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Job Number:	1001540401
Project Number:	12ME06094
File Number:	E164178
Revision Date:	2013-01-11
Model:	M87X series

Electromagnetic Compatibility Test Report

For

BITRONICS

Test Report Details

Tests Performed By:		**Underwriters Laboratories Inc.**
		1285 Walt Whitman Rd.
		Melville, NY 11747
Tests Performed For:		**BITRONICS**
		261 BRODHEAD RD **BETHLEHEM, PA 18017**
Applicant Contact:		**ROBERT FISHER**
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Revision Test Report Date:		**2013-01-11**
Product Type:		**Measurement Transducer and Event Monitor (IED)**
Product Standards		**EN61326-1, EN61000-6-4, EN61000-6-2, EN60255-26, EN60255-26**
Model Number:		**M87X series with new H12 Host module**
Sample Serial Number:		**895101**
EUT Category:		**Industrial Control - Heavy Industry, Laboratory Equipment,**
Testing Start Date:		**2012-10-16**
Date Testing Complete:		**2012-12-07**
Overall Results:		**Compliant**

Underwriters Laboratories Inc. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. Underwriters Laboratories Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from Underwriters Laboratories Inc. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the US government.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA websites referenced at the end of this report.

Report Directory

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
None	N/A	N/A	N/A
2013-01-11	Correct typographical errors, correct set up information, add additional set up diagram, identify ESD test location	Joseph Danisi	Mike Antola

1.0 G E N E R A L - Product Description

1.1 Equipment Description

The M87x Multifunction Recording Transducer and Event Monitor is an electric measurement system for substation applications Its primary role is a substation electrical measurement server for substation LANs and corporate WANs.

EMC type testing is performed on a representative model from the M87x product family.
There are various M87x models since the product is modular, offering various chassis and modules. M87x can function as a transducer and/or an event monitor. These transducers are Intelligent Electronic Devices (IEDs), which are multifunctional, intending to address single or dual bus applications, or serve as digital transducers with I/O monitoring. The analog measurements (voltage and current), Digital I/O and Communications availability will depend on the model number and module types. Chassis type and module types can vary. The EMC type testing will be performed using a Model M871 sample with H12 Host module that contains optional Ethernet communications.

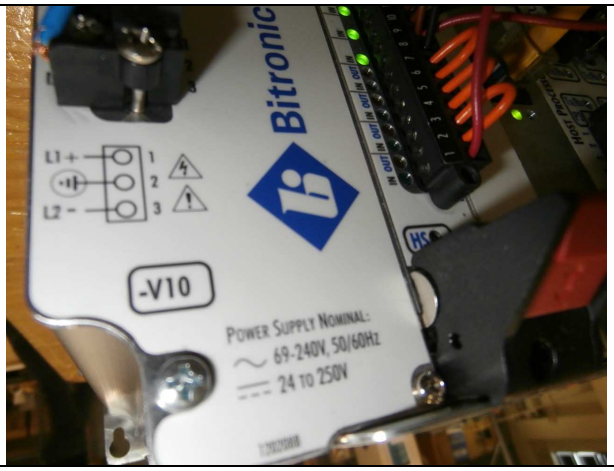
The M871 consists of 12 independent isolated analog inputs – 4 AC current, 6 AC voltage and 2 auxiliary voltage inputs, either AC or DC. The modular chassis design allows various options to be selected such as communications output and other options such as Digital I/O that provides status monitoring and control outputs (relay outputs). The C07A5 chassis size allows up to 3 option cPCI expansion bays. The range of cPCI expansion bays may be extended up to 6 in other chassis sizes, which are available as options.

M871 measurement calculations include RMS current, voltage, power, harmonics, energy and others. These measurements may be communicated via the following communication methods:
UCA 2.0 protocol using MMS Object Explorer through Ethernet; Masters connected to its communications ports, either serial or Ethernet, using Modbus or DNP3.0 protocols; Nodes on a Modbus Plus network connected through a Modbus Plus module.The M871 can be configured to simultaneously support these multiple protocols.

The communication ports on the Host processor consist of the following:
Port P1, an RS232 service port with a DB9 connector using “Zmodem /Display/ Log” protocol.
Ports P2-P4 that support serial RS232/RS485 communications using one of the following protocols:
“Zmodem /Display/Log” protocol, Modbus, DNP3.0, or IRIG-B (time synchronization protocol via satellite).

Each analog input signal is continuously sampled at 128 (or 256) times per cycle. Non-volatile flash memory is used for periodic data logging and event capturing of waveforms as oscillography files which can be exported as Comtrade files and viewed using SubCycleStuf, Wavewin and other comtrade viewers.

1.2 Equipment Marking Plate



1.3 Device Configuration During Test

The Bitronics Ulilities program using the latest Configurator version v3.10 was used to configure the EUT for operation with the various communication ports.

For M871 as the EUT the communication ports were configured as follows: P1 for RS232 service port operation at 9600 baud communication with the test PC; P2 for RS232 at 38.4Kbaud. Ethernet network IP addresses will connect over a 100Mb copper Ethernet connection.

The M871 EUT has been configured for monitoring through a PC laptop computer on the RS232 and ethernet communication links. The communication links were made using the following connection methods: an RS232 serial operation link with the service port P1 connected to PC laptop USB port through an RS232 USB converter. Port P2 configured as RS232 connected to the PC laptop USB Port using an RS232 to USB converter, and the Ethernet connection running at 100Mb. Modbus protocol was used over Ethernet and RS232 links; Zmodem/Display/Log protocol will automatically communicate Zmodem data when queried over the EUT's service port link. The LEDs on the Digital I/O module panel shall be monitored visually during the tests. The digital input status LEDs will be ON (illuminate as green) when the inputs are connected to a 24Vdc source. M871 Relay output LEDs have been configured to be ON (illuminate yellow) when the relays are in the closed state. Relay outputs are Normally Open but must be set to a closed state. The output states are able to be set using the BiView2 software Digital I/O screen. The BiView2 software program v3.03, which has been installed on the desktop of the Test laptop/PC, will be used to monitor the transducer inputs in Modbus during the test. Signal Input voltage readings, Digital I/O states, heartbeat, etc. may be monitored as well.

On M871, the relay outputs are isolated form one another, so the relay outputs were connected in series. Relay outputs 1-4 were hardware configured as closed contacts during the test. This configuration lends itself to monitoring the group for a single relay opening in the series connection of relay contacts, so that if any one relay opens it is detected as a change in output state for the entire group.

Device Configuration During Test Continued

The M871 Ethernet port has been configured to operate using Modbus protocol; and communicate while connected with the laptop over a local network interconnection. The Signal Input amplitude can be viewed in the BiView2 v3.03 Instantaneous screen running Modbus over Ethernet; the Digital I/O states can be viewed from the Digital Input/Output screen in BiView using Zmodem over serial connection (P1 if Hyper terminal is not connected, or P2); The BiView2 v3.03 software screen labeled Digital Input/Output will be used to visually monitor the Digital I/O status and toggle outputs in order to verify the relay outputs are operational. Using BiView2 software the output state of the relay contacts will need to be periodically changed to verify operation of the relays.

1.3.1 Supporting Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	IED Meter	BITRONICS	M87X	Host module installed in EUT:CPCI-H12M512E1, Host Processor Assy w/256M CF, with Ethernet option 10/100UTP (PHY, internal to CPU chip)
EUT	IED Meter	BITRONICS	M87X	Host module to install as 2nd Host module for testing EUT with Ethernet E3 Option: CPCI-H12M512E3, Host ProcessorAssy w/256M CF, with Ethernet option 10/100UTP & 100F (PHY, external to CPU chip, with separate 25MHz crystal)
AE	Laptop	Lenovo	T60	None
AE	USB to RS232 DB9 adapter	Keyspan	USA-19HS	Provided by Applicant
AE	USB to Ethernet adapter	StarTech	USB21000S	Provided by Applicant
AE	Power supply	Power Designs Inc.	6050A	None
Note: The Host module with E3 Ethernet option was only tested for Radiated Emissions **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)				

1.3.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
1	Mains	AC	NO	NO	None
2	S11 (Aux Power)	AC	NO	NO	8 assigned terminals (Bus1 VT & Bus2 VT) and 2 Vaux terminals on terminal block for voltage and 8 terminal studs for current connection (Bus 1 CT).
3	Ethernet	I/O	YES	NO	RJ45 Copper 10/100 Mbps Option E1 Module H12.
4	Ethernet	I/O	YES	NO	RJ45 Copper fiber 10 Mbps Option E3 Module H12.
5	Digital I/O (P30)	I/O	YES	NO	16 position terminal block 8 input channels (inputs 1 thru 4 shared with outputs 1 thru 4) Relay Outputs: 4 output channels (shared with inputs 1 thru 4).
6	Port P1 Serial (RS232)	I/O	YES	YES	RS232/Display/service Port P1 configured for RS232 service port
7	Port P2 (Terminal)	I/O	YES	YES	RS232/RS485 Port (3 ports, P2- P4, of same design.) configured
8	S11	I/O	YES	NO	8 terminal studs for current connection (Bus 1 CT).

Note:
AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

1.3.3 EUT Internal Operating Frequencies:

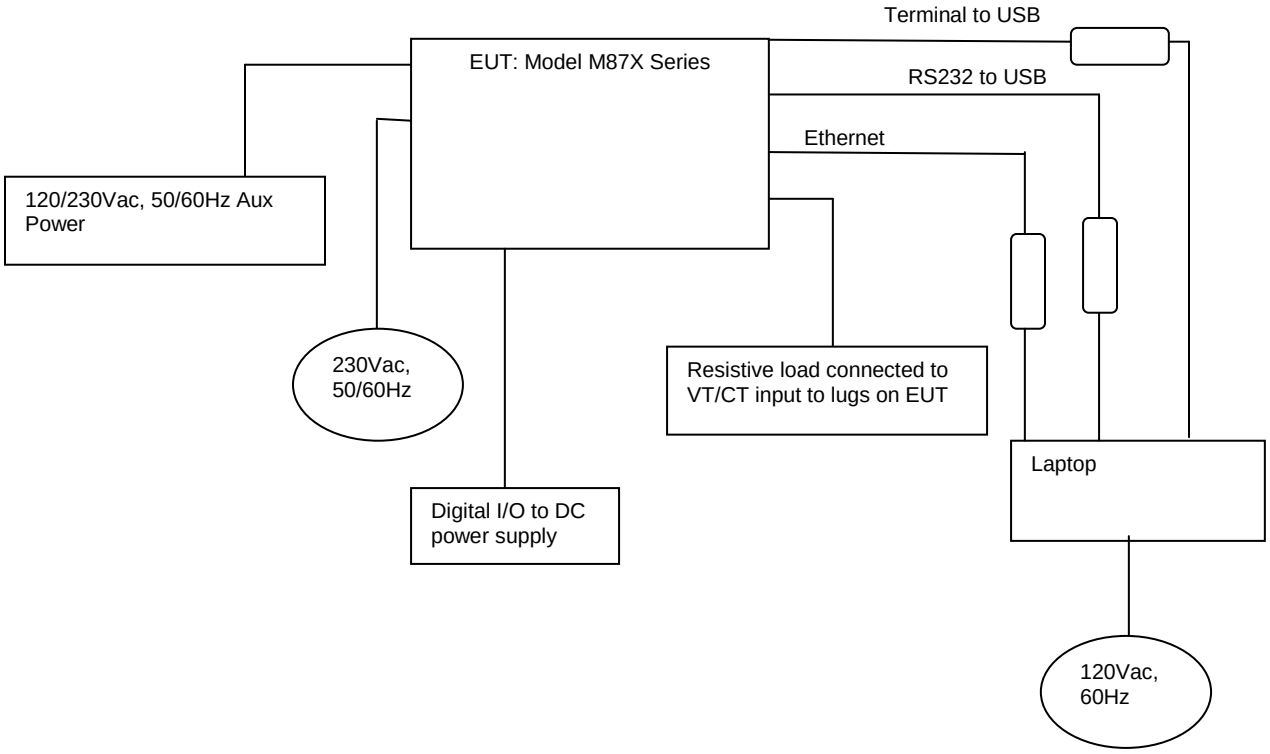
Frequency (MHz)	Description
0.032768	Crystal
14.318	Crystal
33.3	PCI Bus
25	Oscillator
125	100 MBps (Ethernet)
200	Memory
600	Processor

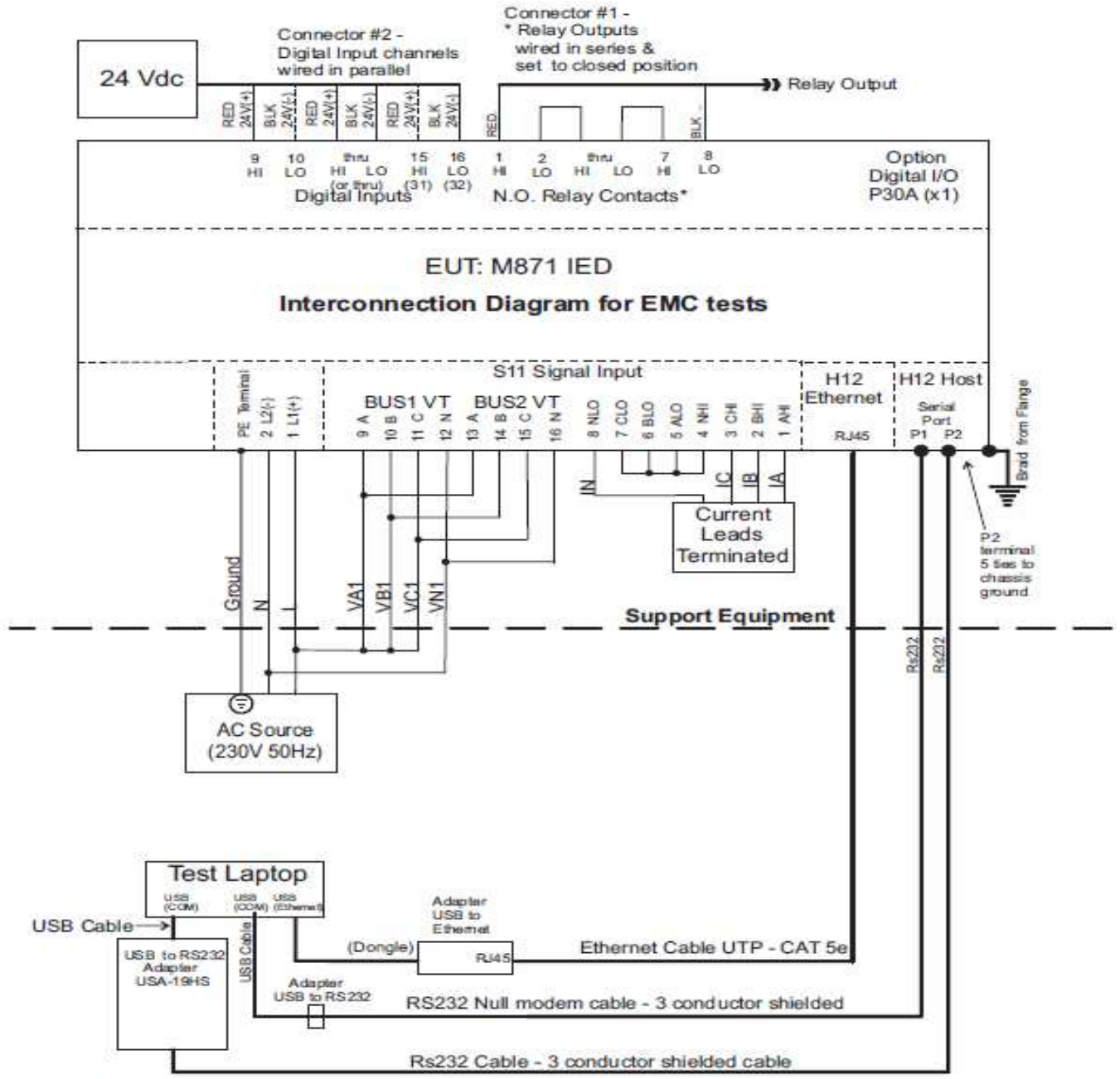
1.3.4 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	69-240Vac	-	-	50/60Hz	Single Phase	None
1	230Vac	-	-	50Hz	Single Phase	None
2	120/230VAC			60/50Hz	Single Phase	Auxiliary power

1.4 Block Diagram:

The diagram below illustrates the configuration of the equipment above.





