ENGINEERING TEST REPORT

NUMBER: 10216476EEU1

ON

Model Name:

BB-BONE-000

IN ACCORDANCE WITH:
EN 61326-2-1: 2006
FOR CLASS B EQUIPMENT

TESTED FOR:

Circuitco Electronics
1380 Presidential, Suite 100
Richardson, Texas 75081

TESTED BY:
Nemko USA, Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

Number of Pages: 45

TESTED BY:	Brian Boyea	DATE:	02-Nov-2011
	Brian, Boyea, EMC Engineer		
APPROVED BY:	Arturo Ruvalcaba	DATE:	14-Nov-2011
	Arturo Ruvalcaba, EMC Engineer		

NVLAP Lab Code 100426-0

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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 EN 61326-2-1: 2006, Electrical equipment for measurement control and laboratory use for Class B equipment using the following test standards as test methodologies:

All tests were performed using measurement procedure CISPR 16. Frequencies were initially identified in a semi-anechoic chamber. Amplitude measurements were made in a semi-anechoic chamber.

Abstract:

Emissions:

Name of Test	Basic Standard	Results
Conducted Emissions (Mains port)	EN 61326-2-1: 2006	Complies
Radiated Emissions	EN 61326-2-1: 2006	Complies
Harmonics	EN 61000-3-2: 2006	Not Tested Note 1
Flicker	EN 61000-3-3: 2008	Not Tested Note 1

Note 1: The EUT is powered by the host computer.

Abstract: - Continued

Immunities:

Name of Test	Basic Standard	Test Specification	Performance	Results
Electrostatic Discharge	EN61000-4-2: 2001	±4kV Contact Discharge ±8kV Air Discharge	B	Complies
Radiated Electro-magnetic Field	EN61000-4-3: 2006	80 to 1000 MHz 1.4GHz to 2.7GHz 80% AM @ 1 kHz 10V/m 2.0GHz to 2.7GHz 80% AM @ 1 kHz 3V/m	A	Complies
Electrical Fast Transients / Burst	EN61000-4-4: 2004	±0.5 kV on I/O Signal and Control Lines ±1kV and ±2kV on Power Supply	B	Not Tested Note 1
Surge Immunity	EN61000-4-5: 2006	Line to Earth ±2kV Line to Line ±1kV	B	Not Tested Note 1
RF Conducted Immunity	EN61000-4-6: 2003	150 kHz to 80MHz 3 Vrms 80% Mod.	A	Not Tested Note 1
Magnetic Immunity	EN61000-4-8: 2000	3A/m @ 50Hz (For CRT 1A/M)	A	Not Tested Note 2
Voltage Dips and Interruptions	EN61000-4-11: 2004	0% Reduction (1 cycle) 40% Reduction (10/12 cycles) 70% Reduction (25/30 cycles) 0% Reduction (250/300 cycles)	B	Not Tested Note 1

Note 1: The EUT is powered by the host computer.
Note 2: The EUT does not have any components susceptible to Magnetic Immunity.
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:	Circuitco Electronics
Name:	BeagleBone
Model Number:	BB-BONE-000
Serial Number:	22
Part Number:	BB-BONE-000
Production Status:	Pre-Production
E.U.T. Arrival Date:	11/2/11

Description of E.U.T.

Development Board

Modifications Incorporated in E.U.T.: None

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.

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.

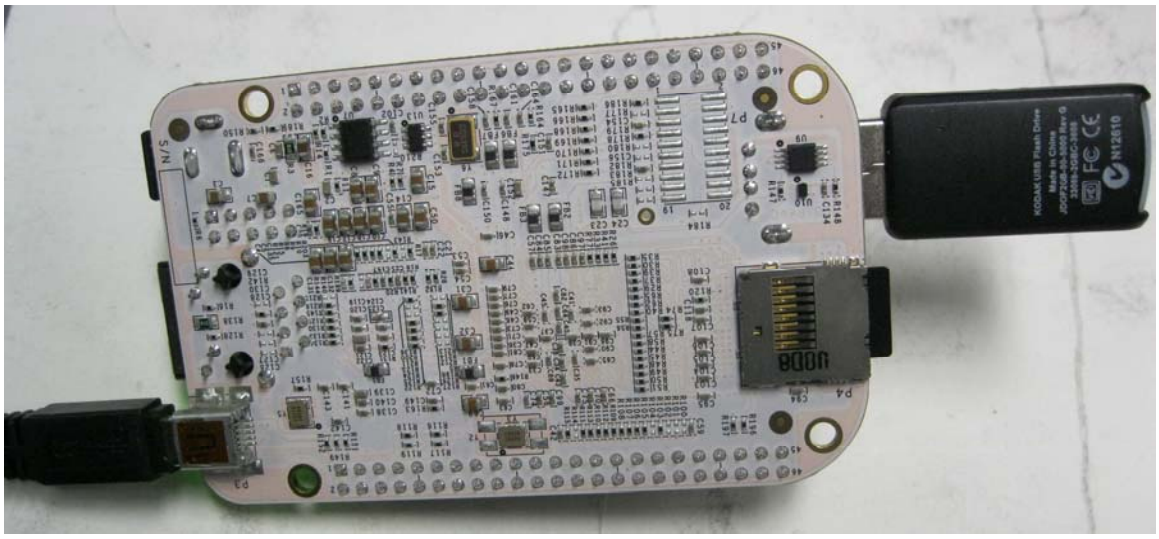
The EUT was in the following exercise mode:

Powered on running

Clock, Oscillator, Highest Frequencies Utilized:

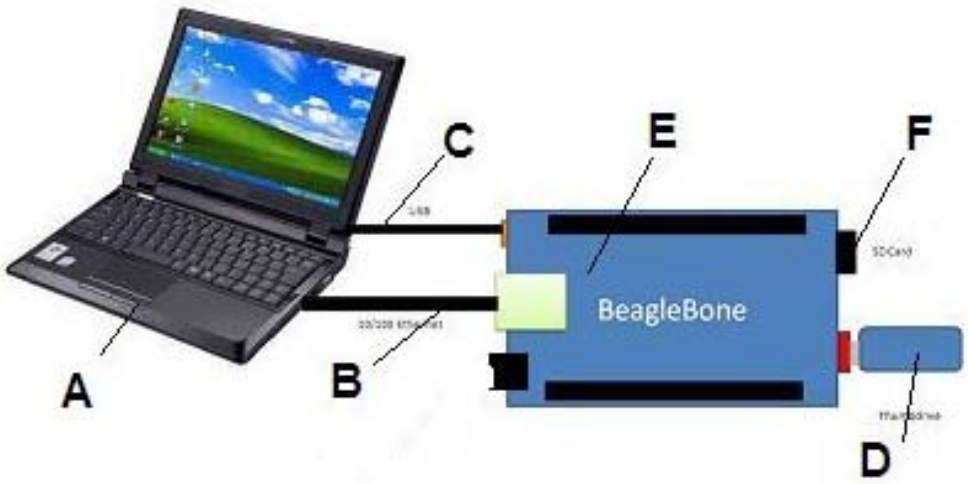
25MHz, 24MHz, 48MHz, 100MHz

E.U.T. Photographs:



Section 3. Equipment Configuration

Equipment Configuration List:				
Item	Description	Identification: *(M/N #, S/N #, P/N #, Rev.)*		
(A)	Laptop	Dell Lattitude S/N E6410 15665268 601		
(B)	Ethernet Cable	Fry's		
(C)	USB Cable	Qualtek 3021003-03		
(D)	2GB Thumbdrive	Kodak 2GB		
(E)	EUT	BeagleBone S/N 22 Rev B		
(F)	SD Card	Kingston 2GB		
(G)				
(H)				
(I)				
(J)				
EUT Power and Interfaces:				
Item	Description		Type	Qty
i.				
ii.	USB Cable to the PC		5	1



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 EN 61326-2-1: 2006, Class B.

