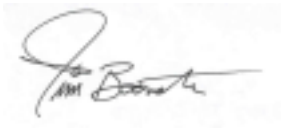
Complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including that may cause undesired operation.

I have determined and warrant that above described device has been shown to comply with the requirements of the FCC Part 15, subpart B, class B, by having a device tested at TUV Product Service, which is accredited by NVLAP (accreditation No. 100271-1). Each unit marketed is identical to the device tested. Compliance assumes no unauthorized changes will be made to the equipment and it will be maintained and operated properly. A test report will be maintained for a period at least 2 years after manufacturing ceases. It is also understood that any changes to the device which could adversely affect the emission characteristics of this equipment will require retesting.

Supplementary Information:

Agent:



Signature:	_____
Name:	Tim Boonstra
Position:	Quality Manager
Date:	September 24, 2002
Place:	Boulder, Colorado, USA

Addendum 17: DLT VS160e ESD Test Report

Addendum 18: DLT VS160 TUV GS Mark Report

Addendum 19: DLT VS160e TUV GS Mark Report

Addendum 20: DLT VS160 CE DoC

Addendum 21: DLT VS160e CE DoC