Revision History:
Rev 0: RWF 8/22/2012, Interconnect Proposed.
Rev 1: RWF 9/10/2012, Included USB Adapters and USB Hub
Rev 2: RWF 10/3/2012, P2 was RS485 (2 conductor) to RS232 (3 conductor). Terminal 16 corrected to 5. Adapter for P2 was USOLT4 optically isolated. Ethernet cable was STP. Relay was N.C.
Rev 3: RWF: 11/2/2012, Removed USB hub & ferrite Fair-rite 0461164181@ P2

Support_Eq_M871Layout_121102.cdr Rev 3
2-Nov-2012, R. Fisher

1.5 EUT Configurations

Mode #	Description
1	The manufacturer BITRONICS configured the equipment under test for normal operation on display reading voltages with serial port also see section 1.3. E1 Module
2	The manufacturer BITRONICS configured the equipment under test for normal operation on display reading voltages with serial port also see section 1.3. E3 Module

1.6 EUT Operation Modes

Mode #	Description
1	Virtual Display reading voltage

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

Immunity to 1MHz Burst Disturbances: EN60255-22-1 and IEC61000-4-16 on Input/output ports was not requested by applicant

2.2 Device Modifications Necessary for Compliance

None

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
EN61000-6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments A1: 2011	2010
EN61000-6-2	Electromagnetic compatibility (EMC) Part 6-2: Generic standards – Immunity for industrial environments - IEC 61000-6-2: 2005	2005
EN61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements	2006
EN60255-25	Electrical relays – Part 25: Electromagnetic emission tests for measuring relays and protection equipment	2001
EN60255-26	Measuring relays and protection equipment - Part 26: Electromagnetic compatibility requirements	2009

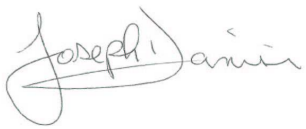
2.4 Results Summary

This product is considered Class A

Requirement – Test	Result (Compliant / Non-Compliant)*
Conducted Emissions - Mains	Compliant
Conducted Emissions - Telecommuncations Ports	Compliant
Conducted Immunity	Compliant
EFT	Compliant
ESD	Compliant
Flicker	Compliant
Harmonics	Compliant
Power Frequency Magnetic Fields	Compliant
Radiated Emissions	Compliant
Radiated Immunity	Compliant
Surge Immunity	Compliant
Voltage Dips and Interruptions	Compliant

Note: The immunity requirements for equipment intended for use in industrial control per table 2 in accordance with IEC 61326-1 are met.

Test Engineer:



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Conformity Assessment Services-

Reviewer:

Mike Antola(Ext.23053)
WiSE Project Lead
International EMC Services
Conformity Assessment Services

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3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to the following regulations:

---------- International ----------

EMC Directive:	EMC - 2004/108/EC (OJ L 390 of 2004-12-31)

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, ℃	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150

Measurement Uncertainty

Test	Uncertainty
Conducted Emissions	± 3.3, K=2
Radiated Emissions 30-200 MHz, Horizontal	± 3.1, K=2
Radiated Emissions 30-200MHz, Vertical	± 3.2, K=2
Radiated Emissions, 200-1000MHz, Horizontal	± 3.3, K=2
Radiated Emissions, 200-1000MHz, Vertical	± 4.0, K=2

Sample Calculations

Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)
Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)
Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.1 Test Conditions and Results – MAINS TERMINAL – CONDUCTED EMISSIONS

Test Description	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.		
Basic Standard		CISPR11/EN61000-6-4	
UL LPG		80-EM-S0026	
		Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range		150kHz to 30MHz	Mains
Limits - Class A			
Frequency (MHz)	Limit (dBµV)		
	Quasi-Peak	Average	
0.15-0.5	79	66	
0.5-30	73	60	
Supplementary information: None			

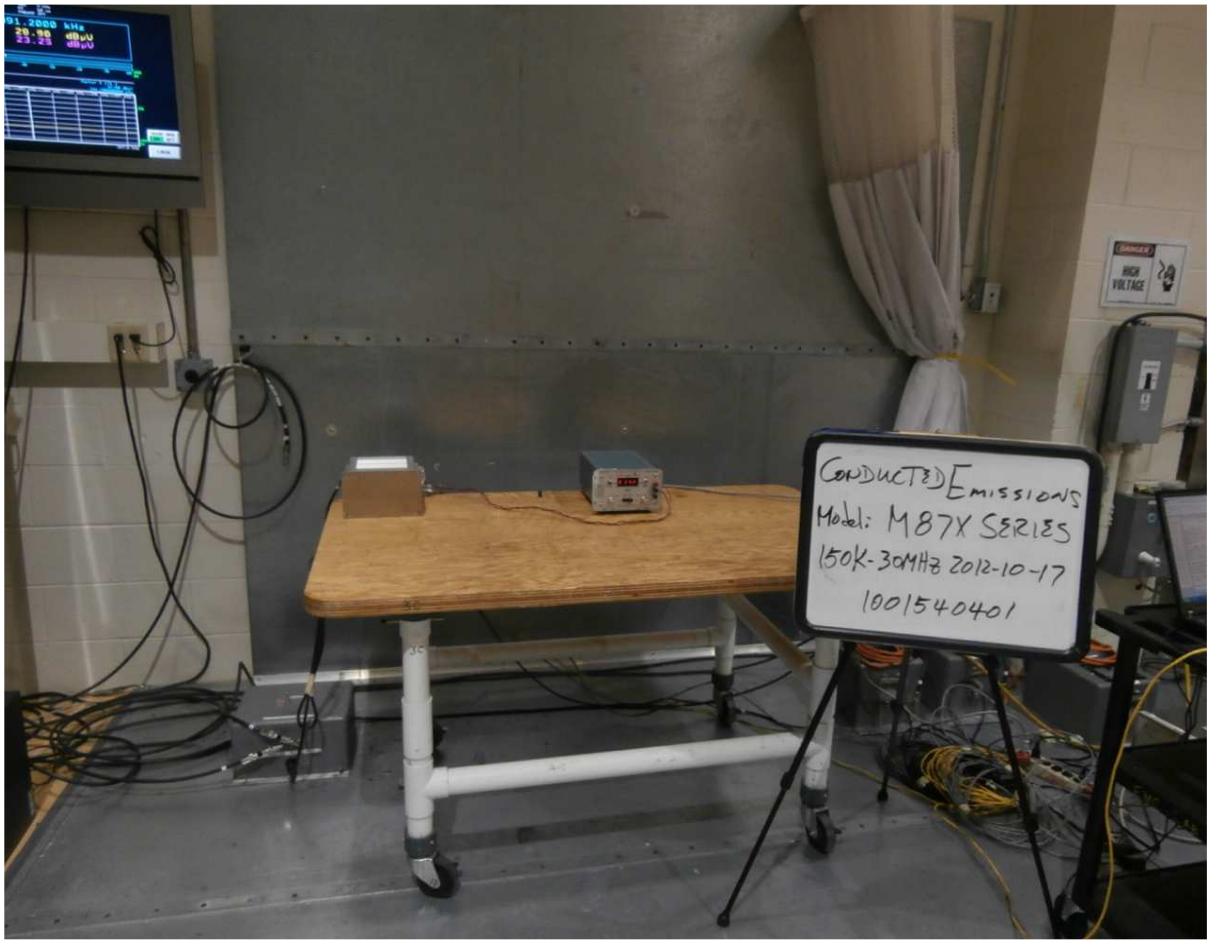
Table 1 Conducted Emissions EUT Configuration Settings

Power Interface Model	EUT Configurations Model	EUT Operation Model
1 & 2	1	1
Supplementary information: None		

Table 2 Conducted Emissions Test Equipment

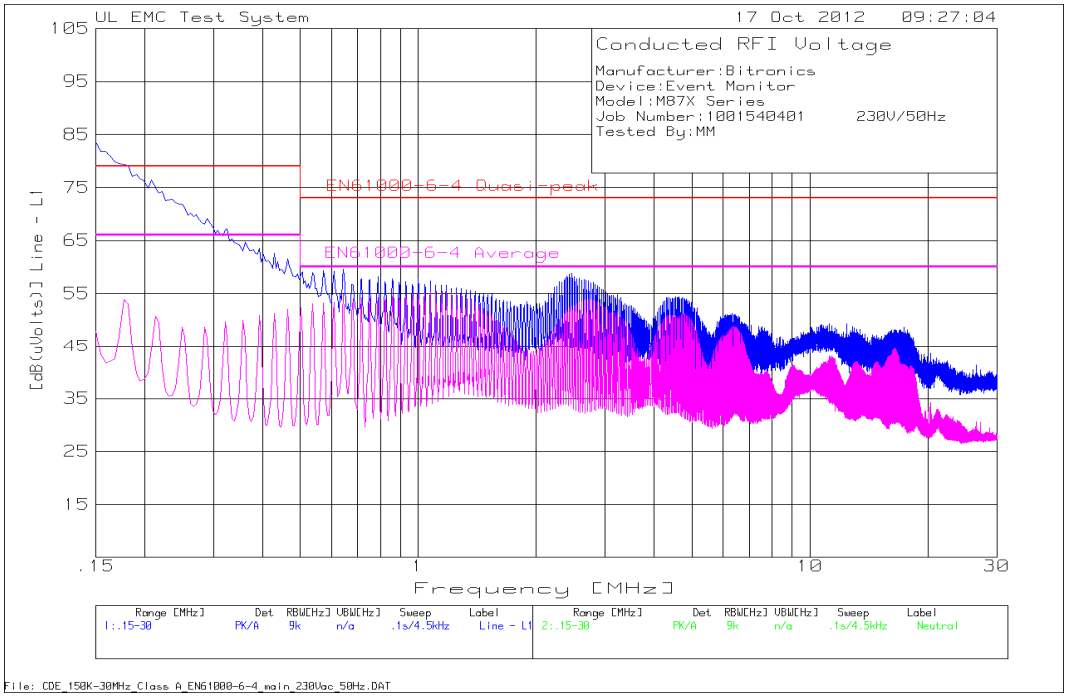
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Due Date
Conducted Emissions – GP 1					
EMI Receiver	Rohde & Schwarz	ESC17	75141	2012-01-06	2013-01-31
LISN	EMCO	3825/2R	ME5-790	N/A	N/A
LISN	Solar	9252-50-R-24-BNC	ME5A-636	2012-02-01	2013-02-28
Switch Driver	HP	11713A	44397	N/A	N/A
RF Switch Box	UL	4	44404	N/A	N/A
Measurement Software	UL	Version 9.5	44736	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734	2012-03-13	2014-03-13
Multimeter	Fluke	83III	ME5B-305	2012-02-01	2013-02-28

Figure 1 Test Setup for Conducted Emissions



Mains

Figure 2 Conducted Emissions Graph



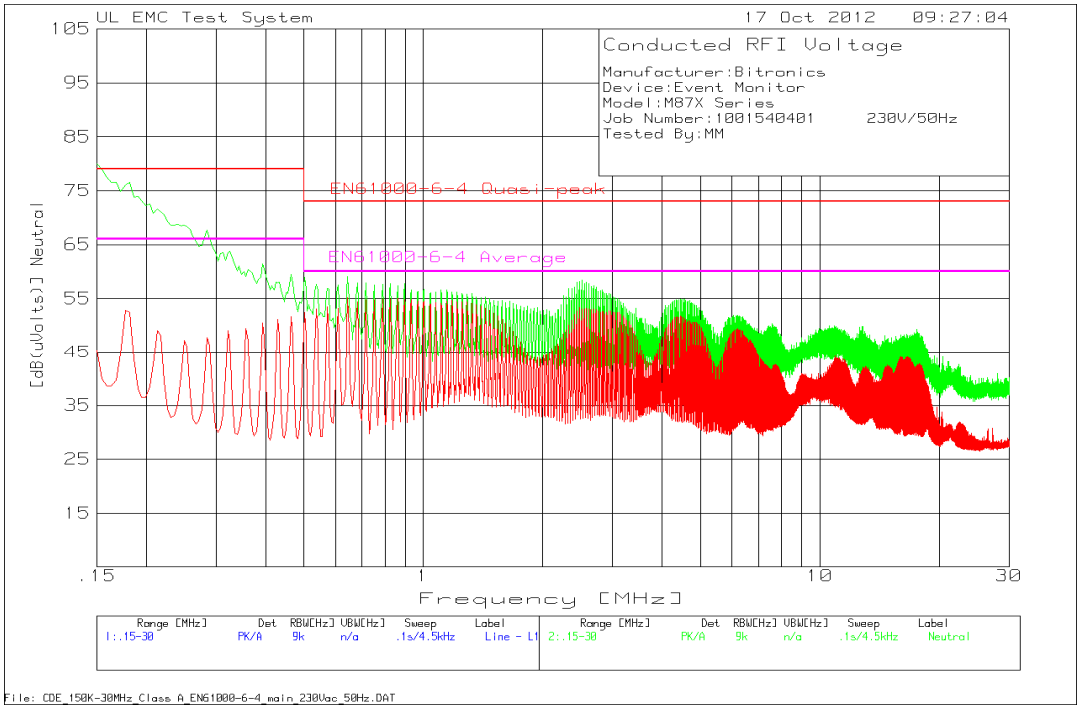


Table 3 Conducted Emissions Data Points

Manufacturer: Bitronics
Device: Event Monitor
Model: M87X Series
Job Number: 1001540401 230V/50Hz
Tested By: MM

Line - L1 .15 - 30MHz

Test Frequency	Meter Reading	Detector	LISN 5A636 Line 1 Cab L1 SW TL [dB]	20 dB Pad [dB]	[dB(uVolts)]	EN61000-6-4 Quasi-peak	Margin	EN61000-6-4 Average	Margin
0.15	53.52	PK	10.1	20	83.62	79	4.62	66	17.62
0.15	17.69	Av	10.1	20	47.79	79	-31.21	66	-18.21
0.1815	49.08	PK	10.1	20	79.18	79	0.18	66	13.18
0.1815	22.93	Av	10.1	20	53.03	79	-25.97	66	-12.97
0.213	44.88	PK	10.1	20	74.98	79	-4.02	66	8.98
0.213	20.62	Av	10.1	20	50.72	79	-28.28	66	-15.28
0.249	41.7	PK	10.1	20	71.8	79	-7.2	66	5.8
0.249	18.5	Av	10.1	20	48.6	79	-30.4	66	-17.4
0.2895	39.06	PK	10	20	69.06	79	-9.94	66	3.06
0.2895	16.55	Av	10	20	46.55	79	-32.45	66	-19.45
0.3255	37.14	PK	10	20	67.14	79	-11.86	66	1.14
0.3255	16.65	Av	10	20	46.65	79	-32.35	66	-19.35
0.3615	34.74	PK	10	20	64.74	79	-14.26	66	-1.26
0.3615	16.61	Av	10	20	46.61	79	-32.39	66	-19.39

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector

Manufacturer: Bitronics
Device: Event Monitor
Model: M87X Series
Job Number: 1001540401 230V/50Hz
Tested By: MM

Neutral .15 - 30MHz

Test Frequency	Meter Reading	Detector	LISN 5A636 Line 2 CabL4Neut SW [dB]	20 dB Pad [dB]	[dB(uVolts)]	EN61000-6-4 Quasi-peak	Margin	EN61000-6-4 Average	Margin
0.15	49.89	PK	10.1	20	79.99	79	0.99	66	13.99
0.15	15.31	Av	10.1	20	45.41	79	-33.59	66	-20.59
0.1815	46.5	PK	10.1	20	76.6	79	-2.4	66	10.6
0.1815	22.33	Av	10.1	20	52.43	79	-26.57	66	-13.57
0.2175	41.03	PK	10.1	20	71.13	79	-7.87	66	5.13
0.2175	18.04	Av	10.1	20	48.14	79	-30.86	66	-17.86
0.249	38.5	PK	10.1	20	68.6	79	-10.4	66	2.6
0.249	17.07	Av	10.1	20	47.17	79	-31.83	66	-18.83
0.285	37.66	PK	10	20	67.66	79	-11.34	66	1.66
0.285	17.78	Av	10	20	47.78	79	-31.22	66	-18.22
0.3255	33.82	PK	10	20	63.82	79	-15.18	66	-2.18
0.3255	16.89	Av	10	20	46.89	79	-32.11	66	-19.11
0.393	31.26	PK	10.1	20	61.36	79	-17.64	66	-4.64
0.393	20.32	Av	10.1	20	50.42	79	-28.58	66	-15.58