Specification Limits:

Limits for conducted disturbance at the mains ports

Frequency Range (MHz)	Quasi-peak Limits (dBuV)	Average Limits (dBuV)
0.15 to 0.50	66 - 56	56 - 46
0.50 to 5.00	56	46
5.00-30.0	60	50

Test Method:
See Section 15.

Test #: CEPV-01

Tested By: Brian Boyea

Date of Tests: 11/2/11

Test Conditions:
Test Voltage: 230Vac

Temperature: 24˚C

Humidity: 40%

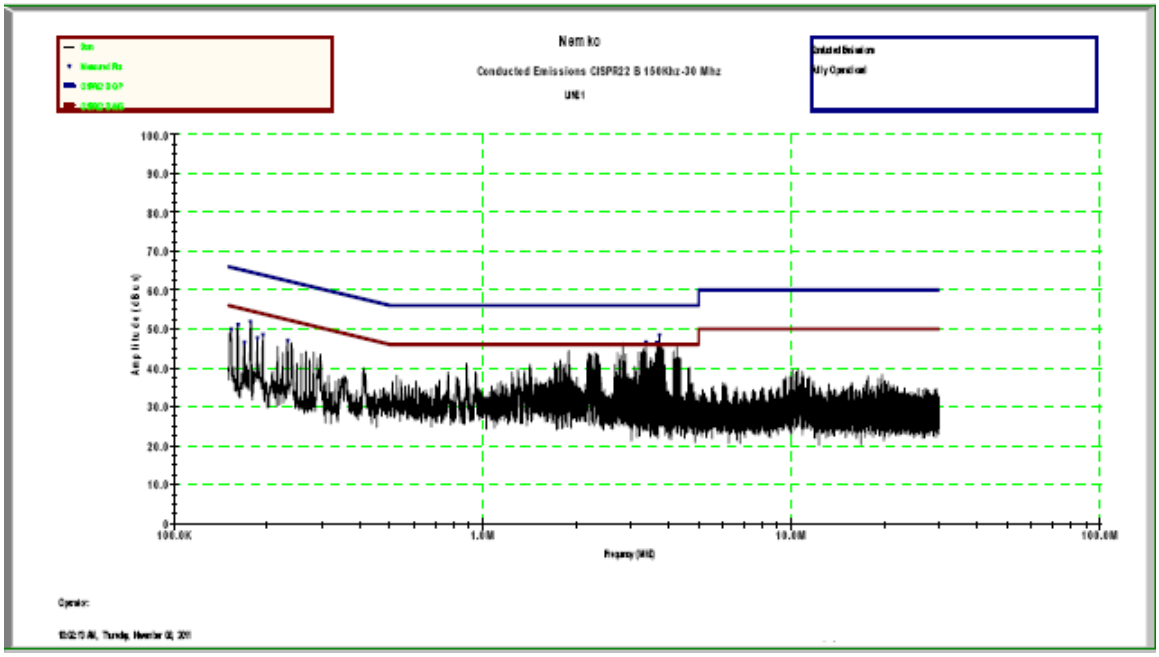
Test Results:

The E.U.T. complies.

TEST EQUIPMENT

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
674	Limiter	Hewlett Packard	11947A	3107A02200	01-Nov-2011	01-Nov-2012
704	Filter, High Pass, 5KHz	Solar Electronics	7930-5.0	933126	01-Nov-2011	01-Nov-2012
749	Cable, 6m	Nemko USA, Inc.	RG223		25-Feb-2011	25-Feb-2012
811	1.5m Cable Assy	Nemko USA, Inc.	RG223		25-Feb-2011	25-Feb-2012
1258	LISN .15mhz-30mhz	EMCO	3825/2	1305	31-Oct-2011	31-Oct-2012
1663	Spectrum Analyzer	Rohde & Schwartz	FSP3	100073	2-Sept-2011	2-Sept-2013

Test Data Conducted Emissions
Line 1

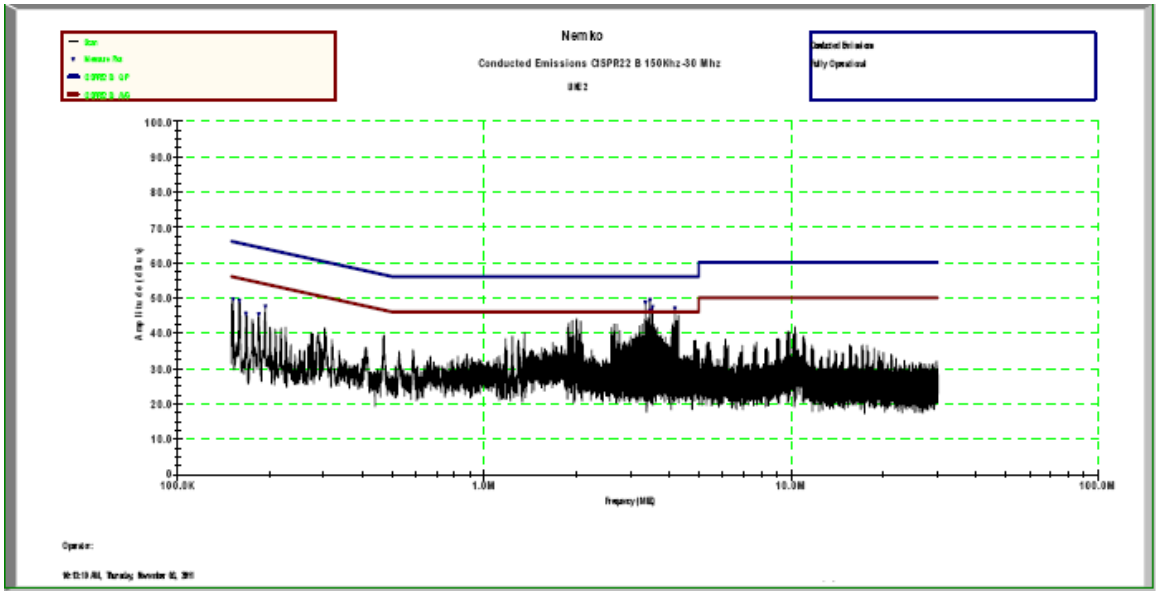


Nemko
Line 1 Final QP/AVG
Operator: Brian

Frequency MHz	FCCB QP LIMIT	FCCB AVG LIMIT	AVG Meas	AVG Margin	QP Meas	QP Margin
3.37	56.00	46.00	29.70	-16.30	40.25	-15.75
3.66	56.00	46.00	29.33	-16.67	42.02	-13.98
3.72	56.00	46.00	29.82	-16.18	42.58	-13.42
3.66	56.00	46.00	29.33	-16.67	42.02	-13.98
3.37	56.00	46.00	29.70	-16.30	40.25	-15.75

Conducted Emissions
Fully Operational

Line 2



Nemko
Line 2 Final QP/Avg
Operator: Brian

Frequency MHz	FCCB QP Limit	FCCB AVG Limit	AVG Meas	AVG Margin	QP Meas	QP Margin
3.41	56.00	46.00	27.93	-18.07	42.39	-13.61
3.47	56.00	46.00	27.97	-18.03	41.54	-14.46
3.48	56.00	46.00	27.87	-18.14	42.00	-14.00
3.54	56.00	46.00	31.73	-14.27	45.24	-10.76
4.17	56.00	46.00	30.91	-15.10	34.92	-21.08

Conducted Emissions
Fully Operational

Test Photographs

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 EN 61326-2-1: 2006, Class B.

Specification Limits:

Limits for radiated disturbance of Class B

Frequency range MHz	Quasi-peak Limits dB (μV/m)		
	@ 3 m	@ 10 m	
30 to 230	40	30.0	
230 to 1000	47	37.0	
Notes: 1. The lower limit shall apply at the transition frequency. 2. Additional provisions may be required for cases where interference occurs. 3. The 3m limits are calculated as follows: $L_3 = L_{10} * 10/3$ where L_{10} is the limit at 10m specified in μV/m			

Test Method:
See Section 15.

