H.B. Compliance Solutions

Un-Intentional Radiator Test Report

For the

PI Engineering Inc.

X-Keys XK-16

Tested under

The FCC Rules contained in Title 47 of the CFR, Part 15 Subpart B

For Class B Digital Device

March 01, 2012

Prepared for:

PI Engineering Inc.

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Prepared By:

H.B. Compliance Solutions

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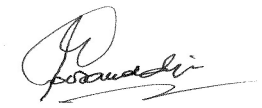
Reviewed By:



Hoosamuddin Bandukwala

Cert # ATL-0062-E

Engineering Statement: The measurements shown in this report were made in accordance with the procedure indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

Report Status Sheet

Revision #	Report Date	Reason for Revision
Ø	March 01, 2012	Initial Issue

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EXECUTIVE SUMMARY

1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15. All tests were conducted using measurement procedure from ANSI ANSI C.63.4 2003 as appropriate.

Test Name	Test Method/Standard	Result	Comments
Conducted Emissions	15.107	N/A	USB Powered device
Radiated Emissions	15.109	Pass	Emissions within applicable limits

EQUIPMENT CONFIGURATION

1. Overview

H.B Compliance Solutions was contracted by PI Engineering to perform testing on the X-Keys XK-16 under the purchase order number 012312PVE.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the PI Engineering, X-Keys Model # XK-16.

The tests were based on FCC Part 15 Subpart B Rules. The tests described in this document were formal tests as described with the objective of the testing was to evaluate compliance of the Equipment Under Test (EUT) to the requirements of the aforementioned specifications. PI Engineering should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been permanently discontinued. The results obtained relate only to the item(s) tested.

Product Name:	X-Keys
Model(s) Tested:	XK-0981-UCK16
Supply Voltage Input:	Primary Power : 5Vdc
Test Item:	Pre-Production
Enviromental Test Conditions:	Temperature: 15-35°C Humidity: 30-60% Barometric Pressure: 860-1060 mbar
Modification to the EUT:	None
Evaluated By:	Staff at Emerson Network
Test Date(s):	02/07/12 till 02/23/12

2. Test Facility

Radiated Emission testing was performed at Emerson Network Power. This facility is located at 2900 S. Diablo Way, Suite 190, Tempe, AZ 85282. All equipment used in making physical determination is accurate and bears recent traceability to the National Institute of Standards and Technology.

Test facility at Emerson Network power is an A2LA accredited test site. The A2LA certificate number is 2716.01. The scope of accreditation covers the FCC Method - 47 CFR Part 15, ICES-003, CISPR 22, AS/NZS 3548 and VCCI.

Conducted Emission testing was performed at H.B. Compliance Solutions. This facility is located at 254 W. Baseline Road, Suite # 103, Tempe AZ-85283.

Radiated Emissions measurements were performed in a semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at Emerson Network Power.

3. Description of Test Sample

The PI Engineering, X-Keys, is a USB keyboard which has been designed to offer extra programmable keys. It runs off USB power port of a computer which is 5Vdc.

4. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number
# 1	X-Keys XK-16 Stick	XK-0981-UCK16	N/A

Table 1. Equipment Configuration

5. Support Equipment

All support equipment supplied is listed in the following Support Equipment List.

Ref ID	Name / Description	Manufacturer	Model #	Serial #
2	Laptop Computer	Dell	D620	RF621A02

Table 2. Support Equipment

6. Ports and Cabling Information

Ref ID	Port name on the EUT	Cable Description	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
#3	USB	USB	1	2	N	Laptop

Table 3. Ports and Cabling Information

7. Method of Monitoring EUT Operation

LED's on the front of the device was monitored for any errors. Also one of the keys was pressed on the device to produce a constant character on the screen of a laptop which was observed throughout the testing test.

8. Mode of Operation

The EUT will be configured in its normal operating mode.

9. Modifications

9.1 Modifications to EUT

Modifications were made to the EUT to meet Radiated Emissions requirements. 0.01uF by pass capacitor was placed near the U1 power pins on the Printed Circuit Board.

9.2 Modifications to Test Standard

No Modifications were made to the test standard.

10. Disposition of EUT

The test sample including all support equipment submitted to H.B Compliance Solutions for testing will be returned to PI Engineering upon completion of testing & certification

Criteria for Un-Intentional Radiators

1. Conducted Emissions

Test Requirement(s):	§15.107	**Test Engineer(s):**	None
Test Results:	None	**Test Date(s):**	None

Test Procedures: The EUT was placed on a non-metallic table, 80cm above the ground plane inside a shielded enclosure. The EUT was powered through a 50Ω/50µH LISN. The conducted emissions tests were performed using the mode of operation and configuration noted within this report. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are the same as those cords normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network). All 50 Ohm measuring ports of the LISN are terminated by 50 Ohms, either by the 50 Ohm EMI receiver or a 50 Ohm resistive load.