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector

Manufacturer: Bitronics
Device: Event Monitor
Model: M87X Series
Job Number:1001540401 230V/50Hz
Tested By: MM

Line - L1 .15 - 30MHz

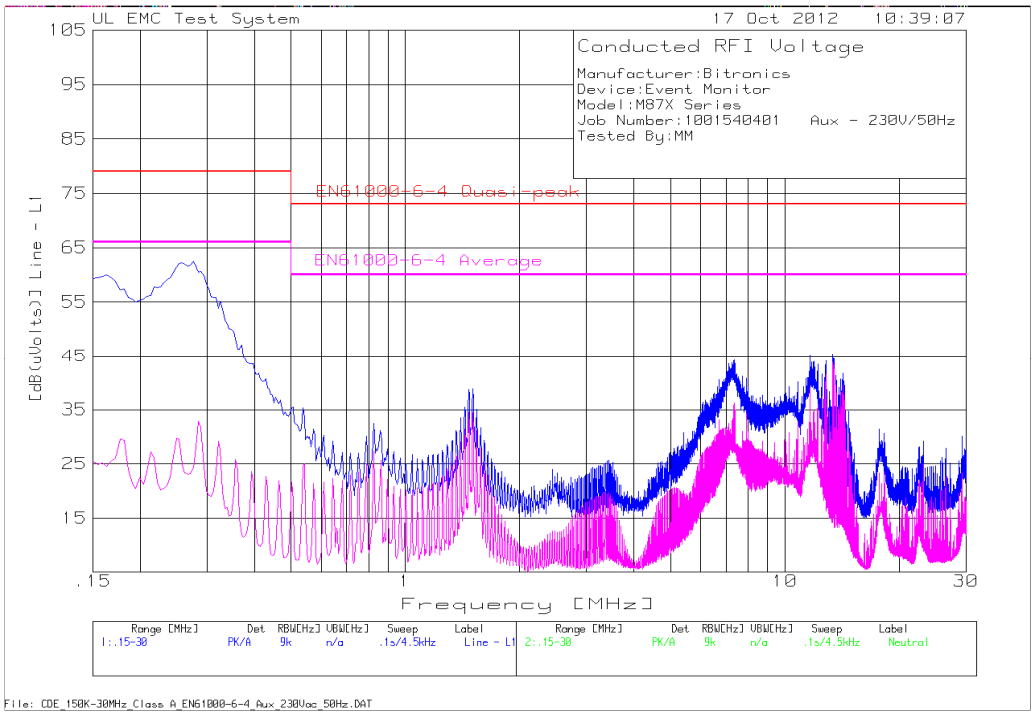
Test Frequency	Meter Reading	Detector	LISN 5A636 Line 1 Cab L1 SW TL [dB]	20 dB Pad [dB]	[dB(uVolts)]	EN61000-6-4 Quasi-peak	Margin	EN61000-6-4 Average	Margin
0.1518	42.42	QP	10.1	20	72.52	79	-6.48	66	6.52
0.15	42.62	QP	10.1	20	72.72	79	-6.28	66	6.72
0.1788	40.67	QP	10.1	20	70.77	79	-8.23	66	4.77
0.2157	35.93	QP	10.1	20	66.03	79	-12.97	66	0.03
0.2499	32.48	QP	10.1	20	62.58	79	-16.42	66	-3.42
0.285	29.54	QP	10	20	59.54	79	-19.46	66	-6.46
0.3246	26.95	QP	10	20	56.95	79	-22.05	66	-9.05
0.3588	25.72	QP	10	20	55.72	79	-23.28	66	-10.28

Neutral .15 - 30MHz

Test Frequency	Meter Reading	Detector	LISN 5A636 Line 2 CabL4Neut SW [dB]	20 dB Pad [dB]	[dB(uVolts)]	EN61000-6-4 Quasi-peak	Margin	EN61000-6-4 Average	Margin
0.1518	42.46	QP	10.1	20	72.56	79	-6.44	66	6.56
0.15	42.94	QP	10.1	20	73.04	79	-5.96	66	7.04
0.1797	40.5	QP	10.1	20	70.6	79	-8.4	66	4.6
0.2175	35.58	QP	10.1	20	65.68	79	-13.32	66	-0.32
0.2481	32.27	QP	10.1	20	62.37	79	-16.63	66	-3.63
0.2823	29.34	QP	10	20	59.34	79	-19.66	66	-6.66
0.321	27.63	QP	10	20	57.63	79	-21.37	66	-8.37
0.3912	23.44	QP	10.1	20	53.54	79	-25.46	66	-12.46

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector

Figure 3 Conducted Emissions Graph



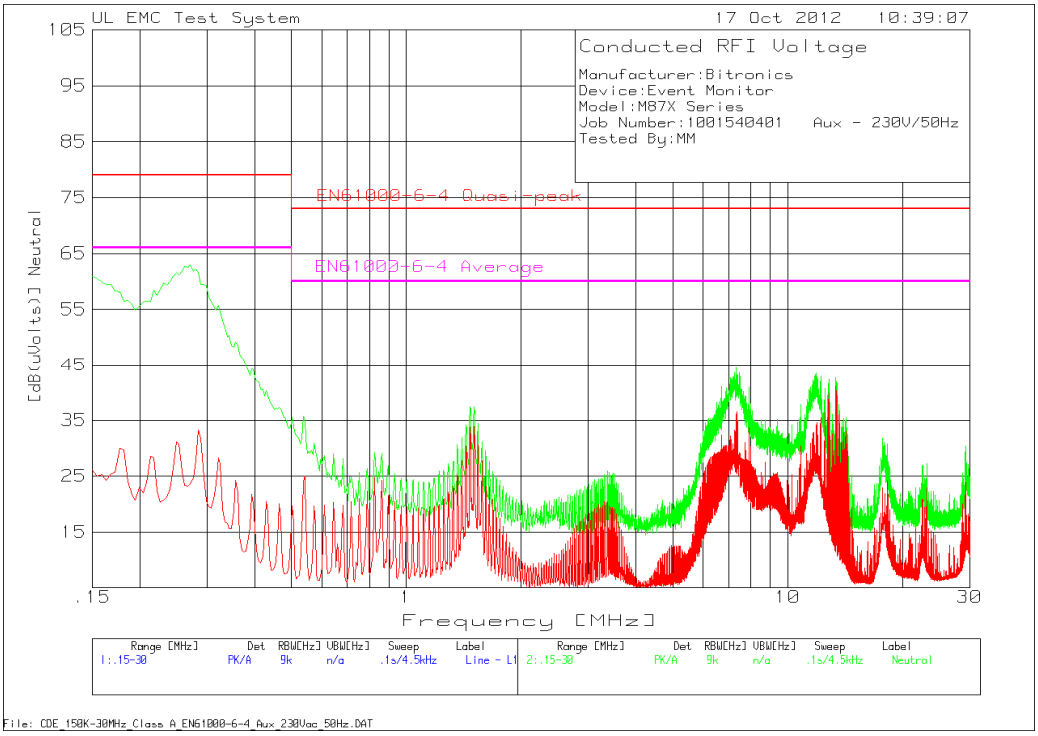


Table 4 Conducted Emissions Data Points

Manufacturer: Bitronics
Device: Event Monitor
Model:M87X Series
Job Number:1001540401 Aux - 230V/50Hz
Tested By: MM

Line - L1 .15 - 30MHz

Test Frequency	Meter Reading	Detector	LISN 5A636 Line 1 Cab L1 SW TL [dB]	[dB(uVolts)]	EN61000-6-4 Quasi-peak	Margin	EN61000-6-4 Average	Margin
0.1635	49.94	PK	10.1	60.04	79	-18.96	66	-5.96
0.1635	14.35	Av	10.1	24.45	79	-54.55	66	-41.55
0.276	52.5	PK	10	62.5	79	-16.5	66	-3.5
0.276	14.21	Av	10	24.21	79	-54.79	66	-41.79
0.384	33.59	PK	10.1	43.69	79	-35.31	66	-22.31
0.384	2.73	Av	10.1	12.83	79	-66.17	66	-53.17
0.825	22.4	PK	10.1	32.5	73	-40.5	60	-27.5
0.825	17.21	Av	10.1	27.31	73	-45.69	60	-32.69
1.5045	28.81	PK	10.1	38.91	73	-34.09	60	-21.09
1.5045	24.37	Av	10.1	34.47	73	-38.53	60	-25.53
7.404	31.44	PK	10.4	41.84	73	-31.16	60	-18.16
7.404	19.5	Av	10.4	29.9	73	-43.1	60	-30.1
13.4205	33.8	PK	10.9	44.7	73	-28.3	60	-15.3
13.4205	32.34	Av	10.9	43.24	73	-29.76	60	-16.76

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Manufacturer: Bitronics
Device: Event Monitor
Model:M87X Series
Job Number:1001540401 Aux - 230V/50Hz
Tested By: MM

Neutral .15 - 30MHz

Test Frequency	Meter Reading	Detector	LISN 5A636 Line 2 CabL4Neut SW [dB]	[dB(uVolts)]	EN61000-6-4 Quasi-peak	Margin	EN61000-6-4 Average	Margin
0.15	50.85	PK	10.1	60.95	79	-18.05	66	-5.05
0.15	15.93	Av	10.1	26.03	79	-52.97	66	-39.97
0.2715	53.04	PK	10	63.04	79	-15.96	66	-2.96
0.2715	13.65	Av	10	23.65	79	-55.35	66	-42.35
0.321	45.63	PK	10	55.63	79	-23.37	66	-10.37
0.321	18.34	Av	10	28.34	79	-50.66	66	-37.66
0.537	25.62	PK	10.1	35.72	73	-37.28	60	-24.28
0.537	13.93	Av	10.1	24.03	73	-48.97	60	-35.97
1.5045	27.37	PK	10.1	37.47	73	-35.53	60	-22.53
1.5045	23.77	Av	10.1	33.87	73	-39.13	60	-26.13
7.314	34.03	PK	10.4	44.43	73	-28.57	60	-15.57
7.314	25.73	Av	10.4	36.13	73	-36.87	60	-23.87
11.769	32.1	PK	10.8	42.9	73	-30.1	60	-17.1
11.769	19.65	Av	10.8	30.45	73	-42.55	60	-29.55

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

4.2 Test Conditions and Results – COMMON MODE (ASYMMETRIC MODE) DISTURBANCE AT TELECOMMUNICATION PORTS

Method	Measurements were made on a ground plane. All power was connected to the system through Artificial Mains Network (AMN). All tested telecommunications lines were connected to an Impedance Stabilization Network (ISN) and conducted voltage measurements on telecommunications lines were made at the output of the ISN. Where an ISN was not appropriate or available measurements were made using a Capacitive Voltage Probe and Current probe.

Basic Standard	CISPR22/EN61000-6-4	
UL LPG	80-EM-S0026	
	Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range	150kHz to 30MHz	Telecom

Limits - Class A

Frequency (MHz)	Voltage Limits (dBµV)		Current Limits (dBµA)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15 to 0.50	97 to 87	84 to 74	53 to 43	40 to 30
0.50 to 30	87	74	43	30

Supplementary information: Ethernet cable

Table 5 Conducted Emissions - Telecommunications Ports EUT Configuration Settings

Power Interface Mode	EUT Configurations Mode	EUT Operation Mode
1	1	1

Supplementary information: Ethernet cable

Table 6 Conducted Emissions - Telecommunications Ports Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Due Date
Conducted Emissions – GP 1					
EMI Receiver	Rohde & Schwarz	ESC17	75141	21012-01-06	2013-06-31
LISN	EMCO	3825/2R	ME5-790	N/A	N/A
LISN	Solar	9252-50-R-24-BNC	ME5A-636	2012-02-01	2013-02-28
Switch Driver	HP	11713A	44397	N/A	N/A
RF Switch Box	UL	4	44404	N/A	N/A
Measurement Software	UL	Version 9.5	44736	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734	2012-03-13	2013-03-13
Test Equipment Used					
Description	Manufacturer	Model	Identifier		
Conducted Emissions – Misc.					
ISN	Teseq	ISN T8	65703	2102-02-04	2013-02-28
Multimeter	Fluke	83III	ME5B-305	2012-02-01	2013-02-28

Figure 4 Test Setup of Telecommunications Port Conducted Emissions

Figure 5 Telecommunications Port Conducted Emissions Graph

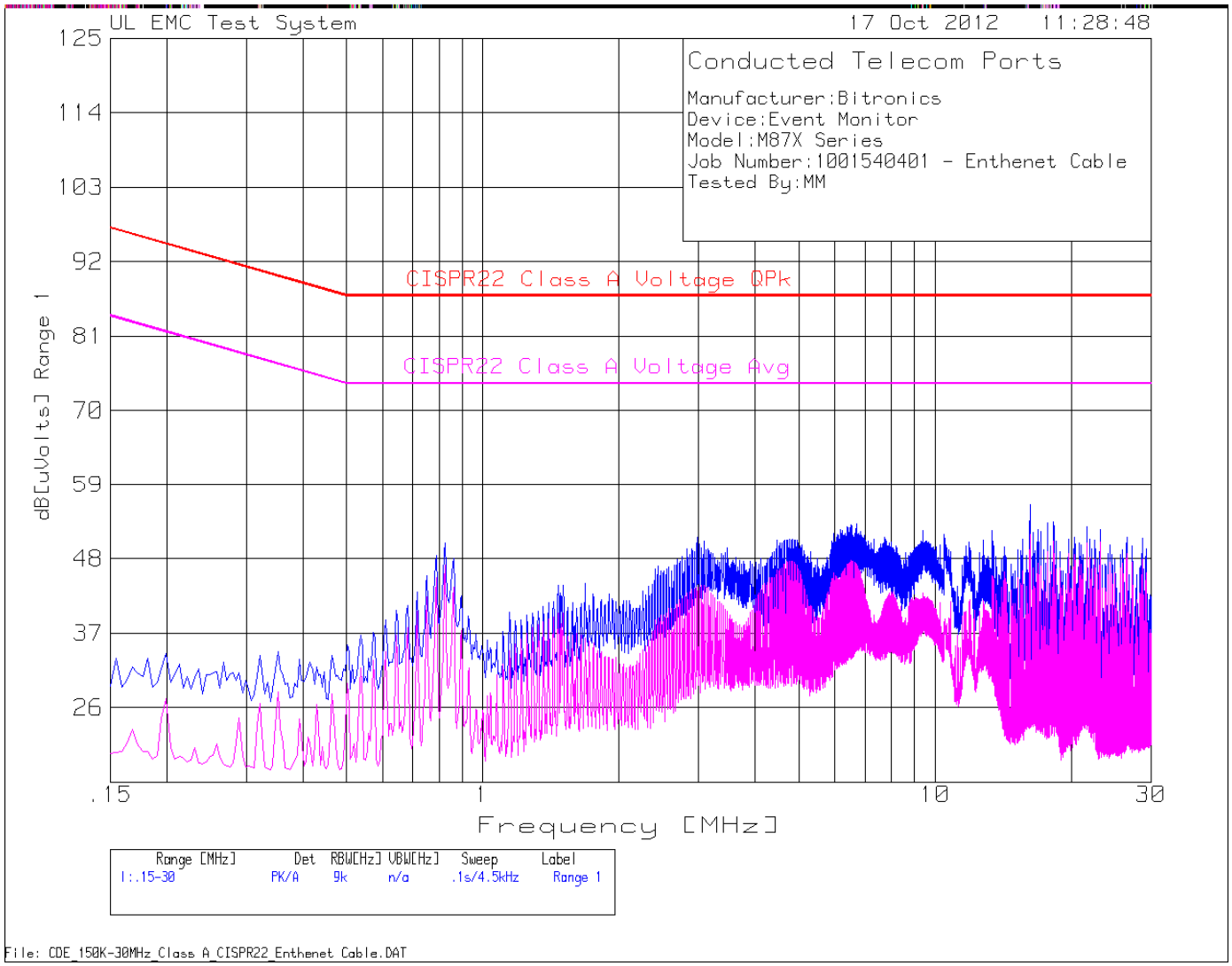


Table 7 Telecommunications Port Conducted Emissions Data Points

Manufacturer: Bitronics
Device: Event Monitor
Model:M87X Series
Job Number:1001540401 - Ethernet Cable
Tested By: MM