Test #: REHE-01

Tested By: Brian Boyea

Date of Tests: 11/2/11

Test Conditions:

Test Voltage 230 Vac

Temperature: 27˚C

Humidity: 25%

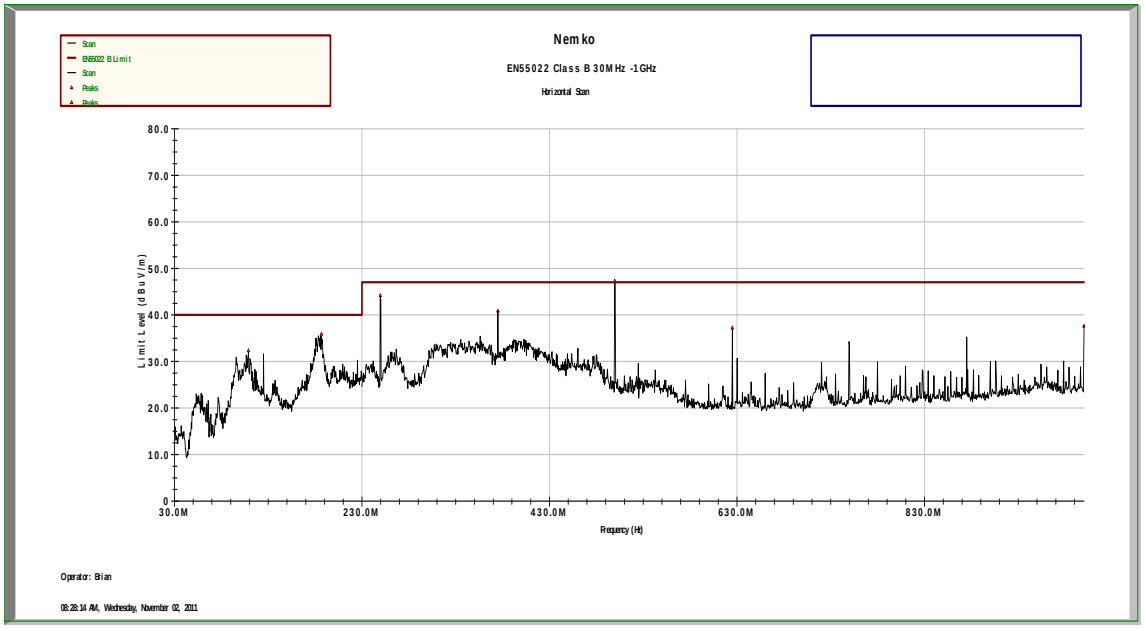
Test Results:
The E.U.T. complies.

TEST EQUIPMENT

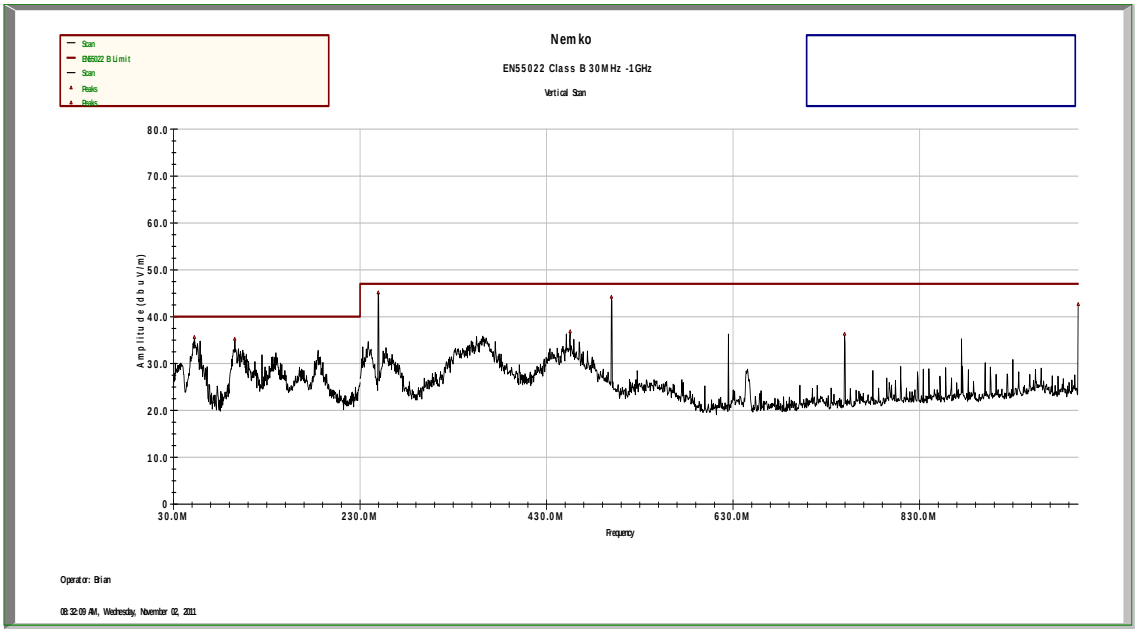
Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
1	3m Semi-Anechoic Chamber	Nemko USA, Inc.	Chamber	1	26-Sept-2011	26-Sept-2012
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	20-July-2011	20-July-2012
1025	Preamplifier, 25dB	Nemko USA, Inc.	LNA25	399	23-Feb-2011	23-Feb-2012
1304	Antenna, Horn	Electro Metrics	RGA-60	6151	24-Nov-2010	24-Nov-2012
1480	Antenna, Bilog	Schaffner-Chase	CBL6111C	2572	19-Jan-2011	19-Jan-2012
1767	Receiver, EMI Test 20Hz - 26.5 GHz - 150 - +30 dBm LCD	Rohde & Schwartz	ESIB26	837491/0002	01-Dec-2010	01-Dec-2011
1783	Cable Assy, 3m Chamber	Nemko	Chanmber		26-Sept-2011	26-Sept-2012

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

Horizontal



Vertical



Nemko, Lewisville, TX
FCC 3 Meter Chamber
Final Quasi Peak Measurements
Operator: Brian

Frequency MHz	Limit	Horizontal QP	QP Margin	Vertical QP	Vertical Margin
51.94	40.00			29.38	-10.63
95.77	40.00			28.36	-11.64
108.82	40.00	31.05	-8.95		
186.27	40.00	26.21	-13.79		
250.01	47.00	44.81	-2.19	42.72	-4.28
375.03	47.00	36.57	-10.43		
455.75	47.00			28.43	-18.57
499.99	47.00	44.44	-2.56		
500.03	47.00			32.94	-14.06
625.01	47.00	38.47	-8.53		
750.01	47.00			34.36	-12.64
999.98	47.00	43.17	-3.83	41.85	-5.15

30 MHz to 1GHz was the spectrum searched.
RBW = 120kHz
VBW = 120kHz

RBW = 120kHz

Test Photographs - Test # REHE-01

Section 6. Harmonics

Not Tested: The EUT is powered from the host computer.

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: 2006.

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:

Test Information:		Test Conditions:	
Test #:	HARM-01	Test Voltage:	230 Vac
Tested By:		Temperature:	23°C
Date of Tests:		Humidity:	34%

Test Results:

Section 7. Flicker

Not Tested: The EUT is powered from the host computer.

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: 2008.