Refer to the Emissions Tests Calculations section in the Radiated Emissions section for sample calculations. For the purposes of the conducted emissions test, the Antenna Factor (AF) is replaced by the LISN correction factor.

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.150 - 30	9.0	9.0	9.0
Measurements were made using the bandwidths and detectors specified. No video filter was used.			

Table 1.Conducted Emissions – Measurement Bandwidth

Frequency Range (MHz)	15.107(b), Class A Limits (dBuV)		15.107(a), Class B Limits (dBuV)	
	Quasi-Peak	Average	Quasi Peak	Average
0.15 – 0.5	79	66	66 - 56	56 - 46
0.5 – 5.0	73	60	56	46
5.0 – 30	73	60	60	50
Note 1 – The lower limit shall apply at the transition frequencies.				

Table 2. Conducted Emissions Limits – FCC Limits from Section 15.107(a)(b)

2. Radiated Emissions

Test Requirement(s):	§15.109	**Test Engineer(s):**	Frank Farrone
Test Results:	Pass	**Test Date(s):**	02/23/12

Test Procedures:

The final radiated emissions test was performed using the parameters described above as worst case. That final test was conducted at a facility that meets the ANSI C63.4 NSA requirements. The frequency range noted in the data sheets was scanned/tested at that facility. Emissions were maximized as specified, by varying table azimuth, antenna height, and manipulating cables.

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level will be detected. This requires the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search is utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT.

> *Note: The specified distance is the horizontal separation between the closest periphery of the EUT and the center of the axis of the elements of the receiving antenna. However, if the receiving antenna is a log-periodic array, the specified distance shall be the distance between the closest periphery of the EUT and the front-to-back center of the array of elements.*

Tests were made with the antenna positioned in both the horizontal and vertical polarization planes. The measurement was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance shall be 3 meters. At any measurement distance, the antenna height was varied from 1 meter to 4 meters. These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the antenna clears the ground surface by at least 25 cm.

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
30 MHz to 1 GHz	120 kHz	120 kHz	N/A
1 GHz to 11 GHz	1MHz	N/A	1MHz
Measurements were made using the bandwidths and detectors specified. The video filter was at least as wide as the IF bandwidth of the measuring receiver.			

Table 3. Radiated Emissions – Measurement Bandwidth

Emissions Tests Calculations

In the case of indoor measurements, radiated emissions measurements are made by the manipulation of correction factors using Rohde and Schwarz ES-K1 software. This is done automatically by the software during the final measurement process.

In both cases, the level of the Field Strength of the interfering signal is calculated by adding the Antenna Factor, Cable Factor and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + (CF –AG)

Where: FS = Field Strength

RA = Receiver (indicated) Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

This laboratory uses an approach of combining the CF and AG using an end-to-end measurement of the entire cabling system, including the test cable, any in-line amplifiers, attenuators, or transient protection networks, all measured in-situ.