Range 1 .15 - 30MHz

Test Frequency	Meter Reading	Detector	ISN T800 48209 use Cable 2 [dB]	Cable L2 Probes Isn Due 2013 [dB]	dB[uVolts]	CISPR22 Class A Voltage QPk	Margin	CISPR22 Class A Voltage Avg	Margin
0.825	29.07	PK	11	10.3	50.37	87	-36.63	74	-23.63
0.825	25.83	Av	11	10.3	47.13	87	-39.87	74	-26.87
1.5045	22.85	PK	10.9	10.4	44.15	87	-42.85	74	-29.85
1.5045	18.68	Av	10.9	10.4	39.98	87	-47.02	74	-34.02
2.976	30.05	PK	10.8	10.4	51.25	87	-35.75	74	-22.75
2.976	21.76	Av	10.8	10.4	42.96	87	-44.04	74	-31.04
4.8345	29.81	PK	10.7	10.4	50.91	87	-36.09	74	-23.09
4.8345	26.49	Av	10.7	10.4	47.59	87	-39.41	74	-26.41
6.6255	30.72	PK	10.6	10.4	51.72	87	-35.28	74	-22.28
6.6255	26.56	Av	10.6	10.4	47.56	87	-39.44	74	-26.44
16.2285	34.48	PK	11.2	10.4	56.08	87	-30.92	74	-17.92
16.2285	30.02	Av	11.2	10.4	51.62	87	-35.38	74	-22.38

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

4.2 Test Conditions and Results – RADIATED EMISSIONS

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.		
Basic Standard	CISPR11/EN61000-6-4		
UL LPG	80-EM-S0029		
	Frequency range	Measurement Point	
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	(10 meter measurement distance)	
Limits - Class A			
Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Average	
30-230	40	NA	
230-1000	47	NA	
Supplementary information: None			

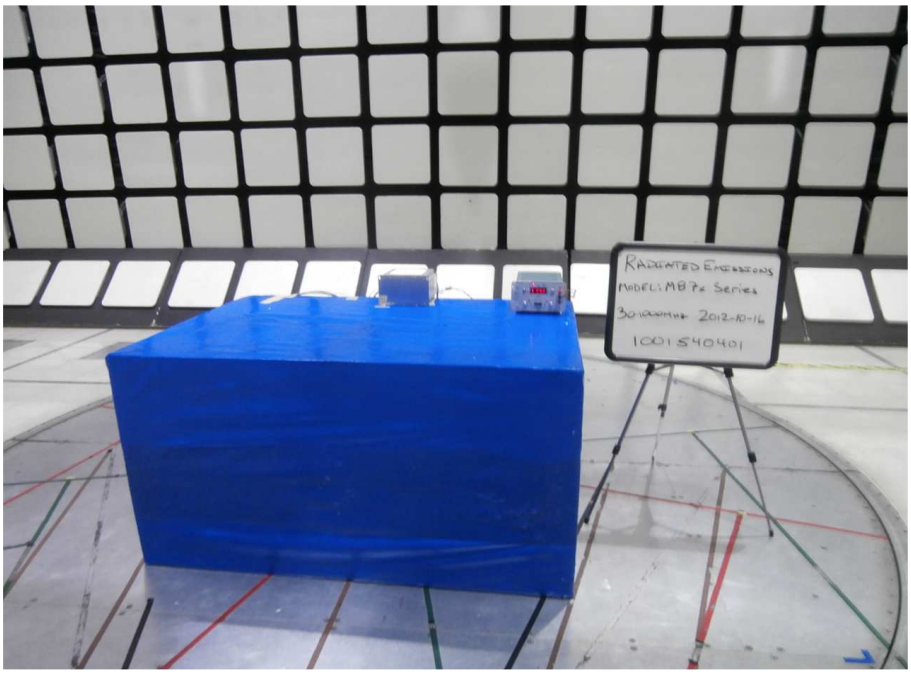
Table 8 Radiated Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1 & 2	1
Supplementary information: None		

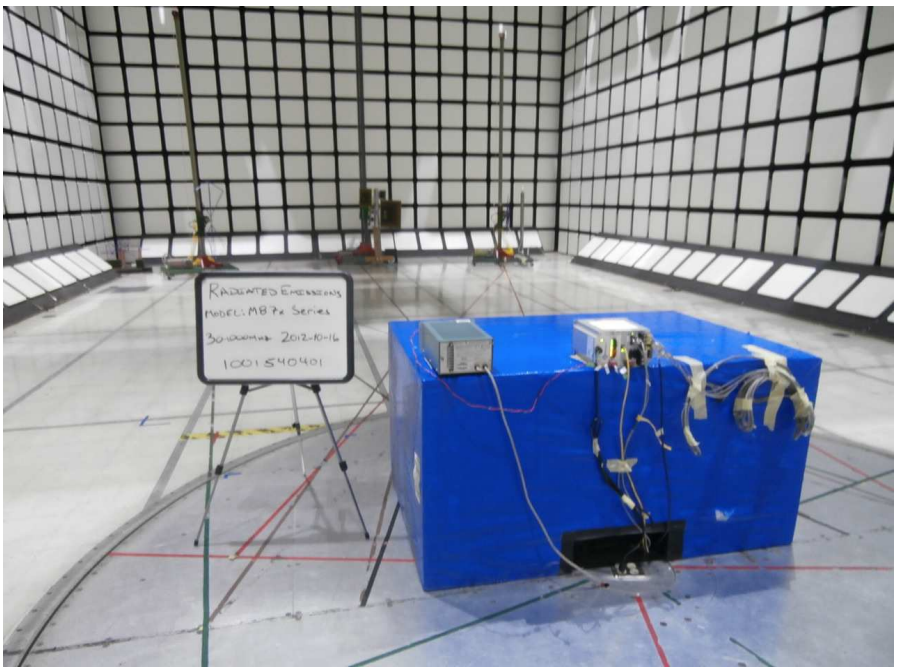
Table 9 Radiated Emissions Test Equipment

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Due Date
30-1000MHz					
EMI Receiver	Rohde & Schwarz	ESIB40	34968	2012-01-30	2013-01-30
Log-P Antenna	Schaffner	UPA6109	44068	2012-04-10	2013-04-10
Bicon Antenna	Schaffner	VBA6106	43441	2011-10-11	2012-10-31
Bias Tee	Miteq	AM-1523-7687	44392	N/A	N/A
Bias Tee	Miteq	AM-1523-7687	44393	N/A	N/A
Preamp	Miteq	AM-3A-000110-7687	44391	N/A	N/A
Preamp	Miteq	AM-3A-000110-7687	44394	N/A	N/A
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol Sciences	SC99V	44396	N/A	N/A
Camera Controller	Panasonic	WV-CU254	44395	N/A	N/A
RF Switch Box	UL	1	44398	N/A	N/A
Measurement Software	UL	Version 9.5	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	83III	ME5B-305	2012-02-01	2013-02-28

Figure 6 Test setup for Radiated Emissions

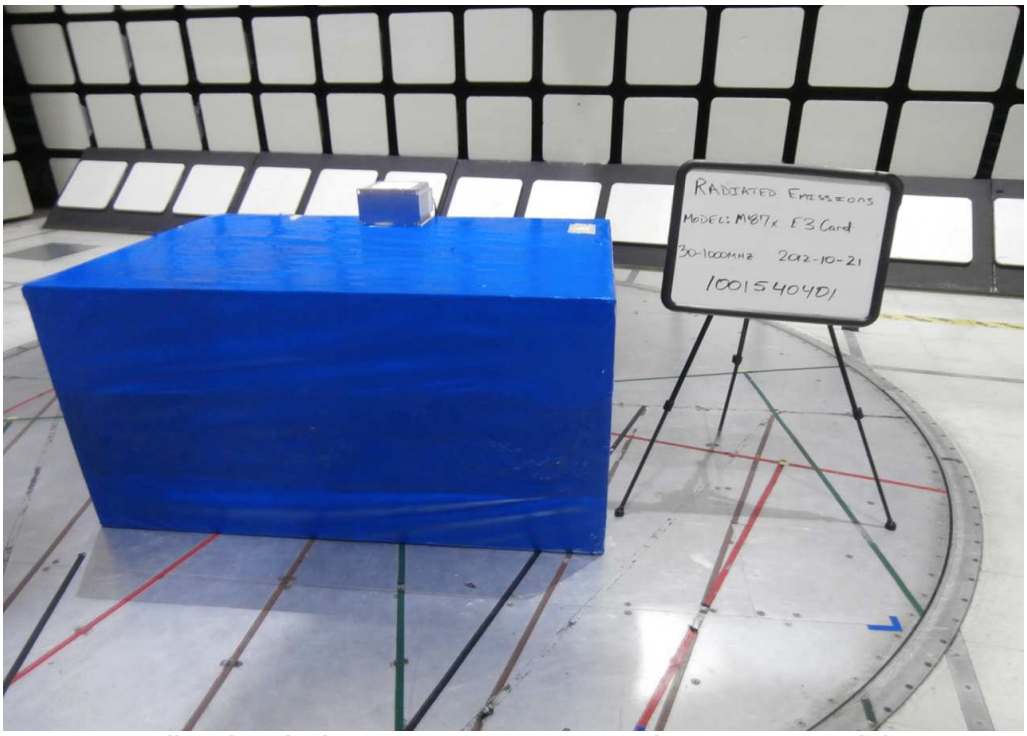


Radiated Emission 30 to 1000MHz Front View E1 Host Module

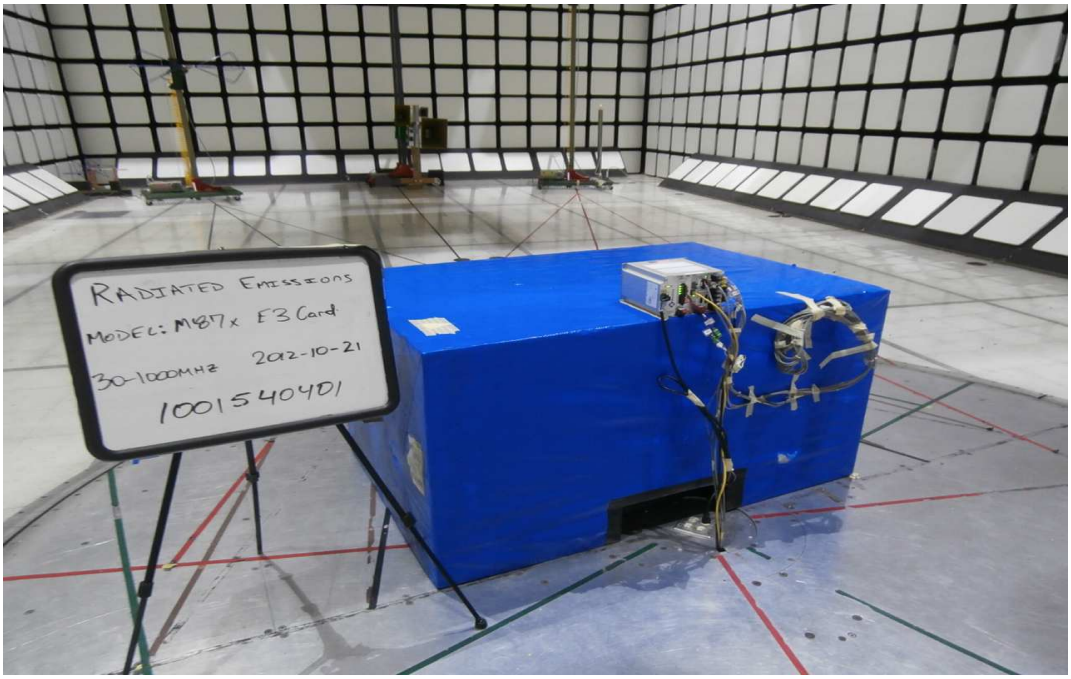


Radiated Emission 30 to 1000MHz Rear View E1 Host Module

Figure 7 Test setup for Radiated Emissions



Radiated Emission 30 to 1000MHz Front View E3 Host Module



Radiated Emission 30 to 1000MHz Rear View E3 Host Module

Figure 8 Radiated Emissions Graph

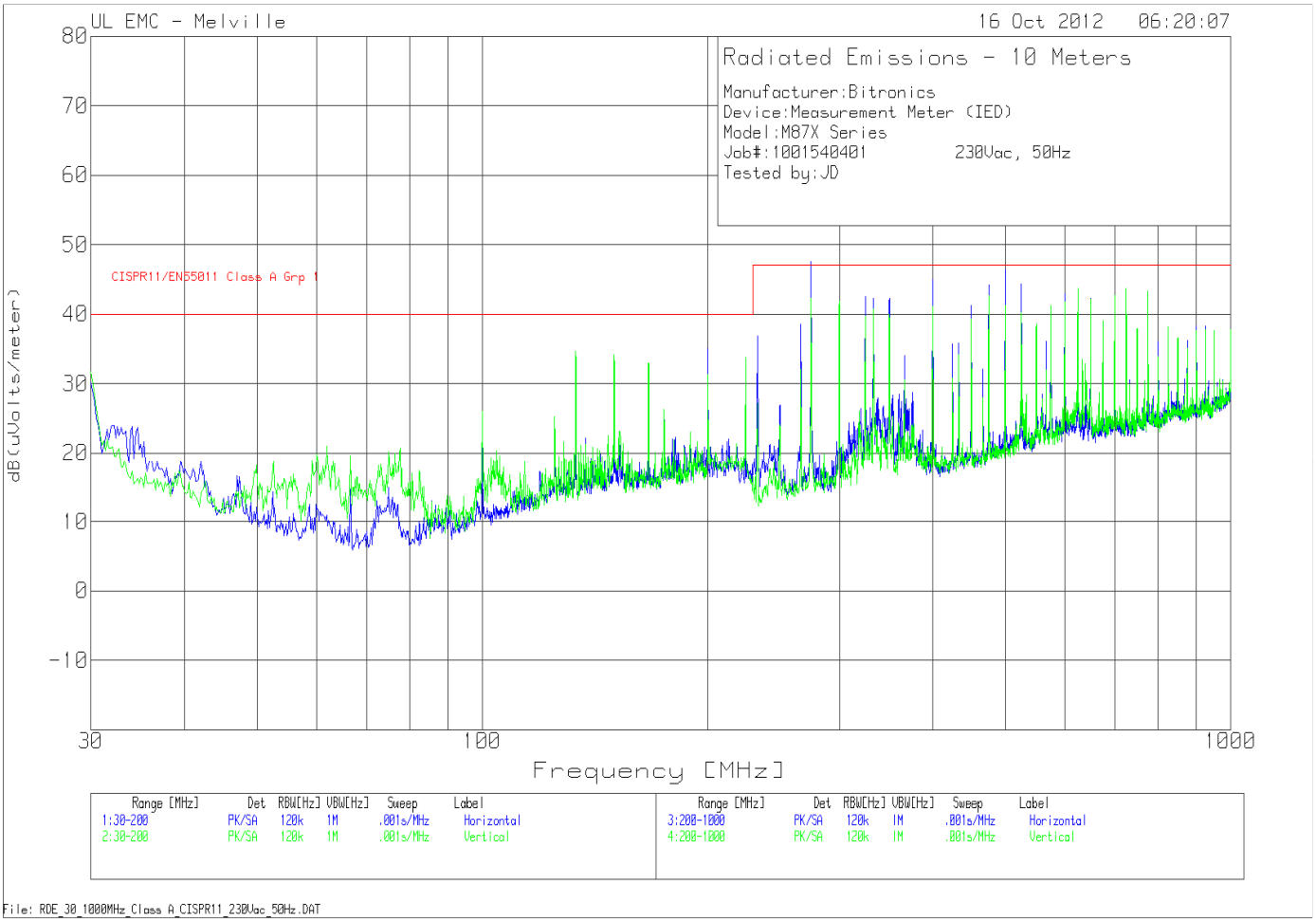
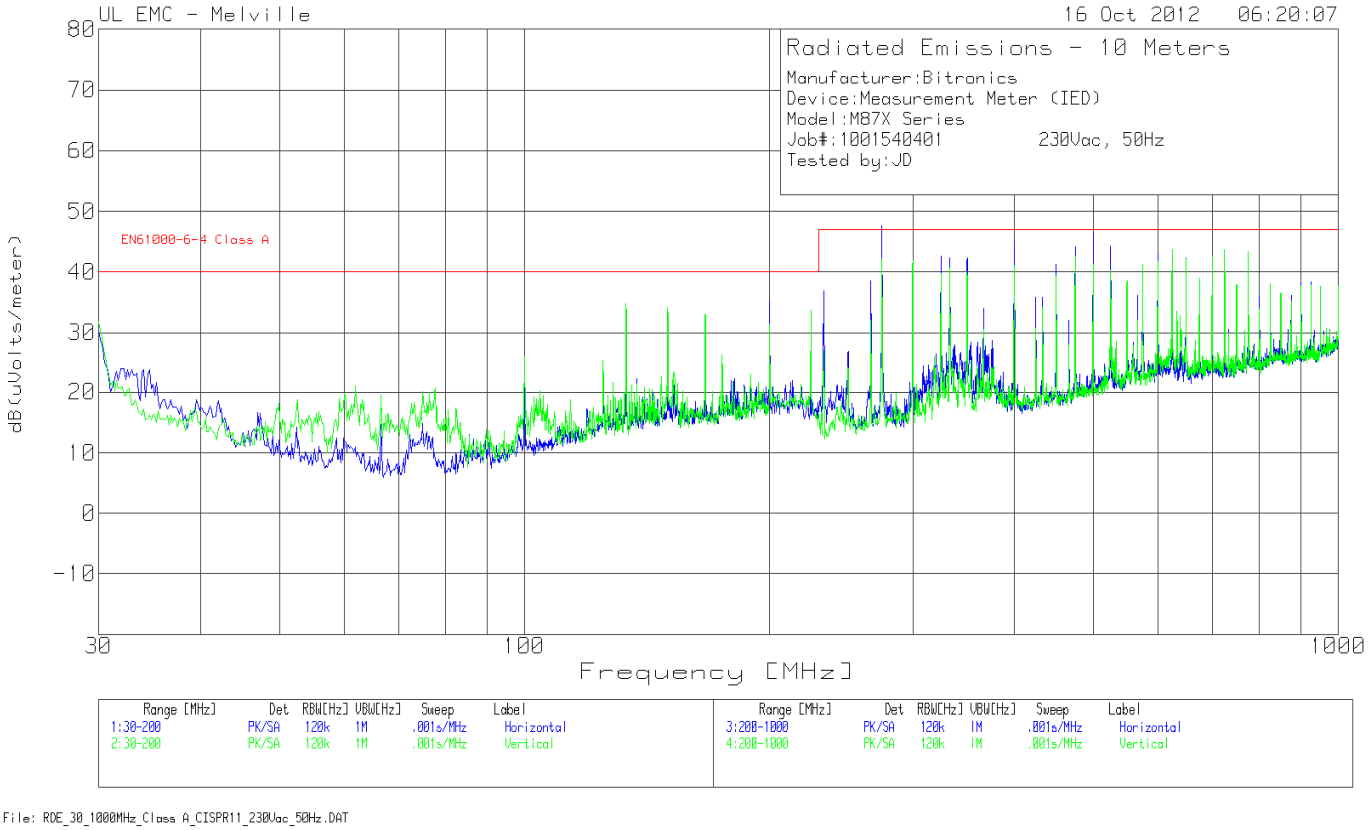