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 Information:		Test Conditions:	
Test #:	Flicker-01	Test Voltage:	230 Vac
Tested By:		Temperature:	23˚C
Date of Tests:		Humidity:	34%

Test Results:

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 #: ESDI-01

Tested By: Brian Boyea

Date of Tests: 11/2/11

Test Conditions:

Test Voltage: 230 Vac

Temperature: 23˚C

Humidity: 35%

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
1247	2 x 470k Ohm Ground Strap	Nemko USA, Inc.			N/R	
1738	All-In-One ESD3000 Gun	EMC-PARTNER/HV Technologies	ESD3000	294	18-Oct-2011	18-Oct-2012
1752	All-In-One ESD DN1 Network, 150 pF, 330 ohm	EMC-PARTNER/HV Technologies	ESD3000DN1	80	18-Oct-2011	18-Oct-2012
1754	All-In-One Relay Module (Tip)	EMC-PARTNER/HV Technologies	ESD3000RM32	99	18-Oct-2011	18-Oct-2012

Test Data –Electrostatic Discharge Test#ESDI-01

Electrostatic Discharge Data

Complete	X			Job # : 10216476	Test # : ESDI-01
Preliminary				Page 1	of 1

Client Name :	Circuitco Electronics
EUT Name :	Beagle Bone
EUT Model # :	BB-BONE-000
EUT Part # :	BB-BONE-000
EUT Serial # :	22
EUT Config. :	Powered on

Specification :	EN 61326-1	Temp. (deg. C) :	24	Reference :	EN 61000-4-2
ESD Generator#	1754	Humidity (%) :	35	Date :	11/02/11
Cable#:	1247	EUT Voltage :	230 Vac	Grnd Strap:	1025k ohms
		EUT Freq:		Staff :	Brian Boyea
1. HCP	X	Barometric Pressure	1014	Photo ID:	ESDI-01
2. VCP	X	Phase:	N/A	Performance Criteria:	B
3	USB Cable	Location:	Lab 3	Table Top or Floor	
4.		7.		10.	
5.		8.		11	
6.		9.		12.	

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	20	0	None	Pass	
1	4	+/-	Contact	20	0	None	Pass	
2	2	+/-	Contact	20	0	None	Pass	
2	4	+/-	Contact	20	0	None	Pass	
3	2	+/-	Air	20	0	None	Pass	
3	4	+/-	Air	20	0	None	Pass	
3	8	+/-	Air	20	0	None	Pass	

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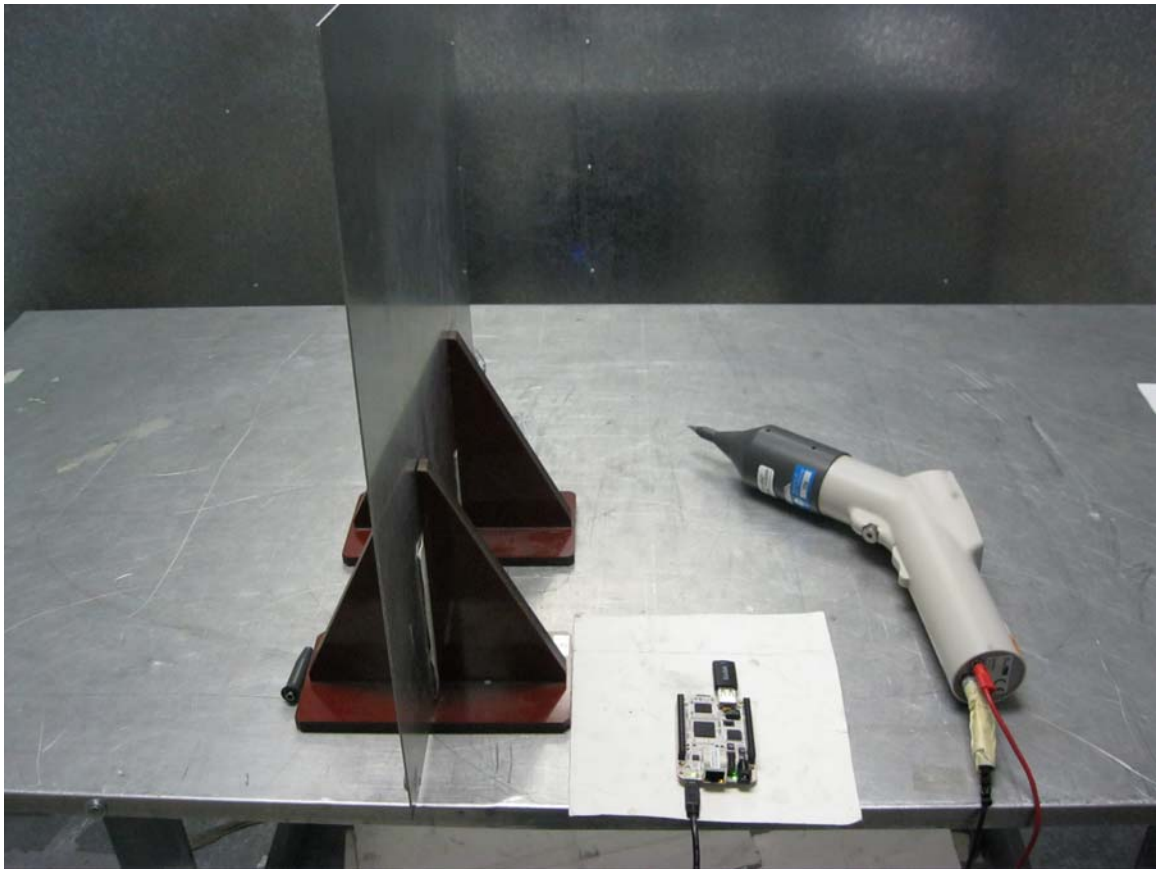
Test Photographs - Test # ESDI-01



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: Brian Boyea

Date of Tests: 11/2/11

Test Conditions:

Test Voltage: 230 Vac

Temperature: 23˚C

Humidity: 30%

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
1724	Field Monitor	ETS-Lindgren	HI-6100	00069660	NR	N/A
1765	Log Antenna	AR	AT1080	0325162	NR	N/A
1770	Signal Generator	R & S	SMIQ 06L	1125.5555.36	NR	N/A
412	RF AMPLIFIER	Amplifier Research	100W1000M1A	21233	NR	N/A
1836	Amp 300W	AR	300T2G8	325204	NR	N/A
1862	Amp 250W	AR	250T1G3	330041	NR	N/A
1793	Field probe	ETS-Lindgren	HI-6005	00090030	12/23/10	12/23/11
1483	Cable 4m	Storm	PR90-010-144	N/A	NR	N/A
1625	CABLE, 18 ft	MEGAPHASE	10311 1GVT4	N/A	NR	N/A
1041	CABLE 3m	Nemko	Semi-Flex		NR	N/A
1066	CABLE 4m	Storm	PR90-010-144		NR	N/A
1304	Horn Antenna	Electro Metrics	RGA-60	6151	11/24/10	11/24/11

Test Data –Radiated Electromagnetic Field Test#RIHE-01

Radiated Immunity Electric Field Test Data

Complete	X			Job # :	10216476	Test # :	RIHE-01
Preliminary				Page	1	of	1

Client Name :	Circuitco Electronics
EUT Name :	Beagle Bone
EUT Model # :	BB-BONE-000
EUT Part # :	BB-BONE-000
EUT Serial # :	22
EUT Config. :	Powered on

Specification :	EN 61326-1			Reference :	ETSI EN 61000-4-3
Signal Gen.#:	1770	Temp. (deg. C) :	23	Date :	11/02/11
Signal Gen.#:		Humidity (%) :	30	Time :	
Cable#:	1483	EUT Voltage :	230 Vac	Staff :	Brian Boyea
Cable#:	1989	EUT Frequency :		Photo ID:	
Cable#:	1041	Barometric Pressure:	1017	Performance Criteria:	A
Amp#:	412	Location:	ANC 3	Table Top or Floor:	
Amp#:	1836	Monitor#:	1724	Sweep rate:	N/A
Analyzer #:	1862	Probe#	1757	Step Size:	1%
Cable#:	1066	Cable#:	1625	Modulated:	80%
Antenna#:	1765	Directional Cpler.:#		Cable#:	
Antenna#:	1304	Cable#:		Cable#:	

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	10	0	N/A	H	Front	Pass	
80	1000	10	0	N/A	V	Rear	Pass	
1400	2000	3	0	N/A	H	Front	Pass	
1400	2000	3	0	N/A	V	Rear	Pass	
2000	2700	3	0	N/A	H	Front	Pass	
2000	2700	3	0	N/A	V	Rear	Pass	