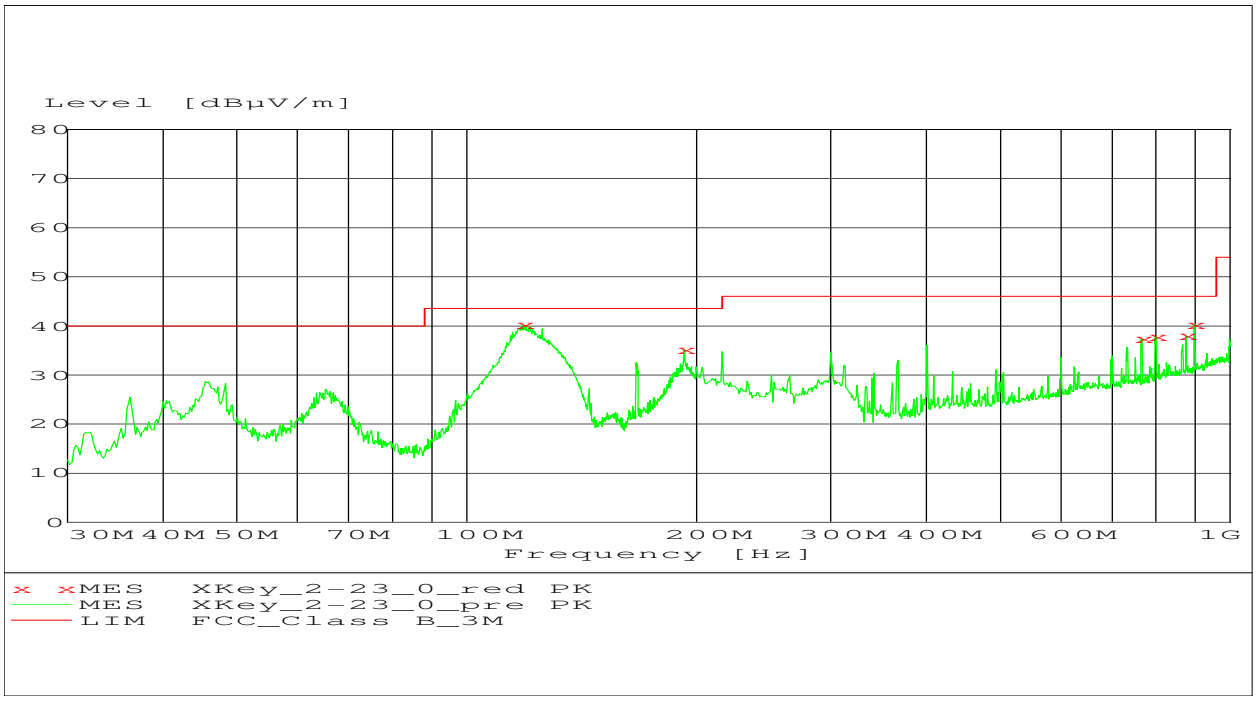
For a sample calculation, assume a receiver reading of 52.5 dBuV is obtained. With an antenna factor of 7.4 and a combined cable factor (CF + AG) of -27.9:

FS = 52.5 + 7.4 + (-27.9) = 32 dBuV/m

FS = 32 dBuV/m

If desired, this can be converted into its corresponding level in uV/m:

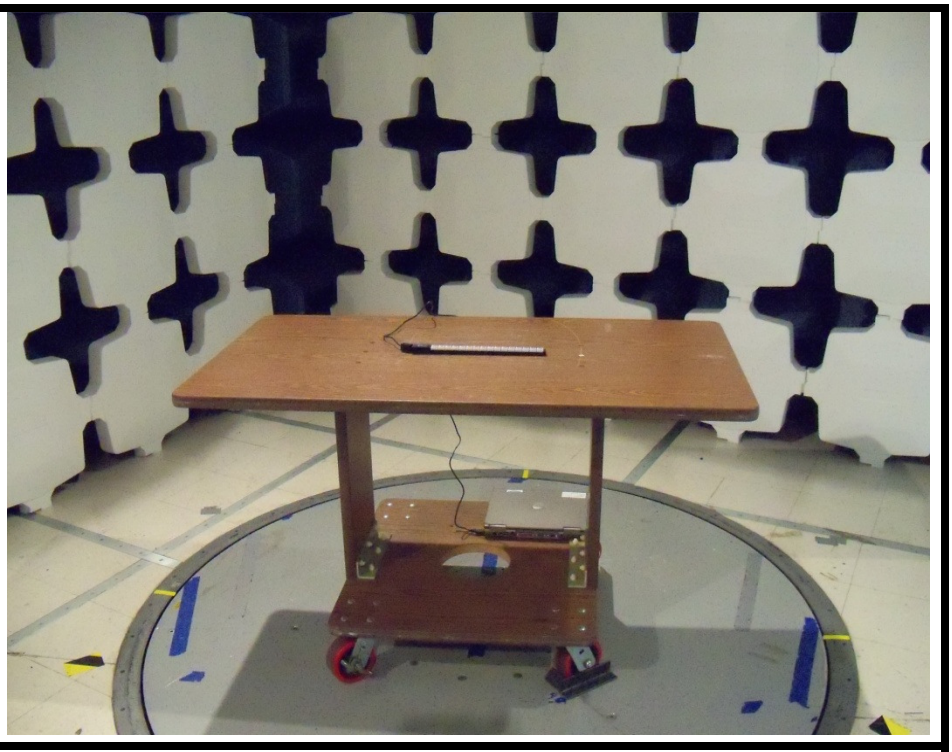
FS = 10^((32 dBuV/m)/20) = 39.8 uV/m



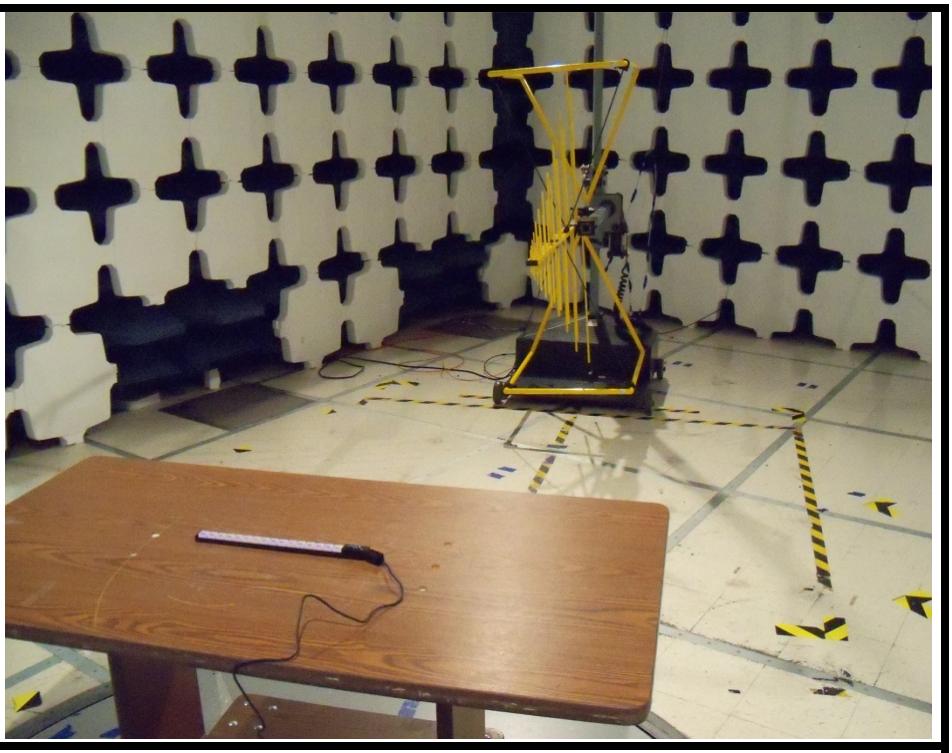
Plot 3 – Radiated Emissions – 30MHz to 1GHz

Frequency (MHz)	Measured Level	Height (cm)	Azimuth (deg)	Polarization
118.58	40.25	300	135	Horizontal
192.63	35.20	100	135	Vertical
765.33	37.44	100	135	Horizontal
800.00	37.77	100	135	Horizontal
875.55	38.01	200	315	Vertical
896.88	40.38	100	135	Horizontal

Table 4. Final Measurement Results for Radiated Emissions



Test Setup Photo 1 – Radiated Emissions



Test Setup Photo 2 – Radiated Emissions

3. Test Equipment

Equipment	Manufacturer	Model	Serial #	Last Cal Date	Cal Due Date
Spectrum Analyzer	Hewlett Packard	8595EM	3801A00177	09/19/11	09/19/12
EMI Receiver	R & S	ESCS-30	828985/007	08/20/11	08/20/12
Bilog Antenna	Chase	CBL6140	1040	10/28/11	10/28/12
LISN	Laplace Instruments	LISN 1600	152946	09/13/11	09/13/12

Table 8 – Test Equipment List

15.105(b) Information to the User

(For Class B equipment only)

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location **in the text of the manual**:

NOTE: This equipment has been tested and found to comply with the limits of Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

The applicant has been cautioned as to the following:

15.27(a) Special Accessories.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

47 CFR 15.19 Labeling requirements.

(b) Products subject to authorization under a Declaration of Conformity shall be labeled as follows:

(1) The label shall be located in a conspicuous location on the device and shall contain the unique identification described in §2.1074 of this chapter and the following logo:

(i) If the product is authorized based on testing of the product or system; or

Trade Name Model Number

Tested To Comply

With FCC Standards

FOR HOME OR OFFICE USE

(ii) If a personal computer is authorized based on assembly using separately authorized components, in accordance with §15.101(c)(2) or (c)(3) and the resulting product is not separately tested:

Trade Name Model Number

Assembled From

Tested Components

(Complete system not tested)

FOR HOME OR OFFICE USE

(2) Label text and information should be in a size of type large enough to be readily legible, consistent with the dimensions of the equipment and the label. However, the type size for the text is not required to be larger than eight point.

(3) When the device is so small to for such use that it is not practicable to place the statement specified under paragraph (b)(1) of this section on it, such as for CPU board or plug-in circuit board peripheral device, the text associated with the logo may be placed in a prominent location in the instruction manual or pamphlet supplied to the user. However, the unique identification (trade name and model number) and the logo must be displayed on the device.

(4) The Label shall not be a stick-on, paper label. The label shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase, as described in §2.2925(d) of this chapter. "Permanently affixed" means that the label is etched, engraved, stamped, silk-screened, indelibly printed, or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic, or other material fastened to the equipment by welding, riveting, or permanent adhesive. The label must be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable.

END OF TEST REPORT