Figure 9 Radiated Emissions Graph



File: RDE_30_1000MHz_Class A_CISPR11_230Vac_50Hz.DAT

Table 10 Radiated Emissions Data Points

Manufacturer: Bitronics
Device: Measurement Meter (IED)
Model:M87X Series
Job#:1001540401 230Vac, 50Hz
Tested by :JD

Vertical 30 - 200MHz

Test Frequency	Meter Reading	Detector	AF-43441 [dB]	GL-10M A [dB]	dB(uVolts/meter)	CISPR11/EN55011 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
133.3353	46.77	QP	14	-32.6	28.17	40	-11.83	14	124	Vert
149.9651	49.14	QP	14.8	-32.5	31.44	40	-8.56	305	101	Vert

Horizontal 200 - 1000MHz

Test Frequency	Meter Reading	Detector	AF-44068 [dB]	GL-10M B [dB]	dB(uVolts/meter)	CISPR11/EN55011 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
274.9743	64.21	QP	12.7	-31.2	45.71	47	-1.29	318	316	Horz
200.0156	50.26	QP	11.3	-31.7	29.86	40	-10.14	54	284	Horz
299.989	54.99	QP	13.1	-30.8	37.29	47	-9.71	146	366	Horz
324.9754	58.74	QP	13.7	-30.5	41.94	47	-5.06	189	298	Horz
333.3152	60.02	QP	14	-30.5	43.52	47	-3.48	55	226	Horz
349.981	55.77	QP	14.9	-30.4	40.27	47	-6.73	109	247	Horz

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Manufacturer: Bitronics
Device: Measurement Meter (IED)
Model:M87X Series
Job#:1001540401 230Vac, 50Hz
Tested by :JD

Test Frequency	Meter Reading	Detector	AF-4406 8 [dB]	GL-10M B [dB]	dB(uVolts/ meter)	CISPR11/EN55 011 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
399.9858	56.02	QP	15.7	-29.9	41.82	47	-5.18	334	260	Horz
449.9756	54.03	QP	16.8	-29.5	41.33	47	-5.67	169	225	Horz
449.9756	54.48	QP	16.8	-29.5	41.78	47	-5.22	350	212	Horz
499.9889	56.53	QP	17.5	-29.5	44.53	47	-2.47	255	189	Horz
524.9711	55.77	QP	18.2	-29.4	44.57	47	-2.43	49	196	Horz
575.0022	52.69	QP	19.1	-28.8	42.99	47	-4.01	196	166	Horz
599.9509	50.97	QP	19.6	-28.6	41.97	47	-5.03	46	213	Horz
624.998	51.07	QP	20.1	-28.7	42.47	47	-4.53	27	185	Horz
649.9946	50.65	QP	19.8	-28.8	41.65	47	-5.35	132	156	Horz
699.9974	49.3	QP	20.7	-28.7	41.3	47	-5.7	253	126	Horz
725	51.16	QP	20.3	-28.9	42.56	47	-4.44	255	350	Horz
774.995	51.17	QP	21.4	-29	43.57	47	-3.43	340	124	Horz

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Manufacturer: Bitronics
Device: Measurement Meter (IED)
Model:M87X Series
Job#:1001540401 230Vac, 50Hz
Tested by :JD

Vertical 200 - 1000MHz

Test Frequency	Meter Reading	Detector	AF-44068 [dB]	GL-10M B [dB]	dB(uVolts/meter)	CISPR11/EN55011 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
224.9653	52.79	QP	10.9	-31.5	32.19	40	-7.81	343	115	Vert
224.9936	53.01	QP	10.9	-31.5	32.41	40	-7.59	343	115	Vert
274.9934	60.94	QP	12.7	-31.2	42.44	47	-4.56	191	102	Vert
299.982	60.93	QP	13.1	-30.8	43.23	47	-3.77	282	105	Vert
333.3212	53.87	QP	14	-30.5	37.37	47	-9.63	61	110	Vert
333.3008	53.68	QP	14	-30.5	37.18	47	-9.82	61	110	Vert
349.9898	56.43	QP	14.9	-30.4	40.93	47	-6.07	78	104	Vert
399.9908	51.21	QP	15.7	-29.9	37.01	47	-9.99	188	108	Vert
474.9752	54.04	QP	17	-29.4	41.64	47	-5.36	72	397	Vert
499.9876	47.58	QP	17.5	-29.5	35.58	47	-11.42	47	100	Vert
524.9752	50.06	QP	18.2	-29.4	38.86	47	-8.14	356	108	Vert
574.9721	55.24	QP	19.1	-28.8	45.54	47	-1.46	43	327	Vert

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

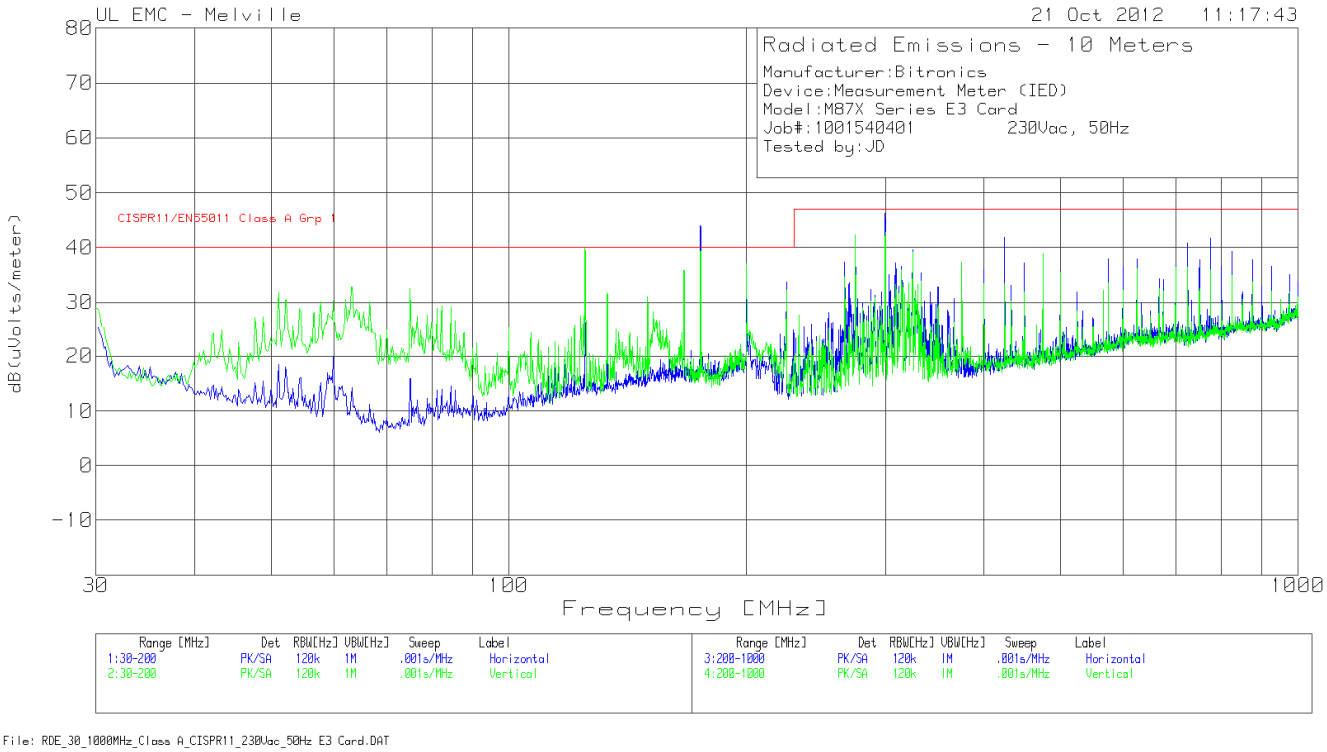
Manufacturer: Bitronics
Device: Measurement Meter (IED)
Model:M87X Series
Job#:1001540401 230Vac, 50Hz
Tested by :JD

Vertical 200 - 1000MHz

Test Frequency	Meter Reading	Detector	AF-4406 8 [dB]	GL-10M B [dB]	dB(uVolts/ meter)	CISPR11/EN550 11 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
599.9946	52.45	QP	19.6	-28.6	43.45	47	-3.55	35	258	Vert
624.995	53.16	QP	20.1	-28.7	44.56	47	-2.44	30	297	Vert
650	48.4	QP	19.8	-28.8	39.4	47	-7.6	357	349	Vert
699.9719	53.65	QP	20.7	-28.7	45.65	47	-1.35	24	272	Vert
724.9699	51.65	QP	20.3	-28.9	43.05	47	-3.95	27	220	Vert
774.985	52.14	QP	21.4	-29	44.54	47	-2.46	353	254	Vert

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Figure 10 Radiated Emissions Graph



File: RDE_30_1000MHz_Class A_CISPR11_230Vac_50Hz E3 Card.DAT

Table 11 Radiated Emissions Data Points

Manufacturer: Bitronics
Device: Measurement Meter (IED)
Model:M87X Series E3 Card
Job#:1001540401 230Vac, 50Hz
Tested by: JD

Horizontal 30 - 200MHz

Test Frequency	Meter Reading	Detector	AF-43441 [dB]	GL-10M A [dB]	dB(uVolts/meter)	CISPR11/EN55011 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
174.9962	42.69	QP	15.3	-32.3	25.69	40	-14.31	104	400	Horz
166.6647	54.35	QP	15	-32.3	37.05	40	-2.95	310	369	Horz

Vertical 30 - 200MHz

Test Frequency	Meter Reading	Detector	AF-43441 [dB]	GL-10M A [dB]	dB(uVolts/meter)	CISPR11/EN55011 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
125.0052	56.08	QP	13.4	-32.6	36.88	40	-3.12	20	140	Vert
166.6792	54.89	QP	15	-32.3	37.59	40	-2.41	341	103	Vert
174.9898	48.25	QP	15.3	-32.3	31.25	40	-8.75	247	209	Vert

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Manufacturer: Bitronics
Device: Measurement Meter (IED)
Model:M87X Series E3 Card
Job#:1001540401 230Vac, 50Hz
Tested by: JD

Horizontal 200 - 1000MHz

Test Frequency	Meter Reading	Detector	AF-44068 [dB]	GL-10M B [dB]	dB(uVolts/meter)	CISPR11/EN55011 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
224.9974	55.54	QP	10.9	-31.5	34.94	40	-5.06	19	356	Horz
300.0108	63.28	QP	13.1	-30.8	45.58	47	-1.42	314	305	Horz
425	51.35	QP	16.1	-29.8	37.65	47	-9.35	330	212	Horz
725	50.32	QP	20.3	-28.9	41.72	47	-5.28	52	110	Horz
775	50.03	QP	21.4	-29	42.43	47	-4.57	316	130	Horz

Vertical 200 - 1000MHz

Test Frequency	Meter Reading	Detector	AF-44068 [dB]	GL-10M B [dB]	dB(uVolts/meter)	CISPR11/EN55011 Class A Grp 1	Margin	Azimuth [Degs]	Height [cm]	Polarity
200.0101	57.23	QP	11.3	-31.7	36.83	40	-3.17	48	101	Vert
274.9995	58.3	QP	12.7	-31.2	39.8	47	-7.2	104	145	Vert
299.998	59.74	QP	13.1	-30.8	42.04	47	-4.96	301	100	Vert

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

4.3 Test Conditions and Results – LIMITS OF HARMONICS OF CURRENT

Not applicable for a Class A type of device

4.4 Test Conditions and Results – LIMITS OF VOLTAGE CHANGES, VOLTAGE FLUCTUATIONS AND FLICKER

Not applicable for a Class A type of device

5.0 IMMUNITY TEST RESULTS

The immunity tests were performed according to following regulations:

---------- International ----------

EMC Directive:	EMC - 2004/108/EC (OJ L 390 of 2004-12-31)

In accordance with:

Basic Standard	Title
IEC/EN61000-4-2	Electromagnetic Compatibility (EMC) - Part 4.2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test
IEC/EN61000-4-3	Electromagnetic compatibility (EMC) Part 4-3: Testing and measurement techniques Radiated, radio-frequency, electromagnetic field immunity test
IEC/EN61000-4-4	Electromagnetic compatibility (EMC) Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
IEC/EN61000-4-5	Electromagnetic Compatibility (EMC) - Part 4-5: Testing and Measurement Techniques - Surge Immunity Test
IEC/EN61000-4-6	Electromagnetic Compatibility (EMC) - Part 4-6: Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
IEC/EN61000-4-8	Electromagnetic Compatibility (EMC) - Part 4-8: Testing and Measurement Techniques - Power Frequency Magnetic Field Immunity Test
IEC/EN61000-4-11	Electromagnetic Compatibility (EMC) - Part 4-11: Testing and Measurement Techniques - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

Note: IEC versions are the latest versions unless otherwise stated in the product standard or noted above.

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, ℃	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150

5.1 Performance Criteria

5.1.1 General

Performance Criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the manufacturer does not specify the minimum performance level or the permissible performance loss, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance Criterion B

After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. 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 by what the user may reasonably expect from the equipment if used as intended.

Performance Criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

Electrical Equipment for Measurement, Control and Laboratory Use

Performance criterion A
During testing, normal performance within the specification limits.

Performance criterion B
During testing, temporary degradation, or loss of function or performance which is self-recovering.

Performance criterion C
During testing, temporary degradation, or loss of function or performance, which requires operator intervention or system reset occurs.

5.1.2 Product Specific Performance Criteria

The Digital I/O states and Signal Inputs are monitored and communicated to the PC laptop, which is running BiView2 software. The virtual display in Biview2 v3.03 is configured to monitor the measurements of the voltage inputs (or current inputs) over serial port P2 with the Zmodem/Display protocol. The M871 Ethernet port has been configured to operate using Modbus protocol; and communicate while connected with the laptop over a local network interconnection. The Signal Input amplitude can be viewed in the BiView2 v3.03 Instantaneous screen running Modbus over Ethernet; the Digital I/O states can be viewed from the Digital Input/Output screen in BiView using Zmodem over serial connection (P1 if Hyperterminal is not connected, or P2); The BiView2 v3.03 software screen labeled Digital Input/Output will be used to visually monitor the Digital I/O status and toggle outputs in order to verify the relay outputs are operational. Using BiView2 software the output state of the relay contacts will need to be periodically changed to verify operation of the relays. Refer to the section, Setup Instructions from BiView2 v3.03 Software for the details on monitoring Digital I/O; For changing the digital output states from BiView2 click on the output point to change the position of the output relay contact; the relay output contact is closed (on) when the LED is Yellow; the output contact is open (off) when the LED is not lit.

5.2 Test Conditions and Results – ELECTROSTATIC DISCHARGES (ESD)

Method	Measurements were made on a ground plane that extends 0.5-meter minimum beyond all sides of the system under test and the minimum distance between the equipment under test and any laboratory walls or any other metallic surfaces shall be at least 1-meter. Air discharges were applied to non-metallic parts of the system. Contact discharges were applied to all accessible metallic parts. Discharges were also applied to the Horizontal and Vertical Coupling Planes, where applicable. Each discharge was applied at a rate of one (1) discharge per second.

Basic Standard	IEC/EN 61000-4-2
UL LPG	87-EM-S0025
	Measurement Point
Fully configured sample subjected to the levels shown below.	Product Enclosure

Test Levels				**Performance Criteria**
Discharge type	Discharge Level (kV)		Number of discharges per location (each polarity)	
	Positive	Negative		
Air – Direct	2, 4, 8	2, 4, 8	10	B
Contact – Direct	2, 4, 6	2, 4, 6	10	B
Contact – Indirect	2, 4, 6	2, 4, 6	10	B
Supplementary information: None				

Table 12 ESD EUT Configuration Settings

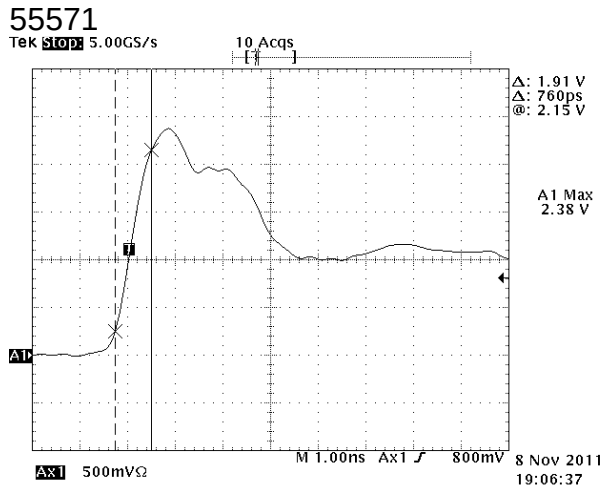
Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None.		

Table 13 ESD Test Equipment

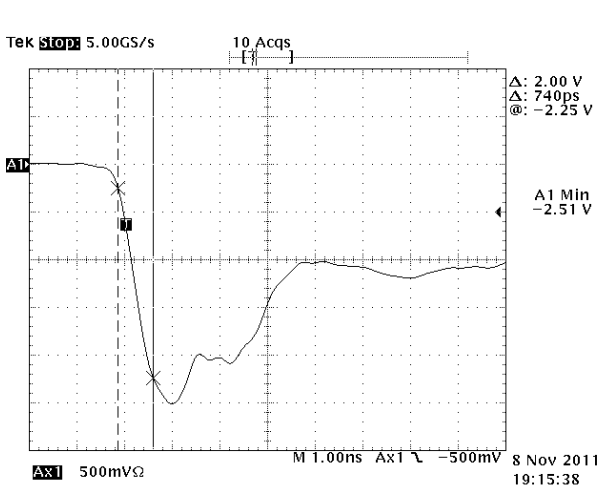
Test Equipment Used			
Description	Manufacturer	Model	Identifier
ESD - GP1			
ESD Gun	EMC-Partner	ESD3000/DM1/RM32	55571
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43735
Multimeter	Fluke	87V	64386

Figure 11 Test Setup for ESD

Figure 12 ESD Verification Waveforms



Positive 6000V Amplitude and Rise Time



Negative 6000V Amplitude and Rise Time

Table 4A Results for Electrostatic Discharges – Contact Discharges

TEST POINT	Positive Polarity			Negative Polarity		
	2kV	4kV	6kV	2kV	4kV	6kV
C1- Top Rear Side	2	2	2	2	2	2
C2 - Left Side Rear	2	2	2	2	2	2
C3- Right Side Rear	2	2	2	2	2	2
C4- Serial Port	2	2	2	2	2	2
C5- Front Side Middle	2	2	2	2	2	2
C6 - Front Left Screw	2	2	2	2	2	2
C7 - Top Screw in P30 Column	2	2	2	2	2	2
VCP - Four Sides	2	2	2	2	2	2
HCP - Four Sides	2	2	2	2	2	2

Results Descriptions:

X - Not Performed nor required.
1 – Compliant - No perceived discharge, no observed response from EUT.
2 – Compliant - Discharge observed, no observed response from EUT.

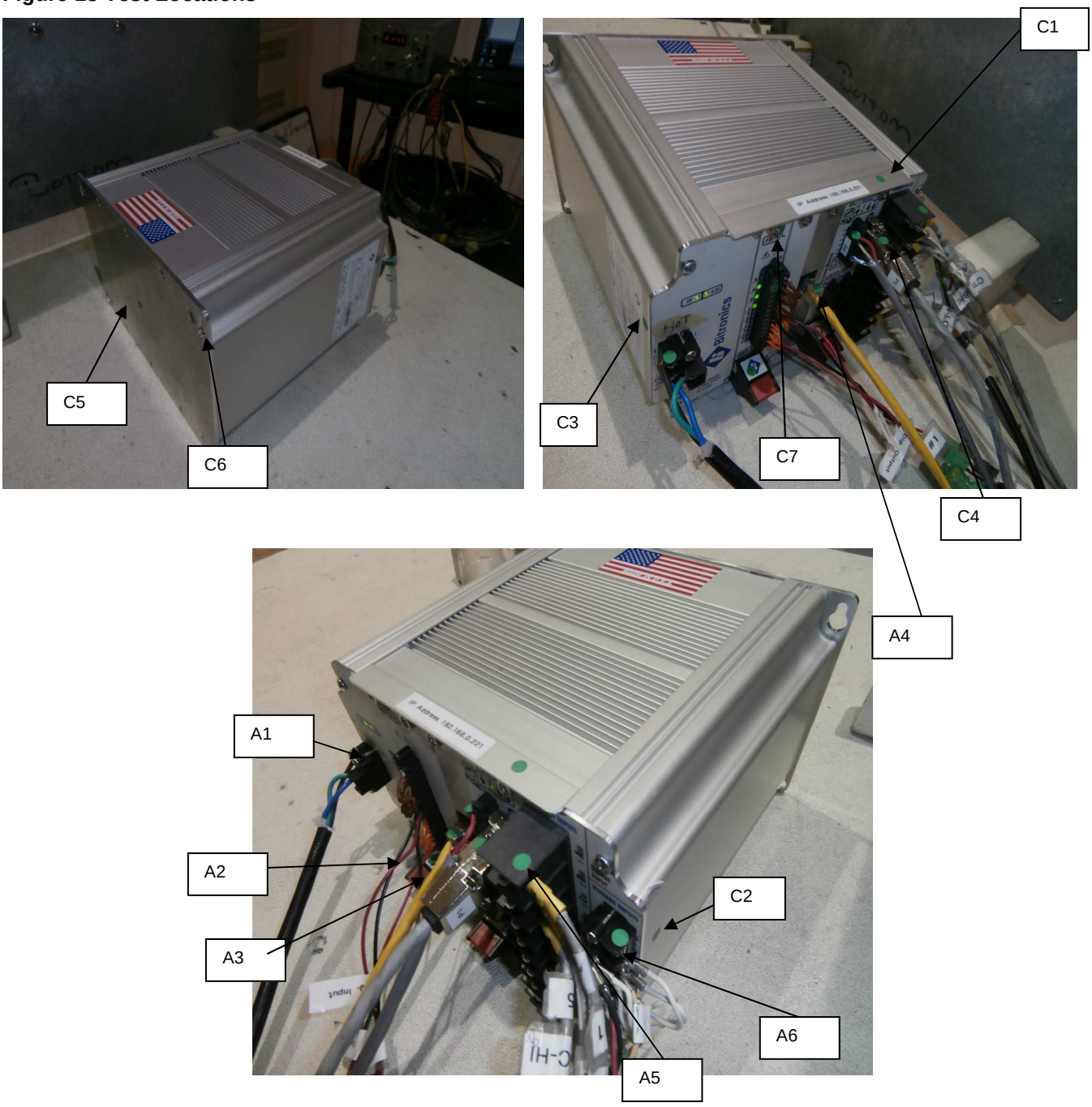
Table 4B Results for Electrostatic Discharges – Air Discharges

TEST POINT	Positive Polarity			Negative Polarity		
	2kV	4kV	8kV	2kV	4kV	8kV
A1- Main A/C	1	1	2	1	1	2
A2- Digital Input	1	1	1	1	1	1
A3- Digital Input	1	1	1	1	1	1
A4 –Ethernet	1	1	1	1	1	1
A5- Current Inputs	1	1	2	1	1	2
A6- Voltage Inputs	1	1	1	1	1	1

Results Descriptions:

X - Not Performed nor required.
1 – Compliant - No perceived discharge, no observed response from EUT.
2 – Compliant - Discharge observed, no observed response from EUT.

Figure 13 Test Locations



5.3 Test Conditions and Results –RADIATED IMMUNITY

Test Description	Measurements were made in a chamber and the indicated field strength was pre-calibrated prior to placement of the system under test. Tests were performed in both the horizontal and vertical polarities, where applicable.
Basic Standard	IEC/EN 61000-4-3
UL LPG	87-EM-S0027

Measurement Point - Enclosure				
Applied Field				**Performance Criteria**
Frequency (MHz)	Strength (V/m)	Modulation	Dwell Time	
80 - 1000	10	80% 1kHz AM	2.8 sec	A
1400-2700	10	80% 1kHz AM	2.8 sec	A
2000-2700	1	80% 1kHz AM	2.8 sec	A
900 / 1800	10	80% AM (1kHz)	60 sec	A
Supplementary information: None				

Table 15 - Radiated Immunity EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

Table 16 - Radiated Immunity Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
3-meter Chamber			
80MHz – 1000MHz			
Signal Generator	Rohde & Schwarz	SMT 03	ME5A-285
Power Meter	Rohde & Schwarz	NRP2	74190
Power Meter Sensor	Rohde & Schwarz	NRP-Z91	74193
Power Meter Sensor	Rohde & Schwarz	NRP-Z91	74194
Isotropic Probe	ETS Lindgren	HI-6053	55719
RF Amplifier 80MHz - 1GHz	Amplifier Research	500W100A	ME7A-798
Log Periodic Antenna 80MHz - 6GHz	Amplifier Research	AT6080	51266
Directional Coupler	Conn. Microwave	440917	ME7A-489
Camera Controller	EMC Automation	VCC-01	44553
Turntable Controller	Sunol Sciences	SC98V	ME7A-624

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Mast Controller	EMCO	1050 Controller	44552
Switch Driver	HP	11713A	44402
Measurement Software	UL	Version 9.3	44737
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43735
Multimeter	Fluke	87V	64386
1GHz – 2.7GHz			
Signal Generator	Rohde & Schwarz	SMT 03	ME5A-285
Power Meter	Rohde & Schwarz	NRP2	74190
Power Meter Sensor	Rohde & Schwarz	NRP-Z91	74193
Power Meter Sensor	Rohde & Schwarz	NRP-Z91	74194
Isotropic Probe	ETS Lindgren	HI-6053	55719
RF Amplifier Rack 800MHz – 10.6GHz	Amplifier Research	SP1022	51202
Double Ridge Guide Antenna	EMCO	3115	
Directional Coupler	Conn. Microwave	440918	ME7A-490
Camera Controller	EMC Automation	VCC-01	44553
Turntable Controller	Sunol Sciences	SC98V	ME7A-624
Mast Controller	EMCO	1050 Controller	44552
Switch Driver	HP	11713A	44402
Measurement Software	UL	Version 9.3	44737
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43735
Multimeter	Fluke	87V	64386

Figure 14 - Test Setup for Radiated Immunity

Below 1 GHz

Above 1 GHz

Table 17-Description of Product Performance – Configuration

EUT Side	Polarity	Results		
		80MHz – 1GHz	1GHz – 2.7GHz	900MHz / 800MHz
Front	Horizontal	2	1	1/1
	Vertical	2	1	1/1
Left	Horizontal	2	1	1/1
	Vertical	2	1	1/1
Right	Horizontal	2	1	1/1
	Vertical	2	1	1/1
Back	Horizontal	2	1	1/1
	Vertical	2	1	1/1
Top	Horizontal	X	X	X
	Vertical	X	X	X
Bottom	Horizontal	X	X	X
	Vertical	X	X	X

Results Descriptions:

X –Not performed nor required.
1 – Compliant - No observed response from EUT.
2- – Compliant - No observed response from EUT. Change in Voltage and amps, but less than the +/-0.1% tolerance allowed.

5.4 Test Conditions and Results – ELECTRICAL FAST TRANSIENTS

Test Description	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. Mains power tests were conducted with the product connected to a Coupling/Decoupling Network (CDN). I/O lines were tested in a Capacitive Coupling Clamp. One of each unique interface was tested for a period of one (1) minute per polarity.
Basic Standard	IEC/EN 61000-4-4
UL LPG	87-EM-S0028

Application Point	Applied Level (kV)	Repetition Frequency (kHz)	Performance Criteria
Input AC Power Ports	2	5	B
Input AUX Power Ports	4	5	B
Input / Output ports	4	5	B
Signal Ports	2	5	B
Telecommunications Ports	2	5	B
Supplementary information: None			

Table 18 EFT EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1 & 2	1	1
Supplementary information: None		

Table 19A EFT Test Equipment

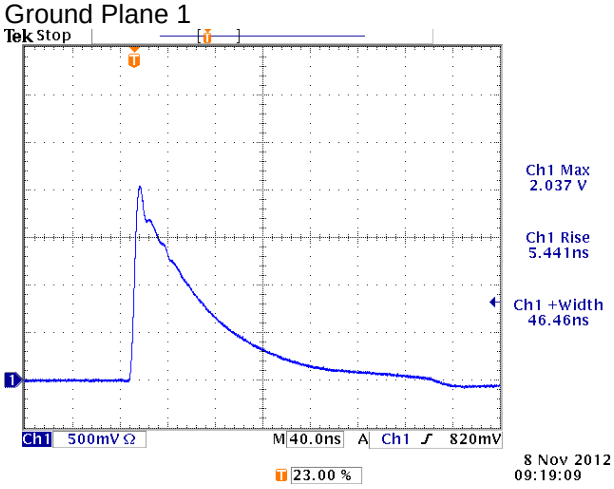
Test Equipment Used			
Description	Manufacturer	Model	Identifier
Electrical Fast Transients – GP1			
Main Generator	Teseq	NSG 3060	62919
EFT Module	Teseq	FTM 3425	64367
Main Coupler	Teseq	CDN 3063-C32	62920
EFT Capacitive Clamp	Keytek	CCL-4/S	ME7A-441
Measurement Software	Teseq	Win 3000 Version 1.0.0	64371
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734

Table 19B EFT Test Equipment

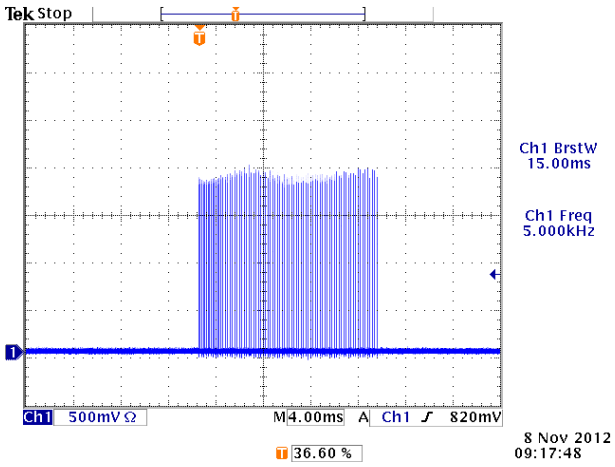
Test Equipment Used			
Description	Manufacturer	Model	Identifier
Electrical Fast Transients – GP3			
Main Generator	Teseq	NSG 3040	62386
EFT Module	Teseq	FTM 3425	62384
EFT Capacitive Clamp	Teseq	CDN 8015	62918
Measurement Software	Teseq	Win 3000 Version 1.1.0	64369
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43735
Multimeter	Fluke	87V	64386

Figure 15A: EFT: Waveform Verification

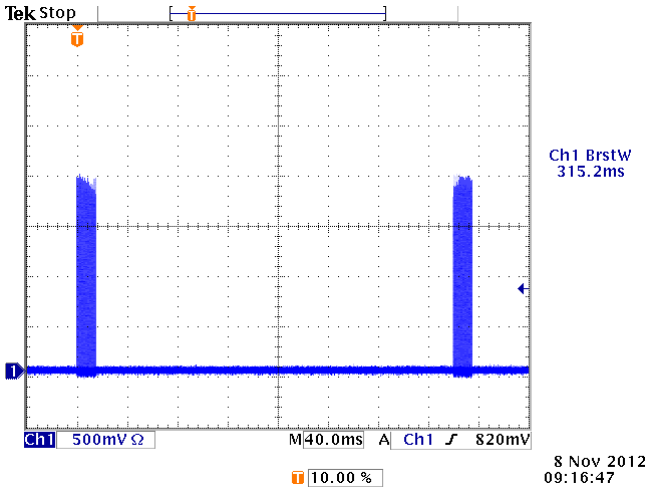
Ground Plane 1



4000V Amplitude, Rise Time and Duration @ 50% amplitude



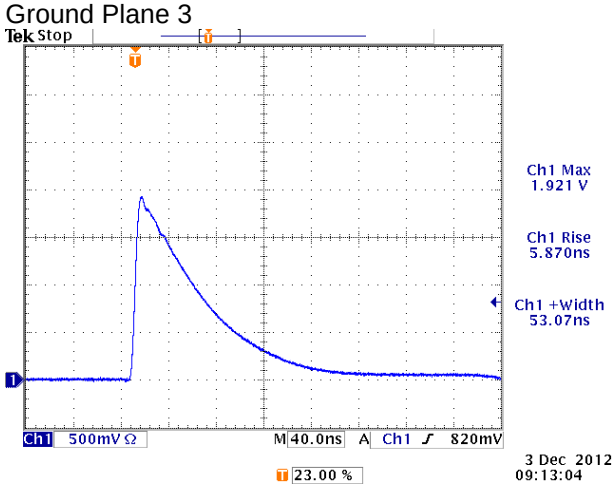
Burst Duration and Repetition Frequency



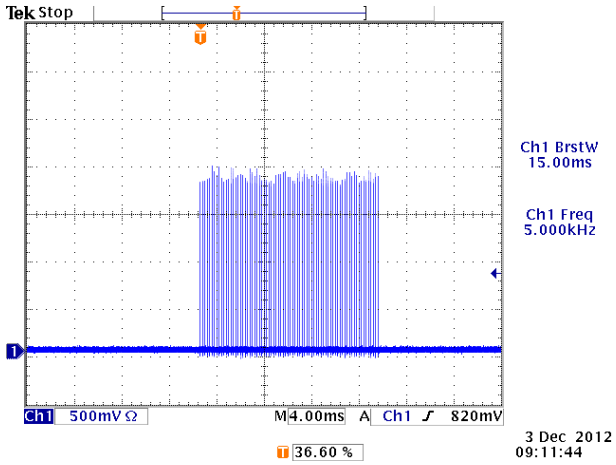
Impulse Duration (Period)

Figure 15B: EFT: Waveform Verification

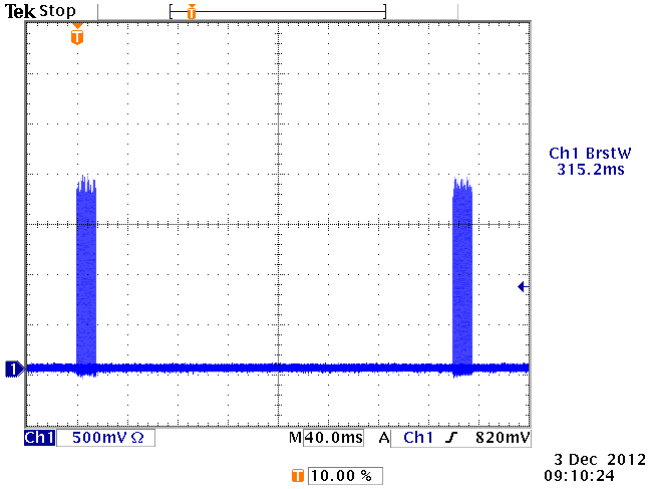
Ground Plane 3



4000V Amplitude, Rise Time and Duration @ 50% amplitude



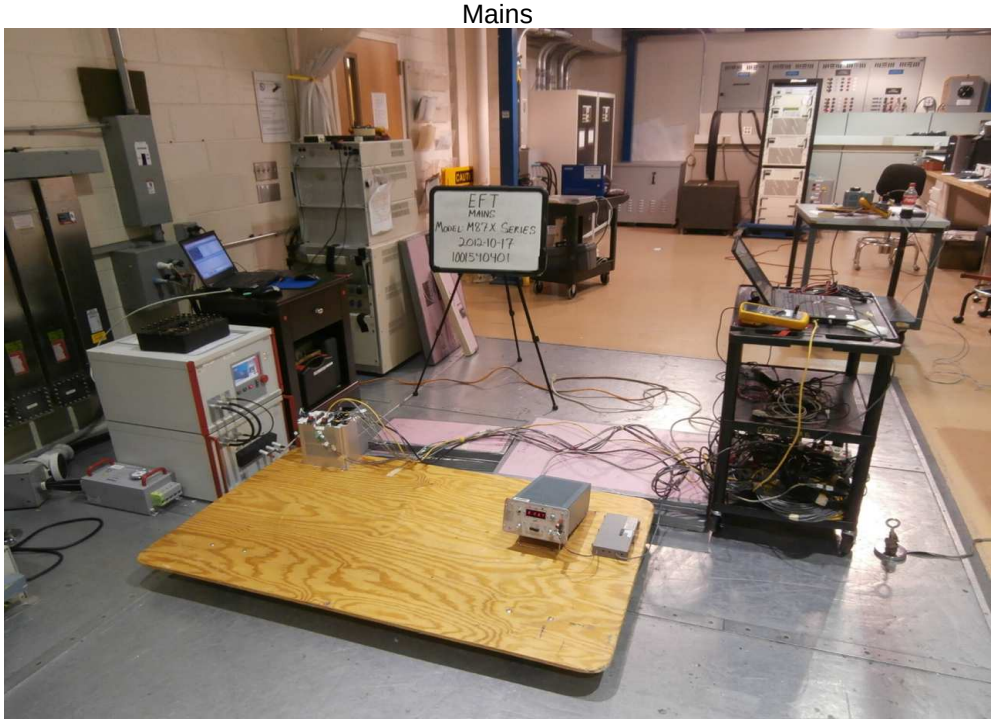
Burst Duration and Repetition Frequency



Impulse Duration (Period)

Figure 16A Test Setup for EFT

Mains



AUX Inputs

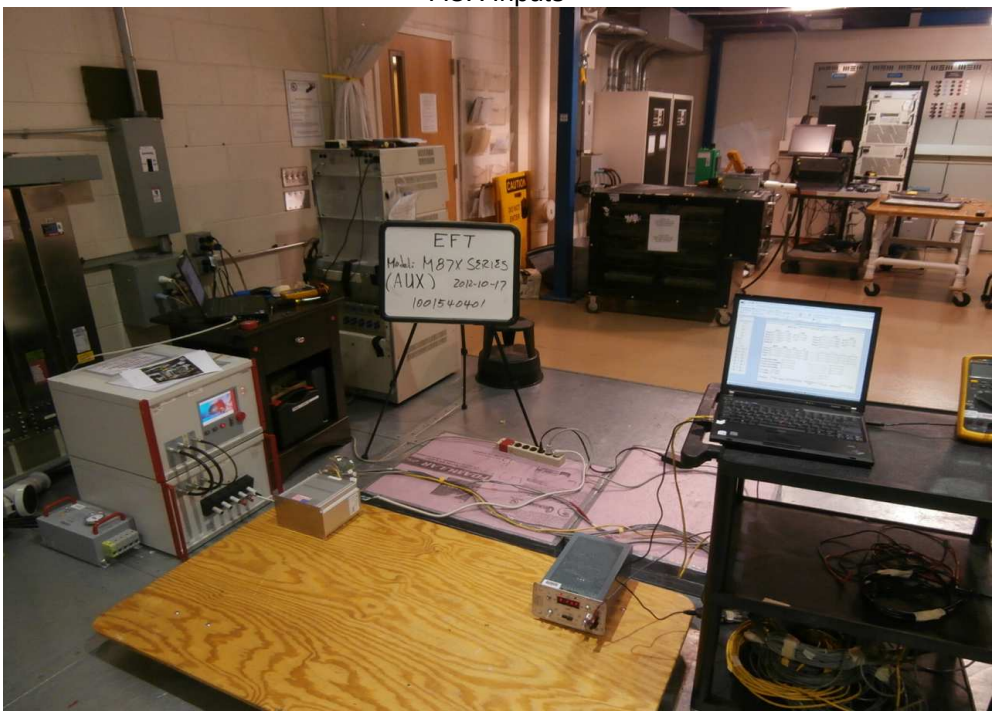


Figure 16B Test Setup for EFT

I/O Lines

Table 20 Results for Electrical Fast Transients

Mains Mode of Application Mains	Burst Potential, kV							
	Positive				Negative			
	0.5	1.0	2.0	4.0	0.5	1.0	2.0	4.0
Line 1, Line 2 & Line PE with respect to RGP	X	X	1	X	X	X	1	X
PE with respect to RGP	X	X	1	X	X	X	1	X

Mode of Application Aux Power	Burst Potential, kV							
	Positive				Negative			
	0.5	1.0	2.0	4.0	0.5	1.0	2.0	4.0
Line 1, Line 2 , Line 3 & Line PE with respect to RGP	X	X	X	1	X	X	X	1
PE with respect to RGP	X	X	X	X	X	X	X	X

I/O Mode of Application		Burst Potential, kV								
		Positive					Negative			
	0.25	0.5	1.0	2.0	4.0	0.25	0.5	1.0	2.0	4.0
I/O Lines – Ethernet	X	X	X	1	X	X	X	X	1	X
I/O Lines – Serial P1	X	X	X	1	X	X	X	X	1	X
I/O Lines – Serial P2	X	X	X	1	X	X	X	X	1	X
I/O Lines – Voltage Inputs	X	X	X	X	1	X	X	X	X	1
I/O Lines – Current Inputs	X	X	X	X	1	X	X	X	X	1
I/O Line Digital I/O	X	X	X	1	X	X	X	X	1	X
I/O Line Digital I/O	X	X	X	1	X	X	X	X	1	X

☐ Artificial Hand Used

Results Descriptions:

X - Not Performed nor required.
1 – Compliant - No observed response from EUT.

5.5 Test Conditions and Results – SURGE IMMUNITY

Test Description	Mains power tests were conducted with the product connected to a Coupling/Decoupling Network (CDN). The test voltage was increased from the lowest indicated level up to the maximum level. Five (5) positive surges and five (5) negative surges were applied at each of phases of the a.c. waveform: 0°, 90°, 180° and 270° . Each surge was applied 60 seconds after the previous surge. Signal and Telecommunications ports were subject to five (5) positive and five (negative) surges applied through the appropriate Coupling/Decoupling Network (CDN).

Basic Standard – Mains	IEC/EN 61000-4-5
UL LPG	80-EM-S0031

Applied Level			**Performance Criteria**
Application Point	(kV)	Required Surge Waveform	
Input a.c. Power Ports	0.5, 1 (Line to Line) 0.5, 1, 2 (Line to Earth)	Combination Wave (1.2µS x 50µS Voltage, 8µS x 20µS Current) Combination Wave (1.2µS x 50µS Voltage, 8µS x 20µS Current)	B
Supplementary information: None			

Table 21 Surge Immunity EUT Configuration Settings

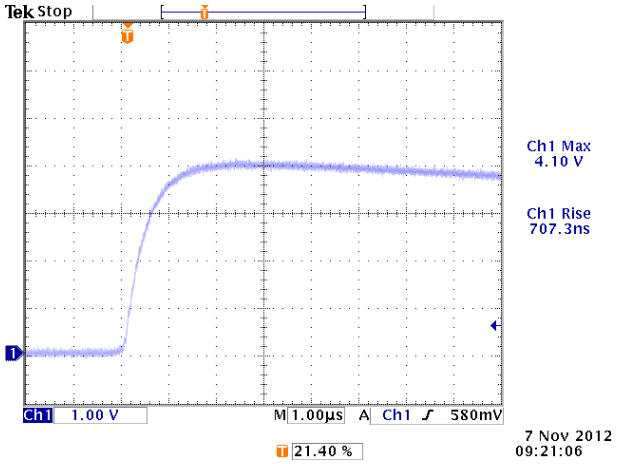
Power Interface Mode	EUT Configurations Mode	EUT Operation Mode
1 & 2	1	1
Supplementary information: None		

Table 22 Surge Immunity Test Equipment

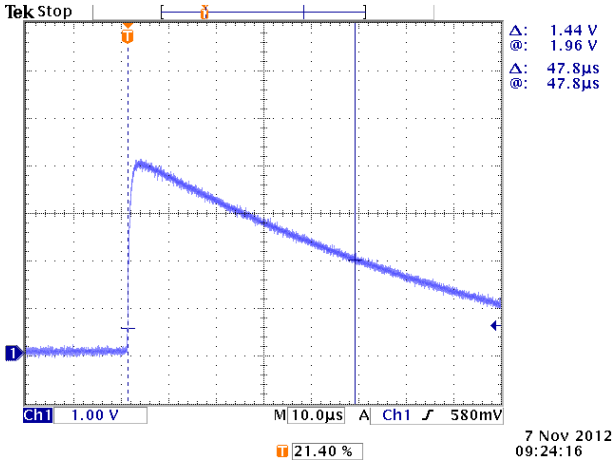
Test Equipment Used			
Description	Manufacturer	Model	Identifier
Surge – GP3			
Main Generator	Teseq	NSG 3040	62386
Surge Module	Teseq	CWM 3450	62385
Measurement Software	Teseq	Win 3000 Version 1.1.0	64369
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43735
Multimeter	Fluke	87V	64386

Figure 17: Surge Waveform Verification

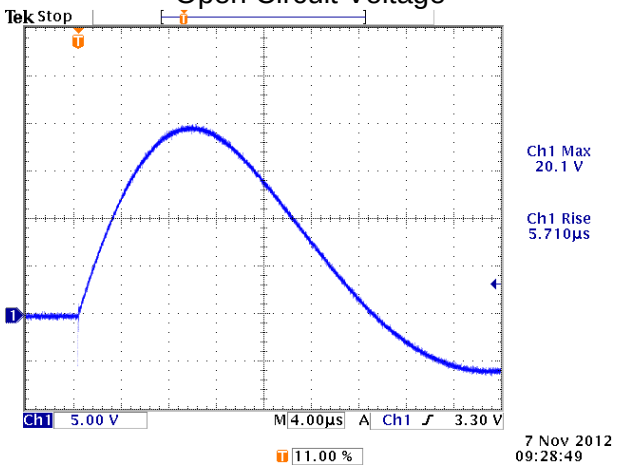
Ground Plane 3



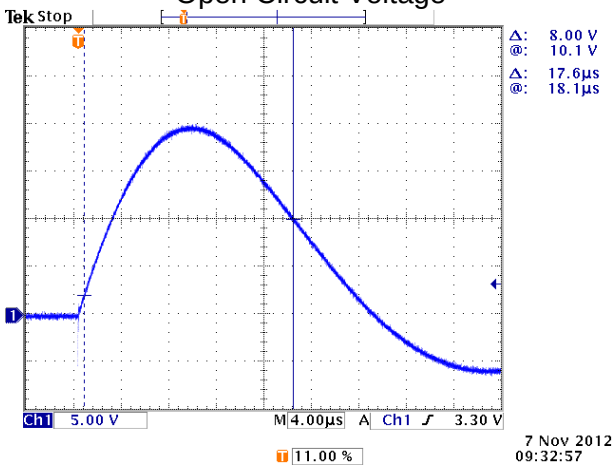
4000V Amplitude and Front Time
Open Circuit Voltage



4000V Time to Half Value
Open Circuit Voltage



4000V Amplitude and Front Time
Short Circuit Current



4000V Duration @ 50% Amplitude
Short Circuit Current

Figure 18 Test setup for Surge Immunity

Table 5A Results for Surges – Mains (a.c or d.c)

Mode of Application - Mains	Level	Polarity	Results AC	Results Aux Power
Line 1 to Line 2 (Differential mode)	0.5kV	Positive	1	1
		Negative	1	1
	1.0kV	Positive	1	1
		Negative	1	1
Line 1 to Earth (Common mode)	0.5kV	Positive	1	1
		Negative	1	1
	1.0kV	Positive	1	1
		Negative	1	1
	2.0kV	Positive	1	1
		Negative	1	1
Line 2 to Earth (Common mode)	0.5kV	Positive	1	1
		Negative	1	1
	1.0kV	Positive	1	1
		Negative	1	1
	2.0kV	Positive	1	1
		Negative	1	1

Results Descriptions:

X – Not Performed nor required.
1 – Compliant – No observed response from EUT.
2- Not Applicable-Aux power does not have a PE

Table 5B Results for Surges – Mains (Signal and Telecommunications Ports)

Mode of Application - Mains	Level	Polarity	Results RS232 shield	Results Ethernet CM pins 1,2,3, & 6	Results H12 shield	Results VT	Results CT	Results Digital I/O DC
Line 1 to Earth (Common mode)	0.5, 1, 2kV	Positive	1	1	1	1	1	1
		Negative	1	1	1	1	1	1
Line 2 to Earth (Common mode)	0.5, 1, 2kV	Positive	1	1	1	1	1	1
		Negative	1	1	1	1	1	1
Line 1 to Line 2 (differential mode)	0.5, 1	Positive	X	X	X	1	1	X
	0.5, 1	Negative	X	X	X	1	1	X

Table 5C Results for Surges – Mains (Signal and Telecommunications Ports with Protection)

Mode of Application - Mains	Level	Polarity	Results
Line 1 to Earth (Common mode)	4kV	Positive	x
		Negative	x
Line 2 to Earth (Common mode)	4kV	Positive	x
		Negative	x
Supplementary information: None			

Results Descriptions:

X - Not Performed nor required.
1 – Compliant - No observed response from EUT.

5.6 Test Conditions and Results –CONDUCTED IMMUNITY

Test Description	Measurements were made on a ground plane that extends 0.5-meter minimum beyond all sides of the system under test. The EUT was located 10cm above the reference ground plane and any associated I/O cables attached to the EUT were located between 30mm and 50mm above the ground plane. The indicated field was pre-calibrated prior to placement of the system under test.

Basic Standard	IEC/EN 61000-4-6
UL LPG	87-EM-S0032

Applied Level				**Performance Criteria**
Frequency (MHz)	(Vrms)	Modulation	Dwell Time	
0.150 – 80MHz	10	80% AM (1kHz)	2.8 sec	A
Supplementary information: None				

Table 24 Conducted Immunity EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1, 2 & 3	1	1
Supplementary information: None		

Table 25: Conducted Immunity Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Conducted Immunity – GP3			
Signal Generator	Hewlett Packard	8648B	000768
Power Meter	Rohde & Schwarz	NRVD	ME5A-681
Power Meter Sensor	Rohde & Schwarz	NRV-Z51	ME5B-134
Power Meter Sensor	Rohde & Schwarz	NRV-Z51	ME5A-715
RF Amplifier	IFI	M75	ME7A-669
CDN	Fischer Custom Communication	801-M3-16	ME5A-223
Receive Probe	FCC	F-33-4	ME5B-153
EM Clamp	AR	S/N 27719	3167
Directional Coupler	Werlatone	C5086-10	38881
Spectrum Analyzer	Advantest	R3261C	ME5A-229
Software	UL	V9.30	44737
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43735
Multimeter	Fluke	87V	64386

Figure 19 Test Setup for Conducted Immunity – Mains

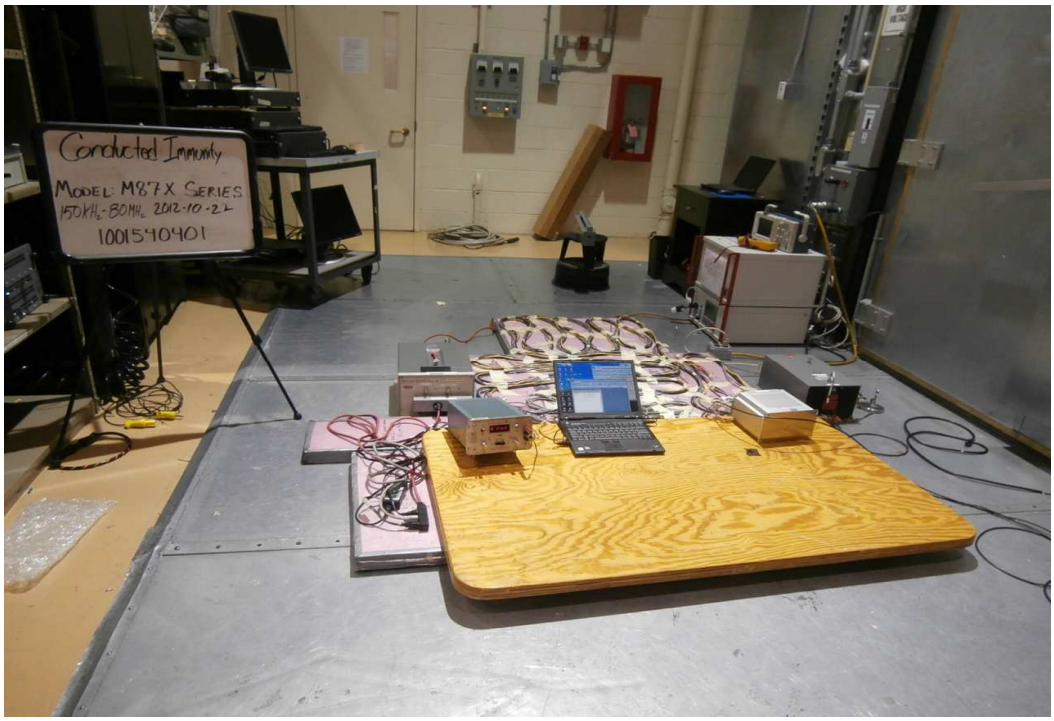


Figure 20 Test Setup for Conducted Immunity – I/O Lines

Table 26 Results for Continuous Conducted Disturbances –

Point of application	Results
Mains AC	1
AC (Aux Power)	1
DC Digital Input/Output	1
I/O Lines – Terminal	1
I/O Lines – Ethernet	1
I/O Lines – Serial	1
I/O Lines –VT Voltage cables	1
I/O Lines –CT Current cables	1

☐ Artificial Hand Used

Results Descriptions:

X - Not Performed nor required.
1 – Compliant - No observed response from EUT.

5.7 Test Conditions and Results – POWER-FREQUENCY MAGNETIC FIELDS

Test Description	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. Tabletop EUTs are located 80cm above the reference ground plane and the indicated field was pre-calibrated prior to placement of the system under test. Floor-standing EUTs are located 10cm above the reference ground plane and the indicated field was pre-calibrated prior to placement of the system under test.	
Basic Standard		IEC/EN 61000-4-8
UL LPG		87-EM-W0028
		Application Point
Fully configured sample tested at the stated power line frequency or frequencies.		Enclosure
Test Level		**Performance Criteria**
Frequency (Hz)	A/m	
50 and 60	30	A
Supplementary information: None		

Table 27 Power Frequency Magnetic Fields EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

Table 28 Power Frequency Magnetic Fields Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
Magnetic Loop Antenna	UL	MLA	ME7A-455
Variac	Power Stat	116BT	ME7-501
AC Power Source	Pacific Power	360-AMX	ME7A-626
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734
Multimeter	Fluke	87V	64386

Figure 21 Test Setup for Power Frequency Fields

Table 29 Description of Product Performance

Point of application	Results @ 50Hz	Results @ 60Hz
X-Axis	1	1
Y-Axis	1	1
Z-Axis	1	1

Results Descriptions:

X - Not performed nor required.
1 – Compliant - No observed response from EUT.

5.8 Test Conditions and Results – VOLTAGE DIPS AND INTERRUPTIONS

Test Description	The product was subjected to voltage dips and interruptions. Testing was performed with the product connected directly to a generator capable of simulating the voltage drops and interrupts as described
Basic Standard	IEC/EN 61000-4-11
UL LPG	87-EM-S0029
	Measurement Point
Fully configured subjected to the levels indicated below.	Input a.c. Power Ports

Applied Levels						**Performance Criteria**
%Ut	%Reduction	Duration (s)	Period (Cycles)		Sync Angle (Degrees)	
			50Hz	60Hz		
0	100%	0.02	1	-	0	C
40%	60%	0.2	10	12	0	C
70%	30%	0.5	25	30	0	C
0%	100%	5	250	300	0	C
Supplementary information: 0 degrees is the crossover point of the voltage waveform.						

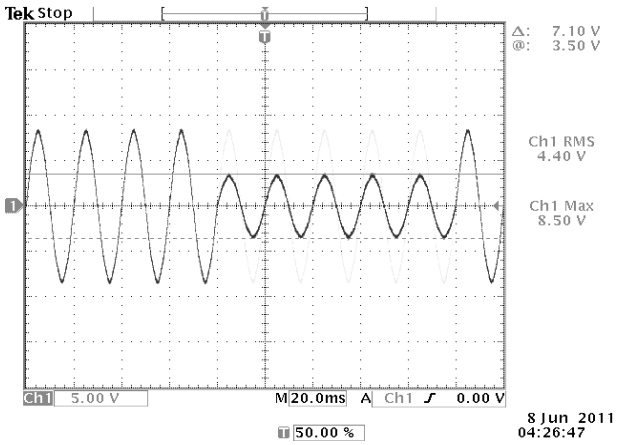
Table 30 VDS EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1
Supplementary information: None		

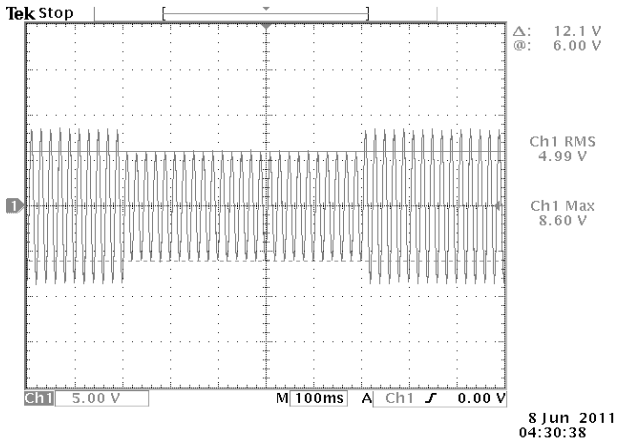
Table 31 VDS Test Equipment

Test Equipment Used			
Description	Manufacturer	Model	Identifier
VDS Generator	Haefley	PLINE 1610	ME5A-118
Oscilloscope	Agilent	545610B	ME5A-850
Measurement Software	Haefley	Version 1.41	44745
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734
Multimeter	Fluke	87V	64386

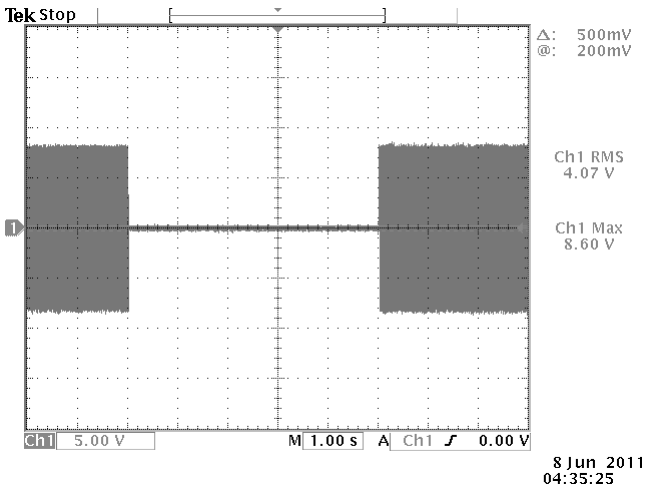
Figure 22 T Voltage Dips and Interruptions Waveform Verifications



60% Dip (40% Amplitude Remaining)



30% Dip (70% Amplitude Remaining)



100% Interruption (0% Amplitude Remaining)

Figure 23 Test Setup for Voltage Dips and Interruptions

Table 32 Results for Voltage Dips and Interruptions –

Voltage Dips and Short Interruptions @ 50Hz					
Point of application	%Ut	%Reduction	Duration (s)	Period (Cycles)	Results
Mains	70%	30%	0.5	25	1
Mains	40%	60%	0.2	10	1
Mains	0%	100%	0.02	1	1
Mains	0%	100%	5	250	1a

Voltage Dips and Short Interruptions @ 60Hz					
Point of application	%Ut	%Reduction	Duration (s)	Period (Cycles)	Results
Mains	40%	60%	0.2	12	1
Mains	70%	30%	0.5	30	1
Mains	0%	100%	5	300	1a

Results Descriptions:

X - Not Performed.
1 – Compliant - No observed response from EUT.
1a– Lost communication at COM2 and Ethernet. Unit needed reboot to recover compliant with criteria.

Appendix A

Accreditations and Authorizations

NVLAP Lab code: 100255-0

NVLAP: The National Institute of Standards and Technology (NIST) administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP is comprised of laboratory accreditation programs (LAPs) which are established on the basis of requests and demonstrated need. Each LAP includes specific calibration and/or test standards and related methods and protocols assembled to satisfy the unique needs for accreditation in a field of testing or calibration. NVLAP accredits public and private laboratories based on evaluation of their technical qualifications and competence to carry out specific calibrations or tests. Accreditation criteria are established in accordance with the U.S. Code of Federal Regulations (CFR, Title 15, Part 285), NVLAP Procedures and General Requirements, and encompass the requirements of ISO/IEC 17025. For a full scope listing see http://ts.nist.gov/ts/htdocs/210/214/scopes/1002550.htm

FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91040).

Industry Canada Industrie Canada

Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: IC 2181

VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: (Radiated Emissions) R-797, (Conducted Emissions) C-832, C-83400, and C-81879 and (Conducted Emissions - Telecommunications Ports) T-1582 and T-1583.

ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).

NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 2004/108/EC, Annex III (2-3). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.
NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).
NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6

Compliance Certificate

Company Name and Location: ***BITRONICS***
261 BRODHEAD RD BETHLEHEM, PA 18017

File Number: ***MC16183*** ***Date of Report:*** **2012-12-27**

Product Description: **Measurement Transducer and Event Monitor (IED)**

Investigated in accordance with EN61000-6-4:A1:2010 (2011) EN61000-6-2(2005), **EN61326-1*(2006)***
EN60255-25: (2001), EN60255-26 (2009).

Model Designation: **M87x with new H12 Host module** ***Serial Number:*** **895101**

Job Number: **1001540401**

Project Number: **12ME06094**

A sample of the product described above has been investigated by Underwriters Laboratories Inc. in accordance with the requirements indicated above and has been found in compliance with those requirements as shown in the Test Report Ref. No. 1001540401which forms part of this Certificate. It is the responsibility of the company shown above that the products it produces are in compliance with the applicable requirements.

The name of Underwriters Laboratories (UL), any abbreviation thereof, or any symbol shall not be used on or in connection with the product unless and until specifically authorized by UL.

Tested by: *Reviewed by:*

UL EMC INTERNATIONAL SERVICES

Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories (UL) or any authorized licensee of UL.