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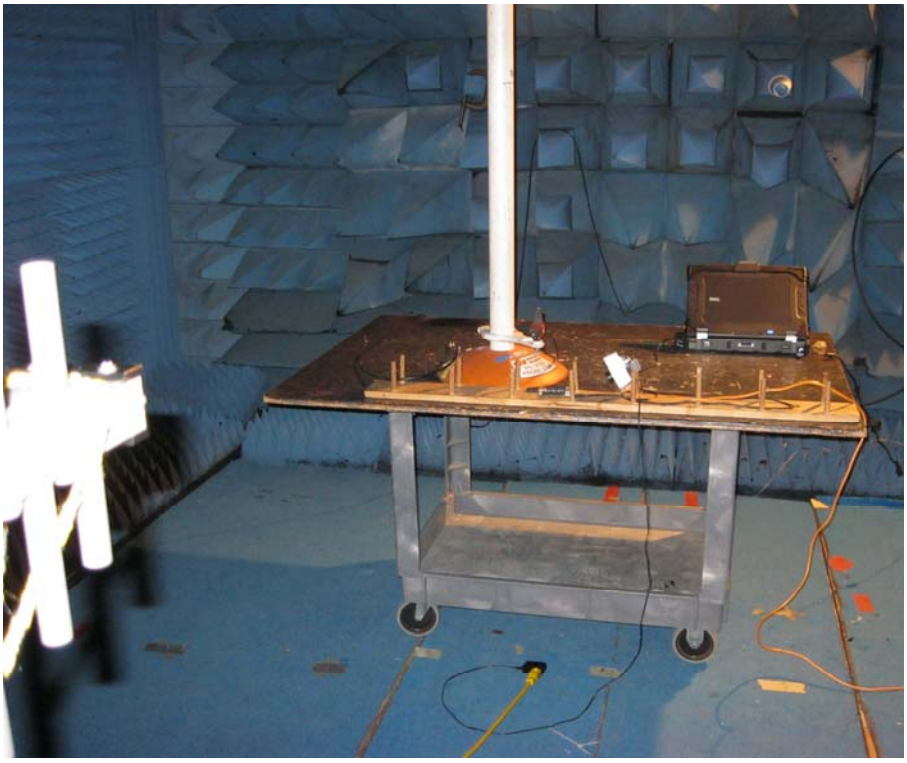
Test Photographs - Test # RIHE-01



Section 10. Electrical Fast Transient / Burst

Not tested: The EUT is powered by the host computer and no cable >3m.

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.

Section 11. Surge Immunity

Not tested: The EUT is powered by the host computer.

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.

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

Not tested: The EUT is powered by the host computer and no cable >3m.

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.

Section 13. Magnetic Immunity

Not tested: The EUT has no components susceptible to 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

Test Method:
See Section 16.

Test Information:		Test Conditions:	
Test #:	RILM-01	Test Voltage:	230 Vac
Tested By:		Temperature:	23˚C
Date of Tests:		Humidity:	33%

Test Results:

Section 14. Voltage Dips and Interruptions

Not tested: The EUT is powered by the host computer

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.

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 Information:		Test Conditions:	
Test #:	VDIP-01	Test Voltage:	230 Vac
Tested By:		Temperature:	24˚C
Date of Tests:		Humidity:	34%

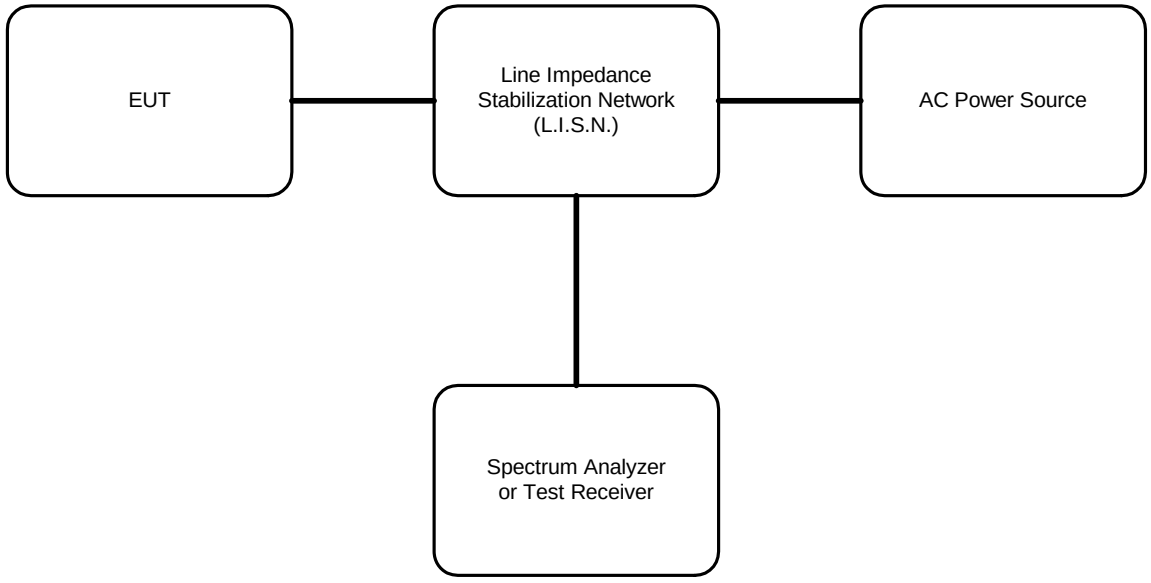
Test Results:

Section 15. Test Methods and Block Diagrams.

Conducted Emissions (Mains Ports)

- Applicable Test Standard: EN 61326-2-1: 2006 Electrical Equipment for measurement, control, and laboratory use.
- 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 EN 61326-2-1: 2006.

Test Configuration - Powerline Conducted Emissions:

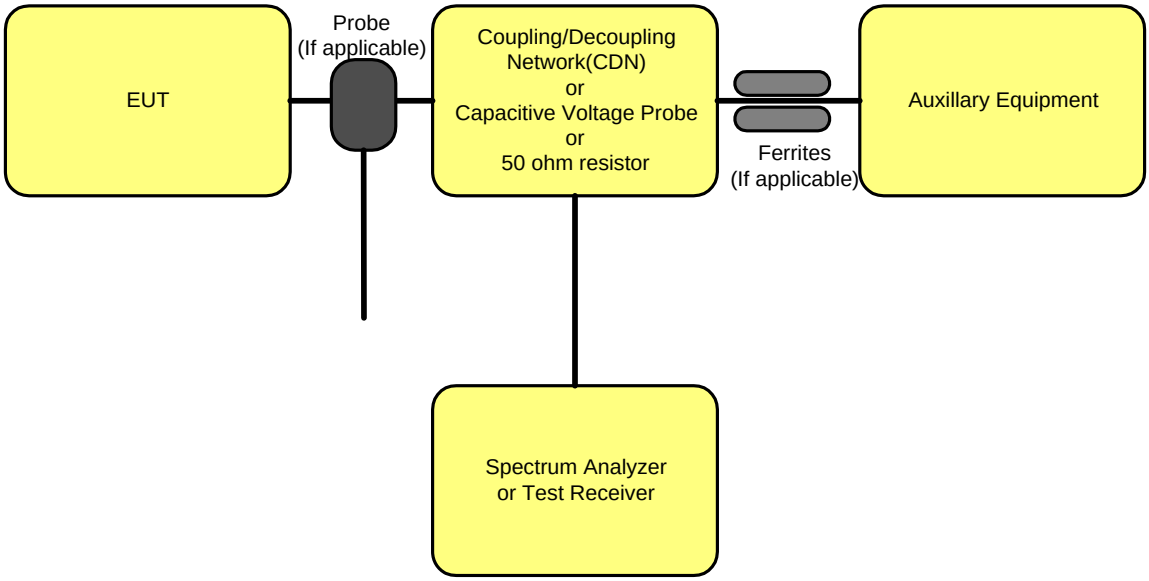


Conducted Emissions (Telecommunication Ports)

Test Method:

- Applicable Test Standard: EN 61326-2-1: 2006 Electrical Equipment for measurement, control, and laboratory use.
- The test set-up is as per the test configuration diagram and as further defined in EN61326: 2006.
- 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 EN 61326-2-1: 2006.

Test Configuration:



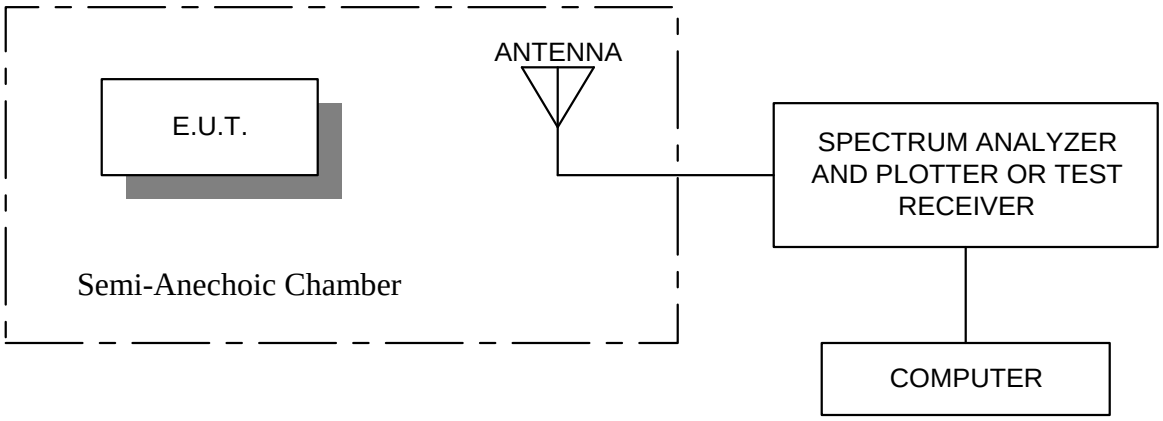
Radiated Emissions

Test Method - Radiated Emissions:

- Applicable Test Standard: EN 61326-2-1: 2006 Electrical Equipment for measurement, control, and laboratory use.
- 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. Frequencies were initially identified in a semi-anechoic chamber. Amplitude measurements were made in a semi-anechoic chamber.
- 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.
- 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:

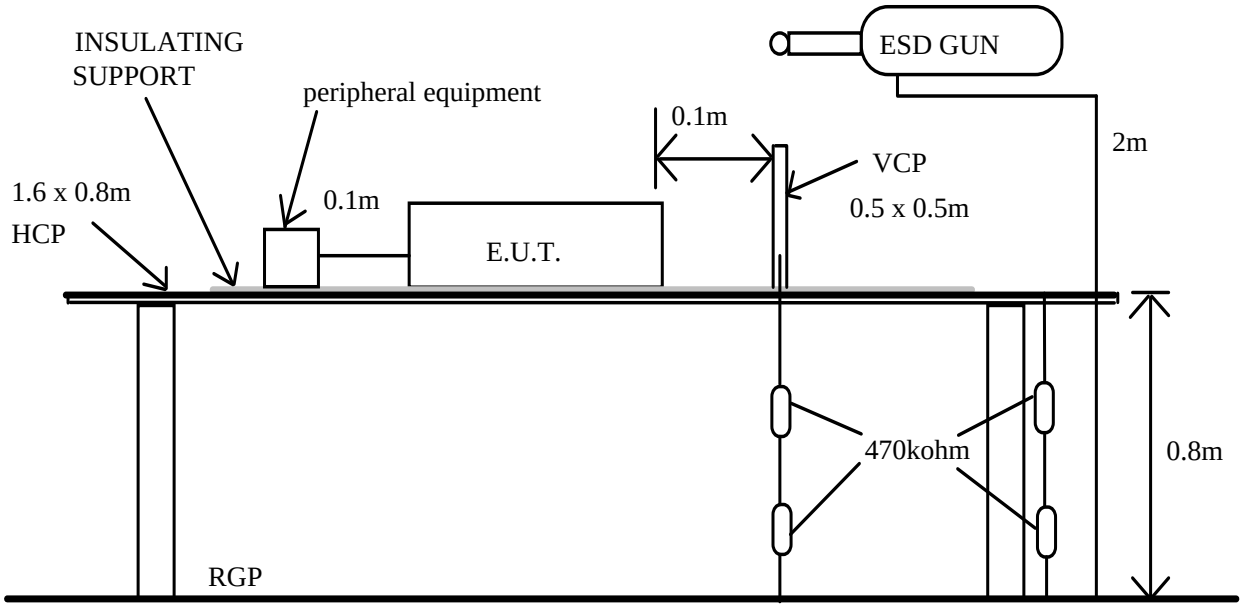


Electrostatic Discharge

Test Method - Electrostatic Discharge:

- Applicable Test Method: EN61000-4-2: 2001.
- 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.

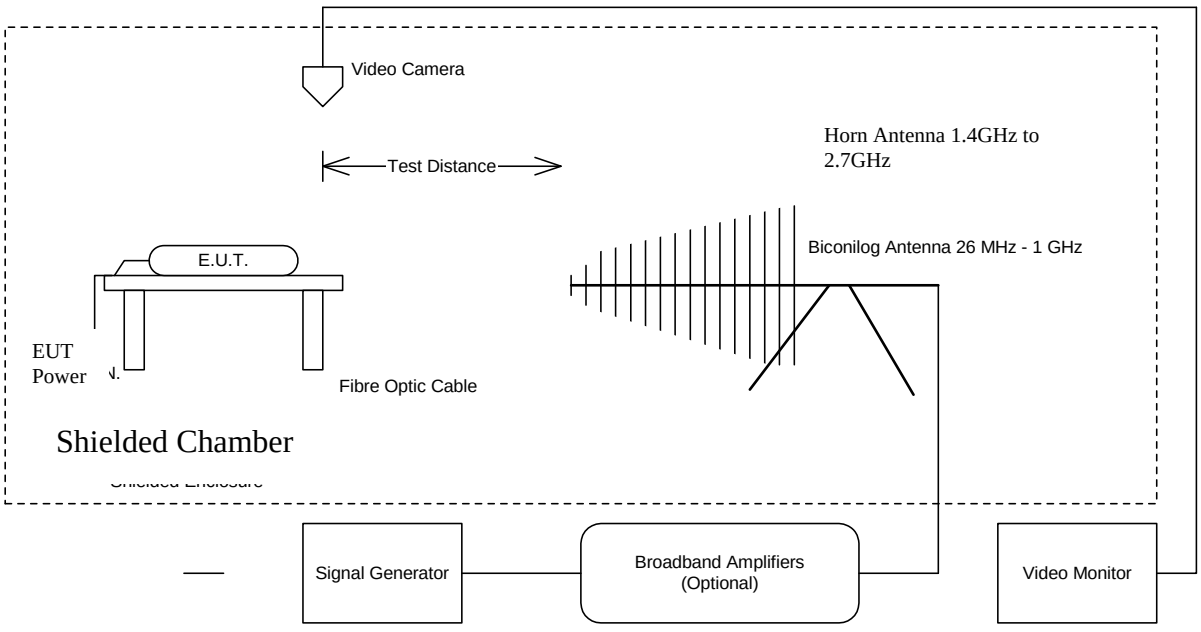
HCP - Horizontal Coupling Plane VCP - Vertical Coupling Plane RGP - Reference Ground Plane

Radiated Electromagnetic Field (Shielded Chamber)

Test Method - Radiated Electromagnetic Field (Shielded Chamber):

- Applicable Test Method: EN61000-4-3: 2002.
- The E.U.T. is placed in the center of the Shielded Chamber 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 & 1400 to 2700MHz..
- 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 Chamber)

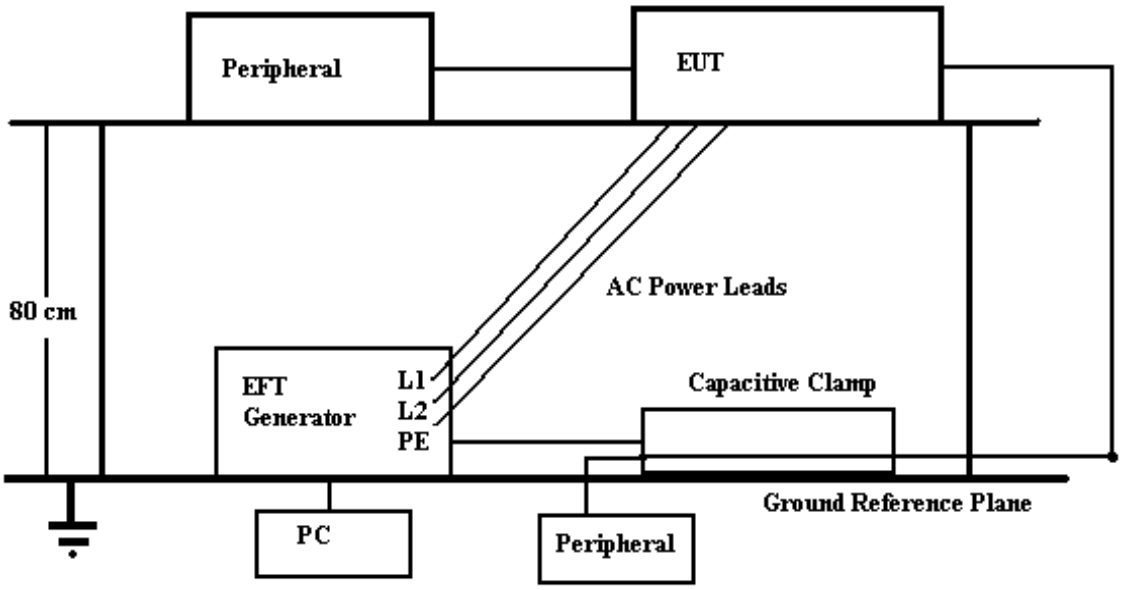


Electrical Fast Transient/Burst/Surge

Test Method - Electrical Fast Transient/Burst/Surge:

- Applicable Test Method: EN61000-4-4: 2004 and EN61000-4-5: 2006.
- 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:



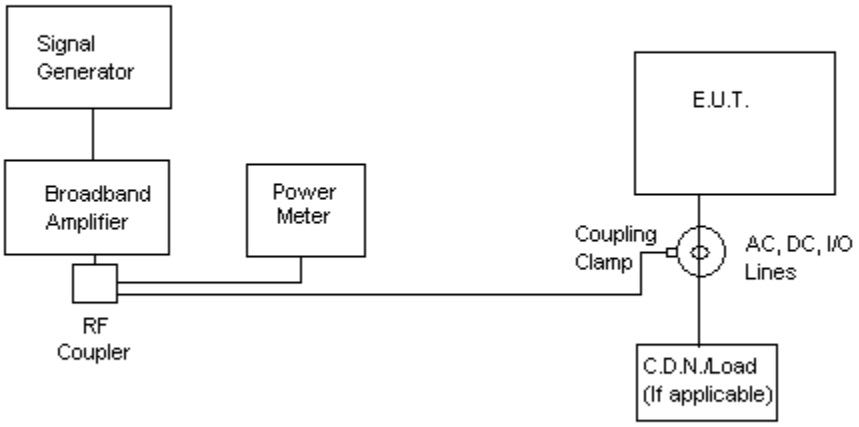
R.F. Common Mode (A.M)

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

- Applicable Test Method: EN61000-4-6: 2003.
- 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 sine wave.
- The rate of sweep is 1.5 x 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:

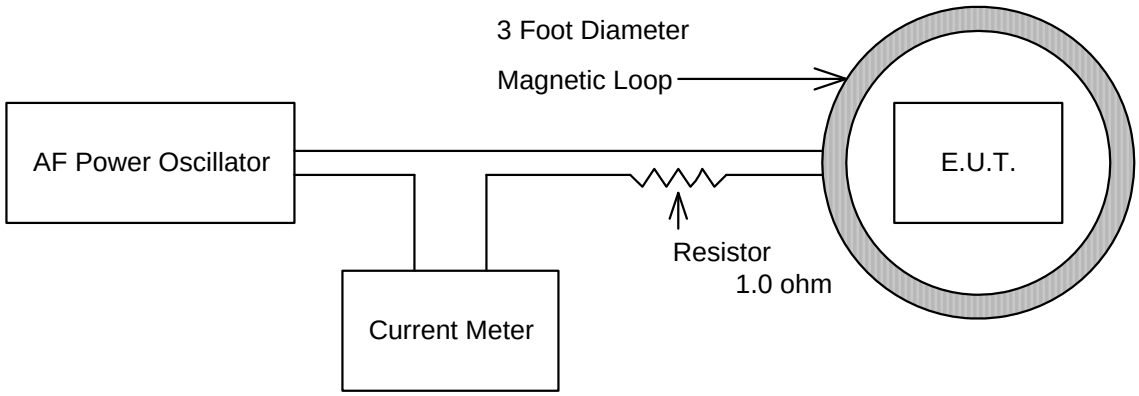


Magnetic Immunity

Test Method - Magnetic Immunity:

- Applicable Test Method: (EN 61000-4-8: 2000).
- 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:



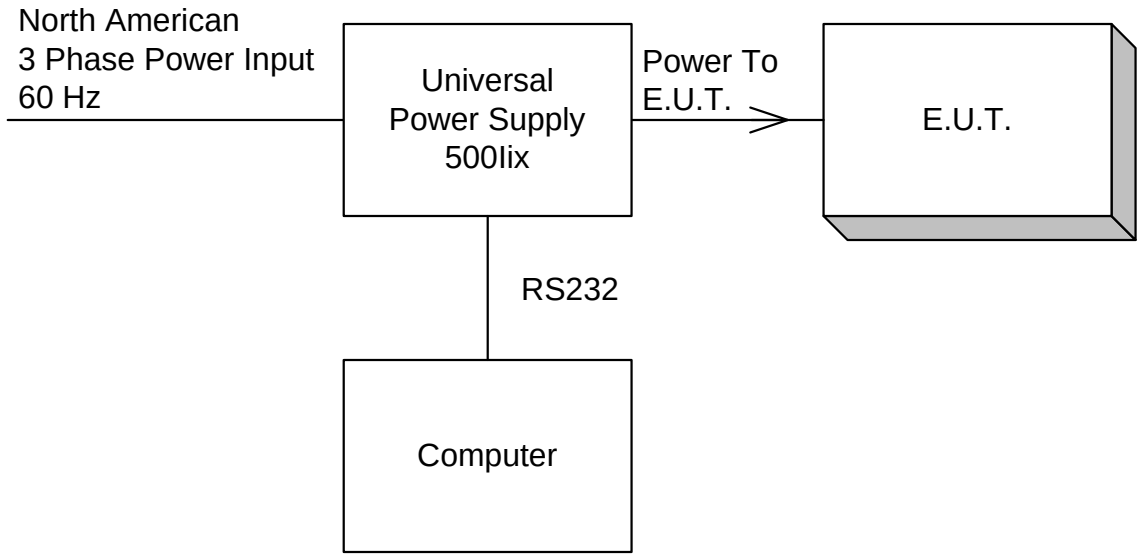
The current meter is used to calibrate the magnetic field

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: 2004.
- The E.U.T. is monitored for normal operation.

Test Configuration – Voltage Dips and Interruptions Tests:

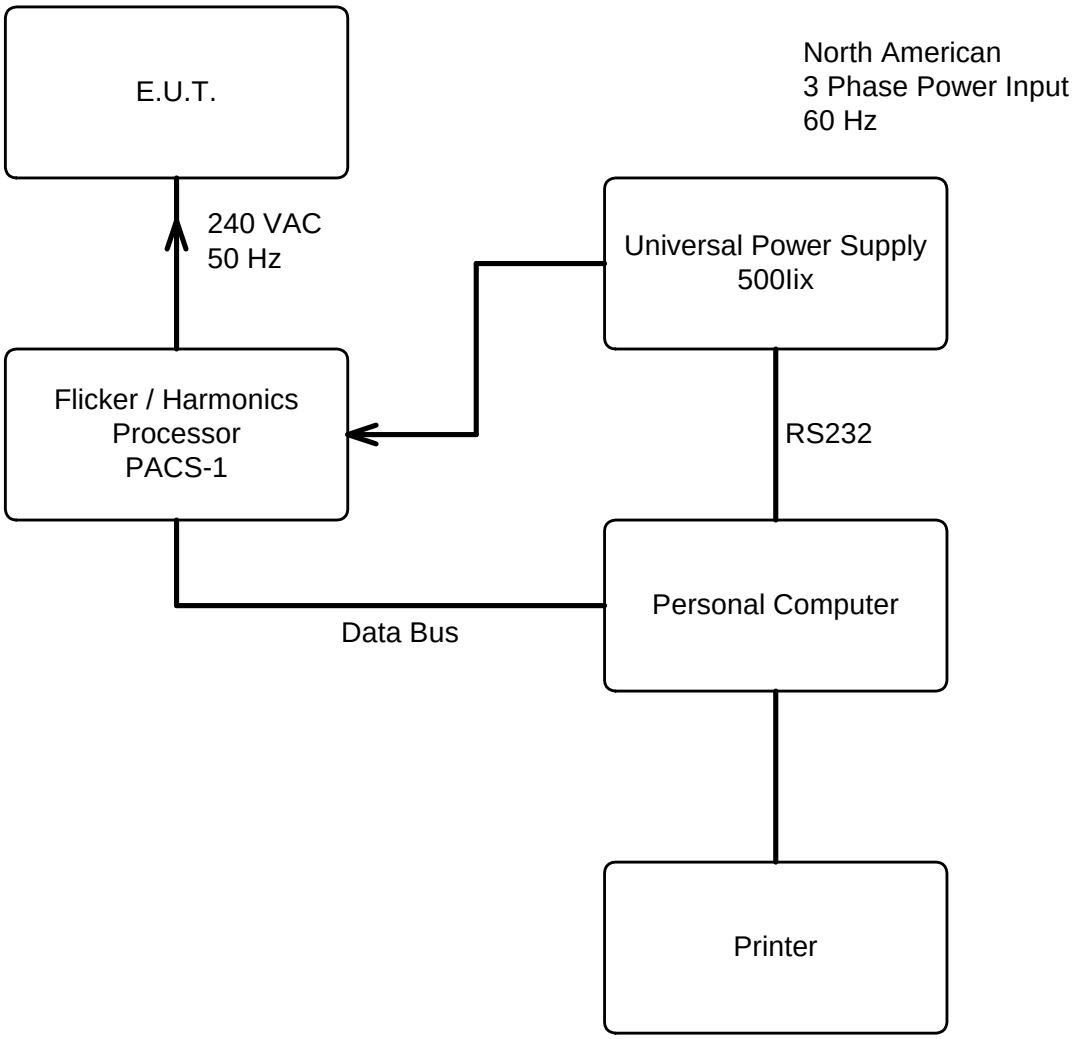


Harmonics

Test Method – Harmonics:

- Applicable Test Method: EN 61000-3-2:2006.
- The E.U.T. is configured as shown in the test configuration diagram.

Test Configuration – Harmonics:

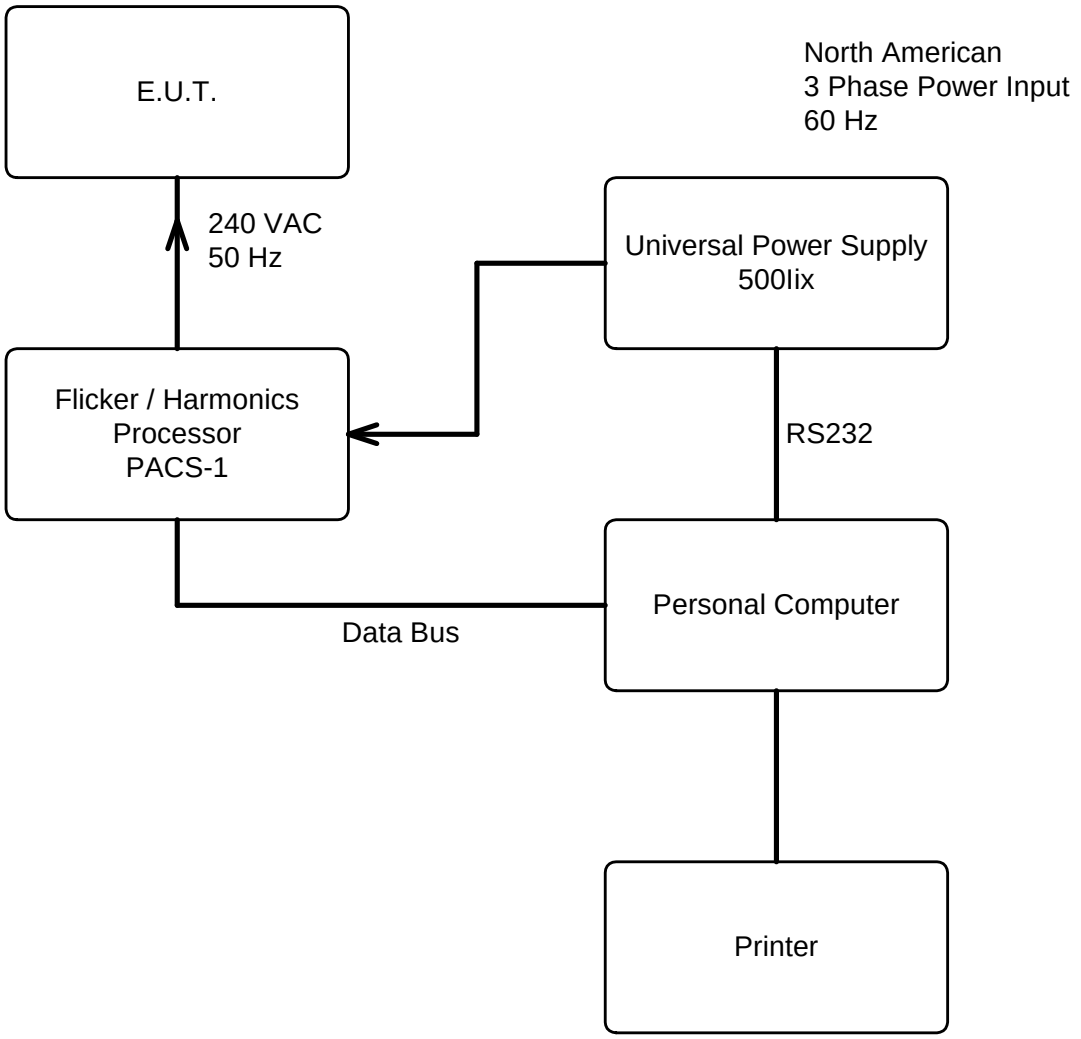


Flicker

Test Method – Flicker

- Applicable Test Method: EN 61000-3-3:2008
- 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.

Performance Criteria A: Normal operation of the EUT is expected.
Please define:
EUT operates normal.
Performance Criteria B: Degradation of product performance is allowed only during the application of the test. No change of stored data is allo
Please define:
EUT operates normal.
Performance Criteria C: Temporary loss of function is allowed as long as the operator can restore proper operation after completion of the tes
Please define:
EUT has interuption in operation reset by the